ANITS
PRAGNANAM BRAHMA

Anil Neerukonda Institute of Technology & Sciences (Autonomous)
(Affiliated to AU, Approved by AICTE & Accredited by NBA & NAAC with 'A' Grade)
Sangivalasa-531 162, Bheemunipatnam Mandal, Visakhapatnam District
Phone: 08933-225083/84/87 Fax: 226395
Website: www.anits.edu.in email: principal@anits.edu.in

DVV 1.1.3: **Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the institution during 2016-17**

Content	PROGRAMME	Page No
Syllabus copy of the courses highlighting the focus on employability/ entrepreneurship/ skill development.		
Year 4 (2016-2017)	Chemical Engineering	**1-79**
	Civil Engineering	**80-144**
	Computer Science Engineering	**145-211**
	Information Technology	**212-38**
	Electronics and Communication Engineering	**309-416**
	Electrical and Electronics Engineering	**417-484**
	Mechanical Engineering	**485-608**
	M.Tech (Control Systems)	**609-627**
	M.Tech (Bio-Technology)	**628-670**
	M.Tech (Machine Design)	**671-717**
	M.Tech (Communication Systems)	**718-751**
	M.Tech (Computer Science & Technology)	**752-778**

ENGLISH

(Common for all branches)

CHE 111 **Credits:3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks: 60

Course Objectives:

- To improve the language proficiency of the students in English with emphasis on Reading and Writing skills.
- To enable the students to study engineering subjects with greater comprehension & cognizance.
- To strengthen the vocabulary of the students.
- To enable the students to write grammatically correct structures with logical flow.
- To equip the students with the knowledge of different formats of business communication.

Course Outcomes:

By the end of the course, the student will be able to:

1. Analyze the structure of the phrases, clauses and sentences
2. Apply his enriched vocabulary to give better shape to his communication skills.
3. Effectively use different formats of business correspondence.
4. Use idiomatic expressions and foreign phrases in his communication.
5. Analyse, interpret and compose meaningful texts.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**				1						3	2			
	2				1						3	2	1	1	1
	3										3	2		1	1
	4										3				
	5				1						3	1	1	1	1

SYLLABUS

UNIT I 10 Periods

Vocabulary **:** One Word Substitutes

Grammar **:** Noun : Noun Phrase, Gerunds

Writing Skills :

1) Formal Letter writing – format, style of letter writing and types of letters — complaint, enquiry, requesting quotations, invitation, regret and acceptance.

2) Story Building-Developing a story from the key words, giving a title and describing learning outcomes.

UNIT II 10 Periods

Vocabulary : Foreign phrases or expressions

Grammar : Adjectives : Quantifiers, qualifiers, determiners, nouns as adjectives, verbs as adjectives, adjective phrases

Writing Skills:

1. Technical Report writing – Formal reports and types: Informational reports, Analytical reports and Recommendation reports— Status, feasibility, progress, incident and project.
2. Essay writing.

UNIT III 10 Periods

Vocabulary : Idiomatic expressions- meaning and usage.

Grammar : Articles (concept and function; definite, indefinite and omission of articles)

Writing Skills :

1. Preparation of C.V. and Resume-format, style purpose and objective.
2. Précis- writing technique with suitable title.

UNIT IV 9 Periods

Vocabulary : Phrasal Verbs derived from the following dynamic verbs: Go, Get, Run, Take, Look, Put, Hold, Stand etc.

Grammar : Prepositions or prepositional phrases

Writing Skills :

1. Reading comprehension – questions based on facts, interpretation, logical deduction, vocabulary.
2. E-mail etiquette- format, style and language

UNIT V 9 Periods

Vocabulary : Synonyms and Antonyms (From the text book only)

Grammar : Pronouns: Kinds of pronouns, relative pronouns – who and whom, whose, which verbs – aspects, moods, tenses, direct and indirect speech (active and passive voice), concord, Infinites and verb participles, verb phrase, conditionals – probable, improbable, impossible, If-clause, correction of sentences

TEXT BOOK:

Life through language, Pearson Publication, Delhi

REFERENCE BOOKS:

1.G.J.K. Gangal, *A Practical Course for Developing Writing Skill in English,* PHI

2. Mark Lester and Larry Beason, *Handbook of English Grammar &Usage,* Tata McGraw Hill.

3. S.M.Gupta, *Current English Grammar And Usage,* PHI

4. Dr. P. Prasad, Rajendra K Sharma, *The Functional Aspects of Communication Skills,* Katson Books

5. Abul Hashem, *Common errors in English,* Ramesh Publishing House

6. M. Ashraf Rizvi, *Effective Technical Communication*, Tata Mc-Graw Hill

7. Edgar Thorpe & Showick Thorpe, *Objective English,* Pearson

ENGINERING DRAWING

(Common for all branches)

CHE 114 **Credits :3**

Instruction : 1 Theory& 3 Practical Periods/week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

- To increase ability to communicate with people and learn to sketch and take field dimensions.
- To make the student familiar to the drawing practices and convection
- To familiarize the student about various engineering curves used in industry
- To enable the student draft simple engineering components and analyze different views of components.
- To introduce basic Auto CAD skills.

Course Outcomes:

By the end of the course, student will be able to:

1. Draw various engineering curves and understand the basic geometrical constructions.
2. Prepare orthographic projections of points and lines
3. Produce orthographic projections of plane surfaces
4. Draw orthographic projections of solids in various orientations.
5. Prepare isometric projections and understand basics of Computer Aided Drafting.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	1	2	2						2		1	1	1
	2	2	1	2	2						2		1	1	1
	3	2	1	2	2						2		1	1	1
	4	2	1	2	2						2		1	1	1
	5	2	1	2	2	1					2		1	1	1

SYLLABUS

UNIT – I

Introduction to Engineering Drawing & basics of geometrical construction. Construction of conic sections, Construction of cycloidal curves (cycloid, epicycloid, and hypocycloid), involutes (over circles and polygon) & Archimedian spiral.

Skill development

UNIT –II

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes)

Skill development/
Employability

UNIT – III

Projections of planes – perpendicular planes – oblique planes

UNIT – IV

Projection of solids – Prisms – Cylinder– Pyramids &Cones

UNIT – V

Isometric projections – Plane solids, Combination of solids Demonstration & Practice: Computer aided drafting of lines, planes solids and Dimensioning.

Skill development/
Employability

TEXT BOOK:

1. N. D. Bhatt, *Engineering Drawing*, Charotar Publishing House Pvt. Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. K. L. Narayana & P. Kanniah, *Engineering Drawing*
2. R. B. Choudary, *Engineering Graphics* with Auto CAD
3. Trymbaka Murty, *Computer Aided Engineering Drawing*

PROGRAMMING WITH C LAB

(Common for all branches)

CHE 117 **Credits:3**

Practicals/week :3 Periods & 1 Tut/Week Sessional Marks :50

End-Exam:3Hrs End-Exam. Marks :50

Course objective:

To enable students to

- Understand the program development steps using compilers.
- Strengthen the problem solving skills using programming techniques.
- Design programs using various control structures.
- Develop programs using structures, unions and files.

Course outcomes:

By the end of the course, student will be able to:	
1.	Gain a working knowledge on programming.
2.	Learn and use the fundamentals of a programming language (such as language-defined data types (int, float, char, double), control constructs (sequence, selection, repetition), program modules (including functions, modules, methods)).
3.	Exhibit the ability to formulate a program that correctly implements the algorithm.
4.	Demonstrate the effective use the programming environment used in the course.

SYLLABUS:

1. Overview
2. Introduction to Unix
3. Data Types, Constants
4. Operators, Expressions
5. Control Structures
6. Arrays & Strings
7. Pointers
8. Functions.
9. Structures & Unions
10. Files

REFERENCE BOOKS:

1.YashwantKanetkar*Let Us C* 5th Edition.

2.V.Rajaraman*Fundamentals of Computers* 4th Edition, PHI 2005.

3.Programming Techniques through C, M.G. V. Murthy, Pearson Education, 2002

4.KRVenugopal, SR Prasad *Mastering C* Tata McGraw Hill.

5.B.W. Kernighan, Dennis M. Ritchie *The C – Programming Language* PHI

WORKSHOP

(Common for all branches)

CHE118 **Credits : 2**

Practical / week :3 Sessional Marks : 50

End Exam : 3Hrs End Exam Marks : 50

Course Objectives :

- To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, house wiring and tin smithy.

Course Outcomes:

By the end of the course, student will be able to:

1. Make different carpentry joints.
2. Make simple fitting jobs.
3. Make simple jobs like funnel, elbow etc. using sheet metal.
4. Understand and build circuits for different types of applications like stair case wiring, series and parallel connections.

CO – PO – PSO Matrix:

		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1			1						1	1			1	1
	2			1						1	1			1	1
	3			1						1	1			1	1
	4			1						1	1			1	1

LIST OF EXPERIMENTS

Minimum of three exercises has to be conducted from each trade.

Trade:

Carpentry
1. Cross Lap Joint
2. Dovetail Joint
3. Mortise and Tennon Joint
4. Briddle Joint

Fitting
1. V Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy

1. Taper Tray
2. Square Box without lid
3. Elbow
4. Funnel

PHYSICAL CHEMISTRY

(Only for Chemical Engineering)

CHE 124 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

- To understand about the concept of chemical equilibrium and its importance industrial process
- To get an idea about the thermodynamic functions, laws and its applications
- To know about mobility of ions in dilute solutions and its significance in instrumental methods (conductivity meter)
- To inculcate the concept of order and molecularity of various reactions
- To give an idea about phase diagrams of various heterogeneous equilibria

Course Outcomes:

By the end of the course, the student will be able to:

1 Apply the principles of laws of thermodynamics in various Industrial Processes and Designing.

2 Develop suitable conditions in reaction equilibria of various Chemical Processes.

3 Identify the changes in heterogeneous systems and understand the role of various physical quantities useful in Chemical Engineering Industry.

4 Adopt suitable catalytic mechanisms to determine kinetic parameters applicable in Chemical Reaction & Bioprocess Engineering

5 Predict the nature of substances and their behaviour by applying advanced electrochemical laws.

6 Implement the various principles for solving the challenges in the field of Chemical Engineering.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	1	1					1			1	1	1
	2	3	1	1	1					1			1	1	1
	3	3	1	1	1					1			1	1	1
	4	3	2	2	1					1			1	1	1
	5	3		2						1			1	1	1
	6	3	1	1	1					1			1	1	1

SYLLABUS

UNIT I 12periods

Thermodynamics and Thermo chemistry: First law-Internal Energy, Work and Heat changes, Enthalpy, reversible isothermal expansion of ideal gas, maximum work. Heat capacities at constant pressure and volume, adiabatic expansion of an ideal gas.Heat of Reaction- heat of Formation, Heat of Combustion, Thermo-chemical Laws, effect of temperature on Heat of Reaction.Second law of Thermodynamics, spontaneous processes, Entropy and physical significance of entropy, Entropy change for an ideal gas.Entropy change accompanying phase change, Gibb's Free Energy and applications.

UNITII 8 periods

Chemical Equilibrium: Reversible reactions, Law of Mass action, Homogeneous equilibria in gaseous and liquid systems and simple example of Heterogeneous equilibria,Le-Chatlier principle- applications, Effect of temperature on equilibrium-VantHoff's equation.

UNITIII 10 periods

Liquid state-vapour pressure, effect of temperature, determination of vapour pressure (static and dynamic method) – surface tension, determination by capillary rise method- viscosity, determination (Ostwald's method)

Phase rule: Definition-explanation of terms-Derivation of phases Rule-One component systems (water system)-Two component systems (Ag-Pb& KI-H_2O), Eutectic mixture-its significance.

UNITIV 10 Periods

Chemical Kinetics and Catalysis: Rate of Reaction- Order &Molecularity, determination of order, first order reaction –illustrations, derivation of rate equation Second order reaction – illustrations, derivation of rate equation, pseudo first order and second order reactions-illustrations,Half life period,numerical problems, Catalysis- Types-Homogeneous-Heterogeneous-Enzyme Catalysis-Mechanisms.

UNIT-V 10Periods

Electrochemistry: Electrolytes-Types-Conductance-Specific, Equivalent, Molar conductance – Conductmetric Titrations **,** measurement of electrical conductivity and numerical problems ,variation of conductance with temperature, Migration of ions , relative speed of ions, Hittrof's rule-transport number, Determination-Hittrof method, Kohlarsauch's law and applications.

TEXT BOOK:

1. ArunBhal, B.S.Bhal and G.D.Thuli, *Essentials of Physical chemistry*, S.Chand and company ltd.

REFERENCE BOOKS:

1. Peter Atkins & Julio de Paula, *Physical Chemistry*, 7th edition, oxford university press
2. B.R.Puri and L.R.Sharma, *Principles of physical chemistry*, 44th edition vishal publishing company, New Delhi.

LANGUAGE LAB

(Common for all branches)

CHE127	**Credits : 2**
Practical / week : 3	Sessional Marks : 50
End Exam : 3Hrs	End Exam Marks : 50

Course Objectives:

- To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning.
- To improve the fluency in spoken English and neutralize mother tongue influence
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.

Course Outcomes:

By the end of the course, student will be able to:

1. Handle CBT (Computer Based Tests) of the qualifying examinations.
2. Receive, interpret, remember and evaluate information by practicing effective listening skills.
3. Speak English with neutralized accent.
4. Narrate, describe and report incidents and situations using appropriate terminology.

CO – PO – PSO Matrix:

		PO												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**										1		1		
	2		1	1	1						3		1	1	1
	3										3		1		
	4				2						3			1	1

SYLLABUS

I CALL (Computer Aided Language Learning)

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Short and long Reading comprehension exercises (listening skills)
4. Telephoning Skills.

II CSL (Communication Skills Lab)

5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7 Video talks
8. Situational Dialogues / Role Play.
9. Oral Presentations- Prepared and Extempore.

Suggested Software

Cambridge Advanced Learners' English Dictionary with CD.

English Phonetics and Phonology – 2 CDs set

English Mastery – Alania ABC

Telephoning English

Cambridge Grammar of English (Ronald Carter and Michael McCarthy) CD

English Grammar in Use -Cambridge University Press

Communication Skills – Oxford U P (Sanjay Kumar and PushpaLatha)

REFERENCE BOOKS:

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems)

1. *Spoken English (CIEFL)* in 3 volumes with 6 cassettes, OUP.
2. Daniel Jones, *English Pronouncing Dictionary*, Current Edition with CD.
3. R. K. Bansaland, J.B. Harrison, *Spoken English*-Orient Longman 2006 Ed.
4. Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, *English Language Communication : A Reader cum Lab Manual*, Anuradha Publications, Chennai
5. Krishna Mohan & NP Singh, *Speaking English Effectively* (Macmillan)
6. J. Sethi, KamleshSadanand & D.V. Jindal, *A Practical Course in English Pronunciation, (with two Audio cassettes)* Prentice-Hall of India Pvt. Ltd., New Delhi.
7. T. Balasubramanian, *A text book of English Phonetics for Indian Students* (Macmillan).
8. *English Skills for Technical Students*, WBSCTE with British Council, OL
9. J.K. Gangal, *A Practical Course in Effective English Speaking Skills*, PHI.

ENGINEERING MATHEMATICS-III

(Common for Chemical, Mechanical, EEE and ECE)

CHE 211 **Credits: 3**
Instruction: 3 periods & 1 tutorial / week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course outcomes:

At the end of the course student will be able to:

1. Understand the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrotational vector fields.
2. Understand the concepts of Green's, Stoke's, Divergence theorems and evaluate their related integrals like line, surface, flux.
3. Understand some basic techniques for solving partial differential equations.
4. Apply the knowledge of partial differential equations to various engineering problems.
5. Understand the characteristics, properties of Fourier transforms and gain knowledge in the application of Fourier Transforms.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	2	2								1	1	1
	2	3	1	2	2								1	1	1
	3	3	1	1	1								1	2	2
	4	3	1	2	2								1	2	2
	5	3	1	1	1								1	1	1

UNIT I: VECTOR DIFFERENTIATION **9L + 3T**

Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT II: VECTOR INTEGRATION **9L + 3T**

Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT III: PARTIAL DIFFERENTIAL EQUATIONS **9L + 3T**

Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT IV: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9L + 3T**

Introduction – Method of separation of variables – Vibrations of a stretched string-Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNITV: FOURIER TRANSFORMS **9L + 3T**

Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 43rd ed., Khanna Publishers,New Dehli.

Reference books:

1. N.P. Bali etal, "A Text book on Engineering Mathematics", 8th ed., Laxmi pub.(p)Ltd., 2011.
2. H.K.Dass , "Advanced. Engineering Mathematics", 1st ed., S. Chand, 2008.
3. Erwin kreyszig , "Advanced Engineering Mathematics", 10th ed., wiley publishers.
4. Dr.M.K. Venkataraman, "Higher Engineering Mathematics", National Pub.Co.,Madras.

ORGANIC CHEMISTRY

CHE212 **Credits: 3**

Instruction: 3 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To impart knowledge on the basic concepts of organic chemistry.
2. To know the importance of stereo chemical approach of organic reactions.
3. To create basic idea on the mechanism of organic reactions involving reaction intermediates.
4. To understand the industrial preparation methods of certain organic compounds and their synthetic applications.
5. To create awareness on various applications of chemical reagents and biological activity of few organic compounds.

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the basics of reaction intermediates and polar effects.
2. Design organic molecules in stereo chemical models.
3. Arrive at an idea on mechanism of addition and condensation reactions.
4. Meet the need to understand the industrial preparation of organic compounds at various conditions.
5. Develop further organic applications using synthetic reagents and understand the biological activity of few organic compounds.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1										1	1	1
	2	3		2									1	1	1
	3	3	1	1	1								1	1	1
	4	3	1	1									1	1	1
	5	3	1	1									1	1	1

UNIT I **9L +3T**

FUNDAMENTALS OF ORGANIC CHEMISTRY:

Introduction to organic functional groups- IUPAC nomenclature and Isomerism.Organic reactions – Types-addition, elimination, substitution, rearrangement, polymerization-examples.Types of reagents- electrophile, nucleophile. Reaction intermediates &hybridisation-carbocation, carbanion, free-radical, examples. Polar effects – Inductive effect, mesomeric effect, electromeric effect and Hyper conjugation with examples; Acidic nature of carboxylic acid and phenol; basic nature of Amines.

UNIT II **9L +3T**

STEREOCHEMISTRY OF ORGANIC COMPOUNDS:

Stereosisomerism- definition-types. Representation of compounds – saw horse projection, newmann projection, fisher-projection, wedge formula- examples.Conformational isomerism- examples of ethane, n-butane, cyclohexane & potential energy diagrams.Axial & equatorial bonds in cyclohexane- Examples of 1,2& 1,3 interactions in substituted cyclohexanes.Geometrical isomerism- Cis-trans & E-Z isomerism-sequence rules and examples.R & S configuration- sequence rules-examples.Optical activity- chirality.Enantiomers, diastereomers, mesomers, racemic mixture.Racemisation, Resolution of racemic mixture.

UNIT III **9L +3T**

CHEMISTRY OF ALCOHOLS, PHENOLS & CARBONYL COMPOUNDS:

Industrial Preparations of Ethyl alcohol(molasses), Differences between alcohols- oxidation, Lucas Test, catalytic dehydrogenation, victor-meyer test. Chemical reactions of phenols- Fries rearrangement, Kolbes reaction ,Reimar-tiemann reaction.Reactivity of carbonyl compounds. Chemical reactions-Cannizaro, Aldol, Reformatsky and Wittig reactions, Perkin, Cope, Knoevenagel and Pinacol-Pinacolone reactions, Differences between Aldehyde and Ketone.

UNIT IV **9L +3T**

CHEMISTRY OF CARBOXYLIC ACIDS& DERIVATIVES & AMINES:

Industrial Preparations of Acidic acid, chemical reactions- Hell-Volhard-Zelinsky reaction, Wolf rearrangement.Functional derivatives of carboxylic acids- esters (acid &base catalyzed hydrolysis of Ester, Claisen condensation), amides, (Hoffmann Bromamide reaction) and acid halides (Rosenmunds reduction).Aniline preparation, differences between amines and chemical reactions - Hoffmann elimination, Hinsberg test, mustard oil test, carbyl amine reaction.Benzene Diazonium salts and Synthetic applications-coupling reactions, Schiemann reaction, Gatterman reaction, Sandmayer reaction.

UNIT V **9L +3T**

HETEROCYCLIC COMPOUNDS & SYNTHETIC APPLICATIONS OF SOME ORGANIC REAGENTS:

Aromaticity, Preparation, Properties and uses of –Five membered heterocyclic compounds- Pyrrole, Furan, Thiophene, Indole.Six membered heterocyclic compounds- Pyridine, Quinoline.Elementary idea on mode of action of sulpha drugs (Sulphanilamide, Sulphapyridene).Chemical nature and Synthetic applications of $LiAlH_4$and OsO_4.

Text Books:

1. ArunBahl and B.S.Bahl, “Text Book of Organic Chemistry”, 21st ed., S.Chand, 2012.
2. Morrison & Boyd, “Text Book of Organic Chemistry”, 7th ed. Pearson, 2008.

Reference Books:

1. Jerry March, “Organic chemistry”, 6th ed., Wiley ind. (P).Ltd., 2012
2. I.L.Finar, “Text Book of Organic Chemistry” 7th ed., Vol.1&2, Pearson, 2011.

MECHANICAL ENGINEERINGANDSTRENGTH OF MATERIALS

CHE 213 **Credits: 3**

Instruction: 3 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To provide knowledge on thermodynamic laws and their applications.
2. To impartknowledge on boilers and use of steam tables.
3. To provide knowledge on various types of IC engines.
4. To impart knowledge on stress and strain concepts.
5. To provide knowledge on stress relations in various types of shells.

Course Outcomes:

By the end of the course, student will be able to

1. Understand the application of thermodynamic laws.
2. Identify the use of boilers in industries.
3. Classify IC engines and their applications.
4. Evaluate stress-strain analysis
5. Understand the design of thin and thick cylinders.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	1	1								1	1	1
	2	3	1												
	3	3	1												
	4	3	1	1									1	1	1
	5	3	1	1									1	1	1

Part A: Mechanical Engineering

UNIT I: Thermodynamics **9L +3T**

Definitions, systems, classification of thermodynamic systems, cycle, and zeroth law of thermodynamics, first law of thermodynamics, Second law of thermodynamics, Carnot cycle, inequality of Classius-reversible Carnot cycle, entropy, general expression for entropy change, entropy change of a perfect gas during various thermodynamic processes, air standard cycles, Otto, diesel, dual combustion cycles.

UNIT II: Boilers **9L +3T**

Properties of steam and use of steam tables,Boilers, classification steam boilers, simple vertical, Cocheran locomotive boiler, Babcock and Wilcox boiler, steam generation, Rankine cycle.

UNITIII: IC engines **9L +3T**

Classification-main composition of IC engines, carburetter, fuel pump injector, cooling systems for IC engines, working of 2-stroke and v4- stroke petrol and diesel engines, power and efficiency of IC engines.

Part B: Strength of Materials

UNIT IV: Simple stress and strains **9L +3T**

Hook's law, stress strain curve for mild steel, stress in compound assemblies, thermal stresses, Poisson ratio, relation between elastic modulus, Principal stresses and principal planes, maximum shear stress and its plane.

UNITV: Thin and Thick Cylinders **9L +3T**

Stress in thin cylindrical shells and spherical shells, stress in thick cylinders, compound cylinders, pressure due to shrink-fitting.

Text books:

1. P.K.Nag, "Engineering Thermodynamics",5th ed., McGraw Hill education, 2013.
2. V. Ganeshan, "Internal Combution Engines", 4th ed., McGraw Hill education,2012.
3. Ramamrutaham, "Strength of Materials", 18th ed., Dhanpati Publishing Company (P) Ltd., 2014.

Reference books:

1. J.B.Jones and R.E.Dugar, "Engineering Thermodynamics", 1st ed., PHI Learning, 2009.
2. R.K.Rajput, "A Text Book of Engineering Thermodynamics", 4th ed. Laxmi Publications, 2007.
3. E. Popov, "Mechanics of solids" Prentice Hall, 1998.

CHEMICAL PROCESS CALCULATIONS

CHE 215 **Credits: 4**

Instruction: 4 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To master fundamentals of stoichiometry and gas laws.
2. To familiarize and to apply material and energy balance for various chemical operations and processes
3. Utilize the knowledge of subject for better understanding of core subjects

Course Outcomes:

By the end of the course, student will be able to

1. Understand and solve basic stoichiometry calculations.
2. Evaluate composition of gases at various temperatures and pressures.
3. Apply material balance on various unit operation and processes.
4. Apply energy balance on various unit operation and processes.
5. Implement the concepts of humidity to humidification and dehumidification processes.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1		1	1							1	2	2
	2	3	1		1			1					1	2	2
	3	3	2	2	1			1					1	2	3
	4	3	2	2	1			1					1	2	3
	5	3	1	1	1								1	2	3

UNIT I **12L +3T**

Stoichiometry and composition relationships:

The gram-mole and pound-mole, limiting reactant, excess reactant, degree of completion, basis of calculation, weight percent, volume percent and mole percent, density and specific gravity-Baume and API gravity scales.

UNIT II **12L +3T**

Behavior of ideal gases:

Application of the ideal-gas law, Dalton and Amagat laws to gaseous mixtures, composition of gases on dry basis and on wet basis.

UNIT III **12L +3T**

Material Balances: Tie substance, yield, conversion, and processes involving chemical reactions, material balance- calculations involving drying, dissolution, and crystallization, processes involving recycle, bypass and purge.

Employability

UNIT IV **12L +3T**

Energy Balances:

Effect of temperature on vapor pressure, Antoine equation, vapor pressure plots, vapor pressure of immiscible liquids, ideal solutions and Raoult's law, non-volatile solutes.

Heat capacities of gases and gaseous mixtures- effect of temperature on heat capacity of gas, Kopp's rule, latent heatsof fusion and vaporization, Trouton's rule, Kistyakowsky equation for non-polar liquids.

Standard heat of reaction - Laws of thermochemistry,Standard heat of formation, standard heat of combustion, standard heat of reaction and their calculations,effect of temperature on heat of reaction, adiabatic and non-adiabatic reactions, theoretical and actual flame temperatures.

UNIT V **12L +3T**

Humidity:

Percentage saturation, relative saturation or relative humidity, dew point, vaporization, condensation, wet and dry bulb temperatures, adiabatic vaporization and adiabatic saturation temperature.

Text books:

1. David M. Himmelblau,"Basic principles and Calculations in Chemical Engineering", 6th ed., Prentice Hall of India Pvt Ltd, 1995.

Reference books:

1. Olaf A Hougen, K.M. Watson and R.A.Ragatz, "Chemical Process Principles, Part-I - Material and Energy balances"2nd ed., CBS Publishers and Distributors,1995.
2. K.V. Narayanan and B. Lakshmikutty, "Stoichiometry and Process Calculations", 5th ed., Prentice Hall of India Pvt Ltd , 2006.
3. B.I. Bhatt and S.M. Vora, "Stoichiometry", 3rd ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 1996.

ORGANIC CHEMISTRY LABORATORY

CHE216 **Credits: 2**

Practical/week:3 Sessional Marks: 50

End Exam: 3 Hours End Exam Marks:50

Course Objectives:

1. To improve skills in synthesizing organic compounds using various chemical techniques.
2. To enable the students to analyze the functional group in the organic compound through qualitative analysis.

Course Outcomes:

At the end of the course, the student will be able to:

1. Synthesize and analyze the properties and nature of the organic compound.
2. Use different types of solvents and reagents in analyzing the functional group of the organic compound.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	2	2	2					1	3		1	1	1
	2	3	2	2	2					1	3		1	1	1

LIST OF EXPERIMENTS:

CYCLE-1

One step synthesis or Microwave assisted synthesis of organic compounds and determination of melting point:

1. Phthalimide
2. Nerolin
3. Benzanilide
4. Aspirin
5. m-dinitrobenzene
6. Methyl Orange

CYCLE-2

Qualitative analysis for the identification of functional group in the organic compound:

1. Demonstration of Qualitative analysis
2. Analysis of Compound -1
3. Analysis of Compound -2
4. Analysis of Compound -3
5. Analysis of Compound -4
6. Analysis of Compound -5
7. Analysis of Compound -6

Text book:

1. Organic Chemistry Lab Manual prepared by Department of Chemistry.

Reference book:

1. Vogel's textbook of Practical Organic Chemistry, 5th edition, Pearson education.

ENGINEERING MATHEMATICS-IV

(Common for Chemical and Mechanical)

CHE 221 **Credits: 3**

Instruction: 3 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes: At the end of the course student will be able to:

1. Understand, interpret and use the basic concepts: analytic function, harmonic function, Taylor and Laurent series, singularity.
2. Familiarize the concepts of Finite Differencesinterpolation techniques.
3. Familiarize the concept and solving of differentiation and integration by numerical methods.
4. Examine, analyze, and compare Probability distributions.
5. Analyze the Statistical data by using statistical tests and to draw valid inferences about the population parameters.

CO – PO – PSO Matrix:

		PO												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	1	1								1	1	1
	2	3	1	2	2								1	2	2
	3	3	1	2	2								1	2	2
	4	3	1	2	2							1	1	2	2
	5	3	1	2	2							1	1	2	2

UNITI: FUNCTIONS OF A COMPLEX VARIABLE **9L + 3T**

Introduction –Limit of a Complex function- Derivative of $f(z)$ – Analytic functions- Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms(Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function .

UNIT II: FINITE DIFFERENCES & INTERPOLATION 9L + 3T

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNITIII: NUMERICAL DIFFERENTIATION AND INTEGRATION 9L + 3T

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule, Simpson's Three-Eighth rule.

UNIT IV: PROBABILITY AND DISTRIBUTIONS 9L + 3T

Introduction – Basic Terminology – Probability and set notations – Addition Law of Probability – Independent events – Baye's Theorem – Random variable – Discrete Probability Distribution – Continuous Probability Distribution – Binomial Distribution - Poisson distribution - Normal Distribution. (Mean , Variance , Standard Deviation and their properties without proofs).

UNIT V: SAMPLING THEORY 9L + 3T

Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.

Text Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 43rd ed., Khanna Publishers, New Dehli.

Reference books:

1. N.P. Bali et al, "A Text book on Engineering Mathematics", 8th ed., Laxmi pub.(p) Ltd., 2011.
2. H.K.Dass , "Advanced. Engineering Mathematics", 1st ed., S. Chand, 2008.
3. Erwin kreyszig , "Advanced Engineering Mathematics", 10th ed., wiley publishers.
4. Dr.M.K. Venkataraman, "Higher Engineering Mathematics", National Pub.Co., Madras.

MOMENTUM TRANSFER

CHE 222 **Credits: 4**

Instruction: 4 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To provide an understanding of fluid mechanics and its scope in the chemical industry.
2. To impart fundamental concepts in fluid mechanics with the knowledge of applying basic quantitative laws and the equations of fluid flow.
3. To provide the basic knowledge on compressible fluids, pressure drop, friction factor, Reynolds number and their relations in flow systems.
4. To provide an understanding about flow past immersed bodies and fluidization.
5. To acquaint knowledge on fluid moving machinery and flow measuring devices.

Course Outcomes:

After studying this subject, student will be able to

1. Understand the fluid statics and apply dimensional analysis
2. Apply quantitative laws to fluid flow problems.
3. Analyze the velocity distributions, frictional flow patterns in pipes.
4. Determine the pressure drop, velocities in packed and fluidized bed columns.
5. Analyze the performance aspects of pumps and flow metering devices.

CO – PO – PSO Matrix:

		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2		1					1	1		1	2	3
	2	3	2	3	1					1	1		1	2	3
	3	3	2	2	1					1	1		1	2	3
	4	3	2	2	1					1	1		1	2	3
	5	3	2	2	2					1	1		1	2	3

UNIT I **12L + 3T**

Basic concepts: Unit systems, units and dimensions, dimensional analysis – Rayleigh's method, Buckingham π theorem, equations of state, similarity.

Fluid statics: Nature of fluids, hydrostatic pressure, pressure distribution in a static fluid, pressure measuring devices.

UNIT II **12L + 3T**

Fluid flow phenomenon: Types of fluids, concept of stream lines, stream tubes, viscosity, rheological properties of fluids, turbulence, flow in boundary layers, its formation and growth in tubes and on plates, boundary layer separation.

Basic equations of fluid flow: Mass balance, steady state energy balance, equation of motion, momentum balance and Bernoulli's equation with the correction factors.

UNIT III **12L + 3T**

Flow of incompressible fluids: Relation between skin friction - wall shear, laminar flow in pipes, Hagen-Poiseuille equation, turbulent flow in pipes, velocity distribution equation, friction factor, friction from changes in velocity or direction.

Flow of compressible fluids: Basic equations, Mach number, flow through variable area conduits, adiabatic and isothermal frictional flow.

UNIT IV **12L + 3T**

Flow past immersed bodies: Flow through beds of solids, motion of particles through fluids, terminal velocity, fluidization, mechanism of fluidization, pressure drop in fluidization, applications of fluidization.

UNIT V **12L + 3T**

Transportation and metering of fluids: Pipes, fittings, valves, positive displacement and centrifugal pumps, fans, blowers and compressors, jet ejectors.

Flow measuring devices: venture meter, orifice meter, pitot tube, rotameter, notches and weirs.

Employability

Textbooks:

1. Warren L.McCabe and Julian C.Smith, "Unit Operations of Chemical Engineering", 7th ed., McGraw Hill, 2005.
2. R. K. Bansal, " A Text Book of Fluid Mechanics and Hydraulic Machines", 8th ed., Laxmi publisher, 2008. (for topics Unit systems, units and dimensions, dimensional analysis,notches and weirs)

Reference Books:

1. De Nevers N., "Fluid mechanics for chemical engineers", 3rd ed., McGraw Hill.
2. J.M.Coulson, J.F.Richardson, "Chemical engineering", 5th ed., Vol –I & II,,Elseveir,1999.
3. Cengel and Cimbala, "Fundamentals of fluid mechanics", 3rd ed.,McGraw Hill Education,2014.
4. R. K. Rajput, " A Text Book of Fluid Mechanics and Hydraulic Machines", 3rd ed., S. Chand, 2002.

MECHANICAL OPERATIONS

CHE 223 **Credits: 4**

Instruction: 4 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To familiarize with characteristics of solids, size reduction aspects, working of various size reduction equipment and its operations.
2. To know about the different screening techniques and screening equipments and other separation methods.
3. To understand the principles of filtration and the working of different filtration and centrifugation equipments.
4. To understand the principles of settling of solids in fluids and sedimentation.
5. To understand the concept of agitation and mixing of liquids.

Course Outcomes:

After studying this subject, student wii be able to

1. Identify the size reduction equipment for various samples.
2. Apply the screening techniques for different size separations.
3. Understand and apply the filtration techniques.
4. Predict the different settling regimes.
5. Classify various agitators and conveyors.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	1	2					1	1		1	2	3
	2	2	1	1	1					1	1		1	2	3
	3	2	1	1	1					1	1		1	2	3
	4	2	1	1	1					1	1		1	2	3
	5	2	1	1	1					1	1		1	2	3

UNIT I **12L + 3T**

Characteristics of solid particles: shape, size, differential and cumulative screen analyses, specific surface area, particle population, different mean diameters for a mixture of particles.**Principles of comminution:** Laws of crushing, description and working of size reduction equipment - jaw, gyratory and roll crushers, hammer mills, revolving mills, attrition mills, fluid energy mill, cutting machines, equipment operations, open and closed circuit grinding, wet and dry grinding, Grindability Index.

UNIT II **12L + 3T**

Miscellaneous separations: screening, industrial screens - grizzly, gyratory and vibratory screens, revolving screens - trommels, capacity and effectiveness of screens, magnetic separation, electrostatic separation, froth flotation.

UNIT III **12L + 3T**

Filtration: description and working of filtration equipment, plate and frame filter press, shell and leaf filters, rotary drum filter, filter aid, centrifugal filtration, top suspended batch centrifuge, theory of filtration, washing of cakes.

UNIT IV **12L + 3T**

Motion of particles through fluids: drag, free and hindered settling, settling velocities, classification, sink and float methods, differential setting methods - jigging and tabling, cyclone separators, batch sedimentation,thickeners, flocculation, centrifugal sedimentation, gravity and centrifugal decanters.

Employability

UNIT V **12L + 3T**

Agitation of liquids: power consumption in agitated vessels, mixing equipment for mixing of solids and pastes, mixers for dry powders, mixing index.

Conveying: types of conveyors – mechanical, belt, chain and screw conveyors, elevators, pneumatic conveyors, size enlargement.

Text books:

1. W.L. McCabe, J.C. Smith and P.Harriot, “Unit Operations of Chemical Engineering”, 4^{th} ed., McGraw- Hill.
2. J.H.Coulson and J.F.Richardson, “Chemical Engineering -Vol.2” 5^{th} ed., Elsevier Science, 2002 (for topics of trommels, magnetic separator, electrostatic separator and froth flotation).

Reference books:

1. R.H.Perry,“Chemical Engineer’s Hand Book”,8^{th} ed., McGraw-Hill Book Co., 2007.
2. Brown et al., “Unit Operations”, 1^{st} ed., CBS Publisher,2005.
3. Badger and Banchero, “Introduction to Chemical Engineering”, 1^{st} ed.,McGraw-Hill, 2002.(forconveying topic).

PROCESS INSTRUMENTATION

CHE 224 **Credits: 4**

Instruction: 4 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To familiarize with characteristics of instruments and their response, types of layouts for the process instrumentation.
2. To know about the principles of expansion thermometer and thermoelectric temperature measurement.
3. To know about the principles of resistance and radiation thermometers.
4. To know the concept of composition analysis by various methods.
5. To know the measurement of pressure, vacuum, head and level, the principles and equipment used

Course Outcomes:

After studying this subject, student will be able to

1. Identify the characteristics of various instruments and the instrumentation process.
2. Recognize the relevant from expansion and thermoelectric thermometers.
3. Understand the working and use of various resistance and radiation pyrometers.
4. Apply the various techniques for composition analysis.
5. Interpret the pressure, head and level measuring devices.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3			1					1	1		1	1	1
	2	2			1					1	1		1	1	1
	3	2			1					1	1		1	1	1
	4	2			1					1	1		1	2	3
	5	2			1					1	1		1	1	1

UNIT I **12L + 3T**

Qualities of measurement: Measurement, functions and the elements of instruments, static and dynamic characteristics, dynamic response of first order and second order instruments.

Process Instrumentation: Recording instruments, types of charts indicating and signaling instruments, control center, different layouts, diametric control center.

UNIT II **12L+3T**

Expansion thermometers: Temperature scales, constant-volume gas thermometer, pressure spring thermometer, theory of volumetric and pressure thermometers, static accuracy of thermometer and comparison of pressure-spring thermometers.

Thermoelectric temperature measurement: Thermoelectricity, industrial thermocouples, thermocouple lead wires, thermal wells, response of thermocouples, the millivoltmeter, nullpotentiometer circuits.

UNIT III **12L + 3T**

Resistance Thermometers: Thermal coefficient of resistance, industrial resistance thermometer bulbs, resistance thermometer circuits, Wheatstone, Calender-Griffithus, double slide wire bridges, nullbridge resistance thermometers, deflectional resistance thermometers.

Radiation temperature measurement: Introduction, laws of radiation, blackbody conditions and devices, radiation receiving elements, radiation pyrometers, radiation receivers, photoelectric pyrometers and optical pyrometers.

UNIT IV **12L + 3T**

Composition analysis: Spectroscopic analysis, types, IR and UV absorption spectrometry, Beer – Lambert's law, mass spectrometry, gas analysis by thermal conductivity, analysis of moisture in gases (humidity), psychrometer, hygrometer and dew-point methods, pH measurement, gas chromatography, HPLC.

UNIT V **12L + 3T**

Measurement of pressure and vacuum: Pressure, vacuum and head, liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, electric pressure gauges, measurement of absolute pressure, measurement of pressure in corrosive fluids.

Employability

Measurement of Head and Level: Density and specific gravity, direct measurement of liquid level, pressure(level) measurement in open vessels, level measurement in pressure vessels, density measurement.

Text books:

1. Donald P.Eckman, "Industrial Instrumentation", Wiley Eastern Ltd., 2004.
2. R. Chatwal& Sham K. Ananad, "Instrumental methods of analysis", Gurudeep Himalaya publishing house (for topics of gas chromatography and HPLC).

Reference Books:

1. Principles of Industrial Instruments, Patrenabis, Tata McGraw Hill Inc,.

CHEMICAL ENGINEERING THERMODYNAMICS-I

CHE 225 **Credits: 4**

Instruction: 4 periods & 1 tutorial / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

1. To provide knowledge on first law of thermodynamics and its importance.
2. To impart the relation between Pressure, Volume and Temperature.
3. To provide the relation between various heat effects and their temperature dependence.
4. To provide knowledge on second law of thermodynamics and its importance.
5. To impart knowledge on different balance equations and their usage.

Course Outcomes:

By the end of the course, student will be able to

1. Apply first law of thermodynamics to various systems.
2. Predict the PVT behavior using Virial equations.
3. Calculate heat effects on industrial reactions.
4. Apply second law of thermodynamics to various systems.
5. Develop balance equations on various equipments.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	2	1	1					1	1		1	2	3
	2	3	2	2	2					1	1		1	2	3
	3	3	2	2	2					1	1		1	2	3
	4	3	2	1	1					1	1		1	2	3
	5	3	2	1	1					1	1		1	2	3

UNIT I **12L + 3T**

The first law and other basic concepts: Joule's experiments, internal energy, the first law of thermodynamics, thermodynamic state and path functions, enthalpy, steady-flow process, equilibrium, the phase rule, the reversible process, constant-V and constant-P processes, heat capacity.

UNIT II **12L + 3T**

Volumetric properties of pure fluids: PVT behavior of pure substances, virial equations, the ideal gas, application of the virial equations, cubic equations of state, generalized correlations for gases, generalized correlations for liquids, molecular theory of fluids, second virial coefficients from potential functions.

UNIT III **12L + 3T**

Heat effects: Sensible heat effects, internal energy of ideal gases, microscopic view, latent heats of pure substances, standard heat of reaction, standard of heat of formation, standard heat of combustion, temperature dependence of heat effects of industrial reactions.

UNIT IV **12L + 3T**

The Second Law of Thermodynamics: Statement of the second law, heat engines, thermodynamic temperature scales, thermodynamic temperature and ideal-gas scale, entropy, entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics, entropy from the microscopic view point, Ideal work, lost work, Thermodynamic analysis of steady state flow process.

UNIT V **12L + 3T**

Thermodynamic Properties of Fluids: Property relations for homogeneous phases, residual properties, two-phase systems, thermodynamic diagrams, generalized property correlations for gases, Thermodynamics of flow processes, Equations of balance, duct flow of compressible fluids, turbines (expanders), compression processes.

Employability

Text Books:

1. J.M.Smith, H.C.Van Ness and M.M. Abbott, "Introduction to Chemical Engineering Thermodynamics" 6thed., McGraw-Hill International Editions, 2000.

Reference Books:

1. Y.V.C.Rao, "Chemical Engineering Thermodynamics", University Press (India) Ltd., Hyderabad, 1997.
2. B.F.Dodge , "Chemical Engineering Thermodynamics", McGraw-Hill Book Co.,
3. Michael M. Abbott and HendrickC.VanNess, "Schaum Outline of Theory and Problems of Thermodynamics'", 3rd ed., McGraw-Hill education, 2013.
4. K.V. Narayanan, "A Text book of Chemical Engineering Thermodynamics", PHI publications, 2009.

MOMENTUM TRANSFER LABORATORY

CHE226 **Credits: 2**

Practical/week: 3 Sessional Marks: 50

End Exam: 3 Hours End Exam Marks:50

Course Objectives:

1. To improve skills in measuring the flow rates.
2. To enable the students to familiarize with the different pumps.

Course Outcomes:

At the end of the course, the student will be able to:

1. Measure the flow rate by using different flow measuring devices.
2. Draw the characteristic curves of various pumps.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	3	3	3					3	2		1	2	3
	2	2	3	3	3					3	2		1	2	3

List of Experiments:

1. Identification of laminar and turbulent flows (Reynolds apparatus).
2. Measurement of point velocities (Pitot tube).
3. Verification of Bernoulli equation.
4. Calibration of rotameter.
5. Determination of orifice coefficient.
6. Determination of venturi coefficient.
7. Friction losses in fluid flow in pipes.
8. Pressure drop in a packed bed for different fluid velocities.
9. Pressure drop and void fraction in a fluidized bed.
10. To study the coefficient of contraction for a given open orifice.
11. To study the coefficient of discharge in a V – notch.
12. To study the characteristics of a centrifugal pump.

Skill development

Text Book:

1. Warren L.McCabe and Julian C.Smith, “Unit Operations of Chemical Engineering”, 7th ed., McGraw Hill, 2005.

Reference Book:

1. Cengel and Cimbala, “Fundamentals of fluid mechanics”, 3rd ed., McGraw Hill Education, 2014.

MECHANICAL OPERATIONS LABORATORY

CHE 227 **Credits: 2**

Practical/week: 3 Sessional Marks: 50

End Exam: 3 Hours End Exam Marks:50

Course Objectives:

1. To understandingthe measuring of the average size of the given sample.
2. To enable the students to familiarize with the different crushing and grinding units and the concepts of equipment operation.
3. To understand the various separation techniques like screening, froth floatation and sedimentation.

Course Outcomes:
At the end of the course, the student will be able to:

1. Measure the average size of a given sample.
2. Operate crushing and grinding equipment.
3. Analyze various separation techniques for a given sample.

CO – PO – PSO Matrix:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	3	3	3					3	2		1	2	3
	2	2	3	3	3					3	2		1	2	3
	3	2	3	3	3					3	2		1	2	3

List of Experiments:

1. To take a representative sample from a bulk by two methods, viz. Riffle and cone & quartering and to find out the average size (volume-surface mean diameter) of the samples.
2. To determine the time of grinding in a ball mill for producing a product with 80% passing a given screen.
3. To verify the laws of crushing using any size reduction equipment like jaw crusher, crushing rolls or ball mill and to find out the work Index {WI} of the material.
4. To compare open circuit and closed circuit grinding by means of a ball mill.

5. To determine the optimum time of sieving for a given sample of material.
6. To find the effectiveness of hand screening of a given sample by a given screen.
7. To find the screen effectiveness of a trommel.
8. To separate a mixture of coal into two fractions using sink and float method.
9. To separate a mixture of coal into two fractions using froth flotation technique.
10. To find the size analysis of a given fine sample using beaker decantation method.
11. To obtain batch sedimentation data and to calculate the minimum thickener area under given conditions.
12. To determine the collection efficiency of a cyclone separator.
13. To determine the settling velocities of various particle sizes and densities.

Skill development

Text Book:

1. Warren L.McCabe and Julian C.Smith, “Unit Operations of Chemical Engineering”, 7th ed., McGraw Hill, 2005.

Reference Book:

1. Brown et al., “Unit Operations”, 1st ed., CBS Publisher, 2005.

ChE-311 Chemical Engineering Thermodynamics-I

The first law and other basic concepts: Joule's experiments, internal energy, the first law of thermodynamics, thermodynamic state and state functions, enthalpy, the steady-state, steady-flow process, equilibrium, the phase rule, the reversible process, constant-V and constant-P processes, heat capacity.

Volumetric properties of pure fluids: PVT behavior of pure substances, virial equations, the ideal gas, application of the virial equations, cubic equations of state, generalized correlations for gases, generalized correlations for liquids, molecular theory of fluids, second virial coefficients from potential functions.

Heat effects: Sensible heat effects, internal energy of ideal gases, microscopic view, latent heats of pure substances, standard heat of reaction, standard of heat of formation, standard heat of combustion, temperature dependence of heat effects of industrial reactions.

The Second law of thermodynamics: Statement of the second law, heat engines, thermodynamic temperature scales, thermodynamic temperature and ideal-gas scale, entropy, entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics, entropy from the microscopic view point.

Thermodynamic properties of fluids: Property relations for homogeneous phases, residual properties, two-phase systems, thermodynamic diagrams, generalized property correlations for gases.

Employability

Thermodynamics of flow processes: Equations of balance, duct flow of compressible fluids, turbines (expanders), compression processes.

Refrigeration and liquefaction: - The Carnot refrigerator, the vapor compression cycle-comparison of refrigeration cycles, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction processes.

Textbook:

1. `Introduction to Chemical Engineering Thermodynamics' by J.M.Smith, H.C.Van Ness and M.M.Abbott, 6th Edition, McGraw-Hill International Editions, 2000.

Reference Books:

1. `Chemical Engineering Thermodynamics' by B.F.Dodge, McGraw-Hill Book Co.,
2. `Schaum Outline of Theory and Problems of Thermodynamics' by Michael M. Abbott and Hendrick C.VanNess, McGraw-Hill International Book Co., Singapore, 1981.

CHE-312 Mass Transfer-I

Introduction: Mass transfer Operations.

Molecular diffusion in fluids: Binary solutions, Fick's law, equation of continuity, Steady state equimolal counter current diffusion, Stefan's diffusion, estimation of diffusivity of gases and liquids, application of molecular diffusion.

Mass transfer coefficients: Mass transfer coefficients in turbulent flow, theories of mass transfer, analogy between momentum, heat and mass transfer in laminar and turbulent flow, correlations for mass transfer coefficients in simple situations, diffusion in solids.

Interphase mass transfer: Concept of equilibrium, diffusion between phases, two resistance theory, material balances in steady state co-current and counter-current stage processes, Murphy stage efficiency.

Equipment for gas-liquid operations: Sparged vessels, mechanically agitated vessels for single phase liquids and gas-liquid mixtures, tray towers, sieve tray for absorption and distillation, venturi scrubbers, spray towers and spray chambers, packed towers for absorption and distillation, tray towers versus packed towers.

Employability

Humidification operations: Definition of fundamental terms, Psychrometric charts, theory of adiabatic saturation and wet bulb temperature, Lewis relation, gas-liquid contact operations, water cooling with air, dehumidification of air-water-vapor mixture, cooling towers, evaporative cooling.

Absorption: Solubility's of gases in liquids, two component systems, multi-component systems, ideal and non-ideal solutions, choice of solvent for absorption, single component absorption material balances, counter current multistage operations, dilute gas mixtures, on-isothermal operation, tray efficiency, continuous contact equipment, HETP, HTU, NTU concepts for single operation absorption with chemical reaction.

Distillation: Principles of VLE for binary systems, phase diagrams, relative volatility, ideal solutions, azeotropes, enthalpy concentration diagrams, flash vaporization, partial condensation, differential distillation, steam distillation, continuous distillation, McCabe-Thiele method, Ponchon-Savarit method, tray efficiencies, introduction to multi-component distillation, azeotropic and extractive distillations.

Employability

Text book:

1. Mass transfer Operations, Robert E. Treybal, 3rd edition, McGraw-Hill Book Co.,

Reference books:

1."Unit Operations in Chemical Engineering" by McCabe,W.L.,Smith,J.C.and Harriot,P., 5th Edition, McGraw-Hill Book Co.,
2. "Chemical Engineering Hand Book" by J.H. Perry.

ChE-313 Heat Transfer
(Effective from the admitted Batch of 2011-12)

Nature of heat flow: Conduction, convection, natural and forced convection, radiation.

Heat transfer by conduction : Basic laws of conduction, thermal conductivity; Steady-state conduction – compound resistances in series, heat flow through a cylinder; Unsteady-state conduction – one dimensional heat flow with constant surface temperature, het flow with variable surface temperature, semi-infinite solid;

Heat transfer by convection: Principles of heat flow in fluids – Typical heat exchange equipment, countercurrent and parallel flows, energy balances, heat flux and heat transfer coefficients, overall heat transfer coefficients, integration over total surface, LMTD, individual heat transfer coefficients.

Heat transfer to fluids without phase change : boundary layers, laminar flow heat transfer, correction for heating and cooling, heat transfer in turbulent flow, estimation of wall temperature, cross-sections other than circular, analogy between transfer of momentum and heat, heat transfer to liquid metals, heating and cooling of fluids outside tubes, natural convection.

Heat transfer to fluids with phase change: heat transfer from condensing vapors, heat transfer to boiling liquids.

Radiation heat transfer: Fundamental facts concerning radiation, emission of radiation, absorption of radiation by opaque solids, radiation between surfaces, radiation to semitransparent materials, combined heat transfer by conduction-convection-radiation.

Heat-exchange equipment: General design of heat exchange equipment, shell and tube heat exchangers, plate-type exchangers, extended surface equipment, heat pipes, scraped-surface exchangers, condensers and vaporizers, heat transfer in agitated vessels, heat transfer in packed beds.

Employability

Evaporation: Evaporation, types of evaporators, performance of tubular evaporators, multiple-effect evaporators, methods of feeding, vapor compression.

Text Book: Unit Operations of Chemical Engineering, 7^{th} Ed. by W. L. McCabe, J. C. Smith and P. Harriot, McGraw Hill International Edition, Singapore (2005).

Reference book: Process Heat Transfer, by D. Q. Kern, Tata McGraw Hill, New Delhi.

ChE-314 Inorganic Chemical Technology

Water: Sources of water, hardness, treatment for different end uses, municipal water conditioning, industrial waste water treatment.

Sulphur and sulphuric acid: Sources of sulphur-sulphuric acid, different processes of manufacturing-contact process, DCDA process for sulphuric acid manufacture.

Nitrogen industries: Manufacture of ammonia, nitric acid, urea and ammonium nitrate.

Phosphorous and phosphoric acid industries: Methods for production of phosphorous and phosphoric acid, manufacture of super phosphate and triple super phosphate.

Chloro-alkali industries: - Manufacture of soda ash, caustic soda and chlorine.

Cement: Types of cement, manufacture of ordinary portland cement [opc], slag cement.

Fuel and industrial gases: Production of water gas, producer gas and coke oven gas, production of acetylene, oxygen and nitrogen.

Employability

Metallurgy: Manufacture of pig iron, cast iron, methods of making steel, open hearth process, production of aluminium by electrolytic process.

Textbooks:

1. "Dryden's Outlines of Chemical Technology" by M.Gopala Rao & Marshall Sitting (Editors). Affiliated East West Press Pvt. Ltd.
2. "Shreve's Chemical Process Industries" by G.T.Austin, McGraw Hill Books

Reference Books:

1. " Encyclopedia of Chemical Technology" by R.E.Kirk & D.F.Othmer (Editors) Interscience.

ChE-315 Process Instrumentation

Qualities of measurement: The elements of instruments, static and dynamic characteristics, dynamic response of first order and second order instruments.

Expansion thermometers: Temperature scales, constant-volume gas thermometer, pressure spring thermometer, theory of volumetric and pressure thermometers, static accuracy of thermometer, comparison of pressure-spring thermometers.

Thermoelectric temperature measurement: Thermoelectricity, industrial thermocouples, thermocouple lead wires, thermal wells, response of thermocouples, the millivoltmeter.

Resistance thermometers: Thermal coefficient of resistance, industrial resistance thermometer bulbs, resistance thermometer circuits, null-bridge resistance thermometers, deflectional resistance thermometers.

Radiation temperature measurement: Introduction, blackbody devices and radiation receiving elements, radiation pyrometers, photoelectric pyrometers and optical pyrometers.

Methods of Composition analysis: Gas analysis by thermal conductivity, analysis of moisture in gases (humidity), psychrometer method, hygrometer method, dew-point method for moisture analysis in gases, measurement of moisture in paper, textile and lumber.

Employability

Measurement of pressure and vacuum: Pressure, vacuum and head, liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, measurement of absolute pressure, measurement of pressure in corrosive fluids, static accuracy of pressure gauges.

Measurement of Head and Level: Density and specific gravity, direct measurement of liquid level, pressure(level) measurement in open vessels, level measurement in pressure vessels, density measurement, level measurement by weighing.

Textbooks:

1. Industrial Instrumentation, Donald P.Eckman.,Wiley Eastern Ltd.,

Reference Books:

1. Hand Book of Instrumentation and control, Considine.

CHE-316 Petrochemicals (Elective-I)

Petrochemical industry-Feedstocks: Petrochemical industry in India, feed stocks for petrochemicals.

Chemicals from ethylene: Vinyl chloride monomer, vinylacetate monomer, ethylene oxide, ethylene glycol, acetaldehyde.

Chemicals from C_3,C_4 and higher carbon atoms: Isopropylalcohol, acrylonitrile, acrylic acid, phenol, bisphenol-A, iso and n-butanol, methyltertbutylether, methacrylic acid, malic anhydride.

Polymers of olefins: Polymer structure, methods of polymerization, high pressure polyethylene (LDPE), low pressure polyethylene (HDPE), polypropylene, polyvinylchloride, polystyrene.

Employability

Petroleum aromatics: Benzoic acid, caprolactum, terephthalic acid, phthalic anhydride,

Synthetic fibres: Production techniques of synthetic fibres, production of polyester, nylon-6,6, nylon-6, acrylic fibers.

Synthetic rubber: Styrene butadiene rubber (SBR), butyl rubber, synthesis of polyurethane.

Plastics: Phenol formaldehyde resins, urea formaldehyde resins, polycarbonates.

Synthetic detergents: Classification of detergents, general manufacture of sulphonates, keryl benzene sulphonate (Surf).

Text book:

1. `A Text on Petrochemicals' by B.K.Bhaskara Rao, 3rd Edition, Khanna Publishers, NewDelhi.

Reference books:

1. `Petrochemical processes', Vol.2, 2nd edition, by A.Chanvel and G. Lefebvre, Gulf publishing company.
2. `Shreve's chemical process industries', 5th edition, by George T. Austin, Mc Graw Hill Publishers

ChE-316 Microbiology (Elective-I)

Introduction to microbiology: Microbiology and origin of life, groups of micro organisms; applied areas and applications of microbiology.

Structure of bacterial cell: Distinguishing features of prokaryotes and eukaryotes, structure and functioning of bacterial cell.

Classification of bacteria: Characterization, classification, general methods of classification, concepts of classification, nomenclature and identification of bacteria.

Cultivation of bacteria: Nutritional requirements, types of bacteriological media, nutritional types of bacteria, physical conditions requirement of bacteria.

Isolation of bacteria: Selective methods of isolation, isolation of pure culture techniques, cultural characteristics, staining techniques, methods of maintenance and preservation of bacteria and culture collections.

Reproduction and growth of bacteria: Reproduction and genetic transformations in bacteria, growth, growth curve, and measurements of bacterial growth.

Microbiology of water and waste water: Municipal water purification, determination of sanitary water quality, water pollution, waste water, chemical and biological characteristics of waste water, waste water treatment processes.

Employability

Text books:

1. `Microbiology' by Michael J. Pelezar Jr., E.C.S. Chan and Noel Kreig
2. `Microbiology' by Ananthnarayan
3. `Microbiology: A text book for university students' by Sharma P.D.

Reference books:

1. `Microbiology' by Carpenter Philip, L.
2. `Microbiology' by Buffaloe Neal, D. and Freguson Dale,V.
3. `Microbiology Fundamentals and Applications' by Purhit, S.S.

ChE-316 MATLAB (Elective-I)

Introduction, Tutorial lessons: MATLAB session, working with arrays of numbers, creating and printing simple data, saving and executing a script file, creating and executing function files, working with files and directories.

Interactive computation - Matrices and vectors, matrix and array operations, creating and using inline functions, using built in functions and online help, saving and loading data, plotting simple graphs.

Script files, function files, language specific features, advanced data objects.

Applications - linear algebra, curve fitting and interpolation, data analysis and statistics, numerical integration, ordinary differential equations, nonlinear algebraic equations.

Basic 2D plots, using subplot to layout multiple graphs. 3-D plots, symbolic Math tool box: two useful tools in symbolic Math tool box, using symbolic Math tool box.

Skill development

Text book:

1. `Getting started with MATLAB: A quick introduction for scientists and engineers' by Rudra Pratap, Oxford University press, 2003

ChE-316 Java (Elective-I)

Fundamentals of object oriented programming, overview of java language, constants, variables and other data types, operators and expressions, decision making and branching, classes, objects and methods, arrays, strings and vectors, managing input/output files in java.

Interfaces, multiple inheritance.

Text Book: `Programming With Java', a Primer 3rd Edition by E.Bala Guruswamy, Tata McGraw-Hill Publishing Company Limited, New Delhi.

ChE-316 FORTRAN (Elective-I)

Fortran programming preliminaries, constants and variables, arithmetic expressions, input-output statements, control statements, the do statements, format specification, functions and subroutines, FORTRAN program examples.

Text Book*:* `Principles of Computer Programming' by V.RajaRaman

ChE-316 Ceramic Raw Materials (Elective-I)

General geology and minerology: Formation of rocks, their characteristics, classification into igneous, sedimentary and metamorphic groups, formation of mineral deposits, physical and mineral characteristics of minerals – composition, color, streak, luster, fracture, cleavage, hardness, density and tenacity, elements of optical mineralogy.

Clays: Clay minerals, clay structure – kaolinite and montmorillonite groups, geology of clay deposits, their classification - china clay, ball clay, fire clay, building clay etc., beneficiation of clays, mica chlorite, illite group, talc, pyrophyllite, wollastonite group, chemical properties, physical properties.

Fluxes: Soda and potash feldspar, other feldspars, nephline syenite, geology of formation, physical and chemical properties, beneficiation.

Silica and silicate materials: Silica, polymorphic modification, silica structure, physical and chemical properties of silica, silicate chemistry, minerals, sillimanite, kyanite, and alusite, availability in India and their uses in ceramic industry.

Other raw materials: Geology of bauxite, magnesite, dolomite, chrome, limestone, rutile, zircon, beryllia minerals, alumina, carbides, nitrides, properties and uses.

Employability

Textbooks:

1. 'Fine Ceramics Technology and Applications' by F.H.Norton, McGraw Hill Publishers, New York,
2. 'Ceramic Raw Materials' by W.E.Worrall, Pergamon press, New York.

Reference books:

1. 'Forming Minerals' by W.A.Deer, R.A. Howie & J.Rock, Longman Publishers, London
2. 'Properties of Ceramic Raw Materials' by W.Ryan, Pergamon press, 2^{nd} Edition
3. 'Clay Mineralogy' by M.J.Wilson, Chapman & Hall.

ChE-317 Mass Transfer Laboratory – I

List of Experiments:

1. Steam distillation
2. Differential distillation
3. Height equivalent to a theoretical plate
4. Vapor-liquid equilibria
5. Determination of liquid diffusion coefficient
6. Determination of vapor diffusion coefficient
7. Surface evaporation
8. Height of a transfer unit

Skill development

ChE-318 Heat Transfer Laboratory

List of Experiments:

1. Determination of total thermal resistance and thermal conductivity of composite wall.
2. Determination of the thermal conductivity of a metal rod.
3. Determination of the natural convective heat transfer coefficient for a vertical tube.
4. Determination of critical heat flux point for pool boiling of water.
5. Determination of forced convective heat transfer coefficient for air flowing through a pipe.
6. Determination of over-all heat transfer coefficient in double pipe heat exchanger.
7. Study of the temperature distribution along the length of a pin fin under natural and forced convection conditions.
8. Estimation of unsteady state film heat transfer coefficient between the medium in which the body is cooled.
9. Determination of Stefan-Boltzmann constant.
10. Determination of emissivity of a given plate at various temperatures.
11. Determination of radiation constant of a given surface.

Skill development

ChE-319 Communication Skills

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Skill development

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, Analysing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. ‘Effective Technical Communications’ by Rizvi M. Ashraf, McGraw–Hill Publication
2. ‘Developing Communication Skills’ by Mohan Krishna & Meera Banerji, Macmillan
3. ‘Creative English for Communication’ by N.Krishnaswami & T.Sriraman, Macmillan
4. ‘Professional Communication Skills’ by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

III/IV B.Tech. (Chemical Engineering) Second semester
(Effective from the admitted batch of 2009-10)

ChE–321 Chemical Engineering Thermodynamics-II

Solution thermodynamics: Theory: Fundamental property relation, chemical potential as a criterion for phase equilibria, partial properties, ideal gas mixtures, fugacity and fugacity coefficient for a pure species, fugacity and fugacity coefficient for species in solution, generalized correlations for the fugacity coefficients, the ideal solution, excess properties, behaviour of excess properties of liquid mixtures,

Solution thermodynamics: Applications: Liquid-phase properties from VLE data, models for the excess Gibbs Energy, property changes of mixing, heat effects of mixing processes,

VLE at low to moderate pressures: The nature of equilibrium, the phase rule, Duhem's theorem, VLE- qualitative behavior, the gamma/phi formulation of VLE, dew point and bubble point calculations, flash calculations, solute (1)/solvent (2) systems,

Thermodynamic properties and VLE from equations of state: Properties of fluids from the virial equations of state, properties of fluids from cubic equations of state, fluid properties from correlations of the Pitzer type, VLE from cubic equations of state,

Topics in phase equilibria: Equilibrium and stability, liquid/liquid equilibrium(LLE), vapor/liquid/liquid equilibrium(VLLE), solid/liquid equilibrium (SLE), solid/vapor equilibrium (SVE),

Chemical reaction equillibria: The reaction coordinate,–application of equilibrium criteria to chemical reactions, the standard Gibbs energy change and the equilibrium constant, effect of temperature on the equilibrium constant, evaluation of equilibrium constants, relation of equilibrium constants to composition, equilibrium conversions for single reactions, phase rule and Duhem's theorem for reacting systems, multi reaction equilibria,

Employability

Thermodynamic analysis of processes: Calculation of ideal work, lost work, thermodynamic analysis of steady-state flow processes.

Text book:

1. `Introduction to Chemical Engineering Thermodynamics' by J.M.Smith, H.C.Van Ness and M.M.Abbott., 6th Edition, Tata McGraw-Hill Edition 2003

Reference book:

1. `Chemical Engineering Thermodynamics' by Y.V.C.Rao, University Press (India) Ltd., Hyderabad 1997

ChE-322

Mass Transfer-II

Liquid-liquid operations: Extraction: Introduction, liquid-liquid equilibria, analytical and graphical solutions for single and multistage operations, continuous counter current operation without and with reflux, fractional extraction, equipment for liquid-liquid contacting operations, single stage, multistage and continuous contacting equipment,

Leaching: Preparation of solid, steady and unsteady state operation, equipment, analytical methods both theoretical and problematic approaches for single and multistage operations,

Adsorption: Theory of adsorption, Industrial adsorbents, adsorption equilibria, Freundlich equation, single and multistage operations, unsteady state adsorption, equipment for single stage and continuous contact, ion-exchange,

Drying: Equilibria, drying rate curve, batch and continuous drying, time of drying and calculations, mechanism of batch drying, equipment's for batch and continuous drying operations,

Employability

Crystallization: Equipment and analytical methods, factors governing nucleation and crystal growth rates, controlled rate of crystals, incorporation of principles into the design of the equipment,

Less conventional operations: Dialysis, thermal diffusion, mass diffusion,

Membrane separation processes: Separation of gases, separation of liquids, dialysis, membranes for liquid extraction, pervaporation, reverse osmosis.

Text book:

1. 'Mass Transfer Operations', by Robert E.Treybal, III Edition, McGraw-Hill Book Co.

Reference books:

1. 'Unit Operations in Chemical Engineering' by McCabe,W.L., Smith, J.C. and Harriot, P., 5th Edition, McGraw-Hill Book Co.

2. 'Chemical Engineering Hand Book' by J.H.Perry

ChE–323

Material Science and Engineering

A brief review on bonding, bond Energy, $H_{crystal,}$? $H_{lattice,}$

Crystal structure: Symmetry, elements of symmetry in cubic crystals-space lattices two and three dimensiona, unit cell, crystal, Bravais lattices, crystal systems with examples, lattice coordinates, Miller and Miller –Bravais indices for directions and planes, linear density of atoms, planar density of atoms-close packed directions and planes, atomic and ionic packing fractions, densities of metals and ionic structures, covalent structures, close packed structures, crystal structure determination,

X-ray diffraction: Powder method, ionic covalent and metallic structures, structure determination of cubic crystals, Ligancy and limiting radii ratio,

Basic thermodynamic functions: Impure phases, solid solutions, alloys, single phase and multi phase alloys, crystal defects, point imperfections, classification, application of configurational entropy to estimate vacancy concentration and other defect concentrations, defect structures, line imperfections, edge and screw dislocations –their nature, Burgers circuit and Burgers vector, dislocation reaction, dislocation motion, multiplication of dislocations during deformation, role of dislocations in determining crystal properties, twining – surface defects, grains and grain boundary, dislocation energy, stress required to move a dislocation, dislocation density,

Elasticity, plasticity, stress, strain: True stress, true strain, Poissons ratio, elastic compliances, strain energy, stress-strain diagrams for ductile and brittle materials, proof stress, yield stress, plastic stress, modulus of elasticity, rigidity, bulk modulus–relationship between the three, plastic deformation, uniform elongation and necking strain hardening, work hardening as strengthening mechanism, plastic deformation by slip-slip systems and planes, critical resolved shear stress (CRSS), cold working, dynamic recovery, re-crystallization, grain growth, grain size and yield stress, Hall-petch equation, single crystal, polycrystalline material, comparison of stress – strain diagrams, anelasticity, elastic after effect, damping, internal friction, energy loss, viscoelasticity, viscoelastic models,

Composite materials: Fibrous, particulate, their properties and Young's modulus of composites when axially and transversely loaded, fraction of the load taken by fiber and matrix,

Fracture, ductile and brittle: Griffth's criterion for brittle failure, ductile brittle transition temperature, creep, mechanisms of creep, creep resistance materials, creep rate and related equations to find creep rates, fatigue-mechanism-factors to increase fatigue resistance,

Transition between states of matter: Energetics of transitioin, structure of solids, nucleation, mechanisms, nucleation rates, homogeneous and heterogeneous nucleation, phase rule, unary, binary phase diagrams, thermal equilibrium diagrams, eutectic, eutectic phase diagrams, Cd-Bi, Pb-Sn, Cu-Ni, Ag-Cu, Fe-C or Fe-Fe_3C-phase transformations, time temperature, transformation curves for eutectoid steels, plain carbon steels, effect of addition of alloying elements on the properties of steels, types of steels used in Chemical industries.

Employability

Text books:

1. `Materials Science & Engineering' by V.Raghavan, Prentice Hall of India Ltd, New Delhi

2. `Elements of Materials Science & Engineering', 5th Edition, Lawrence H.VanVlack, Addision-Weley Publishing Company

Reference books:

1. `Science of Engineering Materials', Vols.1-3, by Manas Chanda, McMillan Company of India, Delhi

2. `Principles of Materials Science & Engineering', William F.Smith, McGraw-Hill Publishing Co.

3. `Essentials of Materials Science' by A.G. Guy.

ChE-324

Organic Chemical Technology

Coal and Coal chemicals: Types of coal, different uses, distillation of coal, treatment of products, low and high temperature carbonization of coal, coal tar distillation,

Petroleum: Origin, classification, composition of crude oil, production of crude oil, distillation of crude petroleum, refining-methods, uses of products,

Extraction of vegetable oils: Purification, acid value, hydrogenation of oils,

Iodine value: Manufacture of fatty acids and soaps, saponification value, detergents-classification and manufacture.

Paints and varnishes: Constituents of paints, functions of paint, manufacturing procedures, Pigments-manufacture of lithophone, varnishes,

Manufacture of pulp: Kraft process and sulphite process, production of paper,

Manufacture of cane sugar: Refining, manufacture of starch, dextrin and dextrose, production of ethanol by fermentation, manufacture of pencillin,

Polymerisation: Different methods, manufacture of polyethylene, phenol formaldehyde, SBR, synthetic fibres, rayon, 6-nylon, 6,6-nylon, polyesters.

Employability

Text books:

1.`Dryden's out lines of chemical Technology' by M.Gopala Rao & Marshall Sitting, Affilated East West Press Pvt.Ltd.

2.`Shreve's Chemical Process Industries' by G.T.Austin, Mcgraw Hill Publishers

Reference book:

1.`Encyclopedia of Chemical Technology' by R.E.Kirk & D.F.Othmer, Inter Science.

CHE – 325 Chemical Reaction Engineering – I
(Effective from the admitted batch of 2011-12)

Introduction and overview of chemical reaction engineering – Variables affecting a chemical reaction – Kinetics of homogeneous reactions – Concentration dependent term of rate equation – Elementary and nonelementary reactions – Temperature dependent term – Arrhenius law, activation energy, collision theory, transition state theory Searching for a mechanism.

Interpretation of batch reactor data – Methods of analysis, integral, differential and half life methods – Analysis of different types of reactions, irreversible and reversible – Variable volume reactor.

Ideal reactors for a single reaction – Performance equations for batch, mixed flow and plug flow reactors – Space time, space velocity and mean residence time.

Design for single reactions – Size comparison of reactors – Multiple reactor systems – Recycle reactor.

Design for parallel reactions – Qualitative and quantitative discussion about product distribution.

Design for series reactions – Qualitative and quantitative discussion about product distribution.

Employability

Textbook:

1. "Chemical Reaction Engineering"., Levenspiel, O. 3rd Edition, John Wiley and Sons.

Reference Books:

1. "Chemical Engineering Kinetics"., Smith, J.M, 3rd Edition. McGraw Hill Inc.
2. "Elements of Chemical Reaction Engineering"., Fogler, H.S, 3rd Edition, Prentice Hall India Ltd.

ChE-326

Polymer Technology (Elective-II)

Introductory concepts and fundamentals: Definitions and concepts of plastics and polymers, comer, co-monomer, mesomer, co-polymer, functionality, visco-elasticity, Classification of polymers, methods of determining molecular weights of polymers-

(i) Methods based on colligative properties
(ii) Sedimentation velocity method
(iii) Sedimentation equilibrium method
(iv) Gel-chromatography method
(v) Light scattering analysis method
(vi) End-group analysis method

Natural polymers- brief study of rubber, shellac, rosin, cellulose, proteins, Lignin's,

Chemistry of polymerization: Elementary concepts of addition polymerization, condensation polymerization and co-polymerization, glass transition temperature of polymers, methods of determining Tg, degradation of polymers due to mechanical, hydrolytic, thermal and backbone effects,
Relation of the mechanical, thermal, electrical, physical and chemical properties with the structure of the polymer,

Methods of polymerization: Mass, solution, emulsion and suspension, role of the initiators, catalysts, inhibitors, solvents, fillers, reinforcing agents, stabilizers, plasticizers, lubricants, blowing agents, coupling agents, flame retardants, photo-degradants and bio-degradable on polymerization,

Methods of manufacture, properties and uses of the following addition products; Polyethylene (LDPE and HDPE) , polypropylene, PVC and its copolymers, Polystyrene and its copolymers, acetals and PTFE (polytetraflouroethylene),

Employability

Methods of manufacture, properties and uses of the following condensation products: (i) Polyesters-PMMA, PET and ALKYO, (ii) PF-, UF- and MF-resins (iii) epoxy resins, polyurethanes and silicones,

Description of the following processing methods: (with the principles involved and equipments used) Mixing and compounding, extrusion, calendaring, laminating, moulding-compression, transfer, injection and blow moulding.

Text books:

1. \`Plastic Materials' by J.A.Brydson, Newnes-Butterworths (London) 1989
2. \`Textbook of Polymer Science', Billymeyer, F.W.Jr., 3rd edition, John Wiley & Sons,

Reference books:

1. 'Introduction to Plastics' by J.H.Briston and C.C. Gosselin, Newnes, London
2. 'Polymeric Materials' by C.C.Winding and G.D.Hiatt, McGraw-Hill Publishers

ChE-326
Computer Applications in Chemical Engineering (Elective-II)

Roots of algebraic and transcendental equations: Iteration methods, Regula-Falsi method, Newton Rapson method, roots of simultaneous sets of transcendental and algebraic equations,

System of linear equations and their solution by different techniques, numerical differential and integration, regression analysis, least squares and orthogonal polynomial approximation,

Skill development

Numerical solution of ordinary differential equations,

Numerical solution of partial differential equations (simple case studies),

Application of the above techniques to problems of interest in Chemical Engineering.

Text book:

1. 'Digital computation for chemical engineers' by Leaon Lapidus, McGraw Hill Book Company

Reference books:

1. 'Applied Numerical Methods' by Camehanet, McGraw Hill Book Co.

2. 'Applied Numerical Methods with Personal Computers, by Constantinides, McGraw Hill Book Co, New York

ChE-326

Paper Technology (Elective-II)

History: Importance of paper industry, historical background of paper making, development of paper industry in India,

Different types and uses of paper: Different types and uses of papers and paper boards, composition, method of making different types of papers and boards,

Raw materials for paper making: Classification of fibres, characteristics and composition of some important vegetable fibers (hard woods, softwoods, bagasse, straws, rags and paper stock)

Preparation of raw materials: Wood preparation – pulp wood measurement, barking, chipping, screening and conveying of chips)

Pulping processes: Mechanical pulping, alkaline pulping (Soda and Kraft), sulfite pulping, semi-chemical pulping, recovery of cooking chemicals from spent cooking liquors,

Employability

Pulp bleaching: Bleaching agents, bleaching methods – single stage and multi stage bleaching,

Stock preparation: Beating and refining, sizing and loading (filling),

Manufacture of paper: Paper machines (Fourdrinier and Cylinder), making of paper – forming section, press section, dryer section, calendaring section,

Testing of different properties of pulp and paper: Testing and evaluation of pulp, various properties of pulp and paper and their testing.

Text books:

1. 'Handbook of Pulp and Paper Technology' by Kenneth W.Britt, Vols.I&II

2. 'Modern Pulp and Paper Making' edited by John B.Calkin

3. `Pulp and Paper: Science and Technology - Vols.I&II' by E.Libby, McGraw Hill Books Co.

4. 'Pulp and Paper Manufacture- Vols. I & II' by R.C.McDonald & Others, McGraw Hill Books Company.

ChE-326

Petroleum Refining (Elective-II)

Origin and formation of petroleum,
Reserves and deposits of the world,
Indian petroleum industry,
Composition of crudes,
Refinery products and test methods,
Evaluation of crudes,
Crude pretreatment,
Dehydration and desalting pipe still heater,
Atmospheric and vacuum distillation of crude oil,
Treatment of products, additives, blending of gasoline, treatment of gasoline, kerosene, lubes, lubricating oils and wax,
Thermal and catalytic cracking,
Hydrocracking and hydrotreating,
Coking,
Visbreaking,
Alkylation,
Isomerisation,
Polymerisation,
Asphalt and air blown asphalt.

Employability

Text books:
1.`Petroleum refining Engineering' by Nelson, McGraw Hill company
2.`Modern Petroleum Refining Processes' by B.K.B.Rao, Oxford, OBH Publishers

ChE-326

Computational Fluid Dynamics (Elective-II)

Numerical solution of ordinary differential equations: Initial value problems of first order, Runge-Kuta methods, linear multi-step and predictor-corrector methods, R-K method for two simultaneous first order equations,

Skill development

Finite difference discretization of first and second derivatives: Implementation of finite difference equations, explicit and implicit methods, errors and stability analysis,

Selected examples for finite difference applications in heat conduction: Heat dissipation through a constant area fin, two-dimensional steady heat conduction in rectangular geometry, one dimensional transient heat conduction in a slab, Crank-Nicolson method, Thomas algorithm,

Fundamentals of fluid flow modeling: Upwind scheme, transportive property, second upwind differencing, hybrid scheme,

Solution of unsteady Navier-Stokes equations for incompressible flows: Staggered grid, introduction to MAC method, MAC formulation of momentum balance equation, pressure correction equation,

Introduction to SIMPLE method: One-dimensional convection, diffusion equation, formulation of flow problem, discretized continuity and momentum equations, pressure correction equation,

Concept of finite volume method: Regular finite volumes, discretization procedure for continuity equation.

Text Book:

1. 'Computational Fluid Flow and Heat Transfer' 2nd edition by K. Muralidharan and T. Sundararajan, Narosa Publishing House, New Delhi, 2003

Reference book:

1. 'Computational Fluid Dynamics - The Basics and Applications' by John D. Anderson, Jr., McGraw-Hill Inc., New Delhi, 1995.

ChE-326 White ware and Heavy Clayware (Elective-II)

Claassification of whiteware products: Body formulation and properties, tableware, earthenware talc bodies, vitreous bodies, high alumina bodies, porcelain, bone china, sanitary ware, stoneware, majolica, terracotta, art ware, physical properties of mixtures, role of water.

Whiteware: Classification, body composition, white wares at home, construction, electrical appliances, industrial uses, manufacturing and properties.

Heavy clayware: Raw materials, methods of winning and handling, classification of building materials, manufacture of building bricks, hollow bricks and other bricks, roof tiles, paving tiles, sewer pipes.

Employability

Fine ceramics: Packing of two component system, porosity, effect of grain size, unfired porosity, experimental verifications, wet to dry contraction, unfired strength, permeability and casting rate, dry to fired contraction.

Tests and quality control: IS inspection, LOI, plasticity, strength, MOR, thermal shock resistance, abrasion resistance, porosity, acid and alkali resistance, chipping resistance, chemical analysis, electrical and thermal conductivity.

Text books:

1. 'Pottery Science: Materials, Processes and Products' by Allen Dinsdale, Ellis Horwood Ltd., New York,
2. 'Ceramic White Ware' by Sudhir Sen, Oxford & IBH Publishing Co., New Delhi

Reference book:

1. 'Industrial Ceramics' by F. Singer and S. Singer, Oxford & IBH Publishing Company,

CHE-327

Mass Transfer Laboratory-II

<u>List of experiments:</u>

1. Ternary liquid equillibria (Binodal curve)
2. Liquid-liquid equilibria.
3. Limiting flow rates in spray tower
4. Hydrodynamics of perforated plate tower
5. Volumetric mass transfer coefficients in perforated plate tower
6. Dynamics of liquid drops (Single drop extraction tower)
7. Studies of axial mixing characteristics in a packed bed
8. Gas-liquid mass transfer in packed tower
9. Drying characteristics of a given material

Skill development

ChE-328

Chemical Technology Laboratory

<u>List of experiments:</u>

A. Analysis of water:

1. Total solids, dissolved solids,pH
2. Chlorides and sulphates
3. Temporary, permanent and total hardness.

B. Analysis of oils:

4. Acid value
5. Iodine value
6. Saponification value

C. Miscellaneous analysis:

7. Analysis of coal: Proximate analysis
8. Analysis of lime: Estimation of acid insolubles, available lime and calcium carbonate
9. Analysis of bleaching powder: Estimation of chlorine content.
10. Analysis of starch/glucose: Estimation of total reducing sugars
11. Analysis of saw dust: Estimation of total cellulose and –cellulose

E. Miscellaneous preparations:

12. Preparation of soap
13. Preparation of copper pigment
14. Preparation of chrome yellow pigment
15. Preparation of phenol formaldehyde resin

Skill development

CHE 411 – Transport Phenomena

PART-A

Momentum transport: Viscosity and the mechanism of momentum transport- i). Newton's law of viscosity, ii). Non-Newtonian fluids and iii). pressure and temperature dependence of viscosity,

Velocity distributions in laminar flow: i). Shell momentum balances boundary conditions, ii). flow of a falling film, iii). flow through a circular tube and iv). flow through an annulus,

The equations of change for isothermal systems: i). The equations of continuity, motion and mechanical energy in rectangular and curvilinear coordinates, ii). use of the equations of change to set up steady flow problems and iii). dimensional analysis of the equations of change,

Velocity distributions with more than one independent variable and unsteady viscous flow,

Velocity distributions in turbulent flow: i). Fluctuations and time-smoothed quantities, ii). time-smoothing of the equations of change for an incompressible fluid and iii). semiempirical expressions for the Reynolds stresses,

Interphase transport in isothermal systems: i) Definition of friction factors, ii). friction factors for flow in tubes and iii). friction factors for flow around spheres,

PART-B

Energy transport: Thermal conductivity and the mechanism of energy transport- i). Fourier's law of heat conduction and ii). temperature and pressure dependence of thermal conductivity in gases and liquids,

Temperature distributions in solids and in laminar flow: i) Shell energy balances- boundary conditions, ii). heat conduction with an electrical heat source, iii). heat conduction with a viscous heat source, iv). heat conduction through composite walls, v). forced convection and vi). free convection,

The equations of change for non-isothermal systems: i). The equation of energy in rectangular and curvilinear coordinates, ii). the equations of motion for forced and free convection in non-isothermal flow, iii). use of the equations of change to set up steady state heat transfer problems and iv). dimensional analysis of the equations of change,

Temperature distribution with more than one independent variable: Unsteady state heat conduction in solids,

Temperature distribution in turbulent flow: i). Temperature fluctuations and the time-smoothed temperature, ii). time smoothing the energy equation and iii). semi empirical expressions for the turbulent energy flux,

Interphase transport in non-isothermal systems: i). Definition of the heat transfer coefficient, ii). heat transfer coefficients for forced convection in tubes and around submerged objects and iii). heat transfer coefficients for free convection,

Employability

PART-C

Mass transport: Diffusivity and mechanism of mass transport- i). Definitions of concentrations, velocities and mass fluxes, ii). Fick's law of diffusion and iii). temperature and pressure dependence of mass diffusivity,

Concentration distribution in solids and in laminar flow: i). Shell mass balances – boundary conditions, ii). diffusion through a stagnant gas film, iii). diffusion with heterogeneous chemical reaction, iv). diffusion with homogeneous chemical reaction and v). diffusion into a falling liquid film,

The equations of change for multicomponent systems: i). The equations of continuity for a binary mixture, ii). the equations of continuity of A in curvilinear coordinates and iii). dimensional analysis of the equations of change for a binary isothermal fluid mixture,

Concentration distributions in turbulent flow: i).Concentration fluctuations and the time smoothed concentration and ii). time-smoothing of the equation of continuity of A,

Interphase transport in multicomponent systems: i). Definition of binary mass transfer coefficients in one phase, ii). correlations of binary masstransfer coefficients in one phase at low mass-transfer rates, iii). definition of binary mass-transfer coefficients in two phases at low mass-transfer rates and iv). definition of the transfer coefficients for high mass transfer rates.

Employability

Text book:

1. 'Transport Phenomena' by R. Byron Bird, W.E. Steward and Edwin N. Lightfoot, John Wiley & Sons Inc., New York

Reference books:

1. 'Transport phenomena' by Robert S. Brodkey & Haryr C. Hershey, McGraw Hills Company, New Yark
2. 'Transport Phenomena-for engineers' byLouis Theodore, International Book Compnay, London
3. 'Transport Phenomena' by W.J.Book and K.M.K.Multzall, JW&Sons Ltd.
4. 'Fundamentals of Momentum, Heat and Mass Transfer' by Mames R Welty, Charlese Wicks and Robert E Wilson, J W & Sons Inc., New York
5. 'Fluid Dynamics and Heat Transfer' by James G. Knudsen and Donald L.Katz., McGraw Hills Company Inc., New York.

CHE–412 Chemical Engineering Mathematics

Mathematical formulation of the physical problems: i). Application of the law of conservation of mass, salt accumulation in stirred tank, starting an equilibrium still, solvent extraction in N stages, diffusion with chemical reaction and ii). application of the law of conservation of energy, radial heat transfer through a cylindrical conductor, heating a closed kettle, flow of heat from fin,

Analytical (explicit) solution of ordinary differential equations encountered in Chemical engineering problems: i). First order differential equations, method of separation of variables, equations solved by integration factors, certain examples involving mass and energy balances and reaction kinetics and ii). second order differential equations, non-linear equations, linear equations, simultaneous diffusion and chemical reaction in a tubular reactor, continuous hydrolysis of tallow in a spray column,

Partial differential equations: i). Formulation of partial differential equations, unsteady-state heat conduction in one dimension, mass transfer with axial symmetry, continuity equation, ii). boundary conditions- function specified, derivative specified and mixed conditions and iii). particular solutions of partial differential equation-compounding the independent variable into one variable, superposition of solutions, the method of images and particular solution suggested by the boundary conditions,

Finite differences: i). The difference operator, properties of the difference operator, difference tables, other difference operators, ii). linear finite difference equation, complementary solution, particular solution, simultaneous linear difference equations and iii). non-linear finite difference equations, analytical solutions,

Skill development

Solutions for the following type of problems by finite difference method: a). Calculation of the number of plates required for an absorption column, b). calculation of the number of theoretical plates required for distillation column and c). calculation of number of stages required for a counter current extraction and leaching operation,

Application of statistical methods: i). Propagation of errors of experimental data, ii). parameter estimation of algebraic equations encountered in heat and mass transfer, kinetics and thermodynamics by method of averages, linear least squares and weighted linear least squares methods and iii). design of experiments - factorial and fractional factorial methods.

Text book:

1. 'Mathematical Methods in Chemical Engineering' by V.G.Jenson and G.V.Jeffreys, Academic Press, London

Reference books:

1. 'Applied Mathematics in Chemical Engineering' by Harold S. Mickley, Thomas S. Sherwood and Charles E. Reed, Tata McGraw Hill Publications
2. 'Applied Statistics' 2nd edition by Volk, W., McGraw Hill Chemical Engg. series
3. 'Applied Numerical Methods with Personal Computers, by Alkis Constantinides,S., McGraw Hills, Chemical Engineering series, 1987

CHE–413 Chemical Reaction Engineering – II
(Effective from the admitted batch of 2011-12)

Temperature and pressure effects – Heats of reaction and temperature – Equilibrium constants from thermodynamics – Equilibrium conversion – General graphical design procedure – Optimum temperature progression – Adiabatic operations.

Non ideal flow – Basics – C,E and F curves – Conversion in non ideal flow reactors – Dispersion model – Tanks-in-series model.

Heterogeneous catalysis – Physical adsorption – Chemisorption – Catalytic properties – Estimation of surface area, pore volume and porosity – Catalyst preparation – Catalyst poisons – Catalytic deactivation.

Solid catalysed reactions – Rate equations – Pore diffusion combined with surface kinetics – Thiele modulus – Effectiveness factor – Performance equations for reactions containing porous catalyst particles – Experimental methods for finding rates – Determining controlling resistances.

Noncatalytic systems – Design of fluid-fluid reactors – Factors to consider in selecting a contractor – Various contractors and contacting patterns for G/L reactions.

Design of fluid particle reactions – Progressive Conversion Model (PCM), Shrinking Core Model (SCM) – Comparison – Controlling mechanisms – Determination of rate controlling step.

Employability

Text book:

1. 'Chemical Reaction Engineering' Levenspiel O, 3rd Edition, John Wiley & Sons.

Reference books:

1. "Chemical Engineering Kinetics' by Smith, J.M. 3rd Edition, McGraw Hill Inc.
2. "Elements of Chemical Reaction Engineering" by Fogler, H.S, 3rd Edition, Printice Hall India Ltd.

CHE–414 Industrial Management

Management: Functions of management - Planning, organizing, staffing, directing controlling and coordinating, levels of management, role of Manager, skills of manager, pioneers in management–F.W.Taylors scientific management and Henry Fayol's principles of management,

Organization: Meaning of organization, principles of organization, organization structure, types of organization structures - line organization structure, line and staff organization structure, functional organization structure, committee organization structure and matrix organization structure,

Forms of business organizations: Salient features of sole proprietorship, partnership, joint stock company, private limited company and public limited company, government enterprises and co-operative societies,

Production operations management: Production **p**lanning and control, **p**lant location and factors affecting plant location, plant layout and types of layout, line or product layout, process or functional layout, fixed position layout and combination layout, work study and method study,

Human resources management: Basic functions of human resource management: Man power planning, recruitment, selection, training, development, placement, compensation and performance appraisal.

Employability

Text books:

1. 'Industrial Organization & Engineering Economics' by S.C.Sharma & T.R.Banga, Khanna Publishers, Delhi
2. 'Management Science' by A.R.Aryasri, Tata McGraw Hill, Publishers, New Delhi

Reference book:

1. 'Industrial Engineering and Management' by O.P.Khanna, Dhanpat Raj and Sons.

CHE–415 Process Dynamics and Control

Linear Open loop systems: Simple first order and second order systems, physical examples of first and second order systems, response of first order systems in series, transportation lag,

Linear closed loop systems : The control systems, controllers , final control element, block diagram of chemical reactor control systems, closed loop transfer functions , transient response of simple control systems,

Stability: Stability, root locus, frequency response, control system design by frequency response, Bode diagram, Bode stability criteria,

Analysis and design of feed –back control systems : Concept of feed back control, types of feed- back controllers, measuring devices, final control elements, dynamic behavior of feed-back control process, block diagram and closed loop response, effect of P.I. & D control action on the response of a controlled process,

Employability

Analysis and design of control systems: Cascade control, feed forward control, ratio control,

Introduction to process applications: Controller tunings, controller mechanisms, control valves,

Text book:

1. 'Process Analysis and Control' 2nd edition by Donald R.Coughnowr, McGraw Hills

Reference books:

1. 'Chemical Process Control- An Introduction to Theory and Practice' by G.Stephanopoulas, Prentice Hall of India Pvt. Ltd., New Delhi

2. 'Computer Control of Industrial Processes' by E.S.Savas, McGraw Hill,London

3. 'Handbook of Instrumentation and Control' by Considine

4. 'Process Modeling Simulation and Control for Chemical Engineers' by Lubin

5. 'Industrial Instrumentation' by Donald P. Eckmen, Wiley Eastern Limited.

CHE–416 Computer Aided Design (Elective-III)

CAD of fluid flow system: Flow of Newtonian fluids in pipes, pressure drop in compressible flow, flow of non-Newtonian fluids in pipes, pipe network calculations, two phase flow system,

CAD of heat transfer equipment: Shell and tube exchangers without phase change, condensers, reboilers, furnaces,

Skill development

CAD of mass transfer equipment: Distillation, gas absorption, liquid extraction,

CAD of chemical reactors: Chemical reaction equilibrium, analysis of rate data, ideal reactor models, non-ideality in chemical reaction, performance analysis using residence time distribution, temperature effects in homogeneous reactors, heterogeneous systems and fluidized bed reactors.

Text book:

1. ‘Chemical Process Computation’ by Raghu Raman, Elsevier Scientific Publications,

Reference books:

1. ‘Fundamentals and Modelling of Seperation Process’ by C.D.Holland, Prentice Hall Inc., New Jercey
2. ‘Catalytic Reactor Design’ by Orhan Tarhan, Mc Graw hills Ltd.
3. ‘Chemical Engineering’ Volume-6, by Sinnot, Pergamon Press, 1993.

CHE–416 Fluidization Engineering (Elective-III)

Introduction: Phenomena of fluidization, liquid like behavior of fluidized beds, advantages and disadvantages of fluidized beds, different types of fluidized beds, applications of fluidization technique in process industries,

Fixed Bed: Derivation of fixed bed pressure drop equation from fundamental characteristics – Kozeny–Carman equation and Ergun equation, effects of - particle size, sphericity, vesicularity, wall effect, surface roughness and voidage on fixed bed pressure drop.

Minimum fluidization: Derivation for minimum fluidization mass velocity and pressure drop equation for minimum fluidization,

Fluidization: Types of fluidization– batch, continuous and semi fluidizations, classifications based on particle diameter and movement, pressure drop-flow diagrams for fluidized bed, slugging bed and channeling bed, effects of L/d, fluid distributors, mode of fluidization, power consumption and pumping requirements, hindered and free settlings, stratification, voidage function, fluidization efficiency, fluctuation ratio,

Employability

Liquid fluidized beds: Rechardson and Zaki correlation,

Bubbles in dense beds: Single rising bubble, two dimensional Davidson model, stream of bubbles from single source, bubble volume and frequency, bubbles in ordinary bubbling beds and bubbling bed model for the bubble phase,

Emulsion phase in dense bubbling beds: Movement of individual particles, turn over rate of solids, residence time distribution, diffusion model and bubbling bed model,

Terminal velocity: Derivation for terminal velocity,

Entertainment and Elutriation: Definitions, transport disengaging height (TDH), entrainment at or above TDH for single size and size distribution of solids, entrainment below TDH, effects of various parameters, entrainment for an infinite free board and a small free board, parameters effecting elutriation, elutriation rate equation, elutriation of fines,

Flow of high bulk density and low bulk density mixtures: Pressure drops in stick-slip flow and aerated flow and related equations, downward discharge from a vertical pipe, flow in a horizontal pipe, saltation velocity, choking velocity, pressure drop in pneumatic conveying, pressure drop in bends and cyclones in fluidization bed reactors,

Spouted bed: Definition, pressure drop-flow diagram, minimum spouting correlation and effect of various parameters on spouting,

Heat and mass transfer in fluidized beds: Variables affecting heat transfer rate, heat transfer at the wall of containing vessel, heat transfer to immersed tubes, models proposed by i) Wicke-Fetting, ii)Mickley and Fair Banks and iii) Levenspiel and Walton, heat transfer in fixed and fluidized beds, definition and evaluation of mass transfer coefficient.

Text books:

1. `Fluidization Engineering' by Diazo Kunii,and Ocatve Levenspiel (Chapters1,2,3,4,5,6,7,8,9,10 and 12).
2. `Fluidization' by Max Leva (Chapters 2,3,4,5and 7).

CHE–416 Industrial Pollution and Control Engineering (Elective-III)

Types of emission from chemical industries and their effects on environment, Environmental legislation, noise pollution, occupational health hazards, meteriological factors in pollution dispersion (ALP and ELP), plume behaviour and characteristics, chimney design considerations: Plume raise, effective stack height,

Methods of analysis of air pollutants, particulate matter, SO_x, NO_x, CO_x analysis, removal of particulate matters: principles and design of setting chambers, solid traps, cyclone separators, fabric and design of fibre filters, scrubbers and electrostatic precipitators,

General methods of control and removal of sulphur dioxide, oxides of nitrogen, organic vapors from gaseous effluents with design aspects, sources of waste waters, effluent guidelines and standards, characterization of effluent streams, oxygen demanding wastes, oxygen sag curve, BOD curve, analysis of water pollutants,

Methods of primary treatment: Screening, sedimentation, floatation and neutralization, biological treatment, bacteria and bacterial growth curve, aerobic processes suspended growth processes, activated sludge process, extended aeration, contact stabilization, aerated lagoons and stabilization ponds, attached growth process with design aspects, trickling filters, rotary drum filters, fluidized bed contactors, anaerobic processes,

Employability

Methods of tertiary treatment: Carbon adsorption, ion exchange, reverse osmosis, ultra filtration, chlorination, ozonation & sonozone process, sludge treatment and disposal,

Solid waste management: solid waste collection, transportation, solid waste processing and recovery, hazards in waste management, risk assessment and safety measures, types of hazardous wastes, health effects, safety measures, risk assessment response measures, case studies or pollutants removal and safety measures in fertilizer, petrochemical, paper, pharmaceutical industries and petroleum refinery,

Industrial safety: Why safety, accidents, causes and remedial measures, safety aspects of site selection, plant layout and unit plot planning, hazards of commercial chemical operations and reactions, safety aspects of process design, instrumentation for safe operations, safety aspects in design and inspection of pressure vessels, effect of toxic agents, toxicity vs hazards, respiratory hazards, safe experimentation and testing of reactions, materials for safety,

Flamable materials: Fire extinguishing agents and their applications, eye safety in chemical processing, personnel protective equipment, permit systems, hazard evaluation techniques, modern safety management systems, safety effectiveness.

Text books:

1. 'Environmental Pollution Control', by C.S. Rao, Wiley Eastern Limited
2. 'Safety and Accident Prevention in Chemical Operations' by Fawcett and Wood

Reference books:

1. 'Environmental Engineering' by Arcdio P.Sincero and Geogoria Sincero
2. 'Loss Prevention in Chemical Industries' by Frank P.Lees

CHE–416 Multi component Separation Processes (Elective-III)

Multi component vapor –liquid equilibria: Ideal mixtures at low pressures, non-ideal mixtures, activity coefficient models - Wilson, NRTL, UNIQUAC and UNIFAC equations, evaluation of model constants from binary experimental data, prediction of multicomponenet VLE from the model constants of the constituent binaries,

High pressure equilibria: Vaporization constants, K, Thermodynamic method for K, graphical charts, chao-Seader correlation,

Equilibrium and Simple Distillation: Multicomponent equilibrium, flash vaporization(EFV), multicomponent differential distillation,

Design considerations in fractionating process: Quantitative relationships, temary and multicomponent system fractionation, key fractionation concepts, selecton of key components, column pressure, material balance, rigorous and approximate minimum reflux calculations, recommended short-cut methods for minimum reflux minimum plates at total reflux, FUG methods, Smith Brinkley method

Skill development

Multicomponent fractionation rigorous design procedures: Sorel method, Lewi Metheson method, Thiele-Geddes method and its versions in distillation column design, techniques of separating azeotropic and close boiling mixtures by fractional distillation, azeotropic and extractive distillation, selection of solvents, design considerations, pseudo binary methods, solvent recovery,

Tray design and operation: The common tray types, tray capacity limits, tray hydraulics parameters, flow regies on trays, column sizing, tray efficiency, fundamentals, tray efficiency prediction,

Packing design and operation: Packing types, packing hydraulics, comparing packings and trays, packing efficiency and scale-up.

Text books:

1. 'Distillation' by M.Van Winkle, McGraw Hill Book Company
2. 'Phase Equilibria in Chemical Engineering' by S.M.Wales, Butterworth publishers, 1985
3. 'Distillation Design' by Henery Z Kister, McGraw Hill Book Company

CHE-416 Biochemical Engineering (Elective-III)

Introduction to Biochemical engineering and Biotechnology: Overall view of biotechnology since its practice–to date, enzyme kinetics, derivation of M.M. equation of single as well as multiple substrates, enzyme inhibition, determination of M.M. parameters, industrial applications of enzymes,

Cell cultivation & kinetics: Microbial, animal and plant cell cultivation, cell immobilization, batch growth of cells, yield coefficient, monod growth kinetics,

Analysis and design of fermenters: Batch fermenter, mixed flow fermenter (chemostat), plug flow fermenter, mixed flow fermenters in series, and cell recycling,

Genetic engineering: DNA and RNA, cloning of genes, stability of recombinant microorganisms, gene manipulation,

Sterilization: Sterilization of media and air, thermal death kinetics, design criterion, continuous sterilization methods,

Aeration and agitation in fermenters: Correlations of mass transfer coefficient, measurement of interfacial area and gas holdup, power consumption, scale up concepts,

Bioanalytical techniques: Gas chromatography, thin layer and paper chromatography, HPLC, affinity, gel, adsorption and ion exchange chromatography.

Employability

Text book:

1. 'Biochemical Engineering Fundamentals' 2nd edition by J.E.Bailey and D.F.Ollis, McGraw-Hill Publishers, Newyork, 1986

Reference books:

1. 'Chemical Engineering' volume-3, 3rd Edition by J.F Richardson and D.G. peacock, (Chapter-5: Biochemical Reaction Engineering), Pergomon Press, U.K, 1994
2. 'Bioprocess Engineering: Basic Concepts' 2nd edition by M.L.Shuler and F.Kargi, Prentice Hall India, New Delhi, 2003
3. 'Biochemical engineering' by D.G. Rao, Tata McGraw-Hill Publishers, New Delhi,
4. 'Biochemical Engineering' by J.M. Lee, Prentice Hall, Englewood Clifts, 1992.

CHE-416 Reservoir Engineering (Elective-III)

Fundamental concepts of Reservoir Engineering: Possibility, fluid saturation, permeability, flow through layered beds, flow through series beds, Klinkenberg effect, effective permeability data, phase behaviour,

Oil reservoirs: Reservoir driving mechanisms, basic equation and tools, volatile oil reservoirs, identification of volatile oil reservoirs, ultimate recovery, predicting reservoirs behavior, performance, mechanics of reservoir performance, prediction procedure, limitations of predictions, relating reservoir performance to time, factors affecting ultimate recovery, analysis gas oil ratio history,

Water drive reservoirs: Effect of free gas saturation on recovery, predicting reservoirs performance, calculating water influx, use of the unsteady state equation in predicting reservoir performance, validity of performance prediction, limitations in predicting reservoir performance, the material balance equation as a straight line,

Gravity drainage reservoirs: Permeability in the direction dip, dip of the reservoir, reservoir producing rates, oil viscosity, relative permeability characteristics, fundamental recovery process, predicting reservoir performance, apparent relative permeability, oil saturation method,

Employability

Combination of drive reservoirs: Index of drives, equations used, material balance equations, instantaneous gas oil ratio equation,

Pressure maintenance: Pressure maintenance by gas injection, condensing gas drive, predicting performance by gas injected gas drive index, pressure maintenance by water injection, predicting performance by water injection, index of injected water drive, control of the gas cap, typical water injection pressure maintenance operations,

Improving oil recovery: Improving oil recovery by fluid immiscible gas–water, miscible fluid injection thermal oil recovery, predicting recovery from fluid injection products, Stiles's method of water flood prediction, derivation of water out and recovery equations, frontal advance techniques for prediction result of either water or gas injection, well arrangements, peripheral water flooding, predicting behavior of peripheral water floods, special consideration involved in water flooding, water flood case history, predicting the results of water flooding.

Text book:

1. 'Reservoir Engineering Manual' – 2nd Edition by Frank W. Cole, Gulf Publishing Company, Houstan, Texas, 1969.

CHE–417 Chemical Reaction Engineering Laboratory

1. Determination of the order of a reaction using a batch reactor and analyzing the data by (a) differential method and (b) integral method
2. Determination of the activation energy of a reaction using a batch reactor
3. To determine the effect of residence time on conversion and to determine the rate constant using a CSTR
4. To determine the specific reaction rate constant of a reaction of a known order using a batch reaction.
5. To determine the order of the reaction and the rate constant using a tubular reactor
6. Determination of RTD and dispersion number in a tubular reactor using a tracer
7. Mass transfer with chemical reaction (solid-liquid system) – Determination of mass transfer coefficient
8. Axial mixing in a packed bed - Determination of RTD and the dispersion number for a packed bed using tracer
9. Langmuir adsorption isotherm - Determination of surface area of activated charcoal.
10. Performance of reactors in series: (i) A plug flow reactor followed by a CSTR and (ii) A CSTR followed by a plug flow reactor.

Skill development

CHE-418 Process Dynamics and Control Laboratory

1. Response of mercury-in glass thermometer
2. Response of mercury-in glass thermometer with thermal well.
3. Calibration & response of resistance thermometer
4. Response of manometer
5. Calibration of thermocouples
6. Response of single-tank liquid level system
7. Response of two-tank non-interacting liquid level system
8. Response of two tank interacting liquid level system
9. Study of on-off control – Control let off position.
10. Valve characteristics of equal % control valve
11. Valve characteristics of linear control valve
12. On-off control – controller on position
13. Studies on hysteresis characteristics of Bourdon pressure gauze
14. Hysteresis characteristics of equal % control valve
15. Studies on hysteresis characteristics of linear control valve
16. Response studies for different types of controller (P, PI, PID) using PID control trainer.
17. Level control trainer
18. Pressure control trainer
19. Temperature control trainer

Skill development

CHE-419 Seminar

CHE-420 Viva-voce on Industrial Training Report

Skill development/Employability

CHE-421 Chemical Process Equipment Design

Introduction of plant design and costs,

Process design development: Design project procedure, design information from the literature and other sources of information, flow diagrams, preliminary design, comparison of different processes, firm process design, equipment design and specialization, scale up in design, safety factors specifications, materials of construction,

General design considerations: Health and safety hazards, fire and explosion hazards, personnel safety, loss prevention, thermal pollution control, noise pollution and control, plant location, plant layout, plant operation and control, utilities, structural design, storage, materials handling, materials and fabrication selection.

Material transfer, handling and treatment equipment design and costs: Incompressible fluid flow systems design, flow through parallel, series and piping network systems, compressible fluid flow systems design, design and cost estimation of filters.

Mechanical design of process equipment: Design and selection of storage vessels and low pressure vessels, design of roofs, bottom plates, formed heads, flat plate and conical closures, tall vertical columns, supports to process vessels, distillation columns, heat exchanges, evaporators.

Heat transfer equipment design and costs: Heat exchangers for sensible heat exchange - double pipe, shell and tube, plate heat exchangers, heat exchangers with extended surface, optimum heat exchanger design, heat exchangers with phase change – single effect evaporators, multiple effect evaporators, vapor recompression evaporators, condensers – condensation of single vapors, condensation with boiling range, reboilers.

Mass transfer equipment design: Continuous distillation- design for binary systems and pseudo binary systems for multi component distillation, plate efficiencies, entrainment, approximate column sizing, selection of plate type, plate construction, plate hydraulic design, plate design procedure, plate areas, diameters, liquid flow arrangements, entrainment, weep point weir dimensions, perforated area, hole size, hole pitch, hydraulic gradient, liquid flow, plate pressure drop, down comer design, packed columns - choice of plate or packing, types of packing, packed bed height, prediction of height of transfer unit (HTU) liquid distribution, stimulation of pressure drop in packed towers, allowable velocities, column diameter, column internals, wetting rates, reactor design, equations for reactor design application - batch reactor, tubular flow reactor, back mix reactors expression of reaction rates mechanical features of reactor design.

Employability

Text books:

1. 'Plant design & Economics for Chemical Engineers', 4th edition, M.S.Peters & K.D.Timmerhaus, Mc Graw Hills Publishing Company
2. 'Process Equipment Design', 3rd Edition, M.V.Joshi, MacMillan India Ltd 1981

Reference books:

1. 'Process-Plant-Design' by J.R.Backhurst & J.H.Harker, Heieman Education London
2. 'Chemical Engineering' Volume-VI (An introduction to Chemical Engineering Design' by J.M.Coulson & J.F.Richardon

CHE-422 Process Optimization (Elective-IV)

Monotonic function, unimodal function, stochastic process, deterministic process, convex and concave sets, feasible and infeasible regions, state and control variables, Lagrange multipliers, saddle point, sensitivity analysis, iterative rule, slake variable principle of optimality, design constraints, constraint surface, objective function, classification of optimization problems, basic and non-basic variables, functions of one variables, methods based on interval of uncertainty, sequential search methods, quadratic interpolation, qubic interpolation, regular Falsi technique,

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Non–linear programming, unconstrained optimization techniques, univarient methods, functions of several variables, alternate variable search method, exploratory and pattern moves method, conjugate gradient method, quasi Newton methods, variable metric method, Powell's method, Newton-Raphson method,

Constrained optima, pivot operation, linear programming, simplex method, revised simplex method, dual relations, dual simplex method, decomposition principle, changes in the right hand side constraints, changes in the cost coefficients, addition of constraints, Kuhn Tucker conditions,

Skill development

Polynomial: Solution of an unconstrained geometric programming problem, solution of a constrained geometric programming problem, dynamic programming, multi-stage optimization, stochastic dynamic programming, integer linear programming, integer non-linear programming, network problems, CPM and PERT methods, transportation problems.

Text books:

1.'Optimisation Theory and Applications' by S.S.Rao, 2nd edition, Wiley Eastern Limited
2. 'Optimisation Techniques for Chemical Engineers' by Asghar Hussain and Kota Gangiah
3. 'Formulation and Optimisation of Mathematical Models' by C.L.Smith, R.W.Pike and P.W.Mur
4. 'Optimization of Chemical Process' by Edgar and Himmelblau, 2nd Edition, McGraw Hill Publications.

CHE-423 Process Engineering Economics

Value of money - equivalence: Value of money, equations for economic studies, equivalence, types of interest- discrete and continuous, annuities - relation between ordinary annuity and the periodic payments, continuous cash flow and interest compounding, present worth of an annuity, perpetuities and capitalized costs, bonds and debentures, value of a bond and yield rate,

Depreciation: Types and various methods of calculating depreciations, depreciation accounting,

Cost accounting: Basic relationship in accounting, balance sheet and income statement, various ratios to study the balance sheet and income statements,

Cost estimation: Cash flow for industrial operations, factors affecting investments and production costs, estimation of capital investment, cost indices, cost factors in capital investment, methods of estimating capital investment, estimation of total product cost-manufacturing costs and general expenses,

Employability

Profitability: Alternate investments and replacements. mathematical methods for profitability evaluation, economic production charts for plants operating below 100%, above 100% and under dumping conditions, general procedure for determining optimum conditions, break even chart for production schedule and its significance for optimum analysis,

Economic balance in fluid flow, heat transfer and mass transfer operations; optimum economic pipe diameter in fluid dynamics, optimum flow rate of cooling water in condenser in heat transfer and optimum reflux ratio in distillation operation,

Economic balance in cyclic operations and semi continuous cyclic operations, economic balance in yield and recovery, economic balance in chemical reactors, batch and flow reactors.

Text books:

1. \`Plant Design and Economics for Engineers' by Max S. Peters and K.D.Timmerhans, McGraw Hill Book Company,

2.\`Process Engineering Economics' by Herbest E. Schweyer, McGraw Hill Book Company.

CHE-424 Chemical Process Equipment Design Laboratory

(Open book practical examination)

The following equipment are to be designed in detail:

1. Sensible heat exchangers (1-2 or 2-4),
2. Condenser and reboiler,
3. Multiple effect evaporator,
4. Fractionating column-Plate and packed columns,
5. Packed bed absorber,
6. Continuous tubular reactor (homogeneous and heterogeneous)

Skill development

CHE-425 Project Work

Skill development

The project work should consist of a comprehensive design of a chemical plant in the form of a report with the following chapters.

1. Introduction
2. Physical and chemical properties and uses
3. Literature survey for different processes
4. Selection of the process
5. Material and energy balances
6. Specific equipment design (Process as well as mechanical design with drawings)
7. General equipment specifications
8. Plant location and layout
9. Materials of construction
10. Health and safety factors
11. Preliminary cost estimation
12. Bibliography

CIV124 CIVIL ENGINEERING MATERIALS

(For B.Tech. I Year II Semester Civil Engineering)

L	T	P	C	Sessional marks	End Exam marks
3	1	0	3	40	60

Course Objectives:

1) To know the characteristics of good building materials such as bricks, stone, timber, metals, plastics, geosynthetics, paints, varnishes, distempers etc.
2) To understand the procedure to conduct required tests to determine the suitability of the material for the given application
3) To study the engineering materials available in the region of Visakhapatnam, Andhra Pradesh and India

Course Outcomes:

At the end of the course, the student will have

a) the ability to identify good building materials such as bricks, stone, timber, metals, plastics, geosynthetics, paints, varnishes, distempers etc. based on their characteristics
b) the ability to conduct required tests to determine the suitability of the material for the given application
c) the Knowledge of the engineering materials available in the region of Visakhapatnam, Andhra Pradesh and India

Unit I

Introduction: Classification of Building materials, uses

Bricks & Other Clay Products:

Clay Bricks- Ingredients of good brick earth; Harmful substances, Additives; Manufacture of bricks (IS:2117); Characteristics of good bricks; Classification of bricks; defects of bricks; Tests on bricks: compressive strength, water absorption, Efflorescence (IS:3495); Uses of bricks; Special bricks: Fire bricks, Heavy duty bricks, perforated bricks, Facing bricks, Lining bricks, Paving bricks, Hollow bricks, Sewer bricks, Soling bricks; Fly ash bricks; Special brick shapes.

Other Clay Products: Tiles- Characteristics of good tiles; Types of common tiles; Classification and properties of Flooring tiles (IS:1478) and Roofing tiles (IS:654); Terracing tiles (IS:2690); Mangalore tiles, Country tiles, Hollow clay tiles. Terra-cotta; Earthenware, stoneware, porcelain; Glazing; Refractories

Unit II

Stones: Quarrying & dressing of stones; Characteristics of good building stones, Common building stones, Uses in Civil Engineering

Timber: Characteristics of good timber; defects in timber, Decay of timber, Seasoning and preservation, properties, tests; uses of timber; Commercial forms of timber products in Civil Engineering; Indian timber trees.

Unit III

Metals: Ferrous metals: Properties & uses of different types of iron; non-ferrous metals: Aluminium & Lead, properties, uses in civil engineering

Glass: Classification & Commercial forms of glasses, uses in civil engineering

Miscellaneous Materials: Asbestos- Properties; uses; Gypsum- Gypsum boards; Gypsum plaster; Rubber – Properties & uses

Unit IV

Plastics: Types of plastics, properties, uses in civil engineering, Fibre glass Reinforced plastics, Properties & Applications.

Geosynthetics: Introduction, Functions and their Applications-tests on geo-textiles, geogrids; geo-membranes and geo-composites;

Unit V

Paints, Varnishes and Distempers : Paints: Characteristics of good paint; PVCN; Ingredients of oil-borne paint; Types of paints; Defects in painting; Varnishes: Characteristics of good varnish; Ingredients; Types; process of varnishing; Distempers: Properties & ingredients; Process of distempering; Wall Paper; White wash; Colour wash.

Case study on Engineering materials commonly used in Visakhapatnam, Andhra Pradesh and India

Text Books

1. Rangwala, Engineering Materials, 41st Edition : 2014, Charotar Publishing House Pvt. Ltd.

References

1. S.K.Duggal, Building Materials, New Age International Publishers
2. D.N. Ghose, Materials of construction, Tata-McGraw-Hill Publishing Company Limited.
3. P. C. Varghese (2005), Buliding Materials, Prentice Hall
4. M. Gambhir, Neha Jamwal (2011), Building Materials: Products, Properties and Systems, Tata McGraw Hill Publishers.
5. R.C. Smith, Materials of construction, McGraw-Hill Company, New York.
6. Relevant Indian Standards

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ENGINEERING MATHEMATICS - III

CIV 211 **Credits : 4**
Instruction : 3 Lecture & 1 Tutorial / week Sessional Marks : 40
End Exam : 3 Hours End Exam Marks : 60

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

At the end of the course the student will be able to

1. Understand the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrotational vector fields.
2. Understand the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
3. Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
4. Understand the methods to solve the Laplace, heat, and wave equations.
5. Gain good knowledge in the application of Fourier Transforms.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3	3	3							2	1	3	3	
	2	3	2	2	2									3	2	
	3		2	2	3							3	1	2	3	
	4		3	2								3		3		
	5		3	2								3		3		

SYLLABUS

UNIT - I 12 Periods

Vector Differentiation: Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT – II 12 Periods

Vector Integration: Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorem (all theorems without proofs) – Irrotational fields.

UNIT - III 12 Periods

Partial Differential Equations: Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations – Equations solvable by Direct Integration– Linear Equations of First order -Homogeneous Linear Equations with Constant Co-efficient – Rules for finding the complementary function - Rules for finding the Particular integral – Non-Homogeneous linear equations.

UNIT - IV 12 Periods

Application of Partial Differential Equations: Introduction – Method of separation of variables – Vibrations of a stretched string- Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT - V 12 Periods

Fourier Transforms: Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Vibrations of a string.

TEXT BOOKS

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli.

REFERENCES

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd.
2. Advanced. Engineering Mathematics by H.K.Dass
3. Advanced Engineering Mathematics by Erwin kreyszig.
4. Higher Engineering Mathematics by Dr.M.K. Venkataraman, National Pub.Co.Madras.
5. Relevant NPTEL Courses.

BUILDING TECHNOLOGY

CIV 212 **Credits : 3**
Instruction : 3 Lecture & 1 Tutorial / week Sessional Marks : 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

The objective of the course is to prepare the student to

1. Learn about building byelaws laid by planning authorities
2. Understand about masonry types in brick and stone construction
3. Learn about building components and foundations

Course Outcomes:

At the end of the course the student will be able to

1. Know the various building Bye-Laws laid by town planning authorities and local regulatory bodies for Planning various buildings like residential, educational, office buildings and hospital buildings.
2. Learn about masonry types in brick and stone construction
3. Understand about various Building components.
4. Learn about various types of foundation.
5. Know about damp prevention and fire protection methods.
6. Understand about various types of roofs.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3	3			3	3	3			2	1	3		3
	2	3	2	2										3		3
	3		2	2			3	3				3	1	2		3
	4		3	2			3	3	2			3		3		3
	5	3	2	2										3		3
	6		2	2			3	3				3	1	2		3

SYLLABUS

UNIT - I 12 Periods

Introduction: Component Parts of a Building - Load bearing construction - Framed buildings - Tall buildings, Advantages, problems - Other types of Buildings - Setting and laying out a building - Responsibilities and Duties of the Client and Engineer.

Skill Development

Walls: Classification of walls; Technical terms - Stone masonry construction - types and rules - Brick masonry walls - bonds and rules - cavity wall construction - Hollow concrete block masonry - Light weight wall construction - Prefabricated brick panel for walls – reinforced masonry - composite masonry - Arches and lintels

UNIT - II 12 Periods

Doors, Windows and Ventilators: Location of doors and windows, technical terms, Dimensions of doors and windows, Door frames, Types of doors and windows, Ventilators, Fixtures and fastenings.

Building Conveyance Verticality: Stair cases - Lifts - Escalators - Ramps - Basic terms - Types - Design considerations – Maintenance

UNIT - III 12 Periods

Floors: Terminology; Materials – Types of floors – suitability (Industrial, Indoor, Stilt & Terrace Floors) and construction; Concrete, mosaic, terrazzo, tiled, stone & synthetic floors and floor finish.

Roofs: Terminology; Classification of roofs - Steel sloping roofs - Roof covering materials - Types of flat roofs - Basic roofing elements - Roof coverings - Pitched, flat and curved roofs - Lean–to–roof - couple roofs, trussed roofs - roof drainage - roof cladding materials and their fixtures. Flat roofs: RCC roofs.

Skill Development

Surface Finishes: Plastering - Pointing - White washing - distempering – Painting - Pebble dash – Dado/Skirting, Tiles etc.

UNIT - IV 12 Periods

Foundations: Need for foundation - types of foundation - open foundation - Shallow foundations – Spread, combined- strap and raft foundation - deep foundations - pile foundation - well foundations and caissons - Factors affecting selection of foundations Foundation on black cotton soils; setting out of foundations - excavations for foundation trenches and base - general principles of dewatering foundation excavations - coffer dams.

Form Work, Scaffolding: Form work, Types of formwork; Centering - scaffolding - Types of scaffolding.

Skill Development

UNIT - V 12 Periods

Construction safety: safety in construction - general requirements - common hazards during excavation; piling and other deep foundations - common hazards during walling; roofing; additional safety requirements for erection of concrete framed structures - additional safety requirements for erection of structural steel work - general requirements; safety in demolition of buildings

Introduction to Green Buildings: Introduction - Necessity - Concept of Green building. Principles of green building - Selection of site and Orientation of the building - usage of low energy materials - effective cooling and heating systems - effective electrical systems - effective water conservation systems - Certification systems - GRIHA and LEED - case studies

Skill Development

TEXT BOOKS

1. The Text Book Of Building Construction by S.P.Arora, S.P.Bindra, Dhanpatrai Publications.
2. Building Construction by B.C. Punmia, Laxmi Publications (p) Ltd.

REFERENCES

1. TERI *"Sustainable Building Design Manual- Volume I & II"* Tata Energy Research Institute.
2. National Building Code of India, SP 7 (1): 1983, First Revision 1992, Bureau of Indian Standards
3. Building Construction by Sushil kumar, Standard publishers distributors.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd.
5. Building Construction, Vol.II & III By W.B. Mckay, E.L.B.S. and Longman, London, U.K.
6. Green Building Design, Construction and Operations, Sustainable Building Technical Manual, U.S.Green Building Council, 1996, Public technology Inc.
7. Relevant NPTEL Courses.

ENGINEERING GEOLOGY

CIV 213 **Credits : 3**

Instruction : 3 Lecture & 1 Practical / week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

The objective of the course is to prepare the students

1. To identify & classify different minerals and map the geological structures present in subsurface.
2. Investigate the selected project site to obtain data and determine the favourable considerations in study area.
3. Measure earthquakes and landslides to classify the hazardous zones and interpret geological maps.

Course Outcomes:

At the end of the course the student will be able to

1. Identify and classify the different minerals and rocks based on their physical properties and geological genesis
2. Map the various geological structures present in the subsurface and their importance in the study of natural hazards like earthquakes etc.
3. Apply the different investigation techniques from initial stage to final stage for the selection of proper project site.
4. Do the interpretation of available data to determine the favorable geological considerations (i.e., Lithological structural and ground water) in the study area for the construction of different civil engineering projects dams etc.
5. Classify and measure the earthquake, Landslides and subsidence prone areas to practice the hazard zonation.
6. Prepare, analyze and interpret the Engineering Geologic maps.

Mapping of course outcomes with program outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**		1	1	2	1	2	2	1		1			1	2	2
	2	1	2	1	2		1	2			1			2	2	2
	3		2	1	2	2	2	2	1		2			2	2	2
	4	1	3	1	2	1	2	2	1		2			2	2	2
	5	1				2	2	1	1		1			1	2	2
	6		1	1	2	1	2	2	1		1			1	2	2

SYLLABUS

UNIT - I 12 Periods

Introduction: Definition of Geology and Engineering Geology, Branches of Geology, Scope and importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some civil engineering constructions due to geological draw backs. Role of engineering geologist in planning, design and construction stages in Civil Engineering works

Earth: Solar System, Origin of the Earth, Internal structure of the Earth and its composition, Elementary knowledge on isostasy, continental drift, plate tectonics and sea floor spreading.

Geological Cycle: Weathering, Effect of Weathering over the properties of rocks, Importance of Weathering with reference to civil engineering constructions like dams, reservoirs and tunnels-Land forms produced by, running water, and glaciers. Land forms produced by wind, sea waves and currents.

UNIT - II 12 Periods

Petrology: Definition of rock, Civil Engineering importance – Geological classification of rocks –Rock cycle, Formation, Structure, texture and mineralogical composition of igneous, sedimentary and metamorphic rocks, Study of physical properties of different types of igneous, sedimentary and metamorphic rocks. Igneous rocks: Granite, synite, dolerite, gabro, diorite, basalt. Sedimentary rocks, dykes and sills: Breccia, conglomerate, Sandstone, Shale, limestone. Metamorphic rocks: Gneiss, khondalite, schist, slate, marble, quartzite, charnokite. Engineering properties of rocks.

Soils: Soil formation, Soil profile, – Geological classification – Engineering classification and description of Indian soils; Soil erosion and conservation.

Skill Development

UNIT - III 12 Periods

Minerology: Definition of mineral, Importance of study of minerals, Different methods of study of minerals, Study of physical properties of different rock forming minerals: Silicate structures, Quartz, feldspars, pyroxenes, amphiboles, micas and clays, Introductory knowledge on Chemical and optical properties of minerals.

Skill Development

Structural Geology: Elements of structural geology: Strike, dip, outcrop, plunge – Study of folds, faults, joints, unconformities, Classification of folds, faults and joints. and their importance in Civil Engineering works. Potential problems from rock structures in engineering constructions, Treatment of rocks by grouting.

Skill Development

UNIT - IV 12 Periods

Geophysical Exploration: Principles of geophysical methods, Electrical, Seismic, Gravity and Magnetic methods. Principle of Resistivity method and configurations. Applications of Resistivity method in prediction of soil profile, hard rock and ground water table. Principles of Seismic refraction and reflections methods and their applications to Civil Engineering problems.

Geological Applications in Civil Engineering: Geological investigations for dams and reservoirs. Case histories of dam failures and their causes. Geology of the major dam sites of India. Factors affecting the seepage and leakage of reservoir and the remedial measures. Geological investigations for bridges and Multi- storied structures. Geological investigations for highways, railways, canals, runways, powerhouses, power channels and flumes.

Geological investigations for tunnels and coastal structures (Seawalls, groins and bulkheads); Environmental geology. Coastal Management, Underground water in relation to Engineering Works.

UNIT - V 12 Periods

Earthquakes: Terminology, Causes and effects, Classification, Earthquake waves, Seismograph, Locating Epicenter, Determination of depth of focus, Intensity, Magnitude, Mercalli & Richter scales, Prediction, Effects, Seismic belts, Shield areas – Seismic zones of India – Civil Engineering considerations in seismic areas – Precautions of building constructions in seismic areas. Safety measures for buildings and dams – Reservoir induced seismicity.

Skill Development

Landslides: Causes, effects, methods of mitigating impact of landslides.

Tsunamis: Meaning of Tsunami, causes & Effects of Tsunami, warning and mitigation.

TEXT BOOKS

1. Engineering Geology by D.Venkata Reddy, Vikas Publishing House Pvt Ltd. 2011.
2. Text book of Engineering Geology, by N.Chenna Kesavulu, MacMillan India Ltd, Hyderabad, 2014

REFERENCES

1. Engineering Geology by Subinoy Gangopadhyay, Oxford University Press. 2013.
2. Fundamental of Engineering Geology by F.G. Bell, Butterworth Publications, New Delhi, 1992.
3. Engineering Geology: Principles and Practice by David George Price, Springer, 2009.
4. Principles of Engineering Geology by KVGK Gokhale. B.S.Publications-2005
5. Engineering and General Geology by Parbin Singh, K Kataria & Sons, New Delhi, 2009
6. Engineering Geology for Civil Engineers by P.C. Varghese, PHI learning pvt. Ltd., 2012
7. Relevant NPTEL Courses.

ENGINEERING MECHANICS

CIV 214 | **Credits : 3**
Instruction : 3 Lecture & 1 Tutorial / week | Sessional Marks : 40
End Exam : 3 Hours | End Exam Marks : 60

Course Objectives:

The objective of the course is to enable the student

1. To develop logical thinking approach to engineering problems.
2. Learn about the basic concepts of force, moment, resultant forces.
3. Learn about centroid & centre of gravity, static analysis of simple plane trusses, area moment of inertia,

Course Outcomes:

At the end of the course the student will be able to

1. Analyze a given physical problem into a suitable forces and moments.
2. Identify the centroid of a given plane area and find its area/ mass moment of inertia.
3. Apply the concept of friction to simple engineering problems.
4. Calculate the displacement, velocity and acceleration of a moving particle.
5. Apply the work-energy, D ALEMBERTS principle to particles and connected systems.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	2	1									3	1	
	2	3	2	1	1									2	1	
	3	3	3		2									3	2	
	4	3	3	2	2								1	3	2	
	5	3	3	2	2								1	3	2	

SYLLABUS

UNIT - I 12 Periods

Basic Concepts: Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple. Resultants of Force Systems, possible resultants of different types of force systems.

Skill Development

UNIT - II 12 Periods

Equilibrium Analysis: Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on

Skill Development

by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar non-parallel force system.
Analysis of trusses: Method of joints, Method of sections and tension coefficient method.

UNIT - III 12 Periods

Friction: Nature of friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction – Problems involving frictional forces – Frictional forces on flexible bands and belts – Rolling friction – Thrust bearing.
Centroid and Centre of Gravity: Centre of gravity of parallel forces in a plane – Centre of gravity of parallel forces in space – centroids and centres of gravity of composite bodies – Theorems of Pappus.

Skill Development

UNIT - IV 12 Periods

Moments of Inertia: Definition – Parallel axis theorm for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas.

Skill Development

Kinematics: Absolute Motion: Introduction – basic terminology of mechanics – Newton's Laws – Introduction to Kinematics of Absolute Motion – Rectilinear motion of a particle – Angular motion of a line.

UNIT - V 12 Periods

Kinetics: Introduction to kinetics – Force, mass and acceleration approach, Newton's laws of motion – D Alembert's principle – Work - Energy principle – Work done by a force – Work done by a varying force – Work done by a force system – Energy – Power – Work Energy equation for translation – Work done by a Spring – Principle of conservation of energy.

Skill Development

TEXT BOOKS

1. Engineering Mechanics by SS Bavikatti and Rajasekharappa, New Age International Pvt. Ltd.
2. Applied Mechanics by I.B. Prasad, Khanna Publishers.

REFERENCES

1. Engineering Mechanics by S. Timoshenko and D.H. Young, Pearson Prentice publication.
2. Engineering Mechanics by Basudeb Bhattacharyya, Oxford University Press.
3. Engineering Mechanics by F.L. Singer, HarperCollins Publishers.
4. Schaum's outline of engineering mechanics: Statics, by E. Nelson, Charles Best, W.G. McLean, Merle Potter.
5. Vector Mechanics & Statics by F.P. Beer and E.R. Jhonston Jr, McGraw Hill.
6. Engineering Mechanics: Statics by J.L. Meriam and L.G. Kraige. Wiley India Ltd.
7. Relevant NPTEL Courses.

SURVEYING - I

CIV 215 | **Credits : 3**
Instruction : 3 Periods & 1 Tutorial / week | Sessional Marks : 40
End Exam : 3 Hours | End Exam Marks : 60

Course Objectives:

The objective if the course is to prepare student

1. To measure the area by chaining.
2. To measure the area and distance between the points by compass.
3. To measure the elevation of points.

Course Outcomes:

At the end of the course the student will be able to

1. Calculate angles, distances and levels.
2. Identify data collection methods and prepare field notes.
3. Understand the working principles of survey instruments.
4. Estimate measurement errors and apply corrections.
5. Demonstrate an ability to compute volume of reservoirs using contours.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3			3			1	2	2	1	2	3	3	
	2	3	3			3			1	2	2		2	3	3	
	3	3	2	1		2				1	2	1	2	2	2	
	4	2	2			2				2	1	1	2	2	2	
	5	3	3	2		2				2	2	1	1	3	2	

SYLLABUS

UNIT - I 12 Periods

Introduction: Surveying – Definition; Objectives; Classification; Principles of surveying; Instruments for Surveying; Scale – Scales used for Maps and Plans; Preparation of Map and Plan.

Chain Survey: Classification of surveying-Principles of Surveying. Sources of errors-Linear measurements, direct measurement. Instrumentation for chaining – Errors due to incorrect chain-Chaining on un-even and sloping ground-Errors in chaining - Tape corrections – Problems: Base line measurement-Chain Triangulation – Check lines, Tie lines, Offsets. Basic problems in chaining obstacles in chaining-Problems - Conventional signs.

12 Periods

UNIT - II

Compass Survey: Introduction to compass survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic bearing – Arbitrary Meridian, R.B. & B.B of lines – Designation of bearings – W.C.B. & R.B. – Conversion of bearings from one system to the other Related problems – Calculation of angles for bearings, Calculation of bearing for angles, Related problems – Theory of Magnetic compass (i.e. Prismatic compass) – Magnetic dip-Description of Prismatic compass. Temporary adjustments of compass-Magnetic Declination – Local attraction-Related Problems-Errors in compass survey.

UNIT - III 12 Periods

Traverse Surveying : Chain and compass traversing-Free or loose needle method – Fast needle method-Checks in closed and open traverse-Plotting methods of traverse Survey - Closing error-Balancing the traverse-Bowditch's method-Transist method, Gale's Travers table.

UNIT - IV 12 Periods

Levelling : Definitions of terms-Methods of leveling - Uses and adjustments of dumpy level-Temporary and permanent adjustments of dumpy level levelling staves - Differential leveling, Profile leveling - Cross sections - Reciprocal levelling. Precise leveling - Definition of BS, IS, FS, HI, TP-Booking and reduction of levels, H.I. methods-Rise and fall method-Checks-Related problems-Curvature and Refraction Related Problems-Correction-Reciprocal levelling-Related problems-L.S & C.S Levelling-Problems in leveling - Errors in levelling.

UNIT - V 12 Periods

Contouring: Definitions- Contour Interval and horizontal equivalent - Characteristics of contours-methods of locating contours-Direct and indirect methods-Interpolation of contours-Contour gradient-Uses of contour maps.

Minor instruments : Uses and adjustments of the following minor instruments:
Plane Table and its accessories, Line Ranger, Optical Square, Abney level, Clinometer, Ceylon Ghattracer, Pantagraph, Sextant and Planimeter.

TEXT BOOKS

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol.1, 2 and 3 – By Punmia, Standard Book House.

REFERENCES

1. Surveying Vol. 1 and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
2. A text book of Surveying by C.L. Kocchar, Dhanpatrai Publishing company.
3. A Text Book of Surveying and Levelling by R.Agor, Khanna Publishers
4. Surveying and Levelling Vol. I & Vol. II by T.P Kanetkar and S.V Kulkarni, Vidyarthi Griha Prakashan, 1988
5. Relevant NPTEL Courses.

STRENGTH OF MATERIALS

CIV 216 | **Credits : 3**

Instruction : 3 Periods & 1 Tutorial / week | Sessional Marks : 40

End Exam : 3 Hours | End Exam Marks : 60

Course Objectives:

1. To have basic knowledge of the stresses in springs, principal stresses, principal planes.
2. To have basic knowledge of the stresses in thin cylindrical, circular shafts and Springs.
3. To learn the concepts of stresses in compound sections and shear force and bending moment in different types of beams.

Course Outcomes:

At the end of this course student will be able to:

1. Understand and solve simple problems involving stresses and strain in two and three dimensions.
2. Analyses stress in two dimensions and understand the concepts of principal stresses and the use of Mohr circles to solve two dimensional stress problems.
3. Draw shear force and bending moment diagrams of simple beams and understand the relationships between loading intensity, shearing force and bending moment.
4. Compute the bending stresses in beams with one or two materials.
5. Apply sound analytical techniques and logical procedures in the solution of engineering problems.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	2	3								2	3	3	
	2	3	3	2	2								1	3	2	
	3	3	3	2	2								1	3	2	
	4	3	3	2	2								1	3	2	
	5	3	3	2	3								2	3	3	

SYLLABUS

UNIT - I 12 Periods

Employability

Simple Stresses and Strains: Elasticity and plasticity – Types of stresses and strains – Hooke's law– stress – strain diagram for mild steel and HYSD-bars Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

UNIT - II 12 Periods

Employability

Shear Force and Bending Moment in beams: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads, moment and combination of these loads – Point of contra flexure – Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT - III 12 Periods

Employability

Bending Stresses: Theory of simple bending – Assumptions – Derivation of bending equations, Neutral axis – Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections.
Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Employability

UNIT - IV 12 Periods

Principal Stresses and Planes: Introduction – Principal planes and Principal Stresses – Method of determining stresses on an inclined section of a member subjected to direct stresses in one plane – member subjected to direct stresses in two mutually perpendicular directions – member subjected to simple shear stress - member subjected to direct stresses in two perpendicular directions accompanied by a state of simple shear – Mohr's circle of stresses
Introduction to theories of failure: (i) Principal Stress theory, (ii) Principal Strain theory, (iii) Maximum Shear Stress theory and (iv) Maximum strain energy theory.

UNIT - V 12 Periods

Employability

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsional Rigidity equation – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts.
Springs: Introduction – Types of springs – deflection of closed and open coiled helical springs under axial load and axial twist.
Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

TEXT BOOKS

1. Ramamrutham, Strength of materials, Dhanpat Rai & Sons.
2. R K Bansal, Strength of materials, Laxmi Publications Pvt. Ltd.

REFERENCES

1. Timoshenko and Young, Elements of strength of materials Affiliated East-West Press Pvt. Ltd.
2. Mechanics of Materials, Beer and Jhonston, Tata McGraw Hill.
3. P.N. Singer and P.K. Jha, Elementary mechanics of solids, New Age International Pvt.Ltd.
4. Mechanics of Solids by Egor P. Popov, Pearson Education.
5. Relevant NPTEL Courses.

SURVEY FIELD WORK - I

CIV 217 | **Credits : 2**

Instruction : 3 Practical / week | Sessional Marks : 50

End Exam : 3 Hours | End Exam Marks : 50

Course Objectives:

1. To know how to conduct the experiments by using different survey instruments.
2. To improve practical knowledge.

Course Outcomes:

At the end of this course student will be able to:

1. Improve ability to function as a member of a survey party in completing the assigned field work.
2. Conduct survey and collect field data
3. Prepare field notes from survey data
4. Learn the measurement of elevation difference between two points using Level instruments.
5. Interpret survey data and compute areas and volumes.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3	2		2				2	2		2	3	2	
	2	3	3	2	2	2				2	2		1	3	2	
	3	3	2	1	2	2				2	1			2	2	
	4	3	2	1	1	2				1	2			2	2	
	5	3	2			2				1	2		1	3	2	

LIST OF EXPERIMENTS:

1. Introduction & list of equipments
2. Chain surveying - Aligning, Ranging and Chaining
3. To determine the area of the given plot using chain, tape & cross–staff.
4. To find the distance between inaccessible points using Compass Surveying.
5. Traversing using prismatic compass.
6. Measurement of elevation difference between two points using and Leveling Instrument.
7. Elevation difference between two points by Reciprocal levelling method.
8. Differential levelling, reduction of levels by rise and fall method.
9. Differential levelling, reduction of levels by height of collimation method.
10. Longitudinal and Cross Sectioning.
11. Contouring of a small area by method of Blocks.

REFERENCES

1. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications, 2005.
2. Relevant NPTEL Courses.

STRENGTH OF MATERIALS LABORATORY

CIV 218	**Credits : 2**
Instruction : 3 Practical / week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:

The student shall have the knowledge of

1. The stress – strain characteristics of mild steel bar.
2. The methods of determining modulus of elasticity, modulus of rigidity of spring and shaft materials.
3. The concepts of hardness, compressive strength, shear strength, impact strength and tensile strength of different materials.

Course Outcomes:

At the end of this course student will be able to

1. Determine the engineering and mechanical properties of materials.
2. To interpret the test results

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	1	1	1	2	2				2	1			1	2	
	2	1	1	1	2	2				2	1			1	2	

LIST OF EXPERIMENTS:

Employability

1. Tension test on Mild Steel / HYSD bars.
2. Compression test on wood (parallel to grains and perpendicular to grains)
3. Test on close coiled helical spring for the determination of rigidity modulus and spring constant
4. Hardness tests - Brinell's & Rockwell's.
5. Impact tests – Charpy and Izod
6. Torsion test.
7. Bending test.: Load deflection test for the determination of young's modulus on simply supported and cantilever beam for wood and steel.

Employability

REFERENCES

1. P.N. Singer and P.K. Jha, Elementary mechanics of solids, New Age International Pvt.Ltd.
2. Relevant NPTEL Courses.

CONCRETE TECHNOLOGY

CIV 221 — **Credits : 3**

Instruction : 3 Periods & 1 Tutorial / week — Sessional Marks : 40

End Exam : 3 Hours — End Exam Marks : 60

Course Objectives:

1. Learn about the manufacturing of cements and hydration process
2. Use different types of cement and admixtures as per their properties for different field applications.
3. Student shall learn about the various ingredients of concrete, admixtures, workability and strength of hardened concrete

Course Outcomes:

At the end of course student will be able to:

1. Understand the composition, manufacturing process and properties of cement.
2. Understand the classification, characteristics and properties of aggregate.
3. Acquire the skill of testing, supervision of concrete work & interpretation of tests results.
4. Understand the behaviour of hardened concrete.
5. Understand the need for special concretes.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	3	2	3	3		2					1	3	3	2
	2	2	2	2	2	3								2	3	
	3		2	2	3	2		3					1	2	3	3
	4		3	2		2		3						3	2	3
	5		2	2	3	2		3					1	2	3	3

SYLLABUS

UNIT - I — 12 Periods

Cement: Composition of ordinary Portland cement- oxide composition and compound composition- their functions in cement. Manufacture of ordinary Portland cement by wet process and dry process. Types of cement - OPC & blended (only fly ash & slag) and their uses. Tests on cement – field tests – laboratory test (Test procedure not required)

Employability

UNIT - II — 12 Periods

Aggreagate: Classification of aggregate based on origin , shape , size, unit weight: Manufactured sand (M – Sand) – characteristics of aggregates – strength, particle shape and texture ,specific gravity ,bulk density ,voids, porosity and absorption of aggregates – moisture content of aggregate – bulking of fine aggregate. Tests on aggregates.

Employability

(Test procedure not required)

UNIT - III 12 Periods

Fresh Concrete: Manufacture of concrete – Batching, Mixing, Transportation, Placing, Vibrating, Finishing, Curing – Workability – Factors affecting workability – segregation and bleeding – Tests available for measurement of workability (Test procedure not required)
Admixtures: Admixtures – functions of admixtures – General purpose admixtures such as Retarding admixture, Accelerating admixtures, Air Entraining admixtures, Water reducing admixture

Employability

UNIT - IV 12 Periods

Hardend Concrete: Strength of concrete – water-cement ratio – gel-space ratio – gain of strength with age – effect of maximum size of aggregate on strength – compressive strength – flexural strength – tensile strength of concrete – bond strength – factors affecting the strength of concrete. Introduction to creep and shrinkage of concrete – Tests on hardened concrete (Test procedure not required)

UNIT - V 12 Periods

Special Concrete: Introduction to special concrete – lightweight concrete – no fines concrete – fibre reinforced concrete – self compacting concrete
Concrete Mix Design: Concrete mix design – BIS Method of mix design

Employability

TEXT BOOKS

1. Concrete Technology – M. S. Shetty – S Chand Co., Publishers – 2006.
2. Properties of Concrete – AM Nevelli – 5th Ed, Prentice Hall Publishers, 2012.

REFERENCES

1. Concrete Technology – M. L. Gambhir – Tata Mc Graw Hill Publishers – 2012.
2. Concrete Technology 3 Edition, Gupta B L, & Amit Gupta, Standard Publishers and Distributors
3. Concrete Technology, A.R.Santha Kumar, Oxford University Press
4. Relevant NPTEL Courses.

ENVIRONMENTAL ENGINEERING - I

CIV 222 **Credits : 3**
Instruction : 3 Periods & 1 Tutorial / week Sessional Marks : 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

1. The principal objective of the course is to develop the technical knowledge for better understanding the concepts of water supply and its characteristics and enabling them to use these technical skills in solving the problems in industries.
2. To impart the knowledge in planning, design, construction, operation and maintenance aspects of water supply systems.
3. To provide theoretical and practical exposure in the field of water treatment and supply.
4. To increase the management skills with regard to collection, treatment and distribution of sustainable water.

Course Outcomes:

By the end of the course the student will be able to

1. Understand the sources of water, quality of water, types of water borne diseases.
2. Learn to estimate demand for water supply, and can apply the physical principles of flow in water distribution networks and pumping stations.
3. Design water treatment systems and operations and working of different units.
4. Design elements of public water systems, pumping and transportation of water, distribution systems, and components of water supply network in a town/city, functioning of water/sewer pipe appurtenances.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2	3	3	3	2	2	3				3	3	3	2
	2	3	3	3	3	3	2	2	3				3	3	3	2
	3	3	3	3	3	3	2	2	2				3	3	3	2
	4	3	3	3	3	3	2	2	3				3	3	3	2

SYLLABUS

UNIT - I 10 Periods

Introduction: Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

Water Demand and Quantity studies : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Forecasting Studies.

UNIT - II 10 Periods

Quality: Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

Employability

UNIT - III 10 Periods

Sources of Water Supply: Surface sources of water: Lakes, Rivers, Impounding Reservoirs, Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from wells and infiltration galleries.

Collection and Conveyance: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Laying of pipe lines.

UNIT - IV 12 Periods

Treatment of Water: Layout and general outline of water treatment units –Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, Defluoridation, Removal of Odours.

Employability

UNIT - V 12 Periods

Pumping: Necessity of pumping in water supply - classification and brief description of types of pumps - selection of pump - calculation of head, horsepower - economical diameter of pumping main.
Distribution System: Distribution of Water: Methods of Distribution system, Components of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks, Water connection to the houses.
Building Plumbing: Water Supply system – Fixing the pipes in building, high rise buildings – Maintenance of building pipe line – Water Meters.

TEXT BOOKS

1. Birdie G S and Birdie J S, "Water Supply and Sanitary Engineering", Dhanpat Rai and Sons, Delhi, Fifth Edition, 1997
2. Garg, S.K, "Environmental Engineering Vol. I ", Khanna Publishers, New Delhi, 1994.

REFERENCES

1. Modi, P.N, "Environmental Engineering Vol. I", Standard Book House, New Delhi, 2001.
2. Punmia B.C, "Environmental Engineering Vol. I", Lakshmi Publications (P) Ltd., New Delhi, 2002.
3. Deswal S and Deswal A, "A basic course in Environmental studies", Dhanpat Rai & Co, First edition, Delhi, 2004

4. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
5. National Building Code of India, SP 7 (1) – 1983, Bureau of Indian Standards, First Reprint, May 1992.
6. Relevant NPTEL Courses.

FLUID MECHANICS - I

CIV 223 **Credits : 4**

Instruction : 4 Periods & 1 Tutorial / week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

1. To develop an insight into engineering problems related to fluids.
2. Student is expected to learn about the pressure at a point, forces on fluid element to solve complex problems in engineering.
3. Student shall be able to know different types of fluid flows and apply the principles of conservations of mass, momentum and energy.

Course Outcomes:

By the end of the course the student will be able to

1. Determine the physical properties of fluids and different types of forces acting on a fluid element extended to forces on various gates.
2. Determine the forces that are acting on immersed bodies in static fluids through application of buoyancy and floatation.
3. Determine different types of fluid flows to find out the local and convective accelerations in 1D, 2D flows fields and derive the Laplace equation.
4. Apply conservation principles of mass momentum and energy on fluids through system and control volume approaches.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	1	1										1	1		
	2	1	1										1	1		
	3	2	3		2								2	3	2	
	4	2	3	1	2								3	2	2	

SYLLABUS

UNIT - I 14 Periods

Basic Fluid Properties: Definition of Fluid, basic properties of fluid, Viscosity - Newton's Law of Viscosity, Capillarity and Surface Tension.

Fluid Pressure: Fluid Pressure at a point, Pascal's law, Variation of pressure with elevation, Hydrostatic law, Absolute, Gauge and Vaccum Pressures. Pressure measurement – Piezometers, Manometers and Pressure Gauges. Centre of Pressure, Forces on submerged surfaces, crest gates and lock gates.

Skill Development

UNIT - II 14 Periods

Buyoancy and Floatation: Archimedes Principle- Buoyancy & Floatation - Stability of Floating Bodies- Centre of Buoyancy - Metacentric Height and its Determination.

Fluid Kinematics: Types of fluid flow, Velocity, Rate of flow, Continuity Equation, Streamline, Path line, Streak line, Local, Convective and Total Acceleration; One & Two Dimensional Flows. Stream Function, Velocity Potential- Rotational & Irrotational Flows, Laplace Equation, Flow net.

Skill Development

UNIT - III 14 Periods

Fluid Dynamics: Energy possessed by fluid in motion, Euler's equation of motion - Bernoulli's equation. Energy correction factor.
Flow through orifices and mouth pieces: Types of orifices and mouth pieces, coefficient of contraction, velocity and discharge.
Flow through notches and weirs: Types of notches and weirs, Measurement of discharge.

Skill Development

UNIT - IV 14 Periods

Impulse momentum equation – Momentum correction factor, Forces on pipe bends and reducers. Angular Momentum – Torque and work done; Sprinkler Problems.
Laminar Flow: Relation between shear and Pressure Gradients in Laminar Flow; Reynold's experiment; Critical velocity; Steady laminar flow through a circular pipe – Hagen Poiseuille's Law.

Skill Development

UNIT - V 14 Periods

Flow through pipes: Flow measurement through pipes – Venturimeter, orificemeter, nozzle meter. Loss of head, head loss due to friction – Darcy –Weisbach equation, minor losses, Total Energy Line, Hydraulic Gradient Line. Pipes in Series, pipes in parallel. Problems on Two reservoir and three reservoir flows. Water hammer, surge tanks.

Skill Development

TEXT BOOKS

1. Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth, Standard Book House.
2. Fluid Mechanics by A.K. Jain, Khanna Publishers

REFERENCES

1. Hydraulics Fluid Mechanics and Fluid Machines, S.Ramamrutham, Dhanpat Rai Publishing Co.
2. Engineering Fluid Mechanics by K.L. Kumar, S. Chand & Co
3. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications.
4. F M White, Fluid Mechanics, Tata McGraw Hill Publication 2011.
5. Relevant NPTEL Courses.

SURVEYING - II

CIV 224	**Credits : 3**
Instruction : 3 Periods & 1 Tutorial / week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Course Objectives:

1. To measure the height and distance by theodolite.
2. To measure the angles and distances by using tacheometric and trigonometric methods.
3. To measure distances and angles by total station.

Course Outcomes:

By the end of the course the student will be able to

1. Learn to determine horizontal and vertical angles between points.
2. To impart experimental skills to determine heights and distances of inaccessible objects.
3. Apply surveying skills in aligning highways and railway curves.
4. Demonstrate the ability to solve surveying problems.
5. Learn basics in GIS and GPS.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3			3							1	3	3	
	2	3	3	1		3							1	3	3	
	3	3	3	2	1	3							1	3	2	
	4	3	3	2	1	1							1	3	1	
	5	3	3	1		3							2	3	3	

SYLLABUS

UNIT - I 10 Periods

Theodolite Survey: Theodolite Component Parts, Classification, – Temporary Adjustments, Measurement of horizontal angle – Method of repitition, Method of reiterition – Uses of theodolities – Errors in theodolite or Permanent adjustments of a theodolite – Identification – Rectifying the errors.

Employability

UNIT - II 12 Periods

Theodolite Traversing: Open and closed traverse – Closing errors, Balancing the error – Bowditch method – Transit method, Omitted measurements – Gales traverse table – Axis Signal Correction.

Employability

Trigonometric leveling: Elevation of the tower - Base of the object accessible and inaccessible – Reduced level of the elevated points – instrument axis at different levels.

Triangulation: Principle of triangulation - Purpose and classification of triangulation surveys – Layout of triangulation.

Employability

UNIT - III 10 Periods

Tacheometry : Instruments - Principle of techeometry – Methods of Tacheometry - Stadia methods – Fixed hair method – Movable hair method – Tangential method – Subtanse bar – Beaman's stadia, Arc – Reduction diagrams or Triangulation – Classification – intervisibility of station – Signals and towers-base line measurements.

Employability

UNIT - IV 12 Periods

Curves: Types of Curves - Simple curves – Elements of simple curves – Methods of setting simple curves – Rankines method – Two theodolite method – Obstacles in curve setting – Compound curves – Elements of compound curves or Reverse curves – Elements of reverse curve – Determination of various elements – Transition curves – Ideal shape – Spiral transition curves - length of transition curve - Setting out methods.

Employability

UNIT - V 10 Periods

Modern Surveying Instruments: Electronic Theodolite, Introduction to geodetic surveying, EDM Instruments, Total station and global positioning system- Introduction to Geographic Information System (GIS)

Employability

TEXT BOOKS

1. Surveying Vol.1,2 and 3 – By Punmia, Standard Book House.
2. Surveying By Dr. K.R. Arora, Standard Book House.

REFERENCES

1. Surveying Vol. 1and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
2. A text book of Surveying by C.L. Kochhar, Dhanpatrai Publishing Company.
3. A Text Book of Surveying and Levelling by R.Agor, Khanna Publishers
4. Surveying and Levelling Vol. I & Vol. II by T.P Kanetkar and S.V Kulkarni, Vidyarthi Griha Prakashan, 1988
5. Principles of GIS for land resource assessment by P.A. Burrough –Clerendon Press, Oxford.
6. Relevant NPTEL Courses.

STRUCTURAL ANALYSIS - I

CIV 225 **Credits : 4**

Instruction : 4 Periods & 1 Tutorial / week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

1. Apply suitable methods for calculating deflections in statically determinate beams and trusses.
2. Apply suitable methods for analyzing statically indeterminate beams.
3. Analyze beams under moving loads.

Course Outcomes:

At the end of the course the student will be able to

1. Calculate deflections in statically determinate beams and trusses.
2. Analyze columns and struts under axial loading.
3. Calculate strain energy due to different types of forces.
4. Analyze statically indeterminate beams.
5. Analyze fixed and continuous beams.
6. Understand how shear force and bending moment vary with application of moving loads.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3	2	3								2	3	3	
	2	3	3	2	2								1	3	2	
	3	3	3	2	2								1	3	2	
	4	3	3	2	2								1	3	2	
	5	3	3	2	2								1	3	2	
	6	3	3	2	3								2	3	3	

SYLLABUS

UNIT - I 13 Periods

Combined bending and direct stresses: Resultant stress when a column of rectangular section is subjected to eccentric load along one axis and along both the axes- kern of a section.

Skill Development

Columns and Struts: Euler's theory – end conditions. Rankine – Gordon formula – other empirical formulae – Eccentrically loaded columns – Perry's formula, Secant formula.

Skill Development

UNIT - II 15 Periods

Deflections of statically determinate beams: (a) Double integration method (b) Macaulay's method (c) Moment area method, (d) Conjugate beam method.

Skill Development

14 Periods

UNIT - III

Strain energy: Expression for strain energy stored in body due to
(i) Axial load, (ii) Shear force, (iii) Bending Moment and (iv)Torque
Deflections of Statically Determinate Beams: (a)Unit load method (b) Castigliano's theorm – 1.
Deflections of Statically Determinate Trusses: (a)Unit load method (b) Castigliano's theorm – 1.

Skill Development

Skill Development

UNIT - IV 14 Periods

Analysis of Statically Indeterminate Beams: (a) fixed beams, (b) three span continuous beams using (i) Theorem of three moments, (ii) Slope deflection method and (iii) Moment distribution method.

Skill Development

UNIT - V 14 Periods

Moving loads and Influence lines: Maximum Shear force and Bending moment diagrams for different types of loads. Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads. Equivalent uniformly distributed live load for Shear force and Bending moment.

Skill Development

TEXT BOOKS

1. Theory of structures – Ramamrutham. Dhanpat rai Publishing company.
2. Theory of Structures by BC Punmia and Arun Kumar Jain and AK Jain, Laxmi Publications

REFERENCES

1. Theory of structures by S.P. Timoshenko and D.H. Young, McGraw Hill International Editions.
2. Basic Structural Analysis by CS Reddy, Tata McGraw Hill Education.
3. Analysis and Design of structures – Vazirani and Ratwani, vol 1, Khanna publishers.
4. Structural analysis by Thandavamoorthy, Oxford University Press.
5. Structural analysis by S.S.Bhavakatti. Vol I, Vikas Publishing House Pvt Ltd.
6. Relevant NPTEL Courses.

BUILDING PLANNING AND DRAWING

CIV 226 — **Credits : 3**

Instruction : 1 Lecture & 3 Practical / week — Sessional Marks : 40

End Exam : 3 Hours — End Exam Marks : 60

Course Objectives:

1. To understand the principles of planning and bylaws.
2. To draw plan, elevation and section of load bearing and framed structures.
3. To prepare detailed drawings for doors, windows, etc.

Course Outcomes:

1. Understand various types of buildings and housing concept.
2. Apply the concepts of climatology and orientation of both residential and commercial buildings.
3. Apply the principles of planning and bylaws used for building planning.
4. Recommend appropriate planning for 2 Bed room and 3 Bed room houses.
5. Draw plan, elevation and section for various structures.
6. Design individual rooms with attention to functional and furniture requirements.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3		3		3	3	3	3		3	3	3	3	3	2
	2	1		1		1	1	3	3		1	1	3	1	1	3
	3	1		3		1	3	3	3		3	3	3	2	2	3
	4	3		3		3	2	3	3		3	3	3	3	3	3
	5	3		3		1	3	3	2		3	3	3	3	2	3
	6	1		3		1	3	3	3		3	3	3	2	2	3

SYLLABUS

UNIT - I — 12 Periods

Climatology: Elements of climate: Sun, Wind, Relative Humidity, and Temperature. Mahoney Tables, Comfort conditions for house. Various types of Macroclimatic zones, Design of Houses and layouts with reference to climatic zones. Solar charts. Wind Roses, Ventilation.

Principles of Planning, Orientation of Buildings.

UNIT - II — 12 Periods

Design of Individual rooms with particulars attention to functional and furniture requirements (for internal evaluation only). Residential Buildings: Different types of Residential Buildings, Selection of site for residential buildings. Guidelines for planning and drawing of residential building. General Building regulations and Bye laws for Residential Buildings.

Skill Development

UNIT - III 36 Periods

Drawing: At least ten sheets shall be drawn during the semester manually using mini-drafter/setsquares (along with AUTOCAD), (a) Conventional signs of materials, various equipment used in a Residential Building (copying exercise). Plan, Sectional Elevation, Front Elevation and site pl Skill Development

(a) A Small House (One Room and Verandah) (Copying exercise), (b). Three bed roomed House in HOT and ARID zone, Hot and humid zone & Cold zone(copying exercise), (c) Houses with given Functional requirements and climatic data. Emphasis may be given to Hot and Humid (d) Duplex Type Houses.

Skill Development

Note:

1. AUTOCAD Drawings for internal assessment only.
2. The question paper consists of Part-A and Part-B. Part-A consists of 4 questions, 2 questions for each of Unit – I & II and Part-B consists of a compulsory question for 36marks

TEXT BOOKS

1. Building Planning and Drawing by Dr.N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors.

REFERENCES

1. Building Drawing with an integrated approach to Built environment by M.G.Shah, C.M.Kale and S.Y.Patki, McGraw-Hill Publishing Company Limited, New Delhi.
2. Civil Engineering Drawing Series ‘B’ by R.Trimurty, M/S Premier Publishing House.
3. Relevant NPTEL Courses.

CONCRETE TECHNOLOGY LAB

CIV 227 | **Credits : 2**
Instruction : 3 Practical / week | Sessional Marks : 50
End Exam : 3 Hours | End Exam Marks : 50

Course Objectives:

1. To apply the basic knowledge of civil engineering in selecting appropriate cement, fine and coarse aggregates in making concrete.
2. To be able to make concrete of required strength.

Course Outcomes:

At the end of this course student will be able to

1. Determine the properties of concrete and its ingredients
2. Check the suitability of various ingredients of concrete in constructions

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	1	2	3	1				1	1		2	2	2	
	2	2	1	2	3	2				1	2		2	2	3	

LIST OF EXPERIMENTS:

1. Specific gravity and unit weight of cement
2. Specific gravity and unit weight of coarse aggregates.
3. Specific gravity and unit weight of fine aggregates.
4. Fineness of cement,
5. Consistency of cement
6. Initial and final setting time of cement.
7. Compressive strength of cement (for different grades of cement).
8. Bulking of sand.
9. Sieve analysis of coarse and fine aggregates
10. Workability tests on fresh concrete by using: Slump cone, Compaction factor apparatus, Flow table, Vee-Bee Consistometer.
11. Compressive Strength of concrete
12. Split tensile strength of concrete
13. Modulus of rupture of concrete

Employability

REFERENCES

1. Properties of Concrete – AM Nevelli – 5th Ed, Prentice Hall Publishers, 2012.
2. Concrete Technology – M. S. Shetty – S Chand Co., Publishers – 2006.
3. Relevant NPTEL Courses.

FLUID MECHANICS LAB - I

CIV 228 — **Credits : 2**

Instruction : 3 Practical / week — Sessional Marks : 50

End Exam : 3 Hours — End Exam Marks : 50

Course Objectives:

The objective of the course is to enable the student to calibrate different types of flow measuring devices to measure flow in tanks, pipes and open channels.

Course Outcomes:

At the end of this course student will be able to

1. Calibrate various flow measuring devices
2. Apply Bernoulli's Principle for pipes and open flows

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	1	1	2					3	1		1	1	2	
	2	2		1	3					2			1	2	3	

LIST OF EXPERIMENTS:

1) Calibration of a small orifice by constant head method and falling head method
2) Time required for emptying the tank through the small orifice.
3) Calibration of a cylindrical mouth piece by constant head method and falling head method.
4) Time required for emptying the tank through the mouth piece.
5) Calibration of Venturi meter
6) Calibration of Orifice meter.
7) Calibration of Flow nozzle meter.
8) Calibration of a triangular V Notch
9) Calibration of a rectangular notch.
10) Calibration of a trapezoidal notch.
11) Experimental verification of laminar, transition and turbulent flows using Reynolds apparatus.
12) Verification of Bernoulli's Equation.

Employability

REFERENCES

1. Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth, Standard Book House.
2. Relevant NPTEL Courses.

SURVEYING FIELD WORK - II

CIV 229 — **Credits : 2**

Instruction : 3 Practical / week — Sessional Marks : 50

End Exam : 3 Hours — End Exam Marks : 50

Course Objectives:

1. To know how to conduct the experiments by using different survey instruments.
2. To improve practical knowledge.

Course Outcomes:

At the end of this course student will be able to

1. Demonstrate an ability to conduct surveying for any infrastructure project.
2. Analyses data and report results.
3. Work in teams doing field work and computer analysis.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	2	1		2				2	2			2	2	
	2	3	3	2	2	1				2	2			3	2	
	3	3	2	1	2	2				1	1			2	2	

LIST OF EXPERIMENTS:

1. To determine horizontal angle by repetition method
2. To determine horizontal angle by reiteration method
3. To determine the vertical angles.
4. To determine Reduced level of different points.
5. To determine height of the object when base is accessible and base inaccessible.
6. To determine the Tacheometric Constants.
7. To determine gradient between two points
8. Setting of simple curve using tape, Rankine's Method and Two theodolite Method
9. Study of Instrument – Determination of Distances, Directions and Elevations (Total Station)
10. Determination of Boundaries of a Field and computation of area using Total Station.
11. Determination of Heights of objects using Total Station.

Employability

REFERENCES

1. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications, 2005.
2. Relevant NPTEL Courses.

TECHNICAL SEMINAR

CIV 2210 | **Credits : -**
Instruction : 2 Practical / week | Sessional Marks : -
End Exam : - | End Exam Marks : -

Course Objectives:

The objective of this course is

1. To enhance the communication skills of the students through participation and giving seminars.
2. To develop an overview of civil engineering and its applications in the students.
3. To promote teamwork and lifelong learning among the students.

Course Outcomes:

At the end of the course the students will be able to

1. Make presentation on a given topic related to civil engineering.
2. Improve the communication skills.
3. Broaden their knowledge about civil Engineering and its practical applications.
4. Update their knowledge on the latest developments in civil engineering.
5. Understand the environmental, safety, economical and sustainability aspects of any civil engineering structure.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2			2		2	2		3	3		2	2	3	2
	2									3	3		2		3	2
	3	2	2	2	2	2	2	2		3				2	2	2
	4		2	2	2	2	2	2		3				2	2	2
	5			2			2	2		3				2		3

OUTLINE OF SYLLABUS

Students have to prepare a Report on a case study, design or practical application in civil engineering and make a presentation in teams of maximum 2 students. Duration of each seminar shall be 20 minutes per team including discussion. Evaluation to be done by a Panel of Examiners nominated by HoD with at least one faculty member of specialization related to the seminar topic.

Employability

REFERENCES

1. National & International Journals / Standard Magazines / Reports / Case Studies in civil engineering.
2. NPTEL courses in civil engineering.
3. World Wide Web resources on state of the art in civil engineering.

CE311 REINFORCED CONCRETE STRUCTURES – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

General : Loading standards as per IS 875, Grades of steel and cement, Stress-Strain characteristics of concrete and steel, Limit State Method (L.S.D.) of design.
Limit State of Collapse of in Flexure : Central Value measures, Measures of distribution, Normal distribution curve. Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

UNIT – I Limit State of Collapse: Flexure of R.C.C. beams of rectangular section. Under reinforced, Balanced and over reinforced sections. Compression stress block, Estimation of ultimate moment by strain compatibility. Guide lines for choosing width, depth and percentage of reinforcements in beams.
Analysis and design of singly reinforced rectangular beams and doubly reinforced beams, design by using SP 16 and Torsteel Design Aids By K.T.S. Iyyangar and Viswanatha (Sessional Work Only)
Design of flanged beams (T and L), Effective flange width, Basis of analysis and design, Minimum and Maximum steel in flanged beams, SP 24 in design of beams.

Skill Development

UNIT – II : Design of one way and two way slab : Simply supported slabs on all four sides, Moment in two way slabs with corners held down. Choosing slab thickness. Design of restrained slabs (with torsion at corners) I.S. code provisions. Detailing of reinforcement. Load from supporting beams. Different kinds of loads on slabs including partition walls, Shear in slabs.

Skill Development

UNIT III : SHEAR, TORSION AND BOND : Limit state of collapse in shear, types of shear failures. Truss analogy, shear span / depth ratio. Calculation of shear stress, types of shear reinforcement. General procedure for design of beams for shear. Enhanced shear near supports. Shear in slabs, steel detailing. Analysis for torsional moment in a member. Torsional shear stress in rectangular and flanged [illegible]nt for torsion in RC beams. Principles of design for combined bending shear and torsion. Detailing of torsion reinforcement – Concept of bond, development length, anchorage, bond, flexural bond.

Skill Development

UNIT – IV : Columns : Short and Long colu[illegible]tricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial and biaxial moments.
Footings : Analysis and design of isolated rectangular footings.
Design of stair case, Mix design by I.S. Code method only.

Skill Development

Skill Development

UNIT - V Working Stress Method – General Introduction, Fundamental Assumptions, Method of Transformed Sections, Stress- Strain relationship. – Rectangular Sections in Bending with Tension Reinforcement only – Under-reinforced, Idealy reinforced Balanced and Over-reinforced Sections – Design of Rectangular sections in Bending with Tension Reinforcement only and with both Tension & Compression reinforcement. – Non-rectangular sections in Bending (T and L sections)

<u>TEXT BOOKS</u> :
Limit State of Design of Reinforced Concrete – P. C. Vergheese
Reinforced Concrete Limit state Design – A.K. Jain.
R.C.C Design – Unnikrishna Pillai and Vasudeva Menon.
<u>REFERENCES</u> :
Reinforced Concrete Limit state Design - P. Dayaratnam
- Purushothaman
- Park and Paulay
- James G. Mac Gregor

CE 312 STEEL STRUCTURES – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T — Sessional Marks: 30

Note: All the designs should be taught in the limit state design method as per IS 800-2007

UNIT – I : Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel.
Bolted connections : Behavior of bolted joints, Desing strength of ordinary black bolts, high strength friction grip bolts, Pin connections, Simple connections, Moment resistant connections.

Employability

UNIT – II : Welded Connections :Advantages of welding, Types and properities of welds, Types of joints,wled specifications Design of welded joints subjected to axial load, Eccentric welded connections.

UNIT – III : (a)Tension members : Types of tension members, Design of strands, slenderness ratio, displacement of tension members, behavior of tension members, modes of failure, factors affecting strength of tension members, angles under tension, design of tension members, Lug angles, splices.
(b)Compression members: Possible failure modes, classification of cross-section, behavior of compression members , Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, Built up compression members, Laced and Battened columns, eccentrically loaded columns, Column splices.

Employability

UNIT - IV (a) Beams : Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, Laterally supported and unsupported beams, Design of built up beams..

Employability

(b) Roof trusses : Types of trusses, Economical spacing of roof trusses, loads on roof trusses, Estimation of wind load on roof trusses as per IS : 875. Design of members of roof truss and joints, Design of purlins.

UNIT – V (a) :Column bases and Foundations : Allowable stress in bearing, Slab base, Gusset base and Grillage foundations.

Employability

(b) Introduction to pre-engineered structures, concepts and advantages, disadvantages.

REFERENCES :

Employability

Design of Steel structures – N. Subramanian, Oxford University Press.
Design of steel structures – Ramchandra (Vol. I & II)
Limit State Design of steel structures IS: 800-2007-V.L. Shah and Veena Gore, Structures Publications, Jai – Tarang, 36 Parvati, Pune.
Design of steel structures by imit State Method as per IS: 800-2007 – S.S. Bhavikatti IK Internatinoal Publishing House, Bangalore – 560 001..

CE313 - Fluid Mechanics – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T — Sessional Marks: 30

Unit I Viscous Effects on Fluid Motion.	
(1) Laminar Flow and N.S. Equations.	Equation of Motion for Real Fluids- Modifications in Equation of Motion- Stress Strain Relationships -Tangential Stress Terms- Development of Navier-Stokes Equations - Solution of N.S. equations for standard cases of Plane two Dimensional and Axi-symmetric Flows.
(2) Plane Two-dimensional Flows.	Steady Flow between Parallel Plates- Couette and Poiseuille Flows- Unsteady laminar Flow Past a Flat Plate,
(3) Axi- symmetric Flows.	Flow through a Circular Annulus- Flow without and with Pressure Gradient- Hagen-Poiseullie Equation, Relationship between Friction factor and Reynolds Number for Laminar Flow through Pipes.
(4) Special Cases	a) Laminar Flow between Co-axial Cylinders, b) Hydrodynamic Lubrication and c) Low

of Viscous Flow	Reynolds Number Flow Around a Sphere.
(5) Turbulent Flow & its Characteristics	Transition from Laminar to Turbulent Flow- Critical Reynolds Number-Stability Parameter- Characteristics of Turbulent Flow –Mean and Fluctuating Components of Velocity – Quantitative Description of Turbulence - Statistical Nature of Turbulent Flow- Isotropic and Homogeneous Turbulence.
(6) Analysis of Turbulent Flows.	Turbulence Modelling – Semi-empirical Theories –Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept, Karman Similarity Hypothesis - Basic Concepts related to the following Governing Equations of Turbulent motion - (i) Continuity Equation, (ii) Reynolds Equations – Reynolds Stress Tensor.

Unit II Boundary Layer Theory	
(7) Boundary Layer Analysis.	Theory of Boundary Layer – Characteristics of Laminar Boundary Layer - Boundary Layer Growth over a Flat Plate (without pressure gradient) - Laminar and Turbulent Boundary Layers, Boundary Layer Thickness and its Characteristics- Displacement, Momentum and Energy Thickness.
(8) Hydrodynamically Smooth & Rough Boundaries.	Velocity Distributions for Turbulent Flow in Pipes- Hydrodynamically Smooth and Rough Flows-Velocity Defect Law- Von Karmans' Universal Law for Mean Velocity near Smooth and Rough Boundaries- Relationship between Mean Velocity and Maximim Velocity.
(9) Resistance of Commercial Pipes.	Friction Factor for Pipe Flows- Dependence on Reynolds Number and Relative Roughness- Resistance of Commercial Pipes- Moody's Diagram- Simple Pipeline Design Problems.
(10) Viscous Drag and Boundary Layer Separation.	Karman Momentum Integral Equation- Viscous drag, Boundary, Layer Separation- Mechanism of Separation -Control of B.L. Separation.

Unit III Drag, Lift & Propulsion.	
(11) Concepts of Drag and Pressure Distribution over Immersed Bodies.	Drag and Lift- Deformation Drag, Friction Drag, Form Drag- Drag coefficient. Distribution of Fluid Pressure on immersed bodies – Pressure Distribution for flow past a circular disk, sphere- Effects of eddy pattern in two dimensional flow – Distribution of pressure for two dimensional flow past a cylinder - Von Karman vortex trail- Eddy shedding; Drag of immersed bodies - Variation of Drag Coefficient with Reynolds Number; Drag on Cylinder –Resistance diagram for bodies of revolution- Drag Coefficient of Practical Bodies.
(12) Lift & Propulsion	Effect of Circulation in Irrotational Flow- Generation of Lift around a Cylinder- Magnus Effect- Computation of Lift Force- Lift on Airfoil- Lift Coefficient and its Variation with Angle of Attack- Jukowsky Profile- Polar Diagram- Stall - Induced Drag

Unit IV Open Channel Flows – I.	
(13) Basic Concepts.	Introduction, Classification of Open Channels- Classification of Flow. Channel Geometry – Geometric Elements of a Channel Section. Velocity Distribution in a Channel – Wide Open Channel – Measurement of Velocity – Velocity Distribution Coefficients – Pressure Distribution in a Channel Section – Effect of Slope on Pressure Distribution. Basic Equations – Chezy's Equation – Manning's Equation.
(14) Uniform Flow in Rigid & Mobile Boundary Channels	Uniform Flow Computation- Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow. Determination of Normal Depth and Velocity. Design of Channels for Uniform Flow – Design of Nonerodible Channels –Best Hydraulic Section – Determination of Section Dimensions for Uniform Flow for Uniform Flow - Most Economical Channel Sections- Rectangular, Trapezoidal, Circular and Triangular Channel Sections - Critical Flow –Computation of Critical Flow – Section Factor for Critical Flow.
(15) Design of Channels for Uniform Flow	Design of Channel Sections for Non-erodible channels –Design of Erodible Channels- Critical Velocity and Critical Tractive Force Concepts.

(16) Application of Energy Principle in Open channels.	Definition of Specific Energy, Conjugate or Alternate Depths- Sub-critical, Critical and Super-critical Flows- Froude Number- Specific Energy Diagram, Critical depth, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections.
(18) Application of Momentum Principle in Open channels.	Specific Force- Sequent Depths- Hydraulic Jump in Rectangular Horizontal Channels- Loss of Energy due to Hydraulic Jump- Types of Jumps and their features.
(19) Canal Transitions & Control Sections.	Canal Transitions- Change of Depth in Channels with (a) Change in Cross-section and (b) Hump in the Bed- Control Sections- Venturi Flume and Parshall Flume.

Unit V Varied Flow in Open Channels.	
(20) Analysis & computation of G.V.F.	Definition of G.V.F. and Derivation of Governing Equation- Mild, Steep, Critical, Horizontal and Adverse Slopes- Classification of G.V.F. Profiles- Backwater and Drawdown Curves- G.V.F. Profiles for Channels with Changing Slopes. Computation of G.V.F. Profiles- Graphical Integration Method and method of Direct Integration (Procedures Only), Direct Step and Standard Step Methods – Computation of G.V.F. Profiles in rectangular channels using Direct and Single Step methods (Simple Slope cases only).
(21)Practical Problems in G.V.F. and Rapidly Varied Flow.	Two Lake (Reservoir) Problems – Delivery of a canal for sub-critical flow – Delivery of a canal for supercritical flow. Rapidly Varied Flow – Hydraulic jump – Types of jump – Hydraulic jump in horizontal rectangular Channels – Hydraulic jump in sloping rectangular channels.
(22) Spatially Varied Flow	Basic principles and assumptions – Dynamic equation for spatially Varied Flow for Flows with increasing and decreasing discharges-Analysis of Flow Profile for i) Rectangular lateral-spillway channel with free- overfall without losses and ii) Rectangular channel of small sloe with a bottom rack.

Text Books

(1) Engineering Fluid Mechanics by K.L. Kumar S. Chand & Co.
(2) Fluid Mechanics by A.K. Jain Khanna Publishers.
(3) Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth Standard Book House
(4) Flow through Open Channels by K. Subramanya
(5) Flow through Open Channels by K.G. Ranga Raju

CE314 GEOTECHNICAL ENGINEERING – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

UNIT – I : A) Introduction: Historical development – Physical properties of Soil – Void ratio – Porosity, Degree of Saturation, Water content, Unit Weights, Specific Gravity – their relationships, Relative density. Consistency limits – determination and various indices – plasticity index Liquidity index – Significance and Importance, Activity.

Classifications : Mechanical analysis – Sieve analysis, stoke's law, hydrometer and Pipette Analysis Textural Classification, Structural Classification based on size – unified soil classification and modification by Bureau of Indian Standard.

Employability

B). Soil Hydraulics – Types of soil water capillary rise and surface tension, Darcy's law and its limitations constant head and variable head permeameters pumping tests, Factors effecting coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, No flow downward flow and upward flow conditions, quick sand conditions, critical hydraulics gradient.

Employability

Employability

UNIT – II : Stress distribution : Bousinesq's theory for determination of vertical stress, assumptions and validity, extension to rectangular and circular loaded areas, 2 : 1 approximate method, westergard's theory Newmarks influence chart. Construction and use, contact pressure distribution beneath footings.

Consolidation : Oedometer Test, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi's one dimensional consolidation theory assumption, derivation and

Employability

application, coefficient of consolidation time curve fitting methods, initial compression, primary compression and secondary compression determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

Employability

UNIT – III : Compaction : Mechanism of compaction Factors effecting compaction – water content, compactive effort, Nature of soil. B.S., Modified AASHO and IS compaction tests. Effect of compaction on physical and engineering properties of soils, Field compaction – Equipment and Quality Control proctors penetrometer.
Subsoil Exploration : Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.

Employability

UNIT – IV : Shear Strength of Soils : Stress at a point, Mohr circle of stress, Mohr coulomb failure theory shear tests – shear box, unconfined compression, and triaxial compression tests, fieldvane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio and dilatancy, shear strength of clays, total stress analysis and effective stress analysis, skemptons pore pressure coefficients, stress paths.

Employability

<u>TEXT BOOKS</u> :

1. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao.
2. Soil Mechanics, Foundation Engineering by V.N.S. Murthy.
3. Soil Mechanics and Foundation Engineering by K.R. Arora.

CE315 ENVIRONMENTAL ENGINEERING – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 0 T Sessional Marks: 30

<u>UNIT – I</u>

Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.
Water Demand and Quantity studies : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

Employability

<u>UNIT - II</u>

Hydrological Concepts: Hydrological Cycle, Types of Precipitation, Measurement of Rainfall. Surface sources of water: Lakes, Rivers, Impounding Reservoirs, Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, Springs, Wells and Infiltration galleries, Yields from wells and infiltration galleries.
Collection of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water : Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Laying of pipe lines.

<u>UNIT - III</u>

Quality and Analysis of Water : Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water. Water borne diseases. Drinking water quality standards.

Employability

<u>UNIT –IV</u>

Treatment of Water : Flowchart of water treatment plant, Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, Defluoridation, Removal of Odours.

Employability

<u>UNIT – V</u>

Distribution of Water : Methods of Distribution system, Components of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks, Water connection to the houses.

References :

1. Environmental Engineering – Peavy, Rowe, Tchenobolus
2. Elements of Environmental Engineering – K.N. Duggal
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S.Birdie

4. Water Supply Engineering – Dr. P.N.Modi
5. Water Supply and Wastewater Engineering – Dr. B.S.N.Raju
6. Water Supply Engineering – B.C. Punmia
7. Water Supply Engineering – Hussain
8. Water Supply Engineering – Chatterjee

ELECTIVE-I

CE316 A ESTIMATING AND QUANTITY SURVEYING

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction : Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

UNIT – II : Specialisations : Meaning, purpose, types of specialisations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Race analysis – Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

UNIT – III : Detailed estimate of buildings. Different items of work in building; Principles of taking out quantities, detailed measurement form; long walls and shortwalls method of building estimate, Centre line method of building estimate. Estimate of RCC building, slope roof buildings; G.I. and A.C. Sheet, Detailed estimate of different types of doors and windows, electricity and water supply. Sanitation works etc.

UNIT – IV : Estimate of earth work; different formulae for calculations, estimate of metalled road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc. Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning.

Employability

<u>REFERENCE BOOKS</u> :

1. Estimation, Costing, Specifications and Valuation in civil Engineering by M.Chakraborti.
2. Estimating and Costing in Civil Engineering by B.N. dutta.
3. Textbook of estimating and costing by G.S. Birdie.
4. Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli.
5.

CE 316B REPAIR AND REHABILITATION OF STRUCTURES (ELECTIVE)

University Examination: Duration 3hrs Marks 70
Sessional Marks: 30
No. of Periods per week: 4L+2T

UNIT-I: Materials: Construction chemicals, Mineral admixtures, Composites, Fibre reinforced concrete, High performance concrete, polymer-impregnated concrete.
UNIT-II: Techniques to test the existing strengths: Destructive and non destructive tests on concrete.
UNIT-III: Repairs of Multistory structures: Cracks in concrete, possible damages to the structural element-beams, slab, Column, Footings, etc., Repairing techniques like Jacketing, Grouting, External prestressing, Use of chemical admixtures, Repairs to the fire damaged structures.

Employability

UNIT-IV: Foundation problems: Settlement of shallow foundations – repairs, sinking of piles, wells – repairs.
UNIT-V: Corrosion of Reinforcement: Preventive measures – coatings –use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, flowing concrete.

Reference:
1. "Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.
2. "Concrete Structures: Repairs, water proofing and protection" by Philip H. perkins, Applied sciences publications Ltd., London, pp.302.

3. "Durability of concrete structure: Investigation, Repair, Protection" Edited by Geoffmang., E. & FN SPON, An imprint of Chapman & Hall, pp.270.
4. "Deterioration, maintenance and Repair of structures" by Johnson, McGraw Hill, pp.375.

CE 316C DISASTER MANAGEMENT (ELECTIVE)

University Examination: Duration 3hrs Marks 70
Sessional Marks: 30
No. of Periods per week: 4L+2T

UNIT-I: Concept of disaster management. Types of disasters. Disaster mitigating agencies and their organization structure at different levels. Overview of Disaster situations in India: Vulnerability profile of India and vulnerability mapping including disaster prone areas, communities and places.
UNIT-II: Disaster preparedness-ways and means; skills and strategies; rescue, relief, reconstruction and rehabilitation.
UNIT-III: Seismic vulnerability of urban areas. Seismic response of R.C frames buildings with soft first storey. Preparedness for natural disasters in urban in urba edness and planning for an urban earthquake disaster. Urban serrlements and natural hazards. Tsunami and its impact.

Employability

UNIT-IV: Landslide hazards zonation mapping and geo-environmental problems associates with the occurrence of landslides. A statistical approach to study landslides. Land causal factors in urban areas organization of mockdrills.
UNIT-V: Role of remote sensing, science & technology, Rehabilitation programmes, Management of Relief Camp, information systems & decision making tools, voluntary Agencies & community participation at various stages of disaster Management, School Awareness & Safety programme

Book:

1. "Natural Hazards in the Urban habitat" by lyengar, CBRI, Tata McGraw Hill
2. "Natural Disaster management", Jon Ingleton (Ed), Tulor Rose, 1999
3. "Disaster Management", RB Singh (Ed), Rawat Publications, 2000.
4. Anthropology of Disaster management", Sachindra Narayan, Gyan Publishing house, 2000.

CE317 ENVIRONMENTAL ENGINEERING LABORATORY

University Examination: Duration 3 hrs. Marks:50
No of Periods per Week : 0 L+ 3P Sessional Marks: 50
Experiments on :

1. (a) p^H.
   (b) Conductivity.
2. (a) Turbidity.
   (b) Jar Test .
3. Hardness.
4. Acidity estimation.
5. Alkalinity estimation.
6. Available Chlorine & Residual Chlorine.
7. Fluorides.
8. Iron Estimation.
9. Estimation of Total Solids : Settleable Solids : Suspended solids, dissolved solids.
10. D.O.
11. B. O. D.
12. C. O. D.
13. Chlorides.

Skill Development

CE318 GEOTECHNICAL ENGINEERING LABORATORY – I

University Examination: Duration 3 hrs. Marks :50
No of Periods per Week : 0 L+ 3P Sessional Marks: 50

1. Atterberg limits
2. Field density by Core Cutter and Sand replacement method.
3. Grain size analysis

Employability

4. Hydrometer/pipette analysis.
5. Specific gravity by pycnometer/density bottle method.
6. Permeability of soil – Constant and variable head tests.
7. IS light compaction.

DEMONSTRATION EXPERIMENTS :

1. Consolidation test.
2. Quick sand model and others if any.

CE319 SOFT SKILLS

(COMMON WITH OTHER BRANCHES)

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Employability

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, Analysing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. ‘Effective Technical Communications’ by Rizvi M. Ashraf, McGraw–Hill Publication
2. ‘Developing Communication Skills’ by Mohan Krishna & Meera Banerji, Macmillan

3. ‘Creative English for Communication’ by N.Krishnaswami & T.Sriraman, Macmillan
4. ‘Professional Communication Skills’ by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

CE321 STRUCTURAL ANALYSIS – III

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii)Castigliano’s theorm – II.

Skill Development

UNIT – II : Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (I)slope-deflection method (ii)moment distribution method (iii)Kani’s method, (iv) Column Analogy.

Skill Development

UNIT – III : Arches : Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

Skill Development

UNIT – IV : Suspension bridges : Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

Skill Development

UNIT – V : Introduction to matrix methods of structural analysis (Very elementary treatment only) Static indeterminacy, Kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only. – Truss with 3 supports and 7 members.

<u>TEXT BOOKS</u> :

1. Statically indeterminate structures – C.K. Wang
2. Structural analysis – A matrix approach – G.S. Pandit and S.P. Gupta.
3. Indeterminate Structures by R.l. Jindal
4. Indeterminate Structural Analysis by J.S. Kinney.

CE322 REINFORCED CONCRETE STRUCTURES – II

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Retaining Walls : Types of retaining walls, forces on retaining walls, Rankine and Coloumb earth pressure theories (c and ϕ soils). Passive earth pressure, Drainage of retaining walls. Stability requirements. Preliminary proportioning of cantilever retaining walls. Design of cantilever and counterfort retaining walls.

Skill Development

UNIT – II : Water Tanks : Stress in concrete and steel in water tanks, Modular ratio, Impermeability requirements, Under ground rectangular tanks, Elevated rectangular and circular tanks, Design of these tanks for strength and cracking, Design of staging of rectangular tanks.

Skill Development

UNIT – III : Bridges : Components of a bridge, sub and super structure. Classification of bridges. Highway loading standards, kerbs, footpaths, railings, parapet loadings, impact, wind, longitudinal forces.
Design of solid slabs (casual reference to MOST drawings)
Design of T-beam bridge deck slab, Longitudinal and Cross beams (casual reference to MOST drawings)
Courbon’s theory.

Skill Development

UNIT – IV : Piles and Pile caps : Design of bored cast in situ piles (bearing and friction types), under reamed piles. Pile Caps design; bending and truss methods.

Skill Development

UNIT – V: Prestresed Concrete – Reinforced Concrete Versus Prestressed Concrete. – Prestressing Systems (Fressinet, Gifford Udal, Magnel Blatten) – Prestressing Losses – Steel and Concrete for Prestressing –

Homogeneous Beam Concept, limiting eccentricities, Pressure line, Elastic Stress distribution across the depth due to D.L. eccentric prestress and L.L.

TEXT BOOKS :

1. Limit State of Design of Reinforced Concrete – P.C. Vergheese
2. Reinforced Concrete Limit State Design – A.K. Jain.
3. Design of reinforced Concrete Structures – P. Dayaratnam.

CE323 STEEL STRUCTURES – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

Note: All the designs should be taught in the limit state design method as per IS 800-2007".

UNIT – I :Plate Girders: Components of a plate girder, Economical depth, Design of flanges (flange area and moment of inertia methods), curtailment of flange plates, connection of flange angles to web and flange angles to flange plates.

Skill Development

UNIT – II :Web stiffeners : Vertical stiffener, horizontal stiffener, Bearing stiffener.
Web splices : Rational, Shear and Moment splices, Splices of flange angles and flange plates.

Skill Development

UNIT – III : Bridges : Loadings, Deck type and through type bridges, Plate girder bridges, design of stringers, cross girders, wind bracings. Design of cross girder bridges, tension and compression members, joints, wind bracings.
Bearings : Types of bearings, plate bearing, Rocker bearing, Roller bearing, Knuckle pin bearing.

UNIT – IV :Water tanks, Introduction, Design of elevated circular and rectangular water tanks, Design of pressed steel tanks.

Skill Development

Skill Development

UNIT – V : Plastic analysis : Introduction, Upper and Lower bound theorems, Uniqueness theorem, Shape factor, Load factor
Beams : Collapse load for fixed and continuous beams, Design of beams
Frames : Collapse load for a frame of single bay single storey frame.

REFERENCES :

Design of Steel structures – N. Subramanian, Oxford University Press.
Design of steel structures – Ramchandra (Vol. I & II)
Limit State Design of steel structures IS: 800-2007-V.L. Shah and Veena Gore, Structures Publications, Jai – Tarang, 36 Parvati, Pune.
Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti IK Internatinoal Publishing House, Bangalore – 560 001..

CE324 GEOTECHNICAL ENGINEERING – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

UNIT – I : Bearing Capacity : Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, General and local shear failure conditions. Factors affecting bearing capacity of Soil. Allowable bearing pressure based on N-values. Bearing capacity from plate load tests. Shallow Foundations : Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations. Foundations on expansive soils.
Settlement analysis : causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

Employability

UNIT – II : Pile Foundations : Types, Construction, load carryig capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

Employability

UNIT-III: Caissons : Types of caissons, pneumatic caissons, Different shapes of well foundations. Relative advantages and disadvantages. Different Components of well and their function. Grip length, problems in well sinking and remedial measures.
Stability Analysis of Slopes : Finite Slopes Fellinius slip circle method, Friction Slip circle method and Taylor's stability numbers, types of failure of finite slopes – Toe slope and Base failure. Infinite slope, factors of safety.

UNIT – IV : Earth Pressure : Types of Earth pressure. Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil Coloumbs wedge theory, Culmanns and Rebhanns graphical method for active earth pressure. Bulkheads – Classifications, Cantilever sheet Piles in Sandy soils and clay soils. Analysis of Anchored bulkheads – free earth support and fixed earth support methods.

Employability

Employability

NOTE : This course does not cover structural design of foundations.

TEXT BOOKS :

1. Analysis, Design of foundations and Earth retaining structures by Shamsher Prakash, Gopal Ranjan and Swami Saran.
2. Foundation Analysis and Design – J. E. Bowles.
3. Soil Mechanics and Foundation Engineering – By K.R. Arora.

CE325 - FLUID MECHANICS - III

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T　　　　Sessional Marks: 30

UNIT I: Dimensional Analysis and Similitude.

(1) Fundamental Concepts of Dimensional Analysis	Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities- Dimensional Homogeneity.
(2) Methods of Arriving at Dimensionless Groups.	Non-dimensional Parameters- Raleigh's Method- Buckingham's π method- Buckingham's modified method- Omitted and Superfluous variables.
(3) Examples in Dimensional Analysis	Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,
(4) Similarity and Similarity Laws.	Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities- Modeling Criteria- Similarity Laws- Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.
(5) Application of Similarity Laws to Practical Problems	Bodies Completely submerged in Fluids, Bodies subjected to Gravity and Viscous Forces, River Models- Manning's Law- Distorted Models -Depth distortion and slope distortion. Problems related to Modeling of Tides, Harbours, and Pumps & Turbines.

Employability

Unit II Hydraulic Machinery – I Turbines.

(6) Introduction and Classification of Turbines.	Function of Prime movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action- Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbines, choice of Type of Turbine-Specific Speed.
(7) Working of Impulse Turbines.	Component Parts & Working Principles of a Pelton Turbine- Recapitulation of Work Done by series of vanes mounted on Wheel- Velocity triangles, Simplified Form of Velocity Triangles for a Pelton Turbine Bucket; Hydraulic and Overall Efficiencies.
(8) Design Principles of Impulse Turbines.	Design Principles of Pelton Turbine- Fixing Various Dimensions of Bucket of a Pelton Turbine- Governing Mechanism for a Pelton Turbine.

Employability

(9) Working of Reaction Turbines & Design Principles.	Component Parts & Working Principles of a Francis Turbine- Design Principles of Francis Turbine- Arriving at vane Angles- Governing Mechanism for a Francis Turbine. Draft Tube Theory-Functions and Types of Draft Tubes in Reaction Turbines- Efficiency of Draft Tube.
(10) Performance characteristics of Turbines	Unit Quantities – Specific Speed and its importance – Model Relationships. Performance Characteristics of Turbines - Operating Characteristics- Iso-efficiency Curves.

Unit III Hydraulic Machinery – II Centrifugal Pumps.	
(11) Centrifugal Pumps	Functions of a Pump- Types of Pumps- Selection Criterion- Rotodynamic and Positive displacement Pumps- Comparison between Centrifugal & Reciprocating Pumps.
(12) Component parts & Working principles of centrifugal pumps	Centrifugal Pumps- Component Parts, Classification of Centrifugal Pumps / Impellers based on Shape and Type of Casing- Pump with Volute Casing, Pump with Vortex Chamber& Pump with Guide vanes, Closed, Semi-closed & Open Impellers, Axial, Radial & Mixed Flow Impellers; Shape and Number of Vanes; Working Principles of Centrifugal Pumps- Working Head and Number of Stages, Single & Double Suction.
(13) Work done by centrifugal pumps	Pressure Change in a Pump, Manometric and Static Head- Velocity Vector Diagrams– Effect of Vane Shape. Work Done -Pump Losses and Efficiency- Pressure Rise in the Impeller- Minimum Starting Speed of pump- Multi Stage Pumps; Pumps in Parallel and Series
(14) Cavitation & NPSH	Cavitation- maximum Suction Lift- NPSH and its Importance in Selection of Pumps,

Employability

Unit IV Hydraulic Machinery – III Reciprocating Pumps & Pump Performance.	
(15) Reciprocating Pumps.-Fundamental concepts	Reciprocating Pumps- Component Parts- Operation of Single Acting and Double Acting Reciprocating Pumps- Discharge Co-efficient, Volumetric Efficiency and Slip.
(16) Work done by Reciprocating pumps	Work Done and Power Input- Indicator Diagram, Effect of Acceleration and Friction on Indicator Diagram, Maximum Speed of Rotation of Crank.
(17) Air Vessels and their principles	Air Vessels and their Effect, Modified Indicator Diagram in the presence of Air Vessels, Work Saved due to Presence of Air Vessel- Flow into and from Air Vessel.
(18)Performance characteristics of Pumps	Similarity Relations and Specific speed of Pumps- Performance Characteristics of Centrifugal Pump- Dimensionless characteristics -Constant efficiency curves of Centrifugal Pumps.

UNIT V: Unsteady flows in Pipes & Open channels	
(19) Water hammer & Governing equations	Definition – General discussion, classification of conduits- general equation for water hammer- Allevie's water hammer charts- Arithmetic integration method. Water hammer for the case of pump fitted in a pipe line.
(20) Control of water hammer	Pressure conditions along the penstock – Mechanically operated relief valves, Surge tanks types, Design principles of Surge Tanks (Simple Surge Tanks only)
(21)Unsteady Flows in Open Channels.	Gradually Varied Unsteady Flow –Dynamic Equation for Unsteady Flow – Monoclinical Rising Wave –Dynamic Equation for Uniformly Progressive Flow. Flood Routing concepts – Channel & Reservoir routing – Hydraulic & Hydrological methods. Wave Profile of Uniformly Progressive Flow- Dam Break Problem - Wave Propagation.(Solution of Unsteady-flow equations and Spatially varied Unsteady Flow are excluded)
(22) Rapidly Varied Unsteady Flow	Rapidly Varied Unsteady Flow - Uniformly Progressive Flow – Moving Hydraulic jump – Positive and Negative Surges – Surges in Power canals, Canal Transitions and Channel Junctions –Pulsating Flow.

Text Books

(1) Engineering Fluid Mechanics by K.L. Kumar S. Chand & Co.
(2) Fluid Mechanics by A.K. Jain Khanna Publishers.
(3) Fluid Mechanics by D.S. Kumar.

(4) Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth -Standard Book House
(5) Hydraulic Transients by Richie
(6) Hydraulic Transients by Streeter

CE326 ELECTIVE – II

CE326 A ENVIRONMENTAL IMPACT ANALYSIS

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to EIA. Definition of E IA and EIS.C.E. guidelines in USA, preparation of EIS, Elements of EIA (1 question either/or).

UNIT – II : Agency Activities, Environmental setting. Environmental attributes, air, water, soil, ecology, noise Socio-Economic aspects, Culture and human aspects (Human settlements – rehabilitations) (1 question either/or).

Employability

UNIT – III : Environmental impacts, Identification measurement, Aggregation, Secondary and Cumulative Impacts (1 question either/or).

Employability

UNIT – IV : Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement (1 question either/or).

Employability

UNIT – V : Case studies, Economic impact analysis energy production impact analysis, cost benefit analysis, Environmental impact mitigation and control measures. (1 question either/or).

Employability

<u>REFERENCE BOOKS</u> :

1) Environmental Impact Analysis – Urban & Jain.
2) Environmental Impact Analysis – Canter, Mc. Graw Hill Publishers.

CE326 B STRUCTURAL DYNAMICS

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to Structural Dynamics – Types of prescribed Loads – Analysis of Dynamical behaviour of Structures – Mathematical and Analytical Models – Degrees of Freedom. Single degree freedom – Un-damped and Damped Systems - Free body diagram – Solution of Differential equation of Motion – Frequency, Period and Amplitude – Logarithmic decrement – Simple Problems.

UNIT – II : Free Vibration of SDOF Systems – Response of SDOF System to Harmonic Excitation, Dynamic Excitation – Rayleigh's method- Vibration measuring instruments, Types of Damping Systems – Response Spectra.---------

Skill Development

UNIT – III : Mathematical model of MDOF Systems – Vibration of Un-damped two Degrees of Freedom system – Simple Problems – Free Vibration of MDOF System – Natural Frequencies & Mode shapes – Mode Superposition method as per IS 1893 Code of Provisions.

UNIT – IV : Shear Building – Free Vibration of Shear Building – Dynamic Analysis of Simple Beam, Plane Frame and Plane Truss – Equation of Motion – Formulation of Element Stiffness Matrix only.

Skill Development

UNIT – V : Introduction to Earth Quake Response of Structures – Response of SDOF and MDOF systems to earth quake excitation – Simple problems on SDOF System - Concept on Seismic Design – IS 1893 (1984) – Provisions for Seismic Design of Buildings.

Skill Development

Text Book :

1) Structural Dynamics by Mario Paz

References :

1) Dynamics of Structures by R.W. Clough & J. Penzien

2) Dynamics of Structures by Anil . K. Chopra
3) Earth quake Engineering by A.R. Chandrasekharn & Jaikrishna.

CE326 C RIVER ENGINEERING

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Incipient Motion of Sediment Particles. Critical tractive force.
Regimes of Flow : Ripple and dune regime, antidune regime, importance of regimes of flow.
Bed Load Transport : Bed load equations.
Suspended Load Transport : General equation of diffusion, integration of sediment distribution equation, method of integrating curves of concentration X velocity, simple relations for suspended load.

UNIT – II : Bed Level Variation in Alluvial Streams : Continuity equation for sediment, equilibrium depth of scour in long channel contractions, general mathematical models, silting of reservoirs, local scour.
Variation in Plan form of Streams : Secondary currents, flow in rigid boundary open channel bends, scour and deposition at Alluvial Bends, sediment distribution at channel bifurcations, meandering, lateral migration of Alluvial Streams cutoffs, delta formation.
UNIT – III : Sediment control in Canals : Methods of sediment control.
River Training : Objective of river training, river training for flood control, navigation, guiding the flow, sediment control, stabilization of rivers.
Alluvial River Models, Debris Flows, Density Currents.

Skill Development

UNIT – IV : Unsteady Flow : Governing Equations for one – dimensional flow, channel routing, kinematic routing, diffusion routing, Muskingum – Cunge routing.

REFERENCES:
1) R.J. Garde and K.G. Ranga Raju, Mechanics of sediment transportation and Alluvial stream problems, Wiley Eastern limited, 1977.
2) M.Hanif Chaudhry, open channel flow, Prentice hall of india private limited, 1994.

CE326 D REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to remote sensing : Introduction, A brief history of RS, Energy sources and radiation principles, sensor systems used in RS, RS satellites, land sat, spot, IRS etc., RS data products, RS analysis examples – measurement analysis – classification.
RS in civil engineering projects : Topographic mapping : Geometric characteristics, digital elementary model, Cartographic requirements of satellite data, Mapping using SLAR.
Resource Mapping : Geometric and hydrographic features. Soil mapping and characteristics.
Application in water resource engineering. Environmental pollution monitoring.
Regional and urban mapping, planning systems and waste disposal sites.

UNIT – II : INTRODUCTION TO GIS :
Introduction, GIS overview, Engineering of GIS applications, GIS components.
Data Structures in Thematic maps :
Data structures for GIS, Data base structures, Data models, H,N,R query languages for data models. The nature of geographic data, spatial data models, Raster data models, Vector data models, Data base management for GIS, Data structures for Thematic maps. The choice between Raster and vector.

UNIT – III : DIGITAL ELEVATION MODELS :
Importance of DEM, Methods of DEM, Image methods, Data sources and sampling methods for DEM.
DATA INPUT, VERIFICATION, STORAGE AND OUTPUT :
Data input, Data verification, Classification, and storage data output.
DATA QUALITY, ERRORS AND NATURAL VARIATION :

Skill Development

Components of data quality, sources of errors, nature of boundaries, statical nature of boundaries, combining attributes from overland maps.

Skill Development

UNIT – IV : GIS ANALYSIS FUNCTIONS :
Introduction, Organization of data analysis, Classification of functions, maintenance and analysis of spatial data, Maintenance & analysis of nonspatial attribute data, integrated analysis of spatial & nonspatial data, output formatting, cartographic modeling.

Skill Development

UNIT - V: CHOOSING AND IMPLEMENTING A GIS
Awareness, need for GIS, Developing system requirements, evaluation of alternative systems, system justification and development of an implementation plan, operational system.

Skill Development

REFERENCE BOOKS :
Principles of Geographical information systems for land resource assessment – P. A. Burrough (Clarendon Press, Oxford).
Geographic Information systems a management perspective Stan Aronoff (WDL Publications, Ottawa, Canada).
Remote sensing in civil engineering – Kennie, J.J.M., Matthews, M.C.
Remote sensing principles and interpretation – Floyd F. Sabims, Jr. W.H. Freeman & Co.

CE326 E ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT OF WATER RESOURCES PROJECTS

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : ECOLOGICAL CONCEPTS : Overview : Environment, Ecology, Ecosystems Human Interaction – linkages consequences and management. Concept of sustainability .
Ecosphere : Atmosphere, Hydrosphere, pedasphere, biosphere and interactions. Residence time of elements.
Energy flow in ecosystems : Solar energy, trophic structure.
Biological building blocks : Nutrients - Macro and Micro, carbon, nitrogen, and phosphorus cycles.
Ecosystems of the world : Terrestrial systems, Estuary; Marine and Wetland Systems; relationships within the ecosystems.
Biotic and abiotic interactions, Nature's resilience.
Biogeographic regions : Forests, grasslands, deserts, Biomass productivity, agroclimatic zones.
Global ecoconcerns Climatic changes, greenhouse effect, ozone layer depletion.

UNIT – II : IMPACT ASSESSMENT : Introduction : Scope, Dams and Reservoirs, Channelisation, dredging, irrigation, hydro-power, flood & drought control projects.
Illustrative Examples. Nature of Impact, Adverse and beneficial, reversible and irreversible, short term and long term impacts.

Employability

Identification : Environmental reconnaissance, Environmental examination, and Environmental studies during planning, design and operation of projects.
Attributes (Parameters) : Air; microclimate, Water; surface water and ground water, Land; erosion, salinization, waterlogging, subsidence. Ecology; Terrestrial and aquatic flora and fauna; Human Aspects; Displacement, rehabilitation; noise pollution, project related hazards; Base line data collection.
Prediction : Qualitative methods based on past experience, quantitative methods based on mass balance and mathematical models.
Assessment : Scoping, adhoc methods, checklists, matrix methods, index method, networks, simulation and modelling, environmental evaluation system, cost benefit analysis.

UNIT – III : MANAGEMENT AND ENHANCEMENT MEASURES : Monitoring and Evaluation : Water quality standards, monitoring network and frequency of data collection, database management, Geographical Information Systems, role of Environmental management models.

Employability

Rehabilitation and Resettlement : Provision for equivalent or better standard of living, cultural, social, educational and medical facilities; live stock management; forest preservation and enhancement. Contingent plans for unforeseen dislocation.
Preventive and Remedial Measures : Saline, alkaline and waterlogged soils; extent, distribution and mode of formation; reclamation procedures, use of chemical amendments in alkali soils, surface and subsurface and vertical drainage system for saline soils; disposal of saline drainage effluent into water bodies, evaporative ponds and deep

injection wells, desalinization by physical, chemical and biological treatment; reuse of saline drainage effluent, salt tolerant crops, agroforestry, aquaculture.
Lining of water distribution networks, land levelling, On Farm Water management, sprinkler and drip irrigation methods, scheduling of irrigation based on crop water requirements, crop management, biodrainage, water pricing, reallocation of water to other sectors.

UNIT – IV : Conjunctive use of groundwater and surface water : Transportation of ground water to water scarce areas, cycling and blending approaches.
Soil and Water Conservation : Erosion control, contour bunding and terracing, pasture development, afforestation, checkdams, strip cropping, agronomic practices, recycling and reuse of water, water harvesting.
Maintenance of Minimum Flow : Quality and quantity for downstream use, development of fisheries and recreational facilities.
Health hazard Mitigation : Measures against water related diseases, vector control, risk analysis.
Waste Land Development : Types of wastelands and their distribution, utilisation of wasteland for forestry, pasture.
Employability
Major Legislation in Direct and Related Areas : Awareness of legislation in respect to water quality, waste disposal, air pollution, groundwater exploitation, forestry, wild life and other environmental impact parameters.
Public Participation : Possible roles for individuals, communities and institutions; appropriate areas; public relations, aspects; role of local and outside leadership; nongovernmental organisations.

TEXT BOOKS & REFERENCES :

Ecological Concepts :

1) Dasman, R.F. Environmental Conservation, John Wiley and Sons, 1984.
2) Ehrlich, P.R. et al., Ecoscience-Population, Resources, Environment, Freeman Publication, 1977.
3) E.J., Kormondy, 'Concepts of Ecology', Prentice Hall, 1989.
4) Odum, E.P. ' Oxford and IBH Publishing Co. 1975.
5) Ramade, F. 'Ecology of a Natural Resources', John Wiley & Sons, 1982.
6) Revelle, P. and C. Revelle, 'The Environment. Issues and Choices for Society', Jones and Bartlett, 1988.

Impact Assessment :

1) Canter, L. 'Environmental Impact Assessment of Water Resources Projects'. Lewis Publishers, 1986.
2) Dee, N.; J.K. Baker; N.L. Dronby, 'Environmental evaluation System for Water Resources Planning, 1972.
3) Guidelines for Environmental Impact Assessment for River Valley Projects: Ministry of Environment and Forests, Govt. of India, 1985.
4) Jain, R.K. et al., 'Environmental Impact Assessment'. Von Nostrand, 1977.
5) Environmental Impact Guidelines for Water Resources development, U.N. Economic and Social Commission for Asia and Pacific, Bangkok, 1990.
6) Lohani, B. and North, 'Environmental Quality Management'. South Asian Publishers, 1984.

Management and Enhancement Measures :
1) Draggan, S., J.j. Cohrssen and R.E. Morrison, 'The Agenda for Long-Term Research and Development'. Praeger Publishers.
2) Goodman, 'Water Resources Systems Analysis and Management, McGraw-Hill.
3) Holdgate, M.W. and G.F. White, 'Environmental Issues (Scope Report 10)', John Wiley & Sons, 1976.
4) Ram Prasad, 'Wasteland Development', Associated Publishing Company, 1991.
5) Tanji, K.K., 'Agricultural Salinity Assessment and Management', American Society of Civil Engineers, 1990.

GENERAL REFERENCE :
Silenced Rivers – Patrick Mc Cully; Orient Longman Publications.

CE326 F OPTIMIZATION TECHNIQUES.

University Examination: Duration 3 hrs. Marks 70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

1. Introduction: Need and scope of optimization. Historical Development. Statement of optimization problems. Objective function and its surface, design variables, constraints and constraint surface. Classification of

optimization problems (Various "functions) continuous, discontinuous and discrete) and function behaviour (Monotonic, Non-monotonic and unimodal).

2. Classical optimization techniques : Differential calculus method, multivariable optimization by method of constrained variation and Lagrangean multipliers (generalised problem). Kuhn-Tucker conditions for optimality,

3. 'Non-linear programming : Unconstrained minimization-Fibonacci, golden section. Quadratic and cubic interpolation methods for a one-dimensional minimization and Univariate method, Powel's method, Newton's method and Davidon Fletchar powell's method for multivariable optimization. Constrained minimization - Cutting plane method, Zoutendjik's method and penalty function methods.

4. Linear programming - Definitions and theorems - Simplex method - Duality in Linear programming. Plastic analysis and minimum weight design and rigid frame.

Skill Development

Reference :

1. Rao,S.S.:"Optimization theory and applications," Wiley eastern Ltd., New Delhi, 1978.
2. Robert M. Stark and Robert L. Nicholls, H, "Mathematical Foundations for Design ; Civil Engineering Systems." McGraw Hill Book Company, New York, 1972.
3. "Optimum structural Design, theory and applications" Edited by R.H. Gallegher and O.C. Zienkiewiez. John Wiley and Sons, New York, 1973.
4. Majid, K.I.: "Optimum Design of Structures" Newness-Butter-Worths. London. 1974

CE327 GEOTECHNICAL ENGINEERING LAB. – I I

University Examination: Duration 3 hrs. Marks :50

No of Periods per Week : 0 L+ 3P — Sessional Marks: 50

(1) Field identification & classification of soils
(2) Unconfined compression test
(3) CBR test/plate bearing test
(4) Triaxial compression test
(5) Direct sheartest
(6) Vane sheartest
(7) Relative density
(8) Triaxial test
(9) Differential freeswell and swell pressure test.
(10) Consolidated drained
(11) Demonstration experiments (subject to availability)
(12) S.P.T.
(13) Consolidated undrained Foundation models
(14) Plate load test
(15) Pressuremeter test
(16) Field vane shear.

Skill Development

CE328 CONCRETE LABORATORY

University Examination: Duration 3 hrs. Marks :50

No of Periods per Week : 0 L+ 3P — Sessional Marks: 50

1) Specific gravity and unit weight of cement
2) Specific gravity and unit weight of coarse and fine aggregates.
3) Determination of normal consistency of cement
4) Determination of initial and final setting time
5) Fineness of cement.
6) Determination of compressive strength of cement (for different grades of cement).
7) Bulking characteristics of sand.
8) Sieve analysis of coarse and fine aggregates and classification as per IS 383.
9) Workability tests on green concrete by using : Slump cone,Compaction factor apparatus,Flow table,Vee-Bee consistometer.
10) Tests on Hardened concrete.
11) Compressive Strength
12) Split tensile strength
13) Modulus of rupture
14) Design of concrete mix by using IS code method (for class work only)
15) Case studies on a) framed structures and b) plate girder bridges.

Employability

CE411 WATER RESOURCES ENGINEERING – I

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 2 T Sessional Marks: 30

UNIT – I INTRODUCTION AND HYDROLOGICAL ASPECTS:

Water Resources in India, Hydrology in water Resources Planning – Hydrologic Planning – Precipitation – Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data- Consistency of rainfall record – Double mass curve, Depth –Intensity, Depthh area duration curves.

Employability

Infiltration – Factors affecting and its determination, Infiltrometers

Evaporation and Evapo – Transpiration. Pan evaporation, Consumptive use, determination of evapotranspiration – Blenney & Creeddle, Penmann and Hargreeaves methods.

Runoff – Factors affecting runoff, methods of determination of runoff, stream gauging, hydrograph analysis, base flow separation, unit hydrographs – Hydrograph of different durations, applications of unit hydrograph, S-hydrograph.

Employability

UNIT II – GROUND WATER FLOW:

Mechanics of interstitial flow, definitions, sub surface distribution of water, ground water movement, Darcy's law – permeability, intrinsic permeability well hydraulics – Steady flow into different types of aquifers and wells – Determination of hydraulic properties of aquifer, Well losses, specific capacity of well, and well efficiency, pumping tests- Recuperation test method for determination of well yield.

Employability

Methods of construction of open well-yield of an open well – methods of construction of tube wells, well shrouding and well development, spacing of tube wells, design of tube well – pumping requirements, centrifugal and bore hole type pumps – collector wells.

UNIT III – RESERVOIR PLANNING:

Types of reservoir- Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir, Purpose of reservoir, Design studies, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, yield from a reservoir of given capacity, operating schedules, Rule Curve for reservoir operation, Economics of Waterresources Projects, Apportionment of total cost of a Multi Purpose project, Benefit - Cost Ratio.

Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, control of reservoir sedimentation.

Employability

Employability

UNIT IV - IRRIGATION:

Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Depth of water held by soil in different zones, Water extraction - Quality of irrigation water.

Employability

Water requirements of crops, Duty, Delta and Base period - Their relationship, Crops – Seasons, Factors affecting duty and methods of improving duty, consumptive use of water – Determination of canal capacities for cropping patterns, Size of reservoir, Assessment of irrigation water charges.

Employability

UNIT V – CANAL SYSTEMS:

Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy's and Lacey's theories, Critical Tractive force method, Design problems – Balancing depth – L.S. of a channel-Dsign according to I.S : 7112, 1975. Schedule of area statistics, Cross section of an irrigation channel, -Maintenance of irrigation channel.

Employability

Regulation of channel system – Canal outlets, Requirements of a good outlet – Types of outlets, Water logging- Causes and control – land drainage, canal lining – methods, design of lined canals, canal navigation – requirements, methods to make navigability feasible.

Employability

REFERENCE BOOKS :

1) Water resources engineering – B.C. Punmia.

2) Water resources engineering – S.K. Garg.
3) Water power engineering – H.K. Barrows.
4) Hand book of applied hydrology – Ven te Chow.

CE 412 TRANSPORTATION ENGINEERING – I

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 1 T Sessional Marks: 30

UNIT I : Highway Engineering – I : Highway development and planning, Classification of roads, Highway alignment, Highway Geometrics – Design of Cross sectional elements, Sight distance, horizontal and vertical alignment.

Employability

UNIT II : Highway Engineering – 2 : Traffic Engineering – Traffic Characteristics, Traffic studies (Surveys), Traffic Control devices – Design of intersections. Design of pavements – Design factors, design of flexible pavements – Group Index method, CBR Methods, Design of Rigid pavements – Wester guard equations, I.R.C. recommendations for design of concrete roads.

UNIT III : Highway Engineering – 3 : Construction of roads – Earthen roads – W.B.M. roads – Bitumens roads – Cement concrete roads – Highway materials and their properties and tests. Maintenance of all types of roads – Highway drainage – Arborical culture – Street lighting.

Employability

UNIT IV : Airport Engineering : Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

REFERENCE BOOKS :

Employability

1) Highway Engineering by Khanna & Justo.
2) Highway Engineering by Sharma & Sharma.
3) Airport planning and Design by Khanna & Arora.

CE413 PROJECT PLANNING AND MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT I : PERT and CPM : Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Barcharts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.

UNIT II : Cost analysis / updating / resource scheduling : Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimising project cost, crash limit, Free float limit, Optimisation. Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource levelling, circle notation and arrow notation.

Employability

UNIT III : Contracts : Contracts – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Master Roll Form 21. Piece work Agreement form, work order; Contract system with tenders – Definitions – Contract ,Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lumpsum contract; Lumpsum and schedule contract, Item rate contract, sub-contracts, joint ventures, Arbitration Disputes and claim settlement.

Employability

UNIT IV : Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personnel Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

Employability

REFERENCE BOOKS :

1) PERT and CPM – L. S. Srinath.
2) PERT and CPM – Punmia.
3) Estimating and Costing – B.N. Dutta.
4) Construction Management and Planning – Guna and Sen Gupta, B.

CE414 ENVIRONMENTAL ENGINEERING – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to sanitation – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers—safety of sewer workers .

Employability

UNIT – II: Storm sewers- design: Pumping of wastewater – Pumping stations – location – components parts– types of pumps and their suitability with regard to wastewaters. House Plumbing: plumbing systems of drainage- sanitary fittings and other accessories– single stack system- one pipe and two pipe systems – Design of building drainage.

UNIT – III: Bacteriology of sewage: Sewage characteristics – Physical, Chemical and Biological Examination– decomposition- cycles of decomposition–- Sampling and analysis of wastewater – BOD-COD-Treatment of sewage - Primary treatment: Screens-grit chambers – grease traps – floatation – sedimentation – design of primary and pretreatment units..

UNIT – IV: Secondary treatment: Aerobic and anaerobic treatment process-comparison.

Employability

Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes,miscellaneous methods, Oxidation ponds, Oxidation ditches,Aerated Lagoons.
Attached Growth Process: Trickling Filters – mechanism of impurities removal- classification– filter problems – design and operation-recirculation. RBCs, Fluidized bed reactors, sewage disposal methods.

UNIT – V: Anaerobic Processes: Septic Tanks and Imhoff tanks-Principles and Design sludge treatment and disposal-Fundamentals of UASB. Biosolids (Sludge): Characteristics- thickening – digestion,drying and sludge disposal,.

Employability

Employability

TEXT BOOKS:

1.Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Environmental Engineering by Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. McGraw-Hill international edition
3. Environmental Engineering –II : Sewage disposal and Air Pollution Engineering, by Garg, S.K. Khanna Publishers
4. Sewage treatment and disposal by Dr. P.N. Modi.
5. Water supply and Waste Water Engineering by Dr. B.S.N. Raju

CE415 COMPUTER APPLICATIONS IN CIVIL ENGINEERING (C A C E)

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 3 L+ 3P Sessional Marks: 50

GENERAL : Data Base management in Civil Engineering Applications. Creation of Data Tables and Retrieval of Data using Structured Query Language.

UNIT I: Determination of Bending Moment Diagram, Deflections for different loading conditions for a Simply Supported Beam and Cantiliver Beam. Determination of fixed end moments for different loading conditions of a fixed beam. Calculation of Influence line diagrams at any section of a Simply Supported Beam.

Employability

Employability

UNIT II : Estimation of Run off for a Catchment. Estimation of Friction factor for Laminar and Turbulent flows, Minor losses in pipe flow. Conversion of Angles from WCB to RB. Classification of Soils. Determination of coefficient of permeability, Degree of Consolidation and Shear Strength.

Employability

UNIT III : Application of problems in Hydraulics such as Hardy cross method in the Analysis of pipe network, Computation of water surface profiles in open channel flows. Estimation of Settlement of foundations in Cohesive Soil, Stability Analysis of Slopes. Estimation Earth Pressures in Cohesive and Cohesionless soils. Application of problems in Environmental engg., Transportation Engg. Design of Slabs using I.S. Code method. Analysis and Design of Beams by using Limit state method. Design of columns subjected to axial load and Uni-axial Moment. Design of Isolated Footing. Design of rolled steel columns, built up columns, Beams and built up Beams.

Employability

UNIT IV : Basic AUTO CAD Commands, Introduction to AUTO LISP Programming, Analysis and Design of R.C. Building Frames by using Staad - III, Analysis and Design of Grid Floors by using Staad – III. Preparation of Contour Maps and Alignment fixing of Roads by using AUTO CIVIL. Quantity estimation of Civil Engineering Structures and Construction Management.

Employability

TEXT BOOKS :

1) Computer aided design, software and analytical tools by C.S. Krishnamoorthy & S. Rajesh.
2) Computer applications in Civil Engineering by S.K. Parikh.
3) Computer aided design in Reinforced concrete by V.L. Shah.

CE 416 A INDUSTRIAL STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Connectios : Design of Frame, seated moment resisting connections(both welded and riveted).

UNIT – II : Analysis of Pitched (Gable) Portal frames, Assumptions, Bending Moment and Shear Force diagrams. Design of portal frame (dead, live and wind loads).

Employability

UNIT – III : Analysis and design of gantry ginders, Steel Bracket design.

UNIT – IV : Towers, Principles of Analysis and Design of Latice towers, Transmission towers. Design of lathic towers and transmission towers(only sessional work).

Employability

Employability

UNIT – V: Analysis of Mill Bends

TEXT BOOKS :

1. Design of Steel Structures by M.Raghupati.
2. Design of Steel Structures by Arya and Azmani.
3. Design of Steel Structures by P. Dayaratnam.
4. Design of Steel Structures by Kazmi and Zindal.

CE416 B MULTISTOREYED STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Analysis of Portal Frames by Moment Distribution Methods with and without sway Analysis of continuous beams and one bay one storey Frames by Kani's method with and without sway.

UNIT – II : Introduction to Matrix methods : Analysis of continuous beams and one bay one storey portal frames by stiffness method.

Skill Development

UNIT – III : Analysis of one bay one storey portal frames and continuous beams by Flexibility matrix methods.

Skill Development

UNIT – IV : Analysis of Multistoreyed frames by substitute frame method.

UNIT – V : Analysis of Multistoreyed frames for wind loads by portal, cantilever and Girder Factor methods.

Skill Development

Skill Development

(For Saessional Work only)
Introduction to shear walls, Different types – Behaviour of cantilever walls with rectangular cross section – Flanged shear walls.

1. Analysis of Inderminate structures – C.K Wang 2. Matrix Analysis of framed Structures-W Weaver& Gere.

CE416 C ELEMENTS OF SOLID WASTE MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT 1 : INTRODUCTION: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes : Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

UNIT 2 : SOLID WASTE MANAGEMENT: Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of Solid Waste management- Waste generation and handling at source-Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

Skill Development

UNIT 3 : TRANSFER AND TRANSPORT OF WASTES: Transfer station-Processing and segregation of the soilid waste- various methods of material segregation.

UNIT 4 : PROCESSING AND TRANSFORMATION OF SOLID WASTES: Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration-advantages and disadvantages of incineration.

Skill Development

Skill Development

UNIT 5 : DISPOSAL OF SOLID WASTE: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

Skill Development

Reference Books : Integrated Solid Waste Management by Tchobanognous
Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

CE416 D SOIL DYNAMICS AND MACHINE FOUNDATIONS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Types of machine foundations – General requirements, Design criteria for machine foundations, Permissible amplitudes and bearing pressures.
Resonance and its effect – free and forced Vibrations with and without damping – Constant force and rotating mass type excitation – Magnification factor – Phase difference between forces and displacement for steady state vibrations – Logarithmic decrement.

UNIT – II : Natural frequency of foundation – soil system – Barkan's and I.S. methods of determining natural frequency. Tachehotarioff's reduced natural frequency.
Elastic properties of soil for dynamical purpose and their experimental determination of shear modulus from wave theory.

Employability

Employability

UNIT – III : Apparent soil mass – bulb of pressure concept – Pauw's analogy of foundation – soil system (charts to be supplied for solving problems).
Theory of elastic half – space lamb and the dynamic Boussinesq problem – Reisner's solution and its limitations – Quinlan and Sung's modifications Hsiegh's equations for vertical vibration.

UNIT – IV : Principles of design of foundations for reciprocating and impact type of machine – as per I.S. codes.- Vibration isolation – types and methods of isolation – isolating materials and their properties.

REFERENCES :

Employability

1) Hand-book of machine foundations by Srinivasulu and Vaidyanathan – M/s. Tata McGraw Hill Publications.
2) I.S. Codes.
3) Soil Mechanics and Foundation Engineering by B.C. Punmia – M/s. Lakshmi publishing co.
4) Analysis and design of Foundations and Retaining Structure by Shamsher prakash, Gopal Ranjan and Swamisaran – M/s Saritha Prakashan, Meerut.
5) Vibrations of soils and Foundation by Richart Hall and Woods Prentice Hall Inc., New Jersey.

CE416 E PRINCIPLES OF WATER QUALITY MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT 1 : Introduction- importance of water quality management-Pollution of surface water bodies – Rivers, Reservoirs and Lakes –The impacts on the natural water bodies -Sampling procedures for the estimation of characteristics.

UNIT 2 : Modeling the fate of pollutant in natural water: Fundamentals of process and mechanisms- Conventional Streeter-Phelps BOD-DO models, Critical deficit and time required to reach the critical de

Employability

UNIT 3 : Fundamentals of ground water flow – variations of ground water levels, fluctuations due to Evapotranspiration, Meteorological phenomena

UNIT 4 : Groundwater pollution and management – Sources of ground water pollution and their effects – municipal, industrial, agricultural and miscellaneous, ground water basin investigations. G[illegible]eling techniques.

Employability

UNIT 5 : Introduction to Urban storm water quality management - Groundwater remediation – Groundwater recharging- recharging methods.

Employability

Reference Books:

1. Ground Water Technology by B. K. Todd.
2. An introduction to Water quality modelling. James,A.
3. Surface water quality modeling by Chopra, S.C

CE416 F PORT AND HARBOUR ENGINEERING

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

Unit – I

Description and formulation of waves and tides in the ocean, Linear wave theory, wave generation, wave transformation; Shoaling, refraction, diffraction and reflection, wave prediction techniques, Long waves in irregular shaped basins or bays, harbor oscillations.

Unit – II

Growth and regulation of ports. Various components of maritime systems, including shorefront and inlan infrastructure, Docks and Repair facilities, Concepts of port and marine terminal design, cargo handling equipment and intermidal transportation networks.

Unit – III

Port and harbor layout for safe and efficient vessels navigation and cargo loading and unloading. Port buildings. Port and marine terminal layout, navigation channels and dredging, shore infrastructure and utilities, land reclamation , and environmental and economic considerations. Dredging; dredging equipment. Dredging for navigation improvement, pipelines and cables, soil replacement. Potential effects of dredging on environment, environmental factors.

Unit – III

Foundamentals of port structures design, design codes, guidelines and functional requirements. Structural, geotechnical, and materials considerations, for a variety of environmental conditions, including extreme wave and current environments, ice, and seismic loading.

Skill Development

Unit – IV

Functional desing of the various components of ports and marine terminals, including steel, concrete, timber, and stone structures. Design procedures for breakwaters, bulkheads, wharves, dolphins, piers, fender and mooring systems and revetments.

Skill Development

Unit – V

Marine and offshore construction equipment: Basic motions of swaway Barges, crane barges, Offshore derrick barges, semisubmersible barges, Jack-up construction barges, launch barges, pipe laying barges, floating concrete plant. Pile driving equipment.

Skill Development

Reference Books / Text Books

1. Port Engineering, by Per Bruun
2.Design and construction of Ports and Marine Structures, by A.D. Qinn, Mc Graw-Hill
3. PHRI (Port and Harbour Research Institute) Japan manual.
4. Handbook of Port Harbour Engineering: Geotechnical and structural aspects, by Gregory Tsinker
5. Construction of marine and offshore structures, by Ben C. Gerwick, CRC Press Tayler and Francis group.
6. Dredging: A Handbook for Engineers by R.N. Bray, A.D. Bates and J.M. Land: John Wiley & Sons, Inc.
7. Planning and Design of Ports and Maritime Terminals: 2ed, edited by Hans Agershou: Thomas Telford

CE417 TRANSPORTATION ENGINEERING LABORATORY

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 0L+ 3P — Sessional Marks: 50

1) <u>Testing of Aggregates</u> : Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & Soundness.
2) <u>Testing of bitumenous material</u> : Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.
3) <u>Testing on Soils</u> : C.B.R. test (IS 2720 – Part-XVI) – N.D.C. Penetration test (IS 2720 Part-XXXII) – Group Index.

Skill Development

REFERENCE BOOKS :

1) Highway material testing by Khanna & Justo.

CE418 FLUID MECHANICS LABORATORY– II

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 0 L+ 3P — Sessional Marks: 50

1) Characteristics of a hydraulic jump. - To measure and draw Y_2/Y_1, $(E_1 – E_2)/E_1$, $Lj/(Y_2-Y_1)$ as a function of F_r, and compare with theoretical results wherever possible.
2) Canal transitions– To measure the depth of water in canal transitions (a) with a reduction of bed width and (b) With a rise in bed level.
3) Pipe friction. (a) To measure the piezometric head variation along the length of a pipe and compute Darcy- Weisbach f. (b)To plot H.G.L and T.E.L.
4) Drag characteristics of a circular cylinder with its axis normal to the direction of flow.
(a) To measure the pressure distribution on the surface of a cylinder and plot the dimensionless pressure variation around the cylinder and compute the pressure drag.

Skill Development

(b)To measure the velocity variation in the wake of the cylinder, velocity of approach, and compute the total drag by momentum principle.

5) Performance characteristics of a centrifugal pump. - To measure the discharge, head developed, and power input at various discharges for centrifugal pump and draw the performance characteristics.
6) Performance characteristics of a reciprocating pump.
7) Performance characteristics of a Pelton / Francis / Kaplan turbine. - To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.
8) Impact of a jet on bodies.

Skill Development

CE419 INDUSTRIAL TRAINING

The students are supposed to submit a detailed report covering the following aspects related to civil engineering projects that are relavant to the industry in which they received training:

- Project Planning,
- Design,
- Scheduling,
- Specifications,
- Tender Document Preparation,
- Calling of Tenders,
- Material Procurement Methods / Pracices,
- Inventory, Stores Maintenance and Material Issue Norms,
- PERT / CPM Details,
- Project Execution,
- Check Measurement,
- Project Management,
- Quality Control,
- Safety and Risk Analysis and
- Maintenance, Repairs and Operation.

Skill Development

The report will be evaluated for 100 marks by a viva-voce committee comprising of the following members:

- Head of the Department
- Two internal Examiners
- One external examiner and
- Chairman Board of studies.

CE421 TRANSPORTATION ENGINEERING– II

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 1 T Sessional Marks: 30

UNIT – I : RAILWAY ENGINEERING – 1 : Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings.

Skill Development

UNIT – II : RAILWAY ENGINEERING – 2 : Track Geometric design – Points & Crossings – Track drainage – Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

UNIT – III : DOCK & HARBOUR ENGINEERING : Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

Skill Development

UNIT – IV : TUNNEL ENGINEERING : Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

Skill Development

<u>REFERENCE BOOKS</u> :

1) Railway Engineering by S.C. Saxena & S. Arora.
2) Railway Engineering by Rangwala.
3) Dock & Harbour by Birdie.
4) Tunnelling by Rangwala.

CE422 WATER RESOURCES ENGINEERING – II

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 2 T — Sessional Marks: 30

UNIT – I Storage Works : Classification of dams, factors governing selection of types of dam, selection of site, preliminary investigation.

Gravity Dams : Forces acting on a gravity dam, stability criteria, modes of failure – elementary and practical profiles, stability analysis, principal and shear stress – construction joints, openings in dams – galleries, foundation treatment of gravity dam.

Employability

UNIT – II Earth Dams : Types, foundation for earth dams, design of earth dams, causes for failure of earth dams, criteria for safe design, phreatic line, seepage analysis – seepage control through body and foundation.

Employability

Spillways : Essential requirements, spillway capacity, components, types of spillways and their working, design of ogee spillway, energy dissipation below spill way, scour protection, use of hydraulic jump as energy dissipater – design of stilling basins – USBR and IS standard basins - spillway crest gates, different types.

Employability

UNIT – III Diversion Head Works : Types, location and components, effects of construction of weirs on permeable foundation, Bligh's, Lanes and Khosla's theories, Method of independent variables, design principles of weirs and barrages, design of weirs on permeable foundations, design of vertical drop weir, canal head regulator, silt control devices.

Employability

Regulation Works : Canal falls, definition necessity and location, classification of falls, design principles of syphon well drop, notch fall, sarada fall, straight glacis fall, offtake alignment, cross regulator and distributary head regulator.

Cross Drainage Works : Types, factors affecting the suitability of each types, classification of aqueducts, design principles of different types of aqueducts.

Employability

UNIT – IV River Training Works : River Training and its objectives, classification of river training works, marginal embankment, guide banks, groynes, cutoffs, bank pitching, launching aprons, miscellaneous types of river training works.

Water Power engineering : Development of hydro power in India, assessment of available power, utilisation factor, load factor, diversity factor, storage and pondage, types of hydro power schemes, components of hydel schemes – fore bay, intake structure, trash racks, surge tanks, water hammer pressure, sub structure and super structure of power house.

Employability

<u>REFERENCE BOOKS</u> :

1) Water resources engineering– B.C. Punmia.
2) Water resources engineering– S.K. Garg.
3) Water power engineering – H. K. Barrows.

<u>CE423 ELECTIVE – IV</u>

CE423 A ADVANCED CONCRETE STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T — Sessional Marks: 30

UNIT – I : Yield Line Analysis : Analysis and Design of Slabs using yield line theory. Slabs supported on four edges, three edges and two opposite edges subjected to uniformly distributed load.

Employability

UNIT – II : Grid Floor : Analysis and Design of Grid Floors as per IS Code and more rigorous method.

UNIT – III : Design of Bunkers and Silos.

Employability

UNIT – IV : I.S. Code provisions for ductility of concrete structures, Serviceability requirements with regard to deflection and crack width.

UNIT – V : Flat Slabs – Different Components of a Flat Slab, Direct Design Method, Bending Moments in the interior and end Spans.

Employability

TEXT BOOKS :

1) Advanced Reinforced Concrete designed by N. Krishnam Raju.
2) Design of Reinforced Concrete Structures by P. Dayaratnam.
3) Reinforced Concrete Structures by Paurk and Pauly.

CE423 B PRESTRESSED CONCRETE

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction, Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete.
Materials for prestressed concrete, high strength concrete and high strength steel.
Prestressing systems (1) Fressinet System (2) Gifford Udall (3) Magnel Blatan System, Tensioning devices, anchoring devices. (d) Pretensioning and Post tensioning.

UNIT – II : Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to curvature etc. I.S. code provisions.

Employability

UNIT – III : Analysis of prestress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

UNIT – IV : Limit state design of flexural members, stress, I.S. code provisions, design of symmetrical beams, design of prestressed concrete poles, design for shear, I.S. code provisions.

Employability

UNIT – V : (a) Transfer of prestress (Pretensioned members), Transmission length, bond stress, Transverse tensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.
(b) Anchorage zone in post tensioned members, stress distribution in end block, Guyon's method of approach of analysis of end block (Not more than 2 cables).

TEXT BOOKS :

1) Prestressed Concrete by P. Dayaratnam.
2) Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns.

CE423 C AIR POLLUTION CONTROL

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.

UNIT – II : Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behaviour accumulation, estimation of pollutants – Effective stack height.

Employability

UNIT – III : Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

Employability

UNIT – IV : Ambient air quality monitoring and stack monitoring.

UNIT – V : Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

Employability

REFERENCES :

1) Air Pollution Control Technology by T. Painter.
2) Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3) Air Pollution Control by K.V.S.G. Murali Krishna.
4) Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.

CE423 D GROUND IMPROVEMENT TECHNIQUES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T — Sessional Marks: 30

UNIT – I : In-situ densification Methods in granular soils – Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth.
In-situ Densification methods in cohesive soils, introduction, preloading or dewatering, drainwalls, sand drains, sand wicks, geodrains/banddrains, stone and lime columns, forced vaccum preconsolidation, thermal methods.

UNIT – II : Grout injections, suspension and solution grouts, grouting equipment and methods. Applications.
Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls.

Employability

UNIT – III : Geotextiles : Introduction, types of geotextiles; Functions and their application, tests for geotextile materials, geogrids, functions.
Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

UNIT – IV : Lime and Bituminous Stabilization : Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.
Stone columns, introduction, construction practice, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc.

Employability

REFERENCE BOOKS:

1) Robert M. Koerner : Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill.
2) E. J. Yoder : Principles of pavement design, John Wiley and sons.
3) Leonards, G.A. Foundation Engineering.
4) Khanna S.K. and Justo C.E.G: Highway Engineering Nemchand Publications.
5) Sowers G.F. : Introductory Soil Mechanics and Foundations.

CE423 E COASTAL ENGINEERING

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T — Sessional Marks: 30

UNIT – I : Mechanics of Wave Motion : Wave fundamentals and classification of waves, small amplitude wave theory, wave celerity, length, and period, orbital motions, pressure distribution, wave trains and wave energy, transformation of waves, higher order wave theories, stokes higher order wave theories, cnoidal wave theory, wave refraction, wave diffraction, wave reflection, wave breaking.

UNIT – II : Tides, Storm surges, Tsunamis - Wave Prediction : Wave height variability, energy spectra of waves, directional spectra of waves, wind information needed for wave prediction, estimating the wind characteristics, delineating a fetch, forecasts for lakes, bays, and estuaries, significant wave method, wave spectrum method, forecasting wind waves in shallow water, deep water relation for wave decay, hurricane waves.

Employability

UNIT – III : Littoral Processes : Ocean currents, long shore currents and setup due to ocean waves, sediment transport in the offshore zone, surf zone, bar-berm prediction and budget of the littoral zone.

Employability

UNIT – IV : Wave runup, over topping and transmission - Wave Forces : Wave forces on cylinders and walls.

Employability

REFERENCES :

1) Ippen, A.T., Estuary and coastline hydrodynamics, Mc Graw – Hill book company Inc., 1966.
2) Sorensen, R.M., Basic coastal engineering, John Wiley & Sons, 1978.
3) U.S. Army Coastal Engineering Research Center, Shore protection manual, Vols. I, II and III, 1977.

CE423 F HYDRAULIC STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Straight Gravity concrete Dams : Single-step design, multiple-step design, Internal stresses in gravity dams, stress distribution around openings, stress distribution around a circular hole in an infinite plate due to a normal stress on the plate, stress distribution around a horse shoe shaped gallery using phillips and zanger's tables, design of reinforcement around galleries in dams.
Arch Dams : Economic central angle of an arch dam, constant radius method, constant angle method, and variable radius and variable angle design of arch dams, trial load method of analysis of arch dams.

UNIT – II : Earth Dams : Seepage analysis, stability analysis of infinite slopes with and without seepage, stability analysis of finite slopes – friction circle method, method of slices, ordinary method of slices, simplified Bishop method of slices, spencer's method.

Skill Development

Spillways : Hydraulic design of ogee spillways, discharge characteristics of ogee spillways, design of reinforcement in the crest region of an ogee spillway, hydraulic design of chute spillways, morning glory spillways, side channel spillways.

Skill Development

Stilling basins and energy dissipaters: Intake Structures

UNIT – III : Water Conductor System : Selection of type of water conductors, economic analysis for determination of sizes of water conductors, analysis and design of lined pressure tunnels, water hammer analysis, analysis and design of surge tanks of various types, design of anchor blocks for penstocks, design of penstock junctions, design of scroll cases and draft tubes.

UNIT – IV : Gates and Valves : Vertical lift gates, tainter gates, cylindrical gates, butterfly valves, Howell – Bunger valves, needle valves, flow induced forces on vertical lift gates, flow induced vibration of vertical lift gates. Layout of Power Houses.

Skill Development

REFERENCES :

1) Creager, W.P. Justin, J.D., and Hinds J., Engineering for dams, Vol.II, Wiley Eastern Private Limited, 1945.
2) Creager W.p. and Justin J.D. Hydro electric hand book, John Wiley & Sons Inc., Newyork, 1949.
3) U.S.B.R. Design of small Dams, 1960.
4) Davis and sorensen, Handbook of applied hydraulics.
5) Lambe and Whitman, Soil Mechanics.
6) Streeter, V.L. and Wylie, G.B. Hydraulic Transients, Mc Graw Hill Book Company, 1967.
7) Hanif Chaudhry, M. Applied Hydraulic Transients, Van Nostrand Reinhold Company, 1979.

CE424 IRRIGATION STRUCTURES0 – DESIGN AND DRAWING (SESSIONAL WORK ONLY)

University Examination: Duration 0 hrs. Marks 0

No of Periods per Week : 0 L+ 4 D Sessional Marks: 50

(a) Tank surplus weir ; (b) Barrage : (c) Glacis type of canal drop : (d) Notch Fall : (e) Syphon Aqueduct (type III) (f) Cross regulator and head regulator

Skill Development

TEXT BOOKS :

1) Water resources Engineering – C. Satyanarayana Murthy.
2) Water resources Engineering – S.K. Garg.
3) Type Designs of Irrigation Structures _ R.S.N. Murthy.

CE425 PROJECT WORK

Skill Development

University Examination VIVA VOCE Marks: 50

No of Periods per Week : 0 L+ 6T Sessional Marks: 50

OBJECT ORIENTED PROGRAMMING WITH C++ LAB

(Common for all branches, except for Civil & Chemical branches)

CSE 128 **Credits :3**

Instruction : 2 Periods/Week & 3 Practicals/week Sessional Marks :50

End Exam:3 Hrs End Exam Marks : 50

Course Objectives :

- To introduce Object Oriented Programming (OOP) using the C++ Language.
- To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics EMPLOYABILITY
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction EMPLOYABILI
5. Objects EMPLOYABILITY
6. Operator Overloading EMPLOYABILITY
7. Inheritance EMPLOYABILITY
8. Virtual Functions & Polymorphism EMPLOYABILITY
9. I/O Streams
10. Templates EMPLOYABILITY
11. File Processing
12. Exception Handling Concepts EMPLOYABILITY

REFERENCE BOOKS:

1. Mahesh Bhave , Sunil patekar*Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2^{nd} Edition New Age International Publishers

3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999

4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition, McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
2. Write a C++ program to find both the largest and smallest number in a list of integers.
3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments
4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation
5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: **void setlength(float)** to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **intsameArea(Rectangle)** that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

1. Write the definitions for each of the above member functions.
2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.
3. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following

   i. Veena, guitear, sitar, sarod and mandolin under string

   ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind

   iii. Table, mridangam, bangos, drums and tambour under perc

   It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

- o String instruments
- o Wind instruments
- o Percussion instruments

The show method should display the relevant details according to user choice .the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to “blue” and “wagon”. there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message “Beautiful music fills the passenger compartment” execute the methods to show the messages

1. Mycar is a blue wagon
2. My father’s car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters — a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively.

10. Write a C++ program to perform operations on complex numbers using operator overloading

11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet ‘A’ present in a text file “STORY.TXT”.
    Example:
    If the file “STORY.TXT” contains the following lines,
    The rose is red.
    A girl is playing there.
    There is a playground.
    An aeroplane is in the sky.
    Numbers are not allowed in the password.
    The function should display the output as 3

CSE 211 DATA STRUCTURES AND ALGORITHMS CREDITS: 4
INSTRUCTION: 4Theory & 1Tutorial/ Week SESSIONAL MARKS: 40
FINAL EXAM: 3Hrs FINAL EXAM MARKS: 60

Objectives:

The course should enable the students:

1. To acquire knowledge on several data structures like stacks, queues, linked list, trees and graphs.
2. To have better insight into linear and nonlinear data structures.
3. To learn various sorting and searching techniques.
4. To exercise the applications of data structures.
5. To have a good understanding of problem solving using data structure tools and techniques.

Course Outcomes:

The student should be able to:

1. Analyze the complexities of recursive and Non recursive algorithms.
2. Apply ADT concepts such as arrays, stacks and queues for solving infix to post fix, postfix evaluation, priority queues.
3. Apply the concepts of dynamic memory allocation for reducing the time and space complexity of algorithms.
4. Implement linear, binary, interpolation, hashing searching techniques and sorting techniques namely bubble, insertion, selection, quick, merge sort.
5. Design and implement the Non linear data structures (trees and graphs) to optimize the solution.

CO-PO Mapping:

S.No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO1	PSO2
CO 1	3	3	2	3	1	1	0	1	1	3	0	2	3	0
CO 2	2	2	3	2	0	0	0	1	1	2	0	2	2	0
CO 3	2	2	3	2	0	0	0	1	1	2	0	2	3	0
CO 4	2	3	3	2	0	0	0	1	1	2	0	3	2	0
CO5	2	3	3	3	0	0	0	1	1	2	0	3	3	0

COURSE CONTENTS:

UNIT I: **10- 12-Periods**

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Fundamentals of algorithmic problem solving – important problem types –Fundamentals of analysis of algorithms and efficiency – Analysis framework – Asymptotic Notations and Basic Efficiency classes – Mathematical Analysis for recursive Algorithms and Non-recursive Algorithms, Algorithm Complexity and Time-Space trade-off.

Employability

UNIT II: **10-12 Periods**

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Sparse Matrices.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix & Prefix expressions using stack, Recursion, Towers Of Hanoi Problem.

Employability

Employability

UNIT III **10-12 -Periods**

Queues: Array representation and implementation of queues, Operations on Queue: Insert, Delete, Full and Empty. Circular queue, De-queue, and Priority Queue, Applications of Queues.

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Insertion and deletion to/from Linked Lists, Doubly linked list, Circular Doubly linked list, Implementing priority queue using Linked List, Polynomial Representation using Linked list & addition.

Employability

UNIT IV: **10-12-Periods**

Trees: Basic terminology, Binary Trees, Binary tree representation, Almost Complete Binary Tree, Complete Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Binary Search Tree (BST), Insertion and Deletion in BST, AVL Trees.

Employability

Searching &Sorting: Sequential search, binary search, Interpolation Search, comparison and analysis, Hash Table, Hash Functions. Complexity of Search Algorithm, Insertion Sort, Bubble Sort, Selection sort, Merge Sort.

Employability

Employability

UNIT V: **10-12 Periods**

Graphs: Terminology & Representations- Graphs, Directed Graphs, Adjacency Matrices, Path OR Transitive Closure of a Graph, Warshall's Algorithm, Shortest path Algorithm-Dijkstra's Algorithm, Connected Component and Spanning Trees, Minimum Cost Spanning Trees, Graph Traversals.

Employability

Employability

TEXT BOOKS

1. Y. Langsam, M. Augenstin and A. Tannenbaum, “Data Structures using C and C++”, Pearson Education, 2nd Edition, 1995.
2. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 3rd Edition, 2012.
3. P. Padmanabham, “C Programming and Data structures”, BS publications, 3rd Edition.

REFERENCE BOOKS

1. E.Horowitz and Sahani, "Fundamentals of Data Structures"
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition.
3. S. Lipschutz, “Data Structures”, McGraw Hill, 1986.
4. P. Dey & M. Ghosh, “Programming in C” , Oxford Univ. Press.
5. ISRD Group, “Data Structures through C++”, McGraw Hill, 2011.

CSE213 DISCRETEMATHEMATICALSTRUCTURES CREDITS: 4
(COMMON TO CSE& IT)

INSTRUCTION: 4 Theory &1Tutorial/ Week SESSIONAL MARKS: 40
FINALEXAM:3Hrs FINAL EXAM MARKS:60

Course Objective :

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

At the end of the course student should be able to:

CO - 1	Understand set theory, relations, mathematical logic, mathematical reasoning and to study about the validity of the arguments.
CO - 2	Apply basic counting techniques to solve combinatorial problems.
CO - 3	Understand Recurrence Relation, Generating functions and solving problems involving recurrence equations.
CO - 4	Familiarize the different types of binary relations and related algorithms on transitive closure.
CO - 5	Familiarize with the applications of graphs, trees and algorithms on minimal spanning tress.

Mapping of course outcomes with program outcomes:

Course Outcomes	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k
CO - 1	3								1		3
CO - 2	3								1		3
CO - 3	3								1		3
CO - 4	3								1		3
CO - 5	3								1		3

COURSE CONTENTS:

UNIT-I

MathematicalLogic **(15Periods)**

Sets-Operations on sets-relations-functions-Fundamentals of Logic- Logical inferences-Methods of proof of an implication-First Order logic and Other methods Proof -Rules of inference for quantified Propositions –Mathematical Induction.

EMPLOYAB

UNIT II

ElementaryCombinatorics **(08Periods)**

Basics of Counting- Combinations and Permutations-Their Enumeration with and without repetition-Binomial coefficients-Binomial and Multinomial Theorems-The Principle of Inclusion-Exclusion.

EMPLOYAB

UNIT III

RecurrenceRelations **(08Periods)**

Generating Functions of Sequences-Calculating their Coefficients-Recurrence relations-Solving recurrence relations-Method of characteristic Roots- Non-homogeneous Recurrence relations and their solutions.

.

UNITIV

RelationsandDigraphs **(09Periods)**

Relations and Directed Graphs - Special Properties of Binary relations- Equivalence Relations-Ordering Relations-Lattices and Enumeration- Operations on relations-Paths and Closures-Directed Graphs and Adjacency matrices .

EMPLOYABILITY

UNIT V

Graphs **(20Periods)**

Introduction to Graphs – types of Graphs – Graphs basic terminology and special types of simple graphs – representation of graphs and graph isomorphism – Euler paths and circuits- Hamilton paths and circuits – Planar graphs – Euler's formula.

EMPLOYABILITY

Introduction to Trees and their properties – Spanning Trees – Depth First Search , Breadth First Search – Minimum Spanning Trees – Kruskal's Algorithm and Prim's Algorithm.

EMPLOY

EMPLOYABILITY

TEXT BOOKS:

1). Joe L. Mott, Abraham Kandel& T. P. Baker, "Discrete Mathematics for computer scientists & Mathematicians" Prentice Hall of India Ltd, NewDelhi.

REFERENCE BOOKS:

1) Keneth. H. Rosen, "Discrete mathematics and its applications", Tata McGraw- Hill Publishing Company, NewDelhi
2) Richard Johnsonbaug, "Discrete mathematics" by Pearson Education, NewDelhi.

CSE 214 **Object oriented Programming with JAVA** **CREDITS: 3**

INSTRUCTION: 3Theory & 1Tutorial/ Week **SESSIONAL MARKS: 40**

FINAL EXAM: 3Hrs **FINAL EXAM MARKS: 60**

Prerequisites:

Basic knowledge of computer fundamentals
Student must have knowledge of some programming languages (such as C, C++)

Course Objectives:

- To understand object oriented programming concepts, and apply them in problem solving.
- To learn the basics of java Console and GUI based programming.

Course Outcomes:

- **CO-1:** Design Classes for Real Time Applications.
- **CO-2:** Establish The Connectivity Among The Classes Using Inheritances And Interfaces.
- **CO-3:** Modularize The Application Using Packages and apply threads on classes to achieve parallelism through synchronization.
- **CO-4:** Develop Test Cases By Including The Runtime Errors Using Exceptions Handling Mechanism.
- **CO-5:** Identify AWT components to Design the GUI Using Applet & AWT Frameworks

CO-PO MAPPING:

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	1	2	3	1	1	-	-	-	1	-	1	3	2	2
CO-2	2	3	3	2	2	-	-	-	2	-	-	3	2	2
CO-3	1	3	3	1	3	-	-	-	2	-	-	3	2	2
CO-4	1	2	3	2	2	1	-	-	2	-	-	3	2	2
CO-5	2	1	3	2	3	-	-	-	2	-	-	3	2	2

Correlation Levels 1 2 3 Defined as Below

1 High: Strong Correlation
2 Medium: Moderate Correlation
3 Low: Slight
Co1: MAPPED TO strongly mapped to Po1

COURSE CONTENTS:

UNIT-I **10-12hours**

OOP concepts - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.

Java programming - History of Java, data types, variables, operators. Control structures, arrays, console input and output, formatting output. Simple programs on java.

Introduction to Classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading constructors and methods, recursion, final keyword, garbage collection, finalize method, inner class and uses of inner classes, String handling.

UNIT-II **10-12 hours**

Inheritance – Basics, using super keyword, multilevel hierarchy, Member access rules, preventing inheritance- using final, the Object class and its methods.

Polymorphism - dynamic binding, method overriding, abstract class and methods.

Interfaces - Interfaces vs. Abstract class, defining an interface, implementing interfaces, accessing implementations through interface references, extending interfaces.

Packages - Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Employability

UNIT –III **10-12 hours**

I/O: I/O basics, byte and character streams , read/ write console input/output, reading and writing files.

Exception handling – Fundamentals, Exception types, use of try and catch, throw, throws, finally, multiple catches, built-in exceptions, user defined exceptions.

Employability

Multithreading – Thread Priorities, synchronization, messaging, reading a thread, creating multiple threads, use of alive and join, inter-thread communication- suspending resuming and stopping threads, producer-consumer problem with multithreading.

Employability

UNIT-IV **10-12 hours**

Applets: Basics, Applet class, Applet Architecture, Applet skeleton. The HTML Applet tag, A simple banner applet. Difference between Application program and applet program.

AWT-Working with Windows, Graphics and Text: AWT Classes, Window fundamentals, working with Frame windows, creating a frame window in an applet. Working with graphics, working with colors, working with fonts.

Employability

UNIT-V **10-12 hours**

Event Handling: The Delegation event model, Event classes, Event Listener interfaces, handling mouse and keyboard events.

Using AWT Controls, Layout Managers and Menus: Control fundamentals, Labels, Buttons, Check Boxes, Choice Controls, Lists, Scroll bars, Text field, Text Area, Layout Managers.

TEXT BOOKS

1. Herbert Schildt, "JAVA The Complete Reference", TataMcGraw Hill,seventh edition.
2. Y.Daniel Liang (PHI),"Introduction to JAVA PROGRAMMING"

REFERENCES BOOKS

1. P.J. Deitel and H.M. Deitel, "Java for Programmers", Pearson education (OR) P.J. Deitel and H.M. Deitel, "Java: How to Program", PHI.
2. P. Radha Krishna, "Object Orientd Programming through Java", Universities Press.
3. Bruce Eckel, "Thinking in Java", Pearson Education
4. Bruce Eckel, "Programming in Java", Pearson Education
5. S. Malhotra and S. Choudhary, "Programming in Java", Oxford Univ. Press.

CSE 215 PROBABILITY, STATISTICS AND QUEUING THEORY — **CREDITS: 4**

INSTRUCTION: 4Theory & 1Tutorial/ Week — **SESSIONAL MARKS: 40**
FINAL EXAM: 3Hrs — **FINAL EXAM MARKS: 60**

Course Objective :

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

At the end of the course student should be able to:

CO - 1	Understand the concepts of various statistical measures like mean, variance and standard deviation of a random variable.
CO - 2	Familiarize the different types of probability distributions and their properties.
CO - 3	Compute simple correlation between the variables and fit straight line, parabola by the principle of least squares.
CO - 4	Analyze the statistical data and apply various small or large sample test for testing the hypothesis.
CO - 5	Learn about different Queuing models and its applications.

Mapping of course outcomes with program outcomes:

Course Outcomes	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k
CO - 1	3								1		3
CO - 2	3								1		3
CO - 3	3								1		3
CO - 4	3								1		3
CO - 5	3								1		3

COURSE CONTENTS:

UNIT I

Probability & Mathematical Expectations **(12 Periods)**

Introduction to probability: Definition of Random Experiment, Events and Sample space, Definition of probability, Addition and Multiplication theorems, Conditional probability, Baye's Theorem, Simple Problems on Baye's theorem. Random Variables: Discrete and Continuous random variables, Distribution function of random variable, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of Mathematical expectations, Mean and Variance.

UNIT II

Probability Distribution **(14 Periods)**

Discrete Distributions: Binomial Distribution, Mean and Standard Deviations of Binomial Distribution, Poisson distribution, Mean and Standard Deviations of Poisson Distribution, Applications. Continuous Probability Distributions: Uniform Distribution, Exponential Distribution, Normal Distribution, Properties of Normal Distribution, Importance of Normal Distribution, Area properties of Normal curve.

UNIT III

Curve Fitting , Correlation and Regression **(10 Periods)**

Curve Fitting : Principle of Least Squares , Method of Least Squares (Straight Line and Parabola).

Correlation : Definition, Measures of correlation, Correlation for Bivariate Distribution, Rank correlation coefficients.

Regression : Simple linear regression, regression lines and properties.

UNIT IV

Testing of Hypothesis **(14 Periods)**

Formulation of Null Hypothesis, Critical Region, Level of Significance.

Small Samples : Students t - distribution (Significance test of a sample mean, Significance test of difference between sample means), F- distribution, χ^2 - test, Goodness of fit.

Large samples : Test of Significance of Large Samples – Single Proportion, Difference between two Proportions , Single mean and Difference of means.

UNIT V

Queuing Theory **(10 Periods)**

Queue description, characteristics of a queuing model, study state solutions of M/M/1: α Model, M/M/1 ; N Model.

TEXT BOOKS

1. T.Veerarajan, "Probability, Statistics and Random Processes" Tata McGraw Hill Publications.

REFERENCE BOOKS

1. Kishor S. Trivedi , "Probability & Statistics with Reliability, Queuing and Computer Applications" Prentice Hall of India ,1999 .

CSE 216 **Data Structures Lab** **Credits: 2**

Instruction: 3 Periods/week Sessional Marks: 50

End. Exam: 3 Hours End-Exam-Marks: 50

Outcomes of the Lab:

1. Be able to design and analyze the time and space efficiency of the data structure.
2. Be capable to identify the appropriate data structure for given problem.
3. Have practical knowledge on the application of data structures.
4. Able to apply different problem solving techniques on real world problems world problem.

CO-PO Mapping:

S.No	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k
CO 1	3	3	2	2	2	0	0	2	0	2	2
CO 2	2	1	2	0	3	0	2	2	2	2	2
CO 3	2	1	3	1	3	1	1	2	3	2	2
CO 4	2	3	3	0	2	0	2	3	3	2	2

List of Programs:

1) Develop C programs to implement the following using an array.
a) Stack b) Queue

2) Develop C programs to implement the following using a singly linked list.
a) Stack b) Queue

Employability

Employability

3) Develop a C program to do the following
a) Infix to Postfix conversion. b) Evaluation of postfix expression.

Employability

4) Develop C programs to implement the following
a) Circular Queue b) Priority Queue

5) Implement the dequeue (double ended queue) using a doubly linked list and an array.

6) Write a C program to perform the following operations:
a) Insert an element into a binary search tree. Employability
b) Delete an element from a binary search tree.
c) Search for a key element in a binary search tree.

7) Write C programs that use non-recursive functions to traverse the given binary tree in
a) Pre-order b) In-order c) Post-order.

8) Write C programs for the implementation of BFS and DFS for a given graph.

9) Write C programs for implementing the following sorting methods: Employability
a) Merge sort b) Quick sort

Employability

10) Write C programs for implementing the following searching methods:
a) Linear Searchb) Binary search

Employability

11) Write a C program to store k keys into an array of size n at the location computed using a hash function, loc = key % n, where k<=n and k takes values from [1 to m], m>n.

12) Write a C program to handle the collisions using the following collision resolution Technique

a) Linear probing b) Quadratic probing c)Separate Chaining

Employability

Note: All programs are to be implemented in C only TEXT BOOKS

1. Y. Langsam, M. Augenstin and A. Tannenbaum, “Data Structures using C” Pearson Education, 2nd Edition, 1995.

2. Richard F, Gilberg ,Forouzan, “Data Structures”, Cengage, 2005,2/e.

CSE 217 | **Digital Electronics Lab (Common to CSE and IT)** | **Credits: 2**

Instruction: 3 Periods/week — Sessional Marks: 50

End. Exam: 3 Hours — End-Exam-Marks: 50

The following are the list of laboratory experiments for DIGITAL ELECTRONICS Laboratory in 2-1 (CSE & I.T Dept Autonomous) for the academic year (2016-17).

***NOTE:** FOUR Experiments from each cycle should be done compulsorily.

CYCLE-I:

Skill Development

1. Study of passive, active components & Integrated Circuits.
2. To study the regulation characteristics of given Integrated Circuits.
3. To verify the adder operation & subtractor operation using Operational amplifiers.
4. To verify the truth tables of given Logic Gates.

CYCLE-II:

Skill Development

1. Verification of truth tables of Logic gates using IC's.
2. Design a combinational circuit for Code Converters using IC's.
3. Design a combinational circuit for Adders & Subtractors (HA & FA) using IC's.
4. Design a sequential circuit for Flip-Flop and verify its characteristics using IC's..
5. Design a bidirectional Universal Shift Register Using IC74LS194.
6. Design of Counters using IC74LS73.

CYCLE-III: (Simulation using VHDL)

Skill Development

1. Write a program for verification of Basic Gates.
2. Write a program for Adder & Subtractor.
3. Write a program for Flip Flops.
4. Write a program for MUX & DEMUX.
5. Write a Program for Shift Registers.

CSE 218 **JAVA Lab** **CREDITS: 2**

INSTRUCTION: 3 Hrs/ Week **SESSIONAL MARKS: 50**
FINAL EXAM: 3Hrs **FINAL EXAM MARKS: 50**

Prerequisites:

Basic knowledge of computer fundamentals
Student must have knowledge of some programming languages (such as C ,C++)

Course Objectives:

- To understand object oriented programming concepts, and apply them in problem solving.
- To learn the basics of java Console, GUI based programming and networking programming.

COURSE OUTCOMES:

CO-1: Understanding of OOP concepts and basics of Java programming (Console and GUI based).
CO-2: The skills to apply OOP and Java programming in problem solving.

CO-3: Should have the ability to extend his/her knowledge of Java programming further on his/her own.

CO-PO MAPPING:

	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K
CO-1	3	3	3	2	2	0	2	2	2	2	2
CO-2	3	3	3	2	2	0	2	2	2	2	2
CO-3	2	2	1	3	2	0	2	3	2	2	2

.

List of Programs:

1. Write a program to find the factorial of a given number.
2. Write a program to print numbers in sorting order.
3. Create a class Odometer that displays the number of kilometers a vehicle run. Give samples as trip information like number of kilometers travelled, fuel consumption per litre. The task is to find the mileage of the vehicle running at different samples of trip information.
4. Create a class Day that represents day, month and year of the calendar day. The class Day should be able to accept the date, update the date, delete the date from a calendar list of activities. Create a class Time that represents hours, minutes, seconds of a clock. The class Time should accept the time, update the time, delete the time from a list of events created for a day using the Day Class.
5. Write a program on illustration of use of packages. Employability
6. Write a program to implement interfaces.
7. Write a program that implements a stack ADT that converts infix expression into postfix expression
8. Write a program to read a file and displays the file on the screen within line number before each line
9. Write a program to copy contents of a file into another file using File streams.
10. Write a program for handling ArrayIndexOutofBoundsException and Divide-by-zero Exception.
11. Write a program for custom exception creation. Employability
12. Write a program on multi-threading showing how CPU time is shared among all the threads. Employability
13. Write a program for Producer-Consumer problem using threads.
14. Write an applet that displays a simple message.
15. Write an applet to handle the mouse events and keyboard events.
16. Write a program to develop a simple calculator. Using Grid layout arrange buttons for the digits and +,-,* % operations. The computation should be performed with a button click "Compute". Display the result on a text field. Employability

CSE 221 DATA COMMUNICATIONS CREDITS: 4

INSTRUCTION: 4 Theory & 1Tutorial/ Week SESSIONAL MARKS: 40
FINAL EXAM: 3Hrs FINAL EXAM MARKS: 60

Prerequisite:

Basic knowledge of Computer Hardware, Network basics.

COURSE OBJECTIVES:

- To educate concepts, vocabulary and techniques currently used in the area of Data Communication, Networking and Internet.
- To interpret the Digital encoding Techniques in Data Communication.
- Familiarize the student with the basic taxonomy and terminology of the Data and signals, Signal Transmission, and Transmission Impairments.
- To accumulate existing state-of-the-art in Data Link Layer concepts and sliding window protocols and its applications.
- To analyze the functions of physical layer and gain knowledge in different mediums used for data transfer.
- Introduce the student to illustrate the point in Data Communication & networking concepts, preparing the student for that entry level courses.

Course Outcomes:

CO-1: Describe the basic data communications model, differentiate TCP/IP models and examine the transmission impairments.

CO-2: Analyze and explain the features of Transmission media, various encoding techniques.

CO-3: Apply the error correction and detection techniques.

CO-4: Analyze the performance issues of different types of LANs

CO-5: Explain the characteristics of multiplexing and spread spectrum.

CO-PO mapping

	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PSO-1	PSO-2
CO-1	3	1	-	-	-	1	1	-	-	-	1	1	-	-
CO-2	3	2	2	-	1	-	1	-	-	-	1	1	-	-
CO-3	3	2	3	2	1	-	-	-	-	-	-	-	-	-
CO-4	1	3	1	1	1	-	-	-	-	-	-	-	-	-
CO-5	2	2	2	1	1	-	-	-	-	-	-	-	-	-

Employability

UNIT 1:

Data Communications, Data Networking, Internet: A Communications Model, Data Communications, Networks, The Internet, An Example Configuration, Protocol Architecture. The Need for a Protocol Architecture: The TCP/IP Protocol Architecture, The OSI Model, Traditional Internet-Based Applications,Characteristics of Data,Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments.

Employability

UNIT 2:

Transmission Media

Guided Transmission Media, Wireless Transmission Data Encoding, Digital Data, Digital Signals, Analog Signals, Analog.

UNIT 3:

The Digital Data Communication Techniques:

Asynchronous and Synchronous Transmission, Line Configurations, Interfacing.Data Link Control Flow Control, Types of Errors, Error Detection, Error Control, High-Level Data Link Control (HDLC).

Employability

UNIT 4:

Local Area Network:

Overview, LAN Protocol Architecture, Bridges, Layer 2 and Layer 3 Switches.
High-Speed LANs: The Emergence of High-Speed LANs.Wireless LANs:Overview,Wireless LAN Technology,IEEE 802.11 Architecture and Services.

Employability

UNIT 5:

Modems and Modem Circuits. Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics, The Concept of Spread Spectrum,Frequency Hopping Spread Spectrum,Direct Sequence Spread Spectrum,Code-Division Multiple Access.

TEXT BOOKS

Wthilliam Stallings, “Data and Computer Communications” , Pearson Education Inc., 2010 8 Edition.

REFERENCE BOOKS

Behrouz A. Forouzan, “Data Communications and Networking”, TMH, 2004, 3rd Edition.

CSE 222 **MICROPROCESSOR AND INTERFACING** **CREDITS: 3**
INSTRUCTION: 3Theory & 1Tutorial/ Week **SESSIONAL MARKS: 40**
FINAL EXAM: 3Hrs **FINAL EXAM MARKS:60**

PREREQUISITE: Digital Logic

Course Objectives:

1. The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor.
2. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces
3. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems.
4. To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional career.
5. The accompanying lab is designed to provide practical hands-on experience with microprocessor software applications and interfacing techniques

Course Outcomes:

CO	Description
CO-1	To interpret the concepts of internal operations of the computer and the working principles of Microprocessor.
CO-2	To understand the architecture, pin configuration of 8085 Microprocessors along with the programming knowledge for practical implementation of assemble level programming using instruction set of 8085
CO-3	To demonstrate the significance of Addressing modes and the timing diagrams to analyse the working of the microprocessor.
CO-4	Experimenting the interfacing of the 8085 microprocessor with co-processors and External I/O devices.
CO-5	To analyse the internal architecture and pin configuration of 8086 MicroProcessor along with the programming knowledge for practical implementation of assemble level programming using instruction set of 8085

CO-PO Matrix

	PO A	PO B	PO C	PO D	PO E	PO F	PO G	PO H	PO I	PO J	PO K	PO L	PSO 1	PSO 2
CO 1	3	1							3	1			2	2
CO 2	3	3	2	2					1	1				1
CO 3	2	2	1		2									
CO 4	2	1	1		2									
CO 5	3	3	2	2					1	1				1

UNIT I

The 8085A µP. Architecture and Instruction Set:

Introduction to Microprocessors and Microcomputers, Internal Architecture and Functional/Signal Description of typical 8-bit µP.- 8085, Instruction Set and Timing Diagrams of 8085 µP. Interfacing SRAMs, and EPROMs to 8085.

15 h

UNIT II

Programming the 8085 µP.:

Assembly Language Programming Requirements, Programming Techniques: Looping, Counting, and Indexing, Counter and timing Delays, Stack and Subroutines, Code Conversion, BCD Arithmetic, 16-bit data Operations, Interrupts and Interrupt Service Routines

Skill Development

Skill Development

10h

UNIT III

Interfacing Peripheral ICs to Intel 8085

Parallel I/O Interface - 8255, Serial I/O Interface – 8251, Timer Interface - 8253, Keyboard/Display Interface - 8279, Interrupt Controller Interface - 8259, D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Skill Development

20h

UNIT IV

The 8086 µP. Architecture and.:

Internal Architecture and Functional/Signal Description of 8086/8088

Segmented Memory, Maximum-Mode and Minimum-Mode Operation, Addressing Modes.

Skill Development

10h

UNIT V

Programming the 8086 µP

Instruction Set and Timing Diagrams Assembly Language Requirements, Data Definition, Loops Procedures, Modular programming, and Macros

Skill Development

TEXT BOOKS:

1. Ramesh S. Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085” Penram International ,6th Edition,

2. John E.Uffenbeck, “The 80x86 Family, Design, Programming and Interfacing3rdEdition, Pearson Education Inc.”, 2002

REFERENCE BOOKS:

1. BARRY B. BREY, “The Intel Microprocessors 8086/8088, 80186/80188,80286,80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing”, Pearson Education Inc., 2003,6thEdition.

2 Walter A. Tribel and Avtar Singh,” The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications”, Pearson Education Inc., 2003,4thEdition.

3. Douglass V. Hall,”Microprocessors and Interfacing, Programming and Hardware” , TMH Edition, 1999, 2ndEdition

4. Sanjay K Bose, “Hardware and Software of Personal Computers”, New Age International (P) Ltd., 1991

CSE 223 **OPERATING SYSTEMS** **CREDITS: 4**

INSTRUCTION: 4Theory & 1Tutorial/ Week **SESSIONAL MARKS: 40**
FINAL EXAM: 3Hrs **FINAL EXAM MARKS: 60**

Course Objectives:

1. Introduce various fundamental concepts and principles of operating systems .
2. This course provides a comprehensive introduction to understand the underlying techniques and approaches which constitute a coherent body of knowledge in operating systems. In particular, the course will consider inherent functionality and processing of program execution .
3. The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software

Course Outcomes:

1. Illustrate the structure of OS, Functionality and services provided by the OS.Analyse the concept of process state and state transitions.
2. Implement the CPU Scheduling algorithms (FCFS, SJF, PRORITY and ROUND ROBIN).Demonstrate the concept of Process synchronization and resource allocation.
3. Apply and analyze the memory management mechanism (virtual memory, demand paging and page replacement).
4. Demonstrate the structure and organization of file systems and analyze the implementation of file systems.
5. Analyze the disk structure, disk scheduling, management and protection issues.

Mapping of COs and POs

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	1	1					1	1	2		1		
	2	2	3	1	1		1	1	1	2	2	1	1	1	
	3	2	3	1	1		1	1	1	2	2	1	1	1	
	4	1	2	1					1	1	2		1	1	
	5	1	2	1			1	1	1	1	2		1		

COURSE CONTENTS:

EMPOLYABILITY

UNIT I

Introduction to OS

Introduction to operating systems – review of computer organization – operating system structures – system calls – system programs – system structure – virtual machines. **Process Management**

Processes: Process concept – Process scheduling – Operations on processes –Cooperating processes – Interprocess communication. Multi threaded programming. Communication in client-server systems. Multi-Threaded Programming:Overview; Multithreading models; Thread Libraries; Threading issues.

EMPLOYABILITY

UNIT II

Process Scheduling and Synchronization

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processorscheduling – Real time scheduling – Algorithm Evaluation. Process Synchronization: The critical-section problem –Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization –Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance, Deadlock detection – Recovery from deadlock.

EMPLOYABILITY

UNIT III

Memory Management

Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

EMPLOYABILITY

UNIT IV

File Systems and its Implementation

File-System Interface: File concept – Access methods – Directory structure – Filesystem mounting – Protection. File-System Implementation : Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery – log-structured file systems.

UNIT V

Secondary Storage Structures and Protection

Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication

EMPLOYABILITY

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Wiley
India Pvt Ltd, 2003, Sixth Edition.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Pearson
Education, 2004, Second Edition.
2. Gary Nutt, “Operating Systems”, Pearson Education, 2004 ,Third Edition.
3. Harvey M. Deitel, “Operating Systems”, Pearson Education, 2004, Third Edition.

CSE 224 COMPUTER ORGANIZATION CREDITS: 4

INSTRUCTION: 4Theory & 1Tutorial/ Week SESSIONAL MARKS: 40
FINAL EXAM: 3Hrs FINAL EXAM MARKS: 60

PREREQUISITE:

Digital Logic COURSE

OBJECTIVE:

- To understand the basics of computer hardware and how software interacts with computer hardware.
- To understand the structure, function and characteristics of computer systems.
- To understand the basic structure and operation of digital computer.
- To study the design of arithmetic and logic unit.
- To study the two types of control unit techniques and the concept of pipelining.
- To understand the hierarchical memory system including cache memories and virtual memory.
- To understand the different ways of communicating with I/O devices and standard I/O interfaces.

COURSE OUTCOMES:

Student will be able to :

CO1: Identify the basic principles and apply to arithmetic for ALU implementation. (Remember& Apply – L1&L3)
CO2: Examine the functional aspects of processor unit. (Analyse – L4)
CO3: Compare and assess the working principles of hardwired and microprogrammed control unit (Understand &Evaluate – L2 & L5)
CO4: Inspect addressing modes, instruction formats in various CPU organizations and Assess the performance implications of processing techniques. (Analyse – L4)
CO5: Infer the design issues in memory and I/O organizations. (Evaluate- L5)

CO-PO MAPPING:

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
CO-1	3	2	2	1					1	1		1	1	1
CO-2	2	2	2	1									1	2
CO-3	1	3	2	3									1	1
CO-4	2	2	2	2									1	2
CO-5	2	3	3	3					1	1		1	2	2

COURSE CONTENTS:

UNIT-1

Register Transfer and Micro operations :

Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Micro operations, Arithmetic Logic Shift Unit,

Computer Arithmetic:

Introduction, Addition and Subtraction, Booth Multiplication Algorithm, Decimal Arithmetic Unit.

Skill Development

UNIT-2

Basic Computer Organization:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description.

UNIT-3

Control Design:

Hardwired & Micro Programmed (Control Unit), Control Memory, Address Sequencing, Conditional and Unconditional Branching, Micro program Example.

Employability & Skill Development

UNIT-4

Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes with numerical examples, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of interrupts, CISC Characteristics, RISC Characteristics.
Introduction to Parallel Processing, Pipelining – General Considerations.

Employability & Skill Development

Employability & Skill Development

UNIT-5

Input-Output Organization:

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXT BOOKS

Employability & Skill Development

1. M.Morris Mano, "Computer System Architecture", Pearson Education Inc., 2003, Third Edition,.

REFERENCE BOOKS

1. John D. "Carpinelli ,Computer Systems Organization and Architecture", Pearson Education Inc., 2003.

CSE 225 FORMAL LANGUAGES AND AUTOMATA THEORY CREDITS: 4

INSTRUCTION: 4Theory & 1Tutorial/ Week SESSIONAL MARKS: 40
FINAL EXAM: 3Hrs FINAL EXAM MARKS: 60

Course Objectives:

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages
- Prove or disprove theorems in automata theory using its properties
- Determine the decidability of computational problems.

Course Outcomes:

1. Analyze the finite automata and regular expressions for accepting the language.
2. Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
3. Construct algorithms for different problems and correctness on different restricted machine models of computation (Context free grammar).
4. Construct a Pushdown automata for languages acceptance of a PDA and pumping lemma for CFGs
5. Construct the Turing machine for accepting unrestricted grammar and determine the decidability of computational problems.

Mapping of COs and Pos

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	2	2	2	0	0	0	1	1	1	1	1	0
	2	2	2	2	2	2	0	0	0	1	1	1	1	1	0
	3	2	2	3	2	2	0	0	0	1	1	1	1	1	0
	4	2	2	3	2	3	0	0	0	1	1	1	1	1	0
	5	2	2	3	2	3	0	0	0	2	1	1	2	1	0

COURSE CONTENTS:

UNIT -1

Introduction to Finite Automata: Introduction to Finite Automata; The Central concepts of Automata theory; Deterministic finite automata;Nondeterministic finite automata.

Finite Automata, Regular Expressions: An application of finite automata ;Finite automata with Epsilon-transitions; Regular expressions; FiniteAutomata and Regular Expressions; Applications of Regular Expressions. Two way finite automata, finite automata with output**:** Mealy and Moore machines.

UNIT -2

Regular Languages, Properties of Regular Languages: Regular languages; Proving languages not to be regular languages; Closure propertiesof regular languages; Decision properties of regular languages; Equivalence and minimization of automata. Pumping lemma, closure properties, decision algorithm, MyHill- Nerode theorem and minimization of finite automata.

UNIT -3

Context-Free Grammars And Languages : Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Languages

UNIT -4

Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic PushdownAutomata.

Properties of Context-Free Languages: Normal forms for CFGs; The pumping lemma for CFGs; **Closure properties of CFLs**

UNIT -5

Introduction To Turing Machine: Problems that Computers cannot solve;The turing machine; Programming techniques for Turning Machines;Extensions to the basic Turing Machines; Turing Machine and Computers.church's hypothesis. The classes P and NP; NP-Completeness; Satisfiability and Cook's theorem; Polynomial reduction and some NP-complete problems.

Undecidability: properties of recursive and recursively enumerable languages, universal Turing machines, Rice's theorem, Post Correspondence Problem, Greibach's theorem, introduction to recursive function theory, Oracle computation; Chomsky Hierarchy**:** regular grammars, unrestricted grammars, context sensitive languages, relations between classes of languages.

TEXT BOOKS

1.John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 2007,3rd Edition.

REFERENCE BOOKS

1. Mishra &Chandrasekharan, “Theory of computer science: Automata language and computation”, Prentice Hall of India, 3rd Ed,2007.
2. K.L.P. Mishra: “Theory of Computer Science, Automata, Languages, and Computation”, PHI Learning, 2009,3rd Edition.
3. John C Martin: “Introduction to Languages and Automata Theory”, Tata McGraw-Hill, 2007 3rd Edition.
4. P. Linz, “Introduction to Formal Language and Computation”, Narosa, 2nd Ed, 2006.

CSE 226 MICROPROCESSOR AND INTERFACING LAB CREDITS: 2
INSTRUCTION: 3Periods/ Week SESSIONAL MARKS: 50
FINAL EXAM: 3Hrs FINAL EXAM MARKS: 50

Course Objectives:

1. Developing of assembly level programs and providing the basics of the processors
2. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems
3. To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional career

Course Outcomes:

CO-1:Able to understand the problem and interfacing of peripheral devices through ALP programming .
CO-2: The students will learn how to design, build, and debug simple microcontroller based systems.
CO-3:To be able to test a solution for different parameters and cases and analyze the solution
CO-4:The students will work in groups of 2 to 4 and thereby learn how to cooperate in teams.

CO-PO Mapping

	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k
CO-1	0	2	3	0	1	0	0	2	1	3	2
CO-2	0	3	3	0	1	0	0	2	1	3	2
CO-3	1	3	0	0	1	0	0	2	1	3	2
CO-4	0	0	0	3	1	0	0	2	0	0	0

Assembly Language Programming :

1. 8085 Assembly Language Programming according to theory course using the following trainers : Keyboard Monitor of 8085µP Trainer.

3 Weeks

2.INTERFACING WITH 8085 TRAINER

2.1.8255 study card for mode 0,1 practice.
HEX KEYBOARD AND DOT MATRIX HEX LED DISPLAY INTERFACE
8279-PROGRAMMABLE KEYBOARD/DISPLAY INTERFACE

Skill Development 3 weeks

3.INTERFACING WITH PC

STEPPER MOTOR CONTROLLER
DAC/ADC INTERFACE
8253 TIMER INTERFACE
TRAFFIC LIGHT CONTROLLER INTERFACE

Skill development

5 weeks

4. 8086 Assembly Language Programming according to theory course using the following :

PC Assembler using TASM or MASM, TD or SYMDEB or CVD(Code View debugger). 2 weeks

Skill Development

CSE 227 **Operating Systems Laboratory** **CREDITS: 2**

INSTRUCTION: 3Periods/ Week **SESSIONAL MARKS: 50**
FINAL EXAM: 3Hrs **FINAL EXAM MARKS: 50**

PREREQUISITE: C Programming

COURSE OBJECTIVE:

1. To understand and write program in Unix environment
2. To design and implement the scheduling algorithms
3. To design and implement advanced file system operations

COURSE OUTCOMES:

CO1: Implement the system calls to communicate with system programming

CO2: Implement the Unix commands and Shell programming

CO3:Implement the process management, page replacement, memory and resource allocation algorithm

Mapping of COs and POs

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	1	2			1	1	1	2	2		1	1	
	2	1	2	3			1	1	1	2	2		1	2	
	3	2	3	3	2		1	1	1	2	2	1	1	2	

LIST OF SAMPLE PROGRAMS

Write a C program for the following

1. Study of laboratory environment:Hardware specifications, software specifications
2. Simple Unix-C programs:Programs using system calls, library function calls to display and write strings on standard output device and files.
3. Programs using fork system calls.
4. Programs for error reporting using errno, perror( ) other system functions.
5. Programs using pipes. EMPOLYABILITY
6. Shell programming.Simple logic programs
7. C Programs to implement the shell commands
8. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.
9. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.
10. Programs to simulate free space management.
11. Programs to simulate virtual memory. EMPLOYABILITY
12. Program on deadlock management.
13. Programs to simulate deadlock detection. EMPLOYABILITY

REFERENCE BOOKS

1. Sumitabha Das, “Unix concepts and applications” ,TMH Publications.
2. Stevens, “Unix programming” , Pearson Education.
3. Yashwanth Kanetkar ,“Shell programming” .
4. Silberschatz, and Peter Galvin ,“Operating System Concepts” .

CSE 228 **Hardware Lab** **CREDITS: 2**

INSTRUCTION: 3Periods/ Week **SESSIONAL MARKS: 50**
FINAL EXAM: 3Hrs **FINAL EXAM MARKS: 50**

Prerequisite

Minimum computer hardware knowledge

Course Objectives:

1. To understand the need of PC hardware
2. To be able to install different operating systems
3. To be able to troubleshoot hardware problems
4. To be able to troubleshoot software problems

Course Outcomes:

1. Understanding of different computer peripherals and interfaces
2. Describe the architecture of various computer hardware devices and their functioning
3. Configure and install the different operating systems

	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO- I	PO-J	PO-K
CO-1	0	2	0	0	0	0	2	2	1	3	2
CO-2	1	2	1	3	1	0	2	3	1	0	0
CO-3	1	3	1	0	2	0	3	2	1	0	1

Week 1 & 2

The Instructor should explain the students about the PC Hardware like Motherboard, Processor, RAM, Hard Disk, Network Interface Card and other peripheral devices.

Employability

Week 2 & 3

Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 4 & 5

Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

SKILL SET

Week 6 & 7

Every student should individually install operating system (Windows) in the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

SKILL SET

Week 8 & 9

Every Student should individually install Operating system (Linux – Ubuntu) in the personal computer. Lab instructor should verify the installation and follow it.

Employability

Week 10 & 11

Every Student should individually install Operating system (Linux – Ubuntu) and Windows as **Dual Boot** in the personal computer. Lab instructor should verify the installation and follow it.

Employability

Week 12 & 13

Hardware Troubleshooting

Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Employability

Week 14 & 15

Software Troubleshooting

Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

TEXT BOOKS

1. Peter Norton ,"Peter Norton's Inside the PC",. –, SAMS publications Eight Edition
2. Kate J. Chase ,"PC Hardware and A+ Handbook" , PHI (Microsoft)
3. Vikas Gupta, "Comdex Information Technology course tool kit" WILEY Dreamtech
4. Cheryl A Schmidt, "The Complete Computer upgrade and repair book", WILEY Dreamtech 3rd edition

CSE 3.1.1 MICROPROCESSORS - II Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam:3 Hours Univ_ Exam Marks:70

Interfacing Semiconductor Memories:
Semiconductor Memories: Classification, Internal Organisation & Functional Description. Interfacing SRAMs, and EPROMs to 8085/8086

Interfacing I/O Devices:
Interfacing Characteristics of I/O Devices, I/O Device addressing methods, I/O Device Programming Methods.

Skill Development

Interfacing Peripheral ICs to Intel 8085/8086:
Parallel I/O Interface - 8255, Serial I/O Interface – 8251, Timer Interface - 8253, Keyboard/Display Interface - 8279, Interrupt Controller Interface - 8259

Interfacing Data Converters to 8085/8086:
D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers:
Intel 8051 Architecture and Programming

Skill Development

Introduction to Hardware and Software of PCs :
Hardware Organization, DOS Internals, ROM BIOS and BIOS Function Calls, DOS Function Calls, Introduction to Pentium Processors

Skill Development

TEXT BOOKS:

1.Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S. Gaonkar, 4th Edition, Penram International, 1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck,

3rd Edition, Pearson Education Inc., 2002
3. Kenneth J.Ayala, 8051 Microcontroller architecture, programming and applications, 2nd Edition, Penram International Publications, 1999

REFERENCE BOOKS:

1. BARRY B. BREY, The Intel Microprocessors 8086/8088, 80186/80188,80286,80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing, 6th Edition, Pearson Education Inc., 2003
2 Walter A. Tribel and Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4th Edition, Pearson Education Inc., 2003
3. Microprocessors and Interfacing, Programming and Hardware, 2nd Edition, Douglass V. Hall, TMH Edition, 1999 4. Sanjay K Bose, Hardware and Software of Personal Computers, New Age International (P) Ltd., 1991 5. Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH, 1999

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CSE 3.1.2 SYSTEMS PROGRAMMING Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam:3 Hours Univ_ Exam Marks:70

Introduction to Systems Programming, Introduction to Assembly Language Programming - Introduction to Instruction Formats, Data formats - Role of Base Register, Index Register.

Introduction to Assembler, databases used in assembler design, Design of Assembler - Single Pass & Double Pass.

Skill Development

Introduction to Macros, various types of Macros, Design of Macro Processor - Single Pass & Double Pass. Introduction to Loaders, functions of a loader, types of Loaders, databases used in Loaders, Design of Loaders - Absolute & DLL.

Introduction to Software Tools, Text editors, Interpreters, Program Generators, Debug Monitors.

Skill Development

Skill Development

TextBook: Systems Programming by Donovan
Tata Mc Graw Hill

Reference: System Programming by Dhamdhere
Tata Mc Graw Hill, IInd Revised Edition

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CSE 3.1.3 ELECTIVE-I COMPUTER GRAPHICS Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam:3 Hours Univ_ Exam Marks:70

Introduction: Usage of Graphics and their applications, Presentation Graphics- Computer Aided Design Computer Art- Entertainment- Education and Training- Visualization- Image Processing- Graphical User Interfaces **Over view of Graphics systems:** Video Display Devices- Raster Scan systems-random scan systems-Graphics monitors and workstations-Input devices-hard copy devices- Graphics software
Output primitives: Points and Lines-Line Drawing Algorithms- Loading the Frame buffer- Line function- Circle Generating Algorithms- Ellipse Generating Algorithms- Other Curves- Parallel Curve Algorithms-Curve Functions Pixel Addressing- Filled Area Primitives-Filled Area Functions- Cell Array- Character Generation **Attributes of Output Primitives:** Line and Curve Attributes-Color and Gray scale levels- Area Fill Attributes Character Attributes-Bundled Attributes- Inquiry Functions- Antialiasing
Two Dimensional Geometric Transformations: Basic Transformations- Matrix Representations-Homogeneous

Employability

Coordinates-Composite Transformations-Other Transformations-Transformations between Coordinate Systems Affine Transformations- Transformation Functions- Raster methods for Transformations

Two Dimensional Viewing: The viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Two Dimensional Viewing Functions-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping- Text and Exterior Clipping

Structure And Hierarchical Modeling: Concepts of Structures and Basic models- Editing - Hierarchical Modeling with Structures-GUI and Interactive Input Methods- Windows and Icons- Virtual Reality Environments **Three Dimensional Concepts and Object representations:** 3D display methods-3D Graphics-Polygon Surfaces Curved Lines and Surfaces-Quadratic Surfaces-Super Quadrics-Blobby Objects-Spline Representations- Cubic Spline methods-Bézier Curves and Surfaces- B Spline Curves and Surfaces

Employability

Three Dimensional Geometric and Modeling Transformations: Translation- Rotation-scaling-Other Transformations-Composite Transformations-3D Transformation Functions-Modeling and Coordinate Transformations.

Three Dimensional Viewing: Viewing Pipeline- Viewing Coordinates- Projections- View Volumes General Projection Transformations-Clipping-Hardware Implementations Three Dimensional Viewing

Chapters 1 to 12 except 10-9 to 10-22 of the Text book

Employability

Text Book: Computer Graphics C Version by Donald Hearn & M. Pauline Baker
Pearson Education, New Delhi, 2004

Reference Books:

1) Procedural Elements for Computer Graphics by David F. Rogers, Tata McGraw Hill Book Company, New Delhi, 2003
2) Computer Graphics: Principles & Practice in C by J. D. Foley, S. K Feiner, A Van Dam F. H John, Pearson Education, 2004
3) Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.

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CSE 3.1.3 ELECTIVE-I DIGITAL SIGNAL PROCESSING Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam:3 Hours
Univ_ Exam Marks:70

An Overview of Digital Signal Processing and its Applications

Introduction to Programmable DSPs

EMPLOYABILITY

Architecture of TMS320C3X

Addressing Modes and Assembly language Instructions of 'C3X

EMPLOYABILITY

Application Programs in C3X

EMPLOYABILITY

An Overview of TMS320C54X

TMS320C54X Assembly language Instructions

Application Programs in C54X FPGA – based DSP

EMPLOYABILITY

System Design **Text Book:**

Digital Signal Processors, Architecture, Programming and Applications, B.Venkataramani ,M.Bhaskar, TMH, 2002

Reference Books:

1. Digital Signal Processing, A Practical Approach, Emmanuel C. Ifeachor , Barrie W. Jervis, 2nd Edition, Pearson Education, Inc., 2002
2. Digital Signal Processing, Steve White, Thomson Delmar Publications, 2000
3. Digital Signal Processing, A computer Based Approach, Snajit K. Mitra, 2nd Edition, TMH, 2001

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CSE 3.1.3 ELECTIVE-I FAULT TOLERANT COMPUTING Credits:4

Instruction: 3 Periods & 1 Tut./week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

Basic Concepts of Reliability

Faults in Digital Circuits

Test Generation

Introduction to Fault Tolerant Design of Digital Systems: Fault Tolerance, Static redundancy, Dynamic redundancy, Fault tolerant design of Memory systems, Practical Fault Tolerant Systems: FTMP, ESS, COMTRAC

EMPLOYAB

Introduction to Self-Checking Logic: The two rail Checker,
Design for Testability: Testability, Controllability and Observability, Design of testable Combinational Logic Circuits, Testable design of Sequential Circuits, The scan path technique, Designing testability into logic boards

EMPLOYABILIT

Text Books:
Fault Tolerant and Fault Testable Hardware Design, Parag K. Lala, PHI, 1985

Reference:

1. Fault Tolerant Computing Theory and Techniques-Volume I, D.K. Pradhan, PHI, 1986
2.. Testing of Digital Systems, Niraj jha and Sandeep Gupta, Cambridge University Press, 2003

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CSE 3.1.3 ELECTIVE-I COMBINATORICS & GRAPH THEORY Credits:4

Instruction: 3 Periods & 1 Tut./week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

PART I: COMBINATORICS

1. FOUNDATION: Basics- Sets- Relations- Proof methods- Problem-solving strategies- Mathematical Induction.
2. COMINATORICS: Basics of counting-Combinations and Permutations- Enumeration of Combinations & Permutations without repetitions and without repetitions- with constr[illegible] repetitions-Binomial Coefficients-Binomial and Multinomial theorems- Principle of Inclusion- Exclusion
3. RECURRENCE RELATIONS: Generating Functions of Sequences- Calculating Coefficients of Generating Functions- Recurrence Relations- Solving Recurrence Relations using Substitution and Generating Functions Method of Characteristic Roots-Solutions of homogeneous and inhomogeneous recurrence relations.

SKILL DEVELOPMENT

SKILL DEVELO

PART II GRAPH THEORY

4. FUNDAMENTAL CONCEPTS: what is a Graph-Paths-Cycles-Trails-Vertex Degrees and Counting Directed Graphs-Trees and Distance-Spanning Trees-Enumeration-Optimization and Trees. 5. MATCHINGS AND CONNECTIVITY : Matchings and Covers-Algorithms and applications of matching Matchings in General graphs-Cuts and Connectivity-k-connected graphs-Network flow problems. 6. COLORING AND PLANAR GRAPHS: Vertex coloring and upper bounds-Structure of k- chromatic [illegible] Graphs-Enumerative Aspects-Embeddings and Euler's formula-Characterization of Planar graphs-Parameters of Planarity-Edges and Cycles-Line Graphs and edge-coloring- Hamiltonian Cycles-Planarity-coloring and cycles.

SKILL DEVELOPMENT

SKILL DEVELOPMENT

TEXT BOOKS:

SKILL DEVELOPMENT

1. J.L. Mott, Abraham Kandel & Theodore P. Baker, " Discrete mathematics for Computer Scientists & Mathematics", Prentice-Hall of India Ltd. New Delhi. (Chapters 1,2,3)
2. Douglas B. West, "Introduction to Graph Theory", Pearson Education Asia, New Delhi. (Chapters 1,2,3,4,5,6,7)

REFFERENCE BOOKS:

1. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
2. Kenneth H Rosen. "Discrete Mathematics and Its Applications, Tata McGrahHill Publishing Company, New Delhi.
3. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.

CSE 3.1.4 FORMAL LANGUAGES AND AUTOMATA THEORY Credits: 4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam: 3 Hours
Univ_ Exam Marks:70

1. Finite Automata and Regular Expressions:
Basic Concepts of Finite State Systems, Deterministic and Non-Deterministic Finite Automata, Finite Automata with e-moves, Regular Expressions, Minimization of Finite Automata, Mealy and Moore Machines, Two-Way Finite Automate.

2. Regular sets & Regular Grammars:
Basic Definitions of Formal Languages and Grammars, Regular Sets and Regular Grammars, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Decision Algorithm for Regular Sets, Myhill-Nerode Theorem, Minimization of Finite Automata.

3. Context Free Grammars and Languages:
Context Free Grammars and Languages, Derivation Trees, Simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, closure properlties of CFL's, Decision Algorithm for CFL.

4. Push down Automata and Deterministic CFL:
Informal Description, Definitions, Push-Down Automata and Context free Languages, Parsing and Push-Down Automata.

5. Universal Turing Machines and Undecidability:
Design and Techniques for Construction of Turing Machines, Undecidability of PCP. Chomsky Hierarchy, Regular Grammars, Unrestricted Grammars, Context Sensitive languages,Relationship between classes of languages.

TEXT BOOKS: Introduction to Automata Theory, Languages & Computation By J.E.Hopcraft & Jeffery D.Ulman – Narosa Publishing Company.

REFERENCE BOOKS:

Theory of Computer Science By Mishra & Chandra Sekharan, PHI.
An Introduction To Formal Languages and Automata,3e By Peter Linz – Narosa Publishing House.

CSE 3.1.5 FILE STRUCTURES Credits:4

Instruction: 3 Periods & 1 Tut /Week Sessional Marks : 30 Univ. Exam : 3 Hours
Univ. Exam Marks:70

File Processing Operations
Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C

Employability

Secondary Storage
Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access,Magnetic Tape – types, performance, organization estimation of tape length and data transmission times, disk vs tape,CD-ROM – CD-ROM as a file structure, physical organization, strengths and weakness of cd-roms, storage hierarchy

Employability

Byte Journey and buffer Management
File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks

Employability

File Structure Concepts
record structurA stream file, field structures, reading a stream of fields,es and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files

Managing records in C files
Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization

Organizing files for performance
Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.

Employability

Indexing
Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists

Indexed sequential file access and prefix B^+ Trees

Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the $^+$ tree, simple prefix B^+ content of the index: separators instead of keys, the simple prefix B tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable B^+ treeorder B-tree, loading a simple prefix

<u>Special Note</u>: **Implementation in C only**

Hashing
Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions

Employability

Extendable hashing
Working of extendable hashing, implementation, deletion, extendable hashing performance
Designing file structure for CD-ROM
Tree structure on CD-ROM, hashing files on CD-ROM, CD-ROM file structure

Text Book: File Structures – An Object Oriented Approach with C^{++} by Michael J. Folk, Bill Zoellick and Greg Riccardi,, Pearson

CSE 3.1.6 OPERATING SYSTEMS Credits:4

Instruction: 3 Periods & 1 Week./Week Sessional Marks : 30
Univ_ Exam : 3 Hours Univ_ Exam Marks:70

Introduction: What IS OS; History of Operating Systems, Operating System Concepts, Operating Systems Structure

Processes: Introduction to Processes, Inter Processor Communication, Classical IPC Problems, Process Scheduling

Memory Management : Memory Management without Swapping or Paging, Swapping, Virtual Memory, Page Replacement Algorithms, Modeling paging algorithms, Design issues for paging systems, Segmentation

File Systems And Input/Output : Files, Directories, File system implementation, Security, Protection mechanism, Principles of I/O Software, Disk Management

Deadlocks: Resources, Deadlocks, The O-----ptical Algorithm, Deadlock Detection and Recovery, Deadlock Avoidance, Deadlock Prevention, Other Issues

Case Study : Unix: Fundamental Concepts in Unix, MS – DOS: Fundamental Concepts in MS-DOS

Text Book: Modern Operating Systems by Andrew S. Tanenbaum

Reference: Applied Operating Systems Concepts by Avi Silberschatz, Peter Galvin, Grey Gagne

CSE 3.1.7 OPERATING SYSTEMS LAB Credits:2

Lab: 3 periods/week Sessional Marks: 50 Univ_Exam: 3 hours. Univ_Exam marks: 50

1. Study of laboratory environment:
 Hardware specifications, software specifications
2. Simple Unix-C programs:
 Programs using system calls, library function calls to display and write strings on standard output device and files.
3. Programs using fork system calls.
2. Programs for error reporting using errno, perror( ) function.
3. Programs using pipes.
4. Shell programming.
5. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.
6. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.
7. Programs to simulate free space management.
8. Programs to simulate virtual memory.
10. Programs to simulate deadlock detection.

References:

Unix concepts and applications by Sumitabha Das, TMH Publications. Unix programming by Stevens, Pearson Education.
Shell programming by Yashwanth Kanetkar.
Operating System Concepts by Silberschatz, and Peter Galvin.

CSE 3.1.8 MICROPROCESSOR-II LAB Credits:2

Lab: 3 Periods/week Sessional Marks: 50
Univ-Exam : 3 Hours Univ-Exam-Marks: 50

INTERFACING WITH 8085 TRAINER

1.1 MEMORY INTERFACE (Interfacing SRAM and EPROM)
1.2 TOGGLE SWITCH KEYBOARD AND LED DISPLAY INTERFACE
1.3 HEX KEYBOARD AND DOT MATRIX HEX LED DISPLAY INTERFACE
1.4 ASCII KEYBOARD INTERFACE
1.5 PUSH BUTTON KEYBOARD MATRIX (8x3) INTERFACE WITH 8085 ICE
1.6 8279-PROGRAMMABLE KEYBOARD/DISPLAY INTERFACE
1.7 CRT TERMINAL INTERFACE

Skill Development

INTERFACING WITH PC

2.1 STEEPER MOTOR CONTROLLER
2.2 DAC/ADC INTERFACE
2.3 8253 TIMER INTERFACE

Skill Development

2.4 MULTIPLEXED DOT MATRIX HEX LEDs INTERFACE
2.5 40-COL./80COL. D.M. PRINTER INTERFACE
2.6 8051 PROGRAMMING EXERCISES
2.7 TRAFFIC LIGHT CONTROLLER INTERFACE

CSE 3.1.9 SOFTSKILLS LAB Cred

Skill Development

Lab: 3 Periods/week Sessional Marks: 50
Univ-Exam : 3 Hours Univ-Exam-Marks: 50

1) English Language Skills

Skill Development

2) Spoken English Skills

3) Presentation Skills

ELECTIVE - II

[1]. PRINCIPLES OF PROGRAMMING LANGUAGE [2]. BIO-INFORMATICS [3]. IMAGE PROCESSING.
[4]. VHDL

* The industrial training will be for three weeks during the summer after third year second semester.

CSE 3.2.1 COMPILER DESIGN Credits:4

Instruction: 3 Periods & 1 Week./Week Sessional Marks : 30 Univ_
Exam : 3 Hours Univ_ Exam Marks:70

The Theory of Automata: Definition and description, Transition systems, properties, Acceptability of string, NDFA, Equivalence in between DFA & NDFA. Grammars, Types of Grammars, Grammars and Automata, Regular expressions, Finite Automata and Regular expressions, Regular sets and Regular Grammars.

Overall view of Compilers: Brief discussion on various phases of Compilers.

Design of lexical analyzer

SKILL DEVELOPMENT

Design of Parsers: Shift Reduce parser, Operator Precedence Parser, Predictive Parser, LR parser, SLR parser. LALR parser.

SKILL DEVELOPMENT

Syntax Directed Translation: Syntax directed translation and implementation, Intermediate code, Postfix notation, parsing tree, Three address code, Quadruples, Triples.

Intermediate Code Optimization: The principle sources of optimization, Loop Optimization, DAG, Global data flow analysis.

Code Generation: Problems, Machine model, A simple code generator, Register allocation and

SKILL DEVELOPMENT

assignment, Code generation from DAG, Peep hole optimization.

Brief discussion on symbol tables, Run-time storage administration.

chapters: 1,2,3,4,5,6,7,9,10,11,12,15 of the text book.

Text Book
Principles of Compiler Design by Aho, D. Ullman
Reference Books:
Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.

CSE 3.2.2 DESIGN AND ANALYSIS OF ALGORITHMS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Introduction – Fundamentals of algorithmic problem solving – important problem types – fundamental data structures.

Fundamentals of analysis of algorithms and efficiency – Analysis framework – Asymptotic Notations and Basic Efficiency classes – Mathematical Analysis of Non-recursive Algorithms – Mathematical Analysis of recursive Algorithms – Empirical Analysis of Algorithms – Algorithm Visualization
Brute Force – Selection Sort and Bubble sort – Sequential Search and Brute – Force String Matching – Closest Pair and Convex-Hull Problems by Brute Force – Exhaustive Search

Employability

Divide-and-Conquer – Mergesort – Quicksort – Binary Search – Binary Tree Traversals and Related Properties – Multiplication of large integers and Strassen's Matrix Multiplication – Closest- Pair Convex Hull Problems by Divide- and – Conquer

Decrease – and – Conquer – Insertion Sort – Depth-First Search and Breadth-First Search- Topological Sorting – Algorithms for Generating Combinatorial Objects – Decrease-by-a- Constant-Factor Algorithms – Variable-Size-Decrease Algorithms

Employability

Transform-and-Conquer – Presorting – Gaussian Elimination – Balanced Search Trees – Heaps and Heapsort – Horner's Rule and Binary Exponentiation – Problem Reduction

Space and Time Tradeoffs – Sorting by Counting – Input Enhancement in string Matching – Hashing – B Trees

Dynamic Programming – Computing a Binomial Coefficient – Warshall's and Floyd's Algorithm – Optimal Binary Search Trees - The Knapsack Problem and Memory Functions.

Greedy Technique – Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees Limitations of Algorithm Power – Lower-Bound Arguments – Decision Trees – P, NP and NP – complete problems – Challenges of Numerical Algorithms

Employability

Coping with the Limitations of Algorithms Power – Backtracking – Branch-and-Bound – Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Book:
Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003
Reference Books:
1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein,

Prentice Hall of India, New Delhi, New Delhi
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft & Ullman, Pearson Education, New Delhi, 2003
3. Fundamentals of algorithmics, Gilles Brassard & Paul Bratley, Prentice Hall of India, New Delhi

CSE 3.2.3 DATABASE MANAGEMENT SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Introduction to DBMS: Overview, File system vs DBMS, Advantages of DBMS, Storage data, queries, Transaction Management, DBMS structure

EMPLOYABILITY EMPLOYABILITY

E-R model: Entities, Attributes and Entity sets, Relation ship and Relation ship sets, Features of ER model, Conceptual database design with ER model

EMPLOYABILITY

Relational model: Integrity constraints over relations and enforcement, Querying relation data, Logical database design, views, destroying/altering tables and views

EMPLOYABILITY EMPLOYA

Relational Languages: algebra and calculus

SQL: Basic SQL, Query, union, interest, except, Nested Queries, Aggregated Operation, Null values, Embedded SQL, cursors, ODBC and JDBC, Triggers and Active database, designing active databases

Schema refinement and normal forms : Schema refinement, fds, reasoning normal forms, normalization up to 3rd & BC normal forms, lossless join & dependency preserving decomposition

EMPLOYABILITY

Transaction management: Transaction concept, transactions and schedules, concurrent execution of transactions, lock – based concurrency control, crash recovery

EMPLOYABILITY EMPLOYABILITY

Concurrency control : Lock management, specialized locking techniques, concurrency control without locking

Crash Recovery: Aries, recovering from a system crash, media recovery

EMPLOYABILITY

Text Book:
Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill

CSE 3.2.4 DATA COMMUNICATIONS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

1. An Introduction to Data Communications:
A Communications Model, Data Communications and Data Communications Networking, Protocols and Protocol Architecture, Characteristics of Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments
2. Transmission Media:
Guided Transmission Media, Wireless Transmission Data Encoding, Digital Data, Digital Signals, Digital Data, Analog Signals, Analog Data, Digital Signals, Analog Data, Analog Signals
3. The Data Communication Interface
Asynchronous and Synchronous Transmission, Line Configurations, Interfacing.
Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link

Control (HDLC),Other Data Link Control Protocols.
4. Data Communications Hardware: Terminals
Introduction, Basic Terminal Components, Enhanced Terminal Components, General-Purpose Terminals, Remote Job Entry Terminals, Transaction Terminals, Clustering of Terminal Devices. Communications Processing Hardware Introduction, Switching Processors, Multidrop Lines, Multiplexers, Concentrators, Front-End Processors.
5. Modems:
Network Attachment and Regulations, Line Conditioning and Leased Lines, Modems and Modem Circuits.
Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

TEXT BOOKS:

1. William Stallings, Data and Computer Communications, 7th Edition, Pearson Education Inc., 2004 2. Mary E.S. Loomis, Data Communications, PHI-N.J.,1983 (Capter 3, Chapter 5)
3. Paul Bates, Practical Digital and Data Communications, PHI-N.J, 1987(Chapter5)

REFERENCE BOOKS:

1.Behrouz A. Forouzan, Data Communications and Networking, 3rd EditionTMH, 2004
2.William A. Shay, Understanding Data Communications & Networks, 2nd Edition Thomson-Brooks/Cole - Vikas publishing House, 1999
3. Michale A. Miller, Data & Network Communications, Thomson/Delmar - Vikas Publishing House, 2000

CSE 3.2.5 ELECTIVE-II PRINCIPLES OF PROGRAMMING LANGUAGES Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-M employability

Language Design Issues: Why Study Programming Languages, A Short History of Programming Languages, Role of Programming Languages, Programming Environments
Impact of Machine Architectures: The Operation of a Computer, Virtual Computers and Binding Times
Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models, Recursive Descent Parsing.
Modeling Language Properties: Formal Properties of Languages, Language Semantics. EMPLOYABILITY
Elementary Data Types: Properties of Types and Objects, Scalar Data Types, Composite Data Types
Encapsulation: Structured Data Types, Abstract Data Types, Encapsulation by Subprograms, Type Definitions.
Inheritance: Abstract Data Types Revisited, Inheritance, Polymorphism
Sequence Control: Implement and Explicit Sequence Control, Sequence with Arithmetic Expressions, Sequence Control Between Statements, Sequencing with Non arithmetic Expressions. EMPLOYABILITY
Subprogram Control: Subprogram Sequence Control, Attributes of Data Control, Parameter Transmission, Explicit Common Environment.
Storage Management: Elements Requiring Storage, Programmer- and System - Controlled Storage, Static Storage Management, Heap Storage Management
Distributed Processing: Variations on Subprogram Control, Parallel Programming, Hardware Developments, Software Architecture.
Network Programming: Desktop Publishing, The World Wide Web EMPLOYABILITY

Text Book: EMPOLABILITY

Programming languages – Design and Implementation by Terrence W. Pratt Marvin V. Zelkowitz. 3 rd Edition, Prentice Hall of India.

References:

1. Concepts of Programming Languages by Robert L. Sebesta, 4th Edition, Pearson Education.
2. Fundamentals of Programming Languages, Design & Implementation by Seyed H.Roosta. Vikas publications.
3. Programming Languages by Paradigm and Practice – Doris Appleby Julius J. Vendekopple Tata McGraw Hill

Edition.

CSE 3.2.5 ELECTIVE-II BIOINFORMATICS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30 Univ. Exam : 3 Hours
Univ-Exam-Marks:70

1. **Introduction:**
   Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy.
2. **Protein Information Resources**
   Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.
3. **Genome Information Resources**
   DNA sequence databases, specialized genomic resources

   Employability
4. **DNA Sequence analysis**
   Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

   Employability
5. **Pair wise alignment techniques**
   Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

   Employability
6. **Multiple sequence alignment**
   Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching
7. **Secondary database searching**

   Employability

   Importance and need of secondary database searches, secondary database structure and building a sequence search protocol
8. **Analysis packages**
   Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

   Employability

Text Books:

1. Introduction to Bioinformatics, T K Attwood & D J Parry-Smith
Addison Wesley Longman

2. Bioinformatics- A Beginner's Guide, Jean-Michel Claveriw, Cerdric Notredame
WILEY dreamlech India Pvt. Ltd

Reference Books:

1. Introduction to Bioinformatics, Arthur M.Lesk, OXFORD publishers (Indian Edition)

CSE 3.2.5 ELCTIVE-II IMAGE PROCESSING Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam :
3 Hours Univ-Exam-Marks:70

1. Fundamentals of Image Processing
Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity , Image Geometry, Photographic film. Histogram: Definition, decision of contrast basing on histogram, operations basing on histograms like image stretching, image sliding, Image classification. Definition and Algorithm of

Histogram equalization.

2. Image Transforms:-

A detail discussion on Fourier Transform, DFT,FFT, properties. A brief discussion on WALSH Transform , WFT, HADAMARD Transform, DCT.

3. Image Enhancement: (by SPATIAL Domain Methods)

a)Arithmetic and logical operations, pixel or point operations, size operations, b. Smoothing filters- Mean, Median, Mode filters – Comparative study, c.. Edge enhancement filters – Directorial filters, Sobel, Laplacian, Robert, KIRSCH, Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement techniques. Comparative study. d. Low Pass filters, High Pass filters, sharpening filters. – Comparative Study. e. Comparative study of all filters. f. Color image processing.

EMPOLABILITY

4. Image enhancement : (By FREQUENCY Domain Methods). Design of Low pass, High pass, EDGE Enhancement, smoothening filters in Frequency Domain. Butter worth filter, Homomorphic filters in Frequency Domain. Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain. 5. Image compression: Definition, A brief discussion on – Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization, Compression at the time of image transmission. Brief discussion on:- Image Compression standards.

EMPOLYABILITY

6. Image Segmentation: Definition, characteristics of segmentation. Detection of Discontinuities, Thresholding Pixel based segmentation method. Region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, spilt and merge technique. Use of motion in segmentation (spatial domain technique only)

7. Morphology:-

Dilation, Erosion, Opening, closing, Hit-and-Miss transform, Boundary extraction,

EMPOLYABILITY

Region filling, connected components, thinning, Thickening, skeletons , Pruning

Extensions to Gray – Scale Images Application of Morphology in I.P

Text Book:

Digital Image Processing , Rafael C. Gonzalez and Richard E. Woods, Addision Wesley

Reference books:

1. Fundamentals of Electronic Image Processing ,Arthur .R. Weeks, Jr. (PHI)
2. Image processing, Analysis, and Machine vision, Milan Sonka , Vaclav Hlavac, Roger Boyle, Vikas Publishing House.

CSE 3.2.5 ELECTIVE-II V H D L Credits:4

1. Overview of Digital Design with Vermilion HDL
2. Hierarchical Modeling Concepts
3. Basic Concepts
4. Modules and ports
5. Gate-Level Modeling
6. Dataflow Modeling
7. Behaviour Modeling
8. Tasks and Functions

Text Book:

1. Verilog HDL – A Guide to Digital Design and Synthesis, Samir Palnitkar, Pearson Education Pte. Ltd. (chapters: 1,2,3,4,5,6,7,8), 2001

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design, Stephen Brown and Zvonko Vranesic, Tata - McgrawHill, 2002
2. A Verilog HDL Primer, J. Bhasker, Second Edition, Star galaxy Pub., 1999

OPERATIONS RESEARCH	
CSE 325	**Credits:3**
Instruction : 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

Prerequisites: Mathematics

Course Objective:

The course is intended to identify and develop operational research models, understand the mathematical tools to solve optimisation problems, and develop a report that describes the model, the solving techniques and analyse the results

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Apply linear programming model and assignment model to domain specific situations
2.	Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results
3.	Apply the concepts of PERT and CPM for decision making and optimally managing projects
4.	Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions
5.	Analyze the inventory and queuing theories and apply them in domain specific situations.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	1	1	1	1	1	1	1	1	1	1	1	2	2
	2	1	3	2	1	1	1	1	1	1	1	1	1	3	2
	3	1	2	1	1	1	1	1	1	1	1	3	1	3	2
	4	1	1	1	1	1	1	1	1	1	1	3	1	3	2
	5	1	1	1	1	1	1	1	1	1	1	3	1	3	2

SYLLABUS **Periods (L+T)**

UNIT I **(8+4)**

LINEAR MODEL

Introduction to Operations Research – Linear Programming - Mathematical Formulation – Graphical method – Simplex method – Two – Phase Simplex method ,Big-M method-Duality Simplex method.

Employability

UNIT II **(8+4)**

TRANSPORTATION AND ASSIGNMENT MODELS:

Transportation model – Initial solution by North West corner method – least cost method – VAM. Optimality test – MODI method and stepping stone method, Assignment model – formulation – balanced and unbalanced assignment problems.

UNIT III **(8+4)**

PROJECT MANAGEMENT BY PERT & CPM:

Basic terminologies – Constructing a project network – Scheduling computations – PERT - CPM – Resource smoothening, Resource leveling, PERT cost

Employability

UNIT IV **(8+4)**

REPLACEMENT AND SEQUENCING MODELS:

Replacement policies - Replacement of items that deteriorate with time (value of money not changing with time) – Replacement of items that deteriorate with time (Value of money changing with time) – Replacement of items that fail suddenly (individual and group replacement policies), Sequencing models- n job on 2 machines – n jobs on 3 machines – n jobs on m machines, Traveling salesman problem.

Employability

UNIT V **(8+4)**

INVENTORY AND QUEUING THEORY

Variables in inventory problems, EOQ, deterministic inventory models, order quantity with price break, techniques in inventory management, Queuing system and its structure – Kendall‟s notation – Common queuing models - M/M/1: FCFS/∞/∞ - M/M/1: FCFS/n/∞ - M/M/C: FCFS/∞/∞ - M/M/1: FCFS/n/m

Employability

Text Books

1. S.D.Shrama, *Operation Research*, Kedar Nath Ram Nath Publishers, 2015.
2. Handy A. Taha, Operations Research An introduction, 10th edition, 2017.

Reference Books

1. Hira D S and Gupta P K, *Operations Research*, S.Chand & Sons, 2007.
2. Panneerselvan. R., *Operation Research*, Prentice Hall of India Pvt Ltd. 2006.

CSE 3.2.6 COMPUTER ARCHITECTURE Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30 Univ_Exam:3 Hours Univ_ Exam Marks:70

Computer Evolution, Computational Models The Concept of Computer Architecture Introduction to Parallel Processing Introduction to Instruction-Level Parallel Processors
Pipelined Processors VLIW
Architectures Superscalar Processors
Processing of Control Transfer Instructions Code
Scheduling of ILP-Processors Introduction to Data-Parallel
Architectures Introduction to MIMD Architectures

Employability

Employability

Employability

Text Books:

1.Dezso Sima, Terence Fountain, Peter Kacsuk, Advanced Computer Architectures: A Design Space Approach, Pearson Education Inc., 1997.

2. J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach*, 3rd Edition, Morgan Kaufmann Publishing Co., 2002.

Reference Text

1. William Stalling, *Computer Organization & Architecture: Designing for Performance*, 6th Edition, PHI, 2003.
2. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, TMH, 2001

CSE 3.2.7 FILE STRUCTURES LAB Credits:2

Lab: 3 Periods/week Sessional Marks: 50 Univ-Exam : 3 Hours Univ-Exam-Marks: 50

1. File Operations:

Opening, reading, writing, closing and creating of files in C^{++}

2. Study of secondary storage devices:

Tracks, sectors, block capacity of disk, tape and CDROMs

3. File Structures in C^{++}

Reading a stream of fields, record structures and its length indicators, Mixing of numbers and characters, Use of a hex dump, Retrieving records by keys using sequential search, direct access

4. File performance

Data compression, storage compacting, reclaiming space dynamically

Employability

5. Indexing and indexed sequential files

Index file, inverted file operations, usage of B and B^{++} trees

6. Hashing files

Hashing functions, algorithms, record distribution and collision resolution by progressive over flow, Extendable hashing and hashing performance

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Employability

CSE 3.2.8 DBMS LAB Credits:2

Lab: 3 Periods/week Sessional Marks: 50 Univ-Exam : 3 Hours
Univ-Exam-Marks: 50

Study features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.(Select two of RDMSs)

Laboratory exercises should include defining schemas for applications, creation of a database, writing SQL queries, to retrieve information from the database, use of host languages, interface with the embedded SQL, use of forms & report writing packages available with the chosen RDBMS product.

Some sample applications, which may be programmed, are given below: Accounting package for a shop,
Database manager for a Magazine agency or a newspaper agency, Ticket booking for performances,
Preparing greeting cards & birthday cards,
Personal accounts - Insurance, loans, mortgage payments, etc., Doctor's diary & billing system,
Personal bank account, Class marks management, Hostel accounting,
Video Tape library, History of cricket scores,
Cable TV transmission program manager, Personal library.

EMPLOYABILITY

CSE 4.1.1 Object Oriented Software Engineering Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1. Software Engineering:
Software related problems, software engineering, concepts, development activities
2. Modeling: Modeling with UML
EMPLOYABILITY
3. Project Communications:
Project communication, modes, mechanisms and EMPLOYABILITY
4. Requirements:
Requirements elicitation, concepts, activities & managing requirements elicitation
5. Analysis:
Analysis overview, concepts, activities and managing analysis EMPLOYABILITY
6. System Design:
Design overview, concepts, activities and managing system design
7. Object Design:
Object design overview, concepts, activities and managing object design
8. Rationale Management:
Rationale overview, concepts, activities and managing rationale
9. Testing;
Testing overview, concepts, activities and managing testing
10. Software Configuration Management:
Configuration Management overview, concepts, activities and managing configuration management 11. Project Management:
Project management overview, concepts, activities and managing project management models and activities.

Text Book:
Object-Oriented Software Engineering: Conquering Complex and Changing Systems
Bernd Bruegge and Allen H. Dutoit

Pearson Education Asia

Reference Book:
Object-Oriented Software Engineering: Practical software development using UML and Java
Timothy C. Lethbridge and Robert Laganiere
McGraw-Hill Higher education

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CSE 4.1.2 COMPUTER NETWORKS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours
Univ-Exam-Marks:70

Employability

Employability

Switched Networks; Circuit-Switching Networks, Circuit Switching Concepts, Soft switch Architecture, Packet Switching Principles, X.25, Frame Relay
Asynchronous Transfer Mode: Protocol Architecture, ATM Logical Connections, ATM Cells, ATM Service Categories, Routing in Switched Networks
Congestion Control in Switched Data Networks: Effects of Congestion, Congestion Control, Traffic management, Congestion Control in Packet Switched networks
Principles of Cellular Networks
Local Area Network Overview: Background, Topologies and transmission media, LAN Protocol Architecture, Bridges, Layer 2 and Layer 3 Switches

Employability

High Speed LANs: The Emergence of High Speed LANs, Ethernet
Wireless LANs: Overview, Wireless LAN Technology, IEEE802.11 Architecture and Services. **Internet Protocols**: Basic protocol Functions, Principles of Internetworking, Connectionless Internetworking, Internet Protocol
Internet Operation: Multicasting, Routing Protocols: Autonomous Systems & Approaches to Routing **Transport protocols**: Connection oriented Transport Protocol Mechanisms: Reliable Sequencing Network Service, TCP: TCP Services, TCP Header Format, TCP Mechanisms, UDP
Distributed Applications: Electronic Mail: SMTP, HTTP Overview, Network Management Systems, SNMPv1

Text Book: Data and Computer Communications, William Stallings 7th Edition, Pearson Education, 2004
Reference Books:

1. Data Communications and Networking, Behrouz A. Forouzan, 3rd Edition, TMH, 2004
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose and Keith W. Ross , 2nd Edition, Pearson Education, 2002
3. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education, 2003
4 An Engineering Approach to Computer Networking, S. Keshav, Pearson Education, 1997 5 Computer Networks and Internets with Internet Applications, Ddouglas e. Comer, 4th Edition, Pearson Education, 2003

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CSE 4.1.3 ARTIFICIAL INTELLIGENCE Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours
Univ-Exam-Marks:70

Introduction to Artificial Intelligence, Artificial Intelligence Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics

Skill Developmen

Heuristic Search Technologies
Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means Endo Analysis

Skill Developme

Predicate Logic
Proof with Backward Chaining, Resolution, question answering.

Employability

Representing Knowledge Using Rules:
Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

Skill Development

Symbolic Reasoning with uncertainty
Non-monotonic Reasoning, Dependency – Directed Backtracking TMS.
Statistical Reasoning with Bayes Theorem, certainty Factors & Rule Based System, DS- Theory.

Weak & Strong Slot Filler Structures
Semantic nets, Frames, Conceptual dependencies, Scripts

Employability

Planning
Block world, Components of a Planning System, Goal State Planning, Non Linear Planning, Hierarchical Planning.

Employability

Natural Language Processing
Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing.

Expert Systems
Representing and Using Domain Knowledge, Expert Systems Shells, Explanation

Entrepreneurship

Text Books:
1. Artificial Intelligence, Rich E & Knight K – Tata Mcgrahill (1991)
2. Introduction to Artificial Intelligence & Expert Systems, Paterson. PHI

CSE 4.1.4 MANAGEMENT PRINCIPLES Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours
Univ-Exam-Marks:**70**

1. Nature and functions of management:
   Importance of management – definition of management – management process – Roles of manager – management _ a science or art – management _ a profession.
2. Planning:
   Nature of planning – Importance of planning – Types of planning – Steps on planning.
3. Decision – Making:
   Meaning of decision – Types of decisions.

ENTREPRENEURSHIP

4. Organization :
   Span of management – principles of organizing – departmentalization.
5. Authority Delegation and Decentralization :
   Source of formal authority – difference between authority and power – line and staff authority – delegation of authority – decentralization of authority.

ENTREPRENEURSHIP

6. Coordination:
   Need for coordination – Types of coordination – Techniques of coordination.
7. Direction:
   Requirements of effective direction – Motivation.

ENTREPRENEURSHIP

8. Importance of communication – Purposes of communication - Formal communication - Informal communication – Barriers to communication – Principles of effective Communication.
9. Leadership:
   Difference between a leader and a manager – Characteristics of leadership – Functions of a leader – Approaches to leadership – Effective leadership – Leadership style in Indian organizations.

ENTREPRENEURSHIP

10. Managerial control :
    Steps in a control process – Need for control – Types of control methods – Essentials of Effective control systems.

ENTREPRENEURSHIP

11. Social Responsibilities of Business :

Meaning of social responsibility – social responsibilities of business towards different groups. **Text Book:**

ENTREPRENEURSHIP

Principles of Management , PC Tripathi, PN Reddy, Second Edition, Tata McGraw-Hill.

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CSE 4.1.5 ELECTIVE-III EMBEDDED SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours
Univ-Exam-Marks:70

Employability

Introduction to embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, EPROM). Tristate devices, Buses, DMA, UART and PLD's. Built-ins on the microprocessor.

Interrupts basics, ISR;Context saving, shared data problem. Atomic and critical section, Interrupt latency. Survey of software architectures, Round Robin , Function queue scheduling architecture, Use of real time operating system.

Employability

RTOS, Tasks , Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore.

Inter task communication, message queue, mailboxes and pipes, timer functions, events. Interrupt routines in an RTOS environment.

Employability

Embedded system software design using an RTOS. Hard realtime and soft real time system principles, Task division, need of interrupt routines, shared data.

Embedded Software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system.

Employability

Debugging techniques. Testing on host machine, Instruction set emulators, logic analysers. In-circuit emulators and monitors.

Employability

Text Books:

1. David A. Simon, An Embedded Software Primer, Pearson Education, Inc., 1999
2. Sriram V Iyer and Pankaj Gupta, Embedded Real Time Systems programming, TMH, 2004

Reference Books:

1. Frank Vahid/ Tony Givargis, Embedded Systems Design – A Unified Hardware/Software Introduction, John Wiley & Sons, Inc., 2002
2. Raj Kamal, Embedded Systems, Architecture, Programming and Design, TMH, 2003

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CSE 4.1.5 ELECTIVE-III NEUTRAL NETWORKS & FUZZY LOGIC Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours
Univ-Exam-Marks:70

1. Neural Networks and Fuzzy Systems
   Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical-Systems Approach to Machine Intelligence, Intelligent Behavior as Adaptive Model- Free Estimation.

2. Neural Dynamics I: Activations and Signals
   Neurons as Functions, Signal Monotonicity, Biological Activations and Signals, Neuron Fields,Neuronal Dynamical Systems, Common Signal Functions, Pulse-Coded Signal Functions.

3. Neuronal Dynamics II: Activation Models
   Neuronal Dynamical Systems, Additive Neuronal Dynamics, Additive Neuronal Feedback, Additive Bivalent Models, BAM Connection Matrices, Additive Dynamic and the Noise-Saturation Dilemma, General Neuronal Activations: Cohen-Grossberg and Multiplicative Models.
4. Synaptic Dynamics I: Unsupervised Learning
   Learning as Encoding, Change, and Quantization, Four Unsupervised Learning Laws, Probability Spaces and Random Processes, Stochastic Unsupervised Learning and Stochastic Equilibrium, Signal Hebbian Learning, Competitive Learning, Differential Hebbian Learning, Differential Competitive Leering.
5. Synaptic Dynamics II: Supervised Learning
   Supervised Function Estimation, Supervised Learning as Operant Conditioning, Supervised Learning as Stochastic Pattern Learning with known Class Memberships, Supervised Learning as stochastic Approximation, The Back propagation Algorithm.
6. Fuzziness Versus Probability
   Fuzzy Sets and Systems, Fuzziness in a Probabilistic World, Randomness vs. Ambiguity: Whether vs. How much, The Universe as a Fuzzy Set, The Geometry of Fuzzy Set, The Geometry of Fuzzy Sets: Sets as Points. The Fuzzy Entropy Theorem, The Subsethood theorem. The Entropy-Subsethood Theorem.
7. Fuzzy Associative Memories
   Fuzzy Systems as Between-Cube Mappings, Fuzzy and Neural Function Estimators, Fuzzy Hebb FAMs, Adaptive FAMs: Product-Space Clustering in FAM Cells.

TEXT BOOK:
Neural Networks & Fuzzy Systems , Bark Kosko, PHI Published in 1994

REFERNCE BOOKS:
1. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum. PHI
2. Neural network Design, Hagan, Demuth and Beale, Vikas Publishing House
3. Fuzzy Set Theory & its Application, .J. Zimmerman Allied Published Ltd.

CSE 4.1.5 ELECTIVE-III RANDOM PROCESSES IN ENGINEERING Credits:4

Instruction: 3 Periods & 1 Tut./week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1.STOCHASTIC PROCESSES:- Notion of Stochastic Process, Classification of Stochastic Process according to Time and State Space; Discrete time Morkovchains, n th step transition probabilities, stationery distribution of Morkovchains, Poisson process, Properties of Poisson; Birth and Death Process, Time dependent Birth and Death process, Renewal theory, Applications of elementary renewal theorem and key renewal theorem.

Employability

2. Stationary and Non Stationary processes:- AR Process; NA Process ; ARMA Process, ARIMA Process, Box and Jinkins Models, Correlogram analysis, Periodogram analysis, Spectrum of a Process.

3.QUEUEING THEORY:- Non Morkovchian queues, Phase type Technique, Embedded Markovchains Technique, GI/G/I Queues model, Polzak. Kintchins formula, queues with bulk arrivals queues with bulk services.

4. PRIORITY QUEUING MODELS:- Queues in Series, Queues in Parallel, Scheduling algorithms, Throughput analysis and waiting time distributions, Applications of Queuing theory in Communication Networks.

Employability

5.RELIABILITY ANALYSIS:- Concepts of Reliability, Failure Time distributions, Hazard rate functions, Reliability of a component, Bath- tub curve, System reliability, Series systems, parallel systems, Stand by redundancy, Availability , Maintainability, Fault tree constructions, Fault analysis.

REFERRENCES:

1. Probability, Statistics and Random Processes – By T.Veerarajan Tata McGraw – Hill

2. Probability and Statistics with Reliability , Queueing & Computer Science Applications – By Kishore S. Trivedi (Prentice Hall)

CSE 4.1.6 WEB TECHNOLOGIES Credits:4 Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

Java Script: - Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script

EMPLOYABILITY

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

EMPLOYABILITY

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's

Web Servers and Servlets: Tomcat web server, **Introduction** to Servelets: Lifecycle of a Serverlet, The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues,

EMPLOYABILITY

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

EMPLOYABILITY

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from Servlets & JSP Page , Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

EMPLOYABILITY

TEXT BOOKS:

EMPLOYABILITY

1. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.

2. Advanced Java™ 2 Platform How to Program, Deitel/Deitel/Santry

3. Java Server Pages –Hans Bergsten, SPD O'Reilly

REFERENCE:

1. HTML Black Book: The Programmer's Complete HTML Reference Book-by Steven Holzner

2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 2: CORE TECHNOLOGIES by Marty Hall and Larry Brown Pearson

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CSE 4.1.7 Graphics & Multimedia Laboratory Credits:2

Lab: 3 Periods/week Sessional Marks: 50 Univ. Exam : 3 Hours
Univ-Exam-Marks:50

Graphics: using any graphic package.

1. Drawing various types of lines and curves.
2. Creating various types text and fonts.
3. Creating two dimensional objects using the lines and curves
4. Animating the two dimensional pictures using transformations.
5. Coloring the pictures and Zooming.
6. Creating an object and applying animation of key framing.
7. Creating three dimensional objects using wire frame modeling.
8. Rotation, scaling and translating the 3 D objects.
9. Coloring the 3 D objects.
10. Shading the 3 D objects
11. Rendering the objects
12. Creating smooth surfaces.
13. Creating rugged surfaces based on fractal geometry.

Multimedia:

1 Preproduction & Presentation Graphics: Create a 7-10 slide presentation in your favorite presentation graphics application. (Power point is suggested; Corel Presentations 9 is free and is acceptable.)
2. Typefaces and Graphics: Create 1 vector and 1 bitmap graphic; they must be *your original work* created in any of the acceptable tools.
3. Desktop Publishing: Create a 2-page desktop-published "newsletter," possibly using your "What is Multimedia?" text. Include graphics.
4. Production Planning and Design: Create a proposal of project. Include summary, flowchart, element and resource lists.
5. User Interface Design & Graphics II: Create a user interface for your final project. Include 2 backgrounds and 1 button set. Aim for a cohesive look.
6. Multimedia Sound: Create 2 soundtracks and 2 EFX sounds for a previous project.
7. Digital Video: Use video capture to digitize your video shoot ro another video source to create short production (15-45 seconds)
8. Create three basic Web pages using Dreamweaver / flash or other authoring package or write bare HTML if you are able; pages must be linked and must include at least one graphic per page.

Books:

1) Prabhat K. Andleigh & Kiran Thakrar, " Mulitmedia Systems Design", Prentice Hall of India, New Delhi.
2) Calleen Coorough, "Multimedia and the Web Creating digital Excitement", Vikas Publishing House, New Delhi.
3) James E. Shuman, " Multimedia in Action", Vikas Publishing House, New Delhi.

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CSE 4.1.8 OBJECT ORIENTED SOFTWARE credits:2 ENGINEERING LAB

Lab: 3 Periods/week Sessional Marks: 50 Univ.-Exam : 3 Hours
Univ-Exam-Marks:50

Computing Platform:

Each student group chooses its own platform, subject to approval by the instructor

Course Objectives:

1. They can design and implement complex software solutions using state of the art software engineering techniques.
2. The have working knowledge of UML, source control, and project management.
3. They have deep knowledge of the technologies they used for implementing their project.
4. They know how to test and document software.
5. They are capable of working as part of a software team and develop significant projects under a tight deadline.
6. They are able to present their work in a professional manner.

Topics to beCovered:

1. Software Engineering Process.
2. Unified Modeling Language (UML).
3. Data Structures and Specification.
4. Object-oriented design.
5. Debugging.

Syllabus Flexibility:

High. The students are free to chose a project based on the instructor's approval.

Assessment Methods:

1. Group meetings with faculty: initial proposal, code review, tracer-bullet implementation demo, final demo.
2. Design documents. Write-up.
3. Code documentation.
4. Presentations.

the students give their final presentations and demos.

Also, each project team meets individually with the instructor at least four times during the semester.
The agenda for each of the four meeting is as follows:

1. Team presents project idea and has it approved by instructor. (first month)
2. design/code review. Instructor goes over design/code with the team to point out problems and formalize requirements. Instructor determines requirements for tracer-bullet implementation. (second month) 3. Tracer-bullet implementation demo. Team shows that it has achieved full vertical integration functionality. Instructor notices missed requirements and reminds students of requirements for final project.(beginning of third month).

Final meeting. Verify requirements, design, documentation, testing, write-up, division of labor, etc. (last month).

Sessional Marks Allotment: Monthly Meeting
Participation: 10% Monthly Progress Reports: 15%
Design/code Document: 15% Presentation: 10%
Prototype Demonstration: 10% Final Project
Demonstration: 30% Final Project Report: 10%

General Software Engineering Tips:

Be careful when making major modifications and keep backups! A good motto: There is no such thing as a safe software change.

One of the biggest mistakes that even professional software teams make is modifying code at the last minute. Either resist the urge to make last minute changes, or keep them isolated and well-marked so that they can be backed out easily if necessary.
Test, test, test!!! You must test your system thoroughly after making any change, no matter how small. Else you will not know if a bug was introduced! You will get no sympathy if you break your system at the last minute.

Regression Testing:
A good habit to get into: frequently run your program on an extensive test set.

Once you have a prototype, create a set of examples that your program handles correctly. Generate files of the input and the correct output as a *test set*.

When you make significant changes, run your program on the test set. If the output is different, then you will know that you've introduced a bug. (Or if the output is improved, you should update the test set.)

Put together an extensive regression set! If it alerts you to one major bug (and it always does), then it is time well spent.

After verifying that a new change is "safe", save a version of your entire system! Never, EVER make changes to the saved version – it is a reliable version that you can recover in an emergency.

Documentation:
Get into the habit of documenting your code quickly as you go. If you think you'll remember why you did something, you are probably wrong.

Computer scientists typically hate to do documentation. One reason is that they leave it all for the end!

Get into the habit of writing small comments as you go. A few comments, explaining what's happening and why, can make a world of difference.

When you make a change, mark it with your initials, the date, a brief explanation, and an example. This will help enormously if the change needs to be removed or modified, and will prevent thrashing.

Working as a Team:
Be honest and realistic with your teammates when setting goals. If you fail to meet a promised deadline, it affects the whole team, not just you.

Communication is crucial! Don't make major decisions by yourself, and let people know when you are behind or ahead of schedule.

Try to exploit each other's strengths.

CSE 4.1.9 INDUSTRIAL TRAINING & SEMINAR credits:2 Univ-Exam :

Employability

Internal Internal-Marks:100

The industrial training will be for three weeks during the summer after third year second semester and assessment will be done in the 4th year first semester with a seminar on the training he/she got

ELECTIVE-IV:
[1]DATA WARE HOUSING & DATA MINING ,[2] SERVICE ORIENTED ARCHITECTURE

CSE 4.2.1 DISTRIBUTED OPERATING SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

Employability

Introduction to Distributed Systems, What is a Distributed System?, Hard ware concepts, Software concepts, Design issues.

Communication in Distributed Systems, Lay red Protocols, ATM networks, The Client – sever model, Remote Procedure call, Group communication.

Employability

Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

Process and processors in Distributed System threads, System Models, Processors allocation, Scheduling in Distributed System, Fault tolerance, Real time Distributed System.

Employability

Distributed File Systems, Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

Distributed Shared Memory, Introduction, What is Shared memory?, Consistency models, Page based Distributed Shared memory, Shared – variable Distributed Shared memory, Object based Distributed Shared Memory.

TEXT BOOK**:**

Distributed Operating Systems, Andrew S. Tanenbanm

Reference Book**:**

Advanced Concepts in Operating Systems, Makes Singhal and Niranjan G.Shivaratna.

CSE 4.2.2 CRYPTOGRAPHY AND NETWORK SECURITY Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

INTRODUCTION: The need for security-security approaches-principles of security-Plain Text and Cipher Text substitution and Transposition Techniques-Encryption and Decryption-Symmetric and Asymmetric Cryptography Stenography-key range and key size-types of attacks
SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: Algorithm types and modes-overview of symmetric key cryptography-DES-IDEA-RC5-BLOWFISH-AES-Differential and Linear Cryptanalysis.

Employability skill

ASYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: Overview of asymmetric key cryptography- RSA algorithm-symmetric and asymmetric key cryptography together-digital signatures-knapsack algorithm-some other algorithms.
PUBLIC KEY INFRASTRUCTURE: Introduction-Digital certificates- Private Key management-The PKIX model-Public Key Cryptography Standards- XML, PKI and Security

Employability skill

INTERNET SECURITY PROTOCOLS: Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET- 3D secure protocol-Electronic money-Email security-WAP security-security in GSM

USER AUTHENTICATION MECHANISMS: Introduction-Authentication basics-passwords- authentication tokens-certificate based authentication-biometrics authentication-kerberos-SSO approaches

Employability skill

PRACTICAL IMPLEMENTATIONS OF CRYPTOGRAPHY/SECURITY: Cryptographic solutions using Java-Cryptographic solutions using Microsoft-cryptographic toolkits-security and operating systems NETWORK SECURITY: Brief Introduction to TCP/IP- firewalls-IP security-Virtual Private Networks- case studies on cryptography and security.

Employability skill

TEXT BOOK:
Cryptography and Network security, Atul Kahate, Tata McGraw-Hill Pub company Ltd., New Delhi

REFERENCE BOOKS:
1) Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi
2) Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi
3) Network Security: The Complete Reference by Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg Tata Mcgraw-Hill

CSE 4.2.3 ELECTIVE-IV DATA WARE HOUSING AND DATA MINING Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30 Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1. Introduction to Data Mining:
   Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.
2. Data Warehouse and OLAP Technology for Data Mining
   What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data

Employa

Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining

3 Data Preprocessing

Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation

4 Data Mining Primitives, Languages and system Architectures,Data Mining Primitives: What defines a Data Mining Task?, A Data Mining query language, Designing Graphical Use Interfaces Based on a Data Mining Query language,Architectures of Data Mining Systems

5 Concept Description: Characterization and comparison ,What is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases

6 Mining Association rule in large Databases, Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Employability

7 Classification and prediction, Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case- Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy

8 Cluster Analysis

What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods

Empolyability

Text Book:

Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications

Reference Books:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari, University Press

CSE 4.2.4 DATA COMMUNICATIONS & NETWORK PROGRAMMING LAB Credits:2

Lab: 3 Periods /week Sessional Marks: 50 Univ.-Exam : 3 Hours Univ-Exam-Marks:50

FIRST CYCLE OF EXPERIMENTS

1.1 PC-to-PC COMMUNICATIONS UNDER **DOS** WITH **NULL MODEM**
a) Using Serial Ports and RS-232 C Cable Connection b) Using Paralell Ports and Parallel Cable Connection

1.2 PC-to-PC COMMUNICATIONS UNDER **DOS** WITH **MODEM** and **4-LINE EXCHANGE** Using Communication Software: COMIT or XTALK

1.3 PC-to-PC COMMUNICATIONS UNDER **WIN 98's** DIRECT CABLE CONNECTION with NULL MODEM a) Using Serial Ports and RS-232 C Cable Connection b) Using Paralell Ports and Parallel Cable Connection

1.4 PC-to-PC COMMUNICATIONS UNDER **WIN 98's DIAL-UP** NETWORKING WITH **MODEM** and **4-LINE EXCHANGE**

1.5 PC-to-PC COMMUNICATIONS UNDER **WIN 98's HYPER TERMINAL** WITH **MODEM** and **4-LINE EXCHANGE**

1.6 a) LAN WITH BUS TOPOLOGY with a minimum of two systems
i) Windows Peer-to-Peer Network ii) Windows NT Client-Server Network
b) LAN WITH STAR TOPOLOGY with a minimum of two systems

1.7 a) LAN WITH BUS TOPOLOGY with a minimum of two systems using NOVELL Netware b) LAN WITH STAR TOPOLOGY with a minimum of two systems using NOVELL Netware

<u>SECOND CYCLE OF EXPERIMENTS</u>

2.1 INERNET CONNECTION SET-UP USING **DIAL-UP** NETWORKING

2.2 TERMINAL NETWORK WITH **UNIX/LINUX SERVER** and one or two Terminals

2.3 **TERMINAL NETWORK** WITH **UNIX/LINUX SERVER, Terminal Server,** and one or two terminals

2.4 NETWORK PROGRAMMING EXERCISE-I USING A SIMPLIFIED API
Echo software(Develop echo client and echo server programs and run the two programs on separate computers and verify that they can communicate Chat software (Develop chat client and chat server programs and test to ensure Employability cate). Build a simple file transfer service that consists of client and server

2.5 NETWORK PROGRAMMING EXERCISE -II USING THE SOCKET API

Write an echo client and server using sockets Bui Employability ng sockets

2.6 CONCURRENT NETWORK PROGRAMMING EXERCISE –III
Build a Concurrent server(threads) – Create a server capable of handling connections from multiple clients concurrently Build a Concurrent file transfer server(processes) – Create separate processes to allow a server to handle multiple clients concurrently

Employability

2.7 NETWORK PROGRAMMING EXERCISE –IV USING PROTOCOL DESIGN
Design a reliable data transfer protocol (Devise, implement and test a protocol that provides reliable data transfer across a network that drops, delays or corrupts packets
Design stop and wait flow control protocol Design a sliding window protocol

Employability

2.7.1 NETWORK PROGRAMMING EXERCISE –V WITH PROTOCOLS FROM TCP/IP SUITE Build a domain name system client program
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Employability

CSE 4.2.5 PROJECT WORK Credits:8

Project: 6 Periods /week Sessional Ma Employability skill Mark s:50

GUIDELINES for preparing the report of the Project Work

FORMAT FOR PREPARATION OF PROJECT REPORT

FOR

B. TECH.(CSE)

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page
2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures

OBJECT ORIENTED PROGRAMMING WITH C++ LAB

(Common for all branches, except for Civil & Chemical branches)

IT-128 **Credits :3** Instruction : 2 Periods/Week & 3 Practicals/week

Sessional Marks :50 End Exam:3 Hrs, End Exam Marks : 50

Course Objectives :

- To introduce Object Oriented Programming (OOP) using the C++ Language.
- To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction — Employability
5. Objects — Employability
6. Operator Overloading — Employability
7. Inheritance — Employability
8. Virtual Functions & Polymorphism — Employability
9. I/O Streams — Employability
10. Templates
11. File Processing — Employability
12. Exception Handling Concepts — Employability

REFERENCE BOOKS:

1. Mahesh Bhave , Sunil patekar*Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2nd Edition New Age International Publishers

3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999

4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition, McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
2. Write a C++ program to find both the largest and smallest number in a list of integers.
3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments
4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation
5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: **void setlength(float)** to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **intsameArea(Rectangle)** that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

1. Write the definitions for each of the above member functions.
2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.
3. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initiliaize string array to contain the following

   i. Veena, guitear, sitar, sarod and mandolin under string

   ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind

   iii. Table, mridangam, bangos, drums and tambour under perc

   It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

- String instruments
- Wind instruments
- Percussion instruments

The show method should display the relevant details according to user choice .the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to “blue” and “wagon”. there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message “Beautiful music fills the passenger compartment” execute the methods to show the messages

1. Mycar is a blue wagon
2. My father’s car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters — a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively.

10. Write a C++ program to perform operations on complex numbers using operator overloading

11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet ‘A’ present in a text file “STORY.TXT”.
Example:
If the file “STORY.TXT” contains the following lines,
The rose is red.
A girl is playing there.
There is a playground.
An aeroplane is in the sky.
Numbers are not allowed in the password.
The function should display the output as 3

DATA STRUCTURES

IT211 **Credits:4**

Instruction: 4 Periods & 1Tut/week Sessional Marks:40

End- Exam:3Hours End-Exam-Marks: 60

Prerequisite: C Programming

Course Objective:

- Assess how the choice of data structures impacts the performance ofprograms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Compare and contrast the benefits of dynamic and static data structures: linked lists and arrays.
2.	Evaluation of infix, prefix and postfix expressions and conversion between infix, prefix and postfix using stacks. Implement linear data structure Queue using arrays and linked lists.
3.	Implement sorting and searching techniques and analyze their computational complexity worst, average and best in terms of the size of the list(n)
4.	Solve and analyze time complexities of shortest path problem usingnonlinear data structures trees and graphs with Prims and Krushkals algorithms and Dijkstra's & Warshall's algorithms.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	1	2	3					1	1	1		1	3	2
	2	1	1	2					1	1	1		1	3	2
	3	2	2	3					1	1	1		1	3	2
	4	2	3	2					1	1	1		1	3	2

SYLLABUS

Unit-I:Introduction **12 Periods**

Introduction to data structures, arrays and structures. Dynamic Memory Management, Abstract Data Type (ADT). Introduction to Time and Space complexity and their tradeoffs.

List: Definition and examples- Primitive Operations- Representation using array and Linked List. Types of Linked Lists and implementation: single, double and circular. The array and linked list advantages, disadvantages and applications.

EMPLOYABILITY

Unit-II: StacksandQueues **12 Periods**

The Stack ADT: Definition, Primitive Operations and representation. Stack ADT implementation using array and linked list. Applications of Stacks: Prefix, infix and Postfix notations, conversion between infix, prefix and postfix, postfix evaluation using stacks. Recursion: definition and examples (ex: Towers of Hanoi Problem, other examples).

EMPLOYABILITY

Queue ADT: Definition, Primitive operations and Representation. Queue ADT implementation using array and linked list. Types of Queue: Circular Queue, Priority Queue, De-queue Operations and implementation using array and linked list. The queues advantages, disadvantages, and applications.

EMPLOYABILITY

Unit - III: SortingandSearching **12Periods**

Sorting: General background, selection sort, bubble sort, insertion sort, shell sort, radix sort, quick sort and merge Sort.

EMPLOYABILITY

Searching: General background, linear search, binary search and Interpolation search. Introduction to Hashing, Hash Function, Hashing techniques, Collision Resolution Methods: Open Addressing, Chaining.

EMPLOYABILITY

Unit-IV:Trees **12 Periods**

Trees: Introduction, Terminology, Binary trees: Terminology, Representation. Binary tree implementation using array and linked list. Tree Traversal Techniques, applications and threaded binary trees.

EMPLOYABILITY

Types: Heap, Binary Search Tree, AVL Tree, B-Tree of order m, introduction to Red-Black tree.

EMPLOYABILITY

Unit-V:Graphs **16periods**

Graphs: Introduction- terminology, Representation of graphs-linked list and adjacency matrix, Representation in C, Implementation of graphs using arrays and linked list, Graph traversals-Breadth-First Search, Depth-First Search. Spanning Trees: Introduction and terminology, Minimum Spanning Tree algorithms: Prims and Krushkals. Applications of Graphs: Dijkstra's & Warshall's Algorithm.

EMPLOYABILITY

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structure, computer sciencePress.

REFERENCE BOOKS:

1. Y.Langsam,M.AugenstinandA.Tannenbaum,"DataStructuresusingC"PearsonEducation , 2nd Edition, 1995.
2. Richard F, Gilberg ,Forouzan, Cengage ,"Data Structures", 2/e,2005.

DIGITAL LOGIC DESIGN
(COMMON FOR CSE & IT)

IT212 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End- Exam :3Hours End-Exam-Marks:60

Prerequisite:

Computer fundamentals.

Course Objective:

- To provide knowledge and understanding of Boolean algebra and digitalconcepts.
- To provide the knowledge of analyzing and designing of combinational and sequential logicnetworks.
- HDL in this course provides the ability to synthesize the designs in Verilog HDL or VHDL.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Analyze and synthesize logic circuits by applying the knowledge of number systems, codes, Boolean algebra and digital logic circuits to solve typical problems on the same.
2.	Minimize the given Switching function in SOP and POS forms using K-Map & Design of different types of combinational logic circuits using various logic gates.
3.	Design and analyze synchronous sequential logic circuits including registers & counters using gates & flip-flops
4.	Design combinational logic circuits using different types of PLDs, namely, PROM, PLA and PAL.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2								3		3		2	2
	2	3								3		3		3	3
	3	3								3		3		2	2
	4	3								3		3.		3	3

SYLLABUS

UNIT-I: Binary Systems, Boolean Algebra andLogicGates **10 Periods**

Digital Systems, Binary Numbers, Number Systems, Base Conversion Methods, Complements, Signed Binary Numbers, Binary Codes, BinaryLogic.

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra. Boolean Functions, Canonical and Standard Forms, Different Logic Operations, Digital Logic Gates.

UNIT-II:Gate-LevelMinimization **4Periods**

The Map Method, Minimal Functions and their properties, Don't-Care Conditions, Tabulation Method, NAND and NOR Implementation, Other Two- Level Implementations, Verilog Hardware Description Language (Verilog HDL).

CombinationalLogicDesign: **6Periods**

Combinational Circuits, Analysis Procedure, Design Procedure, Design of adders, subtractors, adder-subtractor circuit, BCD adder circuit, applications of adders, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Verilog HDL For CombinationalCircuits.

UNIT-III: SequentialLogicCircuits **5 Periods**

Skill Development

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits,Flip-Flop Conversions, Verilog HDL for SequentialCircuits.

Skill Development

RegistersandCounters **6Periods**

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Johnson and Ring counters, Verilog HDL for Registers and Counters.

UNIT-IV: SynchronousSequentialLogic **4Periods**

Skill Development

Basic Design Steps, Serial Adder Example, State Reduction & Assignment Problem

Fundamentals of AsynchronousSequentialLogic **5 Periods**

Introduction, Analysis Procedure, Design Procedure, circuits with latches, Races andHazards.

Skill Development

UNIT-V: ProgrammableLogicDevices **8 Periods**

Programmable Logic Devices : PROM, PLA, PAL, realization of switching functions using PROM, PLA and PAL; comparison of PROM, PLA and PAL, Programming tables of PROM, PLA and PAL, Sequential ProgrammableDevices.

Text Books :

1. M. Morris Mano, Digital Design, Pearson Education, Inc., 2008, 4thEdition.

Reference Books:

2. ZviKohavi, Switching and Finite Automata Theory, Tata McGraw-Hill, 1978, 2ndEdition.
3. Frederick,IntroductiontoSwitchingTheoryandLogicalDesign,2011&J.HillandGerald R. Peterson, John Wiley and Sons, 2011, 3rd Edition.
4. William I. Fletcher, An Engineering Approach to Digital Design, PHI,2008.

DISCRETE MATHEMATICAL STRUCTURES
(COMMON FOR CSE & IT)

IT213 **Credits:4**

Instruction: 4 Periods & 1Tut/week Sessional Marks:40

End- Exam:3Hours End-Exam-Marks:60

Prerequisite:

Engineering Mathematics-1, Engineering Mathematics-2.

Course Objective:

- The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in differentdisciplines.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	To understand set theory, relations, mathematical logic, mathematical reasoning and to study about the validity of the arguments.
2.	Be able to apply basic counting techniques to solve combinatorial problems.
3.	To understand Recurrence Relation, Generating functions and solving problems involving recurrence equations.
4.	To familiarize the different types of binary relations and related algorithms on transitive closure.
5.	To familiarize with the applications of graphs, trees and algorithms on minimal spanning tress.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2								2		2	3	3	3
	2	3	2											3	3
	3	2												2	2
	4	2												2	2
	5	2		2										2	2

SYLLABUS

UNIT-I:MATHEMATICALLOGIC **15Periods**

Sets-Operations on sets-relations-functions-Fundamentals of Logic- Logical inferences-Methods of proof of an implication-First Order logic and other methods Proof -Rules of inference for quantified Propositions –Mathematical Induction.

skill develo

UNIT II:ELEMENTARYCOMBINATORICS **8Periods**

Basics of Counting- Combinations and Permutations-Their Enumeration with and without repetition-Binomial coefficients-Binomial and Multinomial Theorems-The Principle of Inclusion-Exclusion.

UNIT III:RECURRENCERELATIONS **8Periods**

Generating Functions of Sequences-Calculating their Coefficients-Recurrence relations-Solving recurrence relations-Method of characteristic Roots- Non-homogeneous Recurrence relations and their solutions.

UNIT IV: RELATIONSANDDIGRAPHS **9Periods**

Relations and directed Graphs - Special Properties of Binary relations- Equivalence Relations-Ordering Relations-Lattices and Enumeration- Operations on relations-Paths and Closures-Directed Graphs and Adjacency matrices .

Skill Deve

UNITV:GRAPHS **20Periods**

Introduction to Graphs – types of Graphs – Graphs basic terminology and special types of simple graphs – representation of graphs and graph isomorphism – Euler paths and circuits- Hamilton paths and circuits – Planar graphs – Euler's formula.

Skill Develop

Introduction to Trees and their properties – Spanning Trees – Depth First Search , Breadth First Search – Minimum Spanning Trees – Kruskal's Algorithm and Prim's Algorithm.

Text Books:

1) Joe L. Mott, Abraham Kandel & T. P. Baker, "Discrete Mathematics for computer scientists & Mathematicians" Prentice Hall of India Ltd, New Delhi.

Reference Books:

1) Keneth. H. Rosen, "Discrete mathematics and its applications", Tata McGraw-Hill Publishing Company, NewDelhi.
2) Richard Johnsonbaug ,"Discrete mathematics" , Pearson Education, NewDelhi.

COMPUTER ORGANIZATION

IT214 **Credits:4**

Instruction: 4 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks:60

Prerequisite:

Computer fundamentals.

Course Objectives:

- Clearly differentiate between Computer Organization and ComputerArchitecture.
- Identify and describe the functions of all the basic components making up a computer system.
- Present, as clearly and completely as possible, the characteristics of modern-day computer systems, highlighting on the CPU Organization & Operation, Number systems, Operating Systems Memory Systems, Logic Circuits Design and I/O andInterfacing.
- Engage into contrast discussions based on the two CPU design philosophies i.e the Complex Instruction Set.
- Computers (CISC) and Reduced Instruction Set Computers (RISC)systems

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Solve problems using micro operations and perform computer arithmetic operations on integer and real numbers.
2.	Discriminate hardwired and micro programmed way of designing the control unit of a digital computer
3.	Describe the organization of digital computers and identify addressing modes, Instruction formats and types of instructions. or Write an ALP for a given task with the knowledge of computer organization, addressing modes and instruction set.
4.	Evaluate the performance of CPU, Memory and I/O operations.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	2	1	2				1	2		2	2	2	1
	2	2	2	2	3					2	1	2	2	2	1
	3	3	2	2	2	3			1		1	2	3	2	1
	4	2	2	2	3					3		3	3	2	1

SYLLABUS

UNIT-I: **14Periods**

Register transfer and micro operations:

Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Micro operations, Arithmetic Logic Shift Unit

skill development

skill development

Computer Arithmetic:

Introduction, Addition and Subtraction, Booth Multiplication Algorithm, Decimal Arithmetic Unit.

UNIT-II: **12Periods**

skill development

Basic Computer Organization:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description.

UNIT-III: **12Periods**

Control Design:

Hardwired & Micro Programmed (Control Unit), Control Memory, Address Sequencing, Conditional and Unconditional Branching, Micro program Example.

UNIT-IV: **12Periods**

Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes with numerical examples, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of interrupts, CISC Characteristics, RISC Characteristics..

skill development

UNIT-V: **14Periods**

Input-Output Organization:

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

skill development

Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, VirtualMemory.

skill development

TEXTBOOKS:

1. M.MorrisMano ,Computer System Architecture, Third Edition, Pearson Education Inc., 2003

REFERENCE BOOKS:

1. John D. Carpinelli, Computer Systems Organization and Architecture,Pearson Education Inc.,2003.
2. William Stallings, Computer Organization and Architecture,5th Edition,2000.

DATA COMMUNICATIONS

IT215 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks:60

Prerequisite:

Computer fundamentals.

Course Objectives:

- Introduce students to the evolution of computer networks and the concepts data communication
- Introduce students the general principles of network design and compare the different networktopologies
- Introduce students to the digital and analogue representations andchannels
- Describe the mechanism and techniques ofencoding
- Introduce students to the general principles of circuit and packetswitching
- Introduce students to the wireless Local AreaNetworks
- Provide students with in-depth knowledge of data link layer fundamental such as error detection, correction and flow control techniques; multiple access controltechniques

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Understand the basic concepts of Data Communications and different models
2.	Understand and analyses the characteristics of signals propagated through different transmission Media
3.	Apply signal encoding techniques, error detection, correction techniques and learn interfacing
4.	Distinguish various Multiplexing techniques and learn various modems like ADSL, xDSL.
5.	Illustrate various Data link control protocols namely flow control, error control and HDLC

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2		3	1						3		3	3
	2	3	3							2				3	3
	3	2	3			1								3	3
	4	3		2			1						1	3	3
	5	2	2	3								1		3	3

SYLLABUS

UNIT:I **12periods**

Data Communication overview: A communication model, Data communications, Data Communication networking- Introduction to WAN, LAN, wireless Networks, MAN, an example configuration **Data Transmission**: Concepts and Terminology-Transmission terminology, Frequency, spectrum and Bandwidth Analog and Digital Data Transmission-

Employability

Introduction to Analog and Digital Data, Analog and Digital Signals, Analog and Digital Transmission, Transmission Impairments-Attenuation, Delay Distortion, Noise, channel Capacity-Nyquist Bandwidth, Shannon Capacity Formula, The expression Eb/N0 **Transmission media**: guided transmission media-Twisted pair, coaxial cable, Optical fiber, Wireless transmission – Antennas, terrestrial microwave, satellite microwave, Broadcast Radio, Infrared Wireless Propagation- Ground wave propagation, sky wave propagation, Line- of-sight Propagation, Line-of-sight Transmission- free space loss, Atmospheric Absorption, Multipath, Refraction

Employa

UNIT:II **10periods**

Signal Encoding Techniques: Digital Data Digital signals (Nonreturn to Zero(NRZ), multilevel Binary, Biphase, Modulation rate), Digital Data Analog Signals (Amplitude shift keying, frequency shift keying, Phase Shift keying, Quadrature Amplitude Modulation), Analog Data Digital Signals (Pulse code Modulation, Delta Modulation), Analog Data Analog Signals (Amplitude Modulation, AngleModulation)

UNIT:III **6periods**

Digital Data communication Techniques: Asynchronous and synchronous Transmission- Asynchronous Transmission, synchronous transmission, Types of Errors, Error Detection- parity check, CRC, Error correction-Block Code Principles, Line configuration-Topology, Full Duplex and Half Duplex, Interfacing – V.24/EIA-232-F, ISDN PhysicalInterface

UNIT:IV **10periods**

Multiplexing: Frequency Division Multiplexing -Characteristics, Analog carrier systems, wave length-Division Multiplexing, Synchronous Time Division Multiplexing- Characteristics, TDM link control, Digital carrier systems, SONET/SDH , Statistical Time Division Multiplexing- characteristics, performance, cable modem, Asymmetric digital subscriber line- ADSL Design, Discrete Multitone, xDSL-HDSL,SDSL,VDSL,modems

UNIT:V **10 periods**

Data Link Control: Flow Control-stop and wait flow control, sliding window flow control, Error Control- stop-and-wait ARQ, selective- Reject ARQ , High Level Data Link Control (HDLC) – Basic Characteristics, Frame Structure, operation **,** Architecture of computer network, layered approach,X.25, Frame relay,ATM.

Basic hardware: RJ-45, Network interface card, rack, cable standard-Category 5,6, and 7, cross connection, straight connection cable coding standards.

Employability

Text Books:

1. William Stallings ,"Data& Computer Communication", Pearson Education, 7th edition

Reference Books:

1. Forouzan, "Data communication and networking", TATA McGraw, 4th edition
2. Gupta Prakash C.,"Data communication", PHILearning
3. Tomasi, "Introduction to Data Communication & Networking", PearsonEducation.
4. A.S Tanenbum, "Computer Network", PearsonEducation

DATA STRUCTURES LAB

IT216 **Credits:2**

Practical: 3Periods/week Sessional Marks:50

End Exam:3Hours End Exam Marks:50

Prerequisite:

C Programming, Data Structures.

Course Objective:

- Assess how the choice of data structures impacts the performance ofprograms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Implement linear data structures such as stacks, queues, linked lists and apply on real time problem like conversions & evaluations of expressions.
2.	Implement non linear data structures such as Trees and Graphs and apply on real time problem like finding shortest path.
3.	Implement different sorting and searching techniques.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	3	3	3	2	2		3	2	3	3	3	3
	2	3	3	3	3	3	2	2		3	2	3	3	3	3
	3	3	3	3	3	3	2	2		3	2	3	3	3	3

List of Programs:

1) Programs to implement the following using anarray.

a) Stack b)Queue

2) Programs to implement the following using a singly linkedlist.

a) Stack b)Queue

3) Program to do thefollowing

a) Infix topostfixconversion. b) Evaluation of postfixexpression.

4) Programs to implement the following datastructures.
a) CircularQueue b) PriorityQueue

EMPLOYABILITY

5) Implement primitive operations of de-queue (double ended queue) using a doubly linkedlist and anarray.

EMPLOYABILITY

6) Program to perform the followingoperations:
   a) Insert an element into a binary searchtree.
   b) Delete an element from a binary searchtree.
   c) Search for a key element in a binary searchtree.

EMPLOYABILITY

7) Program that use non-recursive functions to traverse the given binary treein
a) Preorder b)In-order c)Post-order.

EMPLOYABILITY

8) Program to implement bfs and dfs for a givengraph.

9)) Program to implement the following sortingmethods:
a) Mergesort b)Quicksort c) InsertionSort d) SelectionSort

EMPLOYABILITY

10)) Program to implement the following searchingmethods:
a) LinearSearch b) Binarysearch

11) Program to store **k** keys into an array of size n at the location computed using a Hash function, loc = key % n, where k<=n and k takes values from [1 to m], m>n, where m is sizeof the hashtable.

EMPLOYABILITY

12) Write a C program to handle the collisions using the following collisionresolution Technique
a) Linearprobing b) Quadratic probing c) SeparateChaining

Reference Books:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, “Data Structures using C”Pearson Education, 2nd Edition, 1995.
2. Richard F, Gilberg, Forouzan, Cengage, Data Structures, 2/e,2005.
3. Data Structures using C, 2/2, ISRDGroup.

DIGITAL ELECTRONICS LAB
(COMMON FOR CSE & IT)

IT217 **Credits:2**

Practical: 3Periods/week Sessional Marks:50

End Exam:3Hours End Exam Marks: 50

Prerequisite:

Digital electronics concepts.

Course Objectives:

- To understand how to design and analyze the electronic circuits usingsemiconductor diodes and operationalamplifiers
- To understand how to design various combinational and sequentialcircuits.
- To develop and test VHDL Program code for combinational and sequentialcircuits.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Identify various analog (active and passive), digital electronic components.
2.	Design and Analyze different circuits using analog ICs like operational amplifier and regulators.
3.	Simplify the given Boolean function and implement using logic gates using Integrated Circuits.
4.	Design, Analyze and Implement combinational and sequential digital circuits.
5.	Model combinational and sequential digital circuits using VHDL program in behavioral, structural, and dataflow models.
6.	Develop test benches to simulate combinational and sequential circuits, perform functional and timing verifications of digital circuits.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2					2			3	2	2	1		
	2	2					2			3	2	2	1		
	3	3	1	3	2		1			3	2	2	2		
	4	3	1	3	2		2			3	2	2	2		
	5	2	2	2	3	1	2			3		3	1		
	6	2	2	2	3	1	2			3		3	1		

LIST OF LABORATORY EXPERIMENTS

CYCLE I:

1. Study of passive, active components & IntegratedCircuits.
2. To study the regulation characteristics of given IntegratedCircuits.
3. To verify the adder operation & subtractor operation using Operationalamplifiers.
4. To verify the truth tables of given LogicGates.

CYCLE II:

1. Verification of truth tables of Logic gates usingIC's.
2. Design a combinational circuit for Code Converters usingIC's.
3. Design a combinational circuit for Adders & Subtractors (HA & FA) usingIC's.
4. Design a sequential circuit for Flip-flop and verify its characteristics usingIC's..
5. Design a bidirectional Universal Shift Register UsingIC74LS194.
6. Design of Counters usingIC74LS73.

CYCLE III: (Simulation using VHDL)

Skill Development

1. Write a program for verification of BasicGates.
2. Write a program for Adder &Subtractor.
3. Write a program for flipflops.
4. Write a program for MUX &DEMUX.
5. Write a Program for ShiftRegisters.

*** NOTE: FOUR Experiments from each cycle should be donecompulsorily.**

Reference Books:

1. M. Morris Mano, Digital Design, Pearson Education, Inc., 2008, 4th Edition.

PYTHON PROGRAMMING LAB

IT218 **Credits:3**

Practical: 3 Periods & 1Tut/week Sessional Marks: 50

End Exam:3Hours End Exam Marks:50

Prerequisite:

Fundamentals of computers, knowledge in any program language

Course Objective:

- Describe the basic elements of the Python language and the Pythoninterpreter
- Analyze and demonstrate the use of lists, tuples and dictionaries inPython.
- Write classes to demonstrate the ideas of encapsulation, inheritance, interfaces and object oriented programdesign.
- Explain and demonstrate methods of error handling and Pythonexceptions.
- Write to and read from files using intermediate file I/O operations in a Pythonprogram.
- Solve problems that have origins in a variety of disciplines including math, science, the Internet andbusiness.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Analyse the syntaxes of python programming and incorporate them in problem solving.
2.	Apply python data structures to solve real world problems.
3.	Develop programs using object oriented concepts in python programming
4.	Develop programs using File I/O and exception handling.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	3	3	2	2			2		1	2	3	2
	2	3	3	2	3	3	3			3		2	3	3	3
	3	3	3	3	3	3	3			3		1	3	3	3
	4	3	3	2	3	3	3			3		1	3	3	3

List of the experiments to be done on the following topics

1. Introduction: Introduction to Python programming language, using the interpreter, running scripts, variables, assignments, comments, operators and expressions. Introduction tobasic data types including strings, integers, lists and tuples.

2. Control Flow: Conditional expressions, if statement, for statement and while statement, break and continuestatements.

Employability

3. Functions, Methods and Modules: Introduction to built in functions, methods and modules. Introduction to standard library modules like sys, os, time and random. Reading command line arguments. Introduction to writing user defined functions and organizing code intomodules.

Employability

4. Data structures: Detailed overview of four major data structures of Python including list, tuple, set and dictionary, including list slicing, sorting lists, listcomprehensions.

Employability

5. Working with Files: Introduction to reading and writing files, text and binary mode. Writing parsers for simple textformats.

Employability

6. Classes and Exceptions **:**Introductions to classes, object creation and class inheritance and overriding methods. Introduction to exceptionhandling.

7. Advanced Topics

Employability

Introduction to some advanced topics in Python.

- Downloading things fromweb
- Webprogramming
- Datavisualization
- Building simple games usingpygame

LIST OF EXPERIMENTS

LEVEL 1: FUNDAMENTAL PROGRAMMING

1. Installation of Python using python interpreter and printing HELLO WORLDmessage

2. program that accept the user's first and last name and print them in reverse order witha space betweenthem

3. To display the first and last colors from the followinglist. color_list = ["Red","Green","White","Black"]

4. To count the number of characters (character frequency) in a string . Sample String: google.com' Expected Result : {'o': 3, 'g': 2, '.': 1, 'e': 1, 'l': 1, 'm': 1, 'c':1}

5. To convert temperatures to and from celsius,fahrenheit.
[Formula : c/5 = f 32/9 [where c = temperature in celsius and f = temperature in fahrenheit] . *Expected Output* : 60°C is 140 in Fahrenheit 45°F is 7 in Celsius

6. To get a list, sorted in increasing order by the last element in each tuple from a givenlist of non emptytuples.
Sample List : [(2, 5), (1, 2), (4, 4), (2, 3), (2, 1)]
Expected Result : [(2, 1), (1, 2), (2, 3), (4, 4), (2, 5)]

7. Write a function translate() that will translate text into “rovarspraket” (Swedish secret language) That is double every consonant and place an occurence of “o” in between .For example translate(“this is fun”) should return the string “tothohisos isosfofunon”

8. program that prints each item and its corresponding type from the followinglist.
Sample List :datalist = [1452, 11.23, 1+2j, True, 'w3resource', (0, 1), [5, 12], {"class":'V', "section":'A'}]

9. Write a Python function that takes a list and returns a new list with unique elementsof the first list. *Sample List:*[1,2,3,3,3,3,4,5] *Unique List :* [1, 2, 3, 4,5]

10. programs for thefollowing:
   a. Defining and Accessing aDictionary:
   b. UpdatingDictionary:
   c. Deleting DictionaryElements:
   d. Defining and Accessing, updating ,deletingTuples.

11. To demonstrate the use of built in stringmethod

12. To demonstrate the use oflists

LEVEL 2 : CLASSES AND I/O

13. To implement classes concept inpython
14. To implement inheritance in a Bankingsystem
15. To implementpolymorphism
16. Python Programs on ExceptionHandling
   a. Write a python program to handle Number formaterror
   b. Write a python program to handleIOError
17. Write a python program to perform the following fileoperations.
   a. Create, open & close afile:
   b. write content on to afile
   c. Read content form thefile
   d. Random access operation on files using tell & seekfunctions
   e. other file operations using the Module‘os’

LEVEL 3 : PROBLEM SOLVING

18. Cryptography:

In cryptography, a *Caesar cipher* is a very simple encryption techniques in which each letter in the plain text is replaced by a letter some fixed number of positions down the alphabet. For example, with a shift of 3, A would be replaced by D, B would become E, and so on. The method is named after Julius Caesar, who used it to communicate with his generals. *ROT 13* ("rotate by 13 places") is a widely used example of a Caesar cipher where the shift is 13. In Python, the key for ROT 13 may be represented by means of the following dictionary:

key = {'a':'n', 'b':'o', 'c':'p', 'd':'q', 'e':'r', 'f':'s', 'g':'t', 'h':'u',

a. 'i':'v', 'j':'w', 'k':'x', 'l':'y', 'm':'z', 'n':'a', 'o':'b','p':'c',
b. 'q':'d', 'r':'e', 's':'f', 't':'g', 'u':'h', 'v':'i', 'w':'j','x':'k',
c. 'y':'l', 'z':'m', 'A':'N', 'B':'O', 'C':'P', 'D':'Q', 'E':'R','F':'S',
d. 'G':'T', 'H':'U', 'I':'V', 'J':'W', 'K':'X', 'L':'Y', 'M':'Z','N':'A',
e. 'O':'B', 'P':'C', 'Q':'D', 'R':'E', 'S':'F', 'T':'G', 'U':'H','V':'I',
f. 'W':'J', 'X':'K', 'Y':'L','Z':'M'}

Your task in this exercise is to implement an encoder/decoder of ROT 13. Once you're done, you will be able to read the following secret message:

Pnrfnepvcure? V zhpucersrePnrfnefnynq!

Note that since English has 26 characters, your ROT 13 program will be able to both encode and decode texts written in English.

19. Speech synthesis:

The *International Civil Aviation Organization (ICAO) alphabet* assigns code words tothe letters of the English alphabet acrophonically (Alfa for A, Bravo for B, etc.) so that critical combinations of letters (and numbers) can be pronounced and understood by those who transmit and receive voice messages by radio or telephone regardless of their native language, especially when the safety of navigation or persons is essential. Here is a Python dictionary covering one version of the ICAOalphabet:

d = {'a':'alfa', 'b':'bravo', 'c':'charlie', 'd':'delta', 'e':'echo', 'f':'foxtrot',
'g':'golf', 'h':'hotel', 'i':'india', 'j':'juliett', 'k':'kilo', 'l':'lima',
'm':'mike', 'n':'november', 'o':'oscar', 'p':'papa', 'q':'quebec', 'r':'romeo',
's':'sierra', 't':'tango', 'u':'uniform', 'v':'victor', 'w':'whiskey',
'x':'x ray', 'y':'yankee', 'z':'zulu'}

Your task in this exercise is to write a procedure `speak_ICAO()` able to translate any text (i.e. any string) into *spoken*ICAO words. You need to import at least two libraries: `os`and `time`. On a mac, you have access to the system TTS (Text To Speech) as follows: `os.system('say ' + msg)`, where `msg` is the string to be spoken. (Under UNIX/Linux and Windows, something similar might exist.) Apart from the text to be spoken, your procedure also needs to accept two additional parameters: a float indicating the length of the pause between each spoken ICAO word, and a float indicating the length of the pause between each word spoken

20. Cows and bulls game:

Create a program that will play the "cows and bulls" game with the user. The game works like this:
Randomly generate a 4 digit number. Ask the user to guess a 4 digit number. For every digit that the user guessed correctly *in the correct place*, they have a "cow". For every digit the user guessed correctly *in the wrong place* is a "bull." Every time the user makes a guess, tell them how many "cows" and "bulls" they have. Once the user guesses the correct number, the game is over. Keep track of the number of guesses the user makes throughout the game and tell the user at the end.
Say the number generated by the computer is 1038. An example interaction could look like this:

Welcome to the Cows and Bulls Game!
Enter a number:
>>> 1234
2 cows, 0 bull
>>> 1256
1 cow, 0 bull
...

21. Chip defect

k defects are randomly distributed amongst *n* integrated circuit chips produced by a factory (any number of defects may be found on a chip and each defect is independent of the other defects). Let p(*k,n*) represent the probability that there is a chip with at least 3 defects. For instance p(3,7) ≈ 0.0204081633.

Find p(20 000, 1 000 000) and give your answer rounded to 10 decimal places in the form 0.abcdefghij

Reference Books:

1. *Swaroop C H* ,A Byte of Python,http://python.swaroopch.com/
2. *David Beazley* , Python Cookbook, 3rd edition, O'ReillyMedia http://chimera.labs.oreilly.com/books/1230000000393/
3. *Mark Pilgrim* ,Dive Into Python 3, http://www.diveinto.org/python3/

Other References:

1. Project Eulerhttps://projecteuler.net/

COMPUTER NETWORKS

IT221 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks:60

Prerequisite:

Data Communications.

Course Objective:

- To provide the students with a sound theoretical and practical knowledge in computer networks.
- To analyze problems associated while connecting components for sharinginformation.
- To select a protocol stack for specificnetwork.
- To select proper algorithm for the protocols..
- To identify the parameters for real time applications innetworks.
- Prepare students for easy transfer from academia to realworld.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Be able to analyze different network architecture's and designs
2.	Mathematically model various error control and routing schemes.
3.	Ability to analyze the working of LAN in an organization.
4.	Ability to design network architecture for an organization.
5.	Ability to design and implement a network for scalability and robustness and security.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3				3						3		3	3
	2	3				3				2				3	3
	3	3				3				2				3	3
	4	3				3				2		2		3	3
	5	2										3		3	3

SYLLABUS

UNIT– I **10periods**

Protocol Architecture: The need for a protocol architecture, A simple protocol architecture A three layer model, standardized protocol architectures , OSI The model, standardization within the OSI framework, service primitives and parameters, the OSI layers , The TCP/IP protocol Architecture The TCP/IP layers, TCP and UDP Operation of TCP and IP, TCP/IP applications, protocol Interfaces, **Local area networks: LAN overview:** Background, LAN protocol Architecture LAN standards, IEEE 802, LLC,MAC. Bridges functions, protocol architecture, Fixed routing, spanning tree approach. Layer 2 and Layer 3 switches hubs, layer2 and3 switches. **High speed LANs:** The Emergence of High speed LANs, Ethernet MAC, Ethernet, fast Ethernet, gigabit, 10 gbpsTokenRing Operation, MAC. **Wireless LANs:** overview, Wireless LAN Technology, IEEE802.11 Architecture and services, MAC, PhysicalLayer

UNIT– II **10 periods**

Wide Area Networks: circuit switching and packet switching: switched communication networks, circuit switching networks and concepts Space Division Switching, Time division switching, packet switching principles switching technique, packet size, comparisons. **Routing in switched networks:** Routing in circuit switching networks, routing in packet switching networks Characteristics, routing strategies, Examples, Least cost Algorithms Dijikstra's Algorithm, Bellman Ford algorithm, comparison. **Congestion Control in Switched Data Networks:** effects of congestion ideal performance, practical performance, congestion control Backpressure, choke packet, implicit congestion signaling, explicit congestion signaling, traffic management fairness, QOS, Reservations, congestion control in packet switchingnetworks

EMPLOYABILITY

EMPLOYABILITY

UNIT – III **10 periods**

Internetworking: Internetwork protocols: Basic protocol Functions, principles of Internetworking requirements, Architectural Approaches, connectionless Internetworking operation of connectionless internetworking scheme, Design issues, Internet protocol IP services, Internet protocols, IP Addresses, ICMP, IPV6 IP next generation, IPv6 structure, IPv6 header, IPv6 Addresses, Hop by Hop options header, routing header, destination options header. **Internetwork operation:** Multicasting, routing protocols Autonomous systems, approaches of routing, BGP, open shortest path first(OSPF)protocol

EMPLOYABILITY

UNIT– IV **10periods**

The Transport Layer: **The Transport Protocols:** connection Oriented transport protocol mechanisms Reliable sequencing network service, unreliable network service, TCP TCP services, TCP header format, TCP Mechanisms, TCP Implementation policy options, TCP congestion control Retransmission timer management, window management,UDP

EMPLOYABILITY

Unit– V **8periods**

Application Layer: **Distributed Applications**: Electronic Mail SMTP and MIME Simple mail transfer protocol (SMTP), multipurpose internet mail extensions (MIME). Hypertext transfer protocol (HTTP) HTTP overview, messages, request message, response messages, Entities Network management SNMP network management systems, SNMPv1, SNMPv2

Text Books:

1. William Stallings ,"Data& Computer Communication", Pearson Education ,7th edition

Reference Books:

1. Forouzan, "Data communication", TATAMcGraw
2. Kurose & Ross, "COMPUTER NETWORKS– A Top-down approach featuringthe Internet", Pearson Education, Alberto Leon,Garciak.
3. LeonGartia, IndraWidjaja, "Communication Networks Fundamental Concepts and Key Architectures",TMH.
4. Nader F.Mir, "Computer and Communication Networks",PHI.

INFORMATION SYSTEMS DESIGN

IT222 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks:60

Prerequisite:

Object Oriented Concepts, C++ programming.

Course Objective:

- On performing a background work prior to begin Projectdevelopment.
- To gather information and analyze user requirements in systemdevelopment
- To apply the Process models in developing aproject.
- To translate end user requirements into system and softwarerequirements

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Identify the features of Information systems and systems design.
2.	Apply the knowledge of information gathering and requirement analysis in SoftwareEngineering
3.	Identify specific components of a software design and use in Interface Designing.
4.	Analyze software testing methodologies and estimate the software development cost.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	2	3	3	2	1	1				2	2	3	3
	2	2	2	2	2	1					2	2	2	3	3
	3	2	3	3	3	3						1	2	3	3
	4	2	2	3	1	3						1	2	2	3

SYLLABUS

UNIT I: TextBook 1 **8Periods**

Information and Management: Types of Information, Computer based information systems, Management Structure , Management and Information Requirements, Qualities of information **(Page No 1 12)**

Examples of Information Systems: Various functions in organizations, Information Processing for a store – An overview , varieties of Information Systems**. (Page No 3122)**

Information Gathering : Strategy to Gather information ,Information Sources, Methods of Searching for Information, Interviewing Techniques, Questionnaires Other methods Case Study – Hostel Information System **(Page No 34 45)**

UNIT – II: TextBook2 **11 Periods**

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. **(Page No 33 47)**

A Generic view of process: Software engineering A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. **(Page No 5273)**

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process. **(Page No 7799)**

EMPLOYABILITY EMPLOYABILITY

UNIT – III: TextBook2 **10 Periods**

Requirements Engineering : Requirements Engineering Tasks ,Initiating the requirements engineering process, Eliciting requirements, developing use cases, Building the analysis model, Negotiating requirements, validating requirements. **(Page No 176204)**

Building analysis model: Requirement analysis, Analysis modeling approaches **(Page No 208 212)**

UNIT – IV: TextBook2 **11Periods**

Design Engineering: Design process and Design quality, Design concepts, the design model. **(Page No 261 280) Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. **(Page No 357382)**

EMPLOYABILITY

UNIT – V: TextBook2 **8Periods**

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Validation testing, System testing **(Page No 387 404,406 410)**

Black Box and White Box testing, Basic Path Testing, Control Structure Testing **(Page No 423 434)**

Product metrics: Software Quality, A frame work for Product Metrics **(Page No.462 471)**

EMPLOYABILITY

Text Books:

1. V. Rajaraman, Analysis and Design of Information System, Second Edition,PHI
2. Roger S Pressman, Software Engineering, A practitioner's Approach Sixth edition. McGrawHill InternationalEdition.

EMPLOYABILITY

Reference Books:

1. Waman S Jawadekar, Software Engineering Principles and Practice, Tata McGrawHill, Ian Sommerville, Software Engineering, Ninth Edition,Pearson

OPERATING SYSTEMS
(COMMON FOR CSE & IT)

IT223 | **Credits:4**
Instruction: 4 Periods & 1Tut/week | Sessional Marks:40
End Exam:3Hours | End Exam Marks:60

Prerequisite:
Knowledge in Computer Organization.

Course Objectives:

- Understand Functions, Services and structure of OperatingSystems.
- Understand processes, threads, schedulers and explanation of CPUscheduling.
- Understand issues related to Process Synchronization and focus on principles of Deadlock and relatedproblems
- Comprehend the mechanisms used in Memory Management and VirtualMemory.
- Understand the concepts of File System, secondary storage management and Disk Scheduling

Course Outcomes:

After completion of this course, a student will be able to :	
1	Analyze basic concepts of operating system and their structures
2	Analyze various issues related to inter process communication like process scheduling, resource management and deadlocks
3	Interpret the issues and challenges of memory management.
4	Synthesize the concepts of I/O management, file system implementation and problems related to security and protection

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	1	2	3	1					1	2	3	3	3
	2	3	1	2	2				2	2		1	1	1	3
	3	3	2	2	1	2			3	2		1	2	2	3
	4	2	2	1	1	2		1	2	1		1	2	2	3

SYLLABUS

UNIT– I **14Periods**
INTRODUCTION TO OS
Introduction to operating systems – operating system structures – system calls – system structure – virtual machines.

PROCESS MANAGEMENT

Processes: Process concept – Process scheduling – Operations on processes –Cooperating processes – Interprocess communication. Multi threaded programming. Communication in client server systems. Multi Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. emplo

UNIT– II **14Periods**

PROCESS SCHEDULING AND SYNCHRONIZATION

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple processor scheduling – Real time scheduling – Algorithm Evaluation. Process Synchronization: The critical section problem –Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization –Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance, Deadlock detection – Recovery from deadlock. Emp

UNIT– III **12Periods**

MEMORY MANAGEMENT

Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

UNIT– IV **10Periods**

FILE SYSTEMS AND ITS IMPLEMENTATION

File System Interface: File concept – Access methods – Directory structure – File system mounting – Protection. File System Implementation : Directory implementation – Allocation methods – Free space management – efficiency and performance – recovery – log structured file systems.

UNIT– V **14Periods**

SECONDARY STORAGE STRUCTURES AND PROTECTION

Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability Basedsystems. Employab

CASE STUDY(Not considered in the examination): THE LINUX OPERATING SYSTEM: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter process communication Employa

Text Book:

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Sixth Edition, Wiley India Pvt Ltd, 2003.

Reference Books:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004.
2. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education,2004.
3. Harvey M. Deitel, “Operating Systems”, Third Edition, Pearson Education,2004.

PROBABILITY STATISTICS & QUEUING THEORY

IT224 **Credits:4**

Instruction: 4 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks: 60

Prerequisite:

Engineering Mathematics 1, 2 & Discrete Mathematical Structures.

Course Objective:

- The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

After completion of this course, a student will be able to:	
1.	Understand the concepts of various statistical measures like mean, variance and standard deviation of a random variable.
2.	Familiarize the different types probability distributions and their properties.
3.	Compute simple correlation between the variables and fit straight line, parabola by the principle of least squares.
4.	Analyze the statistical data and apply various small or large sample tests for testing the hypothesis.
5.	Learn about different Queuing models and its applications

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3									3		3	3
	2	2	3									3		2	3
	3	3	3									3		3	3
	4	3	3									3		2	2
	5	3	3									3		2	2

SYLLABUS

UNIT – I: PROBABILITY &MATHEMATICAL EXPECTATIONS 12Periods

Introduction to probability: Definition of Random Experiment, Events and Sample space, Definition of probability, Addition and Multiplication theorems, Conditional probability, Baye's Theorem, Simple Problems on Baye's theorem. Random Variables: Discrete and Continuous random variables, Distribution function of random variable, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of Mathematical expectations, Mean andVariance.

UNIT – II:PROBABILITY DISTRIBUTION 14Periods

Discrete Distributions: Binomial Distribution, Mean and Standard Deviations of Binomial Distribution, Poisson distribution, Mean and Standard Deviations of Poisson Distribution, Applications. Continuous Probability Distributions: Uniform Distribution, Exponential Distribution, Normal Distribution, Properties of Normal Distribution, Importance of Normal Distribution, Area properties of Normal curve.

UNIT – III: CURVE FITTING , CORRELATION AND REGRESSION 10Periods

Curve Fitting: Principle of Least Squares, Method of Least Squares (Straight Line and Parabola).

Correlation: Definition, Measures of correlation, Correlation for Bivariate Distribution, Rank correlation coefficients.

Skill Development

Regression: Simple linear regression, regression lines and properties.

UNIT – IV: TESTING OF HYPOTHESIS 14Periods

Formulation of Null Hypothesis, Critical Region, Level of Significance.

Small Samples: Students t distribution (Significance test of a sample mean, Significance test of difference between sample means),F distribution, χ^2 test, Goodness offit.

Skill Develop

Large samples: Test of Significance of Large Samples – Single Proportion, Difference between two Proportions, Single mean and Difference of means.

UNIT – V:QUEUEINGTHEORY 10Periods

Queue description, characteristics of a queuing model, study state solutions of M/M/1: α Model, M/M/1; N Model.

Skill Develo

TEXT BOOK:

1. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill Publications.

REFERENCE BOOKS:

1. Kishore S. Trivedi ,Probability& Statistics with Reliability, Queuing and Computer Applications , Prentice Hall of India ,1999.

COMPUTER GRAPHICS & MULTIMEDIA

IT225 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End Exam:3Hours End Exam Marks:60

Prerequisite:

Computer fundamentals, C programming.

Course Objective:

- This course provides an introduction to the principles of computer graphics. In particular, the course will consider methods for modeling 2 dimensional & 3 dimensional objects and efficiently generating photorealistic renderings on color raster graphics devices. The emphasis of the course will be placed on understanding how the various elements that underlie computer graphics (algebra, geometry, algorithms and data structures, optics, and photometry) interact in the design of graphics software systems.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Apply output primitive algorithms for drawing line, circle, ellipse and filled area primitives and transformation on 2D objects
2.	Design and Model objects characteristics using 3D representations and apply transformations on 3D objects.
3.	Design multimedia system architecture for multimedia applications using multimedia technologies digital voice and audio, video image and animation
4.	Construct 2D and 3D multimedia building blocks for developing multimedia applications.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3							1	1	1		1	2	3
	2	1	2	3					1	1	1		1	2	3
	3	1	2	3					1	1	1		1	2	3
	4	3							1	1	1		1	2	3

SYLLABUS

UNIT – I:OUTPUTPRIMITIVES **10hours**

Introduction Line Circle and Ellipse Drawing Algorithms – Attributes – Two Dimensional Geometric Transformations – Two Dimensional Clipping and Viewing.

employability

UNIT – II: THREEDIMENSIONALCONCEPTS **8hours**

Three Dimensional Object Representations – Three Dimensional Geometric and Modeling Transformations – Three Dimensional Viewing – Color models – Animation.

EMPLOYABILITY

UNIT III: MULTIMEDIASYSTEMS DESIGN **10hours**

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT – IV: MULTIMEDIAFILEHANDLING **10hours**

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT –V:HYPERMEDIA **10hours**

Multimedia Authoring & User Interface – Hypermedia messaging Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

Text Books:

1. DonaldHearnandM.PaulineBaker,“ComputerGraphicsCVersion”,Pearson Education, 2003. (UNIT I : Chapters 1 to 6; UNIT 2: Chapter 9 – 12, 15, 16)
2. Prabat K Andleigh and Kiran Thakrar, “Multimedia Systems and Design”, PHI,2003. (UNIT 3 to 5)

Reference Books:

1. Judith Jeffcoate, “Multimedia in practice technology and Applications”, PHI,1998.
2. Foley, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”,Pearson Education, second edition 2003.

NETWORKING LAB

IT226 **Credits:2**

Practical:3Periods/Week Sessional Marks:50

End Exam:3Hours End Exam Marks:50

Prerequisite:

Computer Networks Concepts.

Course Objectives:

- The objective of this lab is to introduce students to the design issues that arise in building and using networks and to give students hands on experience with building and using networkservices.
- The practical issues to be stressed include design and installation of LAN, network operating system, setting up a network system such as users and their permissions and rights, groups and domains, adding workstations and sharing of resources across the network

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Understand and identify the various network infrastructure and command needed for network design and troubleshooting.
2.	Understand the basic concepts and functions of Layer 1 (Hubs), Layer 2(Switches and bridges) and Layer 3 (Router).
3.	Understand the building components of network design.
4.	Understand the basic format of known protocols such as TCP, UDP, ICMP..Etc.
5.	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3				3								3	3
	2	3				3								3	3
	3	3				3								3	3
	4	3				3								3	3
	5	3				3								3	3

LIST OF EXPERIMENTS

I. StudyExperiments: **2 weeksduration**

This study experiments helps the learners to understand certain network components like Hubs, switches, routers, wireless access modems, transmission medium (coaxial cables, twisted pair cables, optical fiber) and several networkingcomponents

1. Study of specifications of latest desktops and laptops
2. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, routersetc.
3. Familiarization with Transmission media and Tools: Co axial cable, UTP Cable, Crimping tool, Connectorsetc.
4. Study of various LAN topologies and their creation using network devices, cables andcomputers
5. Study of Client ServerArchitecture
6. To study LAN using bus, tree, startopology
7. To study pc to pc communication using parallelport
8. To study fiber optics communication
9. To study wireless communication

II. Handson Experiments 8 weeksduration

This set of experiments helps the learners in gaining expertise in developing and maintaining a certain network which includes setting up a LAN network and maintaining it, configuring routers, switches and firewalls using a certain Hardware components.

1. preparing straight and crosscables.
2. Study of network commands and network configurationcommands
3. Implementation of file and printersharing
4. Designing and implementing Class A, B, and CNetworks

EMPLOYABILITY

5. Subnet planning and itsimplementation
6. To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the samecomputer.

EMPLOYABILITY

7. To install any one open source packet capture software like wire sharketc.
8. To configureWLAN
9. To install and configure wireless accesspoints
10. To configure modem of acomputer
11. To configure hub/switch androuter
12. Configuring NetworkNeighborhood.
13. Configuring a router basedfirewall

III. ProgrammingExperiments 5weeks duration

This set of programming experiments helps the learners in simulating different routing protocols, network topologies and several layered protocols using simulators like NS2 and packet tracing software's

1. Configure a network topology using packet tracing software
2. Configure a network using Distance vector routing protocol using packet tracer software

EMPLOYABILITY

3. Static routing using packet tracer software
4. DHCP, DNS, HTTP configuration using packet tracer software

EMPLOYABILITY

EMPLOYABILITY

Experiments beyond the Syllabus:

1. Developing a VPN network for number of 50 users
2. TCP, UDP protocol simulation using NS2

Reference Books:

1. CCNA Studyguide.

COMPUTER GRAPHICS & MULTIMEDIA LAB

IT227 **Credits:2**

Practical:3Periods/Week Sessional Marks:50

End Exam:3Hours End Exam Marks:50

Prerequisite:

Computer Graphics & Multimedia Concepts.

Course Objective:

- The computer graphics and multimedia laboratory is established for the purpose of providing working area for development of computer graphics andmultimedia

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Draw various types of lines and curves.
2.	Create animations using various editing tools
3.	Use audio, video, internet editing tools to develop multimedia applications

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	3	3	3					3		3	3	3
	2	3	3	3	3	3					3		3	3	3
	3	3	3	3	3	3					3		3	3	3

LIST OF EXPERIMENTS

1. To implement Bresenham's algorithms for line, circle and ellipsedrawing
2. To perform 2D Transformations such as translation, rotation, scaling, Reflection and sharing.
3. To implement Cohen–Sutherland 2D clipping and window–viewportmapping
4. To perform 3D Transformations such as translation, rotation andscaling.
5. User Interface Design & Graphics II: Create a user interface for your final project. Include 2 backgrounds and 1 button set. Aim for a cohesivelook.
6. Multimedia Sound: Create 2 soundtracks and 2 EFX sounds for a previousproject.
7. Procedure to create an animation to indicate a ball bouncing onsteps
8. Procedure to simulate movement of acloud.
9. Procedure to create an animation with the following features. WELCOME Letters should appear one by one the fill color of the text should change to a different color after the display of the fullword.
10. Procedure to create an animation to represent the growingmoon
11. Procedure to extract the flower only from given photographic image and organize it on a background. Selecting your own background fororganization.
12. Procedure to use appropriate tool(s) from the toolbox cut the objects from 3 files (f1.jpg, f2.jpg & f3.jpg); organize them in a single file and apply feathereffects.

YABILITY

EMPLOYABILITY

EMPLOYABILITY

Reference Books:

1. Vaughan, T. “Multimedia – Making it work (5th edition)”, McGrawHill.
2. Boyle, T. “Design for Multimedia Learning”, Prentice Hall, 1997.

OPERATING SYSTEMS (LINUX) LAB

IT228 **Credits:2**

Practical:3Periods/Week Sessional Marks:50

End Exam:3Hours End Exam Marks:50

Prerequisite:
Operating System Concepts.

Course Objectives:

- Analyze the working of an operating system, its programming interface and filesystem.
- Develop algorithms for process scheduling, memory management, pagereplacement algorithms and diskscheduling

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Implement schedulling algorithms, deadlock management.
2.	Implement free space managent and page replacement strategies.
3.	Implement file allocation methods and disk schedulling algorithms.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	3		3	2	3			3			3	3
	2	3	3	3		3		2	2		3		3	3	3
	3	3	3	3		3		2	2		3		3	3	3

List of Experiments:

1. Shell Programming & AWKscripts Employability
2. Write programs using the following system calls of LINUX operating system: Fork, exec, getpid, exit, wait, close, stat, opendir,readdir
3. Write programs using the I/O system calls of LINUX operating system (open, read, write, etc) and error reporting usingerrno Employability
4. Write C programs to simulate UNIX commands like ls, grep,etc.
5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for scheduling algorithms FCFS,SJF, PRIORITY & RR. For each of the scheduling policies, compute and print the average waiting time, average turnaround time and Gantt chart
6. Implement the Producer – Consumer problem using semaphores (using LINUX system calls).
7. Programs usingpipes
8. Implement Banker's algorithm for handlingdeadlock
9. Implement free space management strategies such as First fit, Best fit and Worstfit
10. Implement page replacement algorithms such as FIFO,LRU
11. Implement file allocation techniques (Linked, Indexed and Contiguous) Employability
12. Implement disk arm scheduling algorithms such as FCFS,SSTF

Reference Books:

1. Sumitabha Das, UNIX AND SHELL PROGRAMMING, Tata Mcgraw Hill Publishing CoLtd
2. YashwanthKanetkar , UNIX shell programming, BPBpublications
3. W. Richard Stevens, Stephen A.Rago , Advanced programming in the UNIX environment", 3rd Edition Pearsoneducation.
4. Silberschatz,Galvin,andGagne,“OperatingSystemConcepts”,SixthEdition,Wiley India Pvt Ltd, 2003.

IT3.1.1 DATA COMMUNICATIONS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

1. An Introduction to Data Communications:
A Communications Model, Data Communications and Data Communications Networking, Protocols and Protocol Architecture, Characteristics of Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments
2. Transmission Media:
Guided Transmission Media, Wireless Transmission Data Encoding, Digital Data, Digital Signals, Digital Data, Analog Signals, Analog Data, Digital Signals, Analog Data, Analog Signals
3. The Data Communication Interface
Asynchronous and Synchronous Transmission, Line Configurations, Interfacing.
Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC),Other Data Link Control Protocols.
4. Data Communications Hardware: Terminals
Introduction, Basic Terminal Components, Enhanced Terminal Components, General-Purpose Terminals, Remote Job Entry Terminals, Transaction Terminals, Clustering of Terminal Devices. Communications Processing Hardware Introduction, Switching Processors, Multidrop Lines, Multiplexers, Concentrators, Front-End Processors.
5. Modems:
Network Attachment and Regulations, Line Conditioning and Leased Lines, Modems and Modem Circuits. Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

TEXT BOOKS:

1. William Stallings, Data and Computer Communications, 7th Edition, Pearson Education Inc., 2004
2. Mary E.S. Loomis, Data Communications, PHI-N.J.,1983 (Capter 3, Chapter 5)
3. Paul Bates, Practical Digital and Data Communications, PHI-N.J, 1987(Chapter5)

REFERENCE BOOKS:

1.Behrouz A. Forouzan, Data Communications and Networking, 3rd EditionTMH, 2004
2.William A. Shay, Understanding Data Communications & Networks, 2nd Edition Thomson-Brooks/Cole - Vikas publishing House, 1999
3. Michale A. Miller, Data & Network Communications, Thomson/Delmar - Vikas Publishing House, 2000

IT3.1.2 INTERNET CONCEPTS & JAVA PROGRAMMING Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30
Univ_Exam:3 Hours Univ_ Exam Marks:70

Fundamentals: HTML, OOP Concepts, Comparing JAVA with C & C++,JAVA Programming language Syntax, Variables, Data types, statements and expressions.

Control Statements: If else, for, while, and do while loops, Switch statements.

Arrays & Structures: One Dimensional & Two Dimensional Arrays, Named Structures.

Functions: Parameter Passing, Static Modifier.

Features of JAVA: Classes and Interfaces, Threads and multithreaded programming, Exception handling, Introduction to packages, Math package, Lang package, Util package.

Applet Programming: Events, Event driven programming, Events like buttons, mouse, keyboards etc., Applets, Applets package, Fonts, colours, Graphics, images. AWT components, layout managers, writing event driven program using components.

Employability

Networking:
Networking Basics: Socket overview, Client/Server, Reserved sockets. Proxy servers, Internet addressing; Java and the net, Inet address, TCP/IP client sockets, URL, URL connection, TCP/IP server sockets, Datagrams.

Employability

Textbook:
1. "Introduction to Java programming, a primar ", Balaguruswamy.
2. Java Complete Reference , Herbt Schild.

Reference Book: "Introduction to Java programming", Daneal/Young PHI

IT3.1.3 COMPUTER GRAPHICS Credits:4

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30
Univ_Exam:3 Hours Univ_ Exam Marks:70

Introduction: Usage of Graphics and their applications, Presentation Graphics- Computer Aided Design- Computer Art- Entertainment- Education and Training- Visualization- Image Processing- Graphical User Interfaces

Over view of Graphics systems: Video Display Devices- Raster Scan systems-random scan systems-Graphics monitors and workstations-Input devices-hard copy devices- Graphics software

Output primitives: Points and Lines-Line Drawing Algorithms- Loading the Frame buffer- Line function- Circle- Generating Algorithms- Ellipse Generating Algorithms- Other Curves- Parallel Curve Algorithms-Curve Functions-Pixel Addressing- Filled Area Primitives-Filled Area Functions-Cell Array- Character Generation

Attributes of Output Primitives: Line and Curve Attributes-Color and Gray scale levels- Area Fill Attributes- Character Attributes-Bundled Attributes- Inquiry Functions- Antialiasing

Two Dimensional Geometric Transformations: Basic Transformations- Matrix Representations-Homogeneous Coordinates-Composite Transformations-Other Transformations-Transformations between Coordinate Systems- Affine Transformations-Transformation Functions- Raster methods for Transformations

PLOYABILITY

Two Dimensional Viewing: The viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Two Dimensional Viewing Functions-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping- Text and Exterior Clipping

Structure And Hierarchical Modeling: Concepts of Structures and Basic models- Editing - Hierarchical Modeling with Structures-GUI and Interactive Input Methods- Windows and Icons-Virtual Reality Environments

Three Dimensional Concepts and Object representations: 3D display methods-3D Graphics-Polygon Surfaces- Curved Lines and Surfaces- Quadratic Surfaces-Super Quadrics-Blobby Objects-Spline Representations- Cubic Spline methods-Bézier Curves and Surfaces- B Spline Curves and Surfaces

Three Dimensional Geometric and Modeling Transformations: Translation- Rotation-scaling-Other Transformations-Composite Transformations-3D Transformation Functions-Modeling and Coordinate Transformations

EMPLOYABILITY

Three Dimensional Viewing: Viewing Pipeline- Viewing Coordinates- Projections- View Volumes- General Projection Transformations-Clipping-Hardware Implementations- Three Dimensional Viewing

Chapters 1 to 12 except 10-9 to 10-22 of the Text book

Text Book: Computer Graphics C Version by Donald Hearn & M. Pauline Baker Pearson Education, New Delhi, 2004

Reference Books:

1) Procedural Elements for Computer Graphics by David F. Rogers, Tata McGraw Hill Book Company, New Delhi, 2003
2) Computer Graphics: Principles & Practice in C by J. D. Foley, S. K Feiner, A Van Dam F. H John, Pearson Education, 2004
3) Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.

IT3.1.4 FORMAL LANGUAGES AND AUTOMATA THEORY Credits: 4

(Common with CSE 3.1.4)

Instruction: 3 Periods & 1Tut/Week Sessional Marks: 30

Univ_Exam: 3 Hours Univ_ Exam Marks:70

1. Finite Automata and Regular Expressions:

Basic Concepts of Finite State Systems, Deterministic and Non-Deterministic Finite Automata, Finite Automata with e-moves, Regular Expressions, Minimization of Finite Automata, Mealy and Moore Machines, Two-Way Finite automata.

2. Regular sets & Regular grammars:

Basic Definitions of Formal Languages and Grammars, Regular Sets and Regular Grammars, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Decision Algorithm for Regular Sets, Myhill-Nerode Theorem, Minimization of Finite Automata.

3. Context Free Grammars and languages:

Context Free Grammars and Languages, Derivation Trees, Simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, closure properties of CFL‟s, Decision Algorithm for CFL.

Employability

4. Push down Automata and Deterministic CFL:

Informal Description, Definitions, Push-Down Automata and Context free Languages, Parsing and Push-Down Automata.

Employability

5. Universal Turing Machines and Undecidability:

Design and Techniques for Construction of Turing Machines. Undecidability of PCP. Chomsky Hierarchy. Regular Grammars, Unrestricted Grammars, Context Sensitive languages,Relationship between classes of languages.

TEXT BOOKS: Introduction to Automata Theory, Languages & Computation By J.E.Hopcraft & Jeffery D.Ulman – Narosa Publishing Company.

REFERENCE BOOKS:

Theory of Computer Science By Mishra & Chandra Sekharan, PHI.

An Introduction To Formal Languages and Automata,3e By Peter Linz – Narosa Publishing House.

IT3.1.5 **FILE STRUCTURES** **Credits:4**

(Common with CSE 3.1.5)

Instruction: 3 Periods & 1 Tut /Week | Sessional Marks : 30

Univ. Exam : 3 Hours | Univ. Exam Marks:70

File Processing Operations

Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C

Secondary Storage

Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access,Magnetic Tape – types, performance, organization estimation of tape length and data transmission times, disk vs tape,CD-ROM – CD-ROM as a file structure, physical organization, strengths and weakness of cd-roms, storage hierarchy

Byte Journey and buffer Management

File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks

File Structure Concepts

A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files

Managing records in C files

Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization

Employability

Organizing files for performance

Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.

Indexing

Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists

Indexed sequential file access and prefix B+ Trees

Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the + tree, simple prefix B + content of the index: separators instead of keys, the simple prefix B tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable

B+ tree order B-tree, loading a simple prefix

<u>Special Note</u>: Implementation in C only

Hashing

Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions

Extendable hashing

Working of extendable hashing, implementation, deletion, extendable hashing performance

Designing file structure for CD-ROM

Tree structure on CD-ROM, hashing files on CD-ROM, CD-ROM file structure

Employabil

Text Book: File Structures – An Object Oriented Approach with C++ by Michael J. Folk, Bill Zoellick and Greg Riccardi,, Pearson

IT3.1.6 **OPERATING SYSTEMS** **Credits:4**

(Common with CSE 3.1.6)

Instruction: 3 Periods & 1 Week./Week Sessional Marks : 30

Univ_ Exam : 3 Hours Univ_ Exam Marks:70

Introduction: What IS OS; History of Operating Systems, Operating System Concepts, Operating Systems Structure

Processes: Introduction to Processes, Inter Processor Communication, Classical IPC Problems, Process Scheduling

Memory Management : Memory Management without Swapping or Paging, Swapping, Virtual Memory, Page Replacement Algorithms, Modeling paging algorithms, Design issues for paging systems, Segmentation

File Systems And Input/Output : Files, Directories, File system implementation, Security, Protection mechanism, Principles of I/O Software, Disk Management

Deadlocks: Resources, Deadlocks, The O-----ptical Algorithm, Deadlock Detection and Recovery, Deadlock Avoidance, Deadlock Prevention, Other Issues

Case Study : Unix: Fundamental Concepts in Unix, MS – DOS: Fundamental Concepts in MS-DOS

employability

Text Book: Modern Operating Systems by Andrew S. Tanenbaum

Reference: Applied Operating Systems Concepts by Avi Silberschatz, Peter Galvin, Grey Gagne

IT3.1.7 **OPERATING SYSTEMS LAB** **Credits :2**

Lab: 3 periods/week
Univ_Exam: 3 hours.

Sessional Marks: 50
Univ_Exam marks: 50

1. Study of laboratory environment:
   Hardware specifications, software specifications
2. Simple Unix-C programs:
   Programs using system calls, library function calls to display and write strings on standard output device and files.
3. Programs using fork system calls.
2. Programs for error reporting using errno, perror( ) function.
3. Programs using pipes.
4. Shell programming.
5. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.
6. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.
7. Programs to simulate free space management.
8. Programs to simulate virtual memory.
10. Programs to simulate deadlock detection.

Employability

References:

Unix concepts and applications by Sumitabha Das, TMH Publications. Unix programming by Stevens, Pearson Education.
Shell programming by Yashwanth Kanetkar.
Operating System Concepts by Silberschatz, and Peter Galvin.

IT3.1.8 **J A V A P R O G R A M M I N G L A B** **C r e d i t s : 2**

Lab: 3 periods/week Sessional Marks: 50
Univ_Exam: 3 hours. Univ_Exam marks: 50

1. (a) Program to display the area of a rectangle.

   (b) Program to find Sum of series $1+x+x^2+x^3+\ldots\ldots$

2. (a) Write a class to display the area of rectangle and inherit this class into other class which is displaying perimeter of a rectangle and implement.

   (b) Write a class to add three no‟s inherit this class into other class to add five no‟s and implement it.

3. (a) write a program to print the path, filename and extension for a given path of a file.

   (b) write a program to receive two command line arguments check whether they are equal or not.

   Employability

4. (a) A program to take two arguments and divide the first argument with second argument and display the result. Display the error message if divide by zero without abnormal exit.

   (b) A program to accept more than one string and arrange them in alphabetical order.

   (c) Write a program to display simultaneously output of even and odd numbers starting from one to specified number.

5. Write a program to accept data from keyboard and write it into a file.
6. Write a java program to implement stack & Queue operations.
7. Write a program to draw line and circle using mouse.
8. Write a applet program for drawing the bar chart..

   Employability

9. Write a applet program to design a calculator for implementing basic functions like +,-,*, /.
10. Write a program to check active ports in system.

Employability

IT3.2.1 **COMPILER DESIGN** **Credits:4**

(Common with CSE 3.2.1)

Instruction: 3 Periods & 1 Week./Week
Univ_ Exam : 3 Hours

Sessional Marks : 30
Univ_ Exam Marks:70

The Theory of Automata: Definition and description, Transition systems, properties, Acceptability of string, NDFA, Equivalence in between DFA & NDFA. Grammars, Types of Grammars, Grammars and Automata, Regular expressions, Finite Automata and Regular expressions, Regular sets and Regular Grammars.

Overall view of Compilers: Brief discussion on various phases of Compilers.

Design of lexical analyzer.

Design of Parsers: Shift Reduce parser, Operator Precedence Parser, Predictive Parser, LR parser, SLR
parser. LALR parser.

EMPLOYABILITY

Syntax Directed Translation: Syntax directed translation and implementation, Intermediate code, Postfix notation, parsing tree, Three address Code, Quadruples, Triples.

EMPLOYABILITY

Intermediate Code Optimization: The principle sources of optimization, Loop Optimization, DAG, Global data flow analysis.

Code Generation: Problems, Machine model, A simple code generator, Register allocation and assignment, Code generation from DAG, Peep hole optimization.

EMPLOYABILITY

Brief discussion on symbol tables, Run-time storage administration.

chapters: 1,2,3,4,5,6,7,9,10,11,12,15 of the text book.

Text Book

Principles of Compiler Design by Aho, D. Ullman

Reference Books:

Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.

IT3.2.2 DESIGN AND ANALYSIS OF ALGORITHMS
Credits:4

(Common with CSE 3.2.2)

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Introduction – Fundamentals of algorithmic problem solving – important problem types – fundamental data structures.

EMPLOYABILITY

Fundamentals of analysis of algorithms and efficiency – Analysis framework – s Asymptotic Notationand Basic Efficiency classes – Mathematical Analysis of Non-recursive Algorithms – Mathematical Analysis of recursive Algorithms – Empirical Analysis of Algorithms – Algorithm Visualization
Brute Force – Selection Sort and Bubble sort – Sequential Search and Brute – Force String Matching – Closest Pair and Convex-Hull Problems by Brute Force – Exhaustive Search

EMPLOYABILITY

Divide-and-Conquer – Mergesort – Quicksort – Binary Search – Binary Tree Traversals and Related Properties – Multiplication of large integers and Strassen‟s Matrix Multiplication – Closest- Pair Convex-Hull Problems by Divide- and – Conquer

EMPLOYABILITY

Decrease – and – Conquer – Insertion Sort – Depth-First Search and Breadth-First Search- Topological Sorting – Algorithms for Generating Combinatorial Objects – Decrease-by-a- Constant-Factor Algorithms – Variable- Size-Decrease Algorithms

Transform-and-Conquer – Presorting – Gaussian Elimination – Balanced Search Trees – Heaps and Heapsort – Horner‟s Rule and Binary Exponentiation – Problem Reduction

EMPLOYABILITY

Space and Time Tradeoffs – Sorting by Counting – Input Enhancement in string Matching – Hashing – B-Trees

Dynamic Programming – Computing a Binomial Coefficient – Warshall‟s and Floyd‟s Algorithm – Optimal Binary Search Trees - The Knapsack Problem and Memory Functions.

EMPLOYABILITY

Greedy Technique – Prim‟s Algorithm – Kruskal‟s Algorithm – Dijkstra‟s Algorithm – Huffman Trees Limitations of Algorithm Power – Lower-Bound Arguments – Decision Trees – P, NP and NP – complete problems – Challenges of Numerical Algorithms

EMPLOYABILITY

Coping with the Limitations of Algorithms Power – Backtracking – Branch-and-Bound – Approximation
Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

EMPLOYABILITY

Text Book:

Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003

Reference Books:

1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford
   Stein, Prentice Hall of India, New Delhi, New Delhi
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft & Ullman, Pearson Education, New Delhi, 2003
3. Fundamentals of algorithmics, Gilles Brassard & Paul Bratley, Prentice Hall of India, New Delhi

IT3.2.3 DATABASE MANAGEMENT SYSTEMS Credits:4

(Common with CSE 3.2.3)

Instruction: 3 Periods & 1 Tut /week — Sessional Marks: 30
Univ. Exam : 3 Hours — Univ-Exam-Marks:70

Introduction to DBMS: Overview, File system vs DBMS, Advantages of DBMS, Storage data, queries, Transaction Management, DBMS structure

E-R model: Entities, Attributes and Entity sets, Relation ship and Relation ship sets, Features of ER model, Conceptual database design with ER model

EMPLOYABILITY

Relational model: Integrity constraints over relations and enforcement, Querying relation data, Logical database design, views, destroying/altering tables and views

Relational Languages: algebra and calculus

SQL: Basic SQL, Query, union, interest, except, Nested Queries, Aggregated Operation, Null values, Embedded SQL, cursors, ODBC and JDBC, Triggers and Active database, designing active databases

EMPLOYABILITY

Schema refinement and normal forms : Schema refinement, fds, reasoning normal forms, normalization up to 3rd & BC normal forms, lossless join & dependency preserving decomposition

EMPLOYABILITY

Transaction management: Transaction concept, transactions and schedules, concurrent execution of transactions, lock – based concurrency control, crash recovery

Concurrency control : Lock management, specialized locking techniques, concurrency control without locking

Crash Recovery: Aries, recovering from a system crash, media recovery

Text Book:
Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill

IT3.2.4 COMPUTER NETWORKS Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Local Area Networks: LAN Overview.
High Speed LANs: Ethernet, Token Ring.
Wireless LANs.

EMPLOYABILITY

Wide Area Networks: Circuit Switching and Packet Switching
Routing in Switched Networks
Principles of Cellular Networks

EMPLOYABILITY

Internet Protocols: Basic protocol functions
Priniciples of Internetworking
Connectionless Internetworking
Internet Protocol

EMPLOYABILITY

Transport protocols: Connection oriented Transport Protocol Mechanisms
TCP, TCP Congestion Control
UDP

Distributed Applications: E-Mail, HTTP

Textbooks:

1. WILLIAM STALLINGS, Data and Computer Communications, Seven Edition, Pearson Education Asia,2004

Reference Books:

1.ANDREW S.TANENBAUM , Computer Networks, 4th Edition, Pearson Education,2003

2.WILLIAM A.SHAY ,Understanding Communications and Networks ,3rd Edition ,Thomson Asia/ Vikas Publishing,2004

IT3.2.5 WEB TECHNOLOGIES Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Introduction: Java, Distributed computing and J2EE: Requirements of web architecture, web application lifecycle, XML and J2EE, the package of J2EE Applications, Java Script.

The Design and Development of a J2EE Application : J2EE Layers, J2EE Application Components, J2EE Architecture, Development Methodology and process, sample applications introduced; Task list for building J2EE Applications: Completing prerequisite Tasks, designing the database, creating tables and columns, defining the application, creating a backend interface, creating the interface, building pages, creating data access objects, validating your code, refining your code.

JDBC: Introduction; JDBC Architecture: API and Drives, The JDBC API, Retrieving and updating Data, SQL-to-Java Data Types, JDBC Execution Types, Metadata, Scrollable Resultsets, updating rows, transaction support, Batch Statements, JDBC 2.1 New Data Types, JDBC 2.0 Optional package API.

Em

Servlets: What are Servlets?, Benefits of Servlets, use as controller in MVC and the sample application, basic HTTP, servlet container, Servlets API, service method detail, HML clients, servlet lifecycle, HTTP response header, session management, dispatching requests, Servlets with JDBC, web applications.

Java server pages: introduction: features of JSP Pages, the components of a JSP page, de4veloping and deploying JSP pages, JSP architectures; practical development with tag libraries: JSP syntax, Tag libraries

Enterprise JavaBeans: Introduction; Enterprise JavaBeans overview, distributed programming overview, EJB framework, Session and entity Beans, Attributes of a Bean, Parts of a Bean, container-managed persistence(CMP) and bean managed, the lifecycle of enterprise JavaBeans, java message service (JMS) and message driven beans (MDB), distributed programming services, common object request broker architecture (CORBA) and remote method invocation (RMI), Transaction and transaction management, Security, deployment, personal roles for EJB Development, building session beans: creating session beans, Entity beans.

Text Book:
J2EE UNLEASHED – Joseph J. Bambara, Paul R.Allen, Mark Ashnault, Ziyad Dean, Thomas Garben, Sherry Smith – SAMS Techmedia

Reference Book:
The J2EE Tutorial- Stepahnie Bodoff, Dale Green, Kim Hasse, Eric Jendrock, Monica Pawlan, Beth Stearns-Pearson Education –Asia.

IT3.2.6 OPERATIONS RESEARCH Credits:4

Instruction: 3 Periods & 1 Tut /week Sessional Marks: 30
Univ. Exam : 3 Hours Univ-Exam-Marks:70

Overview of operations Research: OR models – OR Techniques

Linear Programming: Introduction – Graphical solution; Graphical sensitivity analysis – The standard form of linear programming problems – Basic feasible solutions - unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.

Dual problems- Relation between primal and dual problems – Dual simplex method

Transportation model – starting solutions. North West corner Rule - lowest cost method –Vogels approximation method – Transportation algorithms –Assignment problem – Hungarian Method.

Network Models : Definitions – CPM and PERT – Their Algorithms
Integer Programming : Branch and Bound Algorithms cutting plan algorithm.

Dynamic Programming: Recursive nature of dynamic programming – Forward and Backward Recursion

Deterministic Inventory Models : Static EOQ Models – Dynamic EOQ models.

EMPLOYABILITY

Game theory: Two person Zero Sum Games – Mixed strategy games and their Algorithms.

EM

Books:

1. Introduction to Operations Research by HILLIER/LIEBERMAN, Tata McGraw Hill
2. Operations Research by R Panneerselvan, Prentice Hall of India.

IT3.2.7 WEB TECHNOLOGIES LAB Credits:2

Lab: 3 Periods/week Sessional Marks: 50
Univ-Exam : 3 Hours Univ-Exam-Marks: 50

Each student should develop two projects out of this list using JSP,JDBC,J2EE

1. Design Airlines Ticket Reservation System
2. Design ONLINE Banking system.
3. Design Library Information system
4. Design Gram Panchayat Information system for House tax, water tax, wealth tax, Library tax collection, phone bill, Electricity bill collection
5. Design student information system portal which maintain attendance, marks etc.
6. Design online examination system.

Employability

IT3.2.8 DBMS LAB Credits:2

Lab: 3 Periods/week Sessional Marks: 50
Univ-Exam : 3 Hours Univ-Exam-Marks: 50

Study features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.(Select two of RDMSs)

Laboratory exercises should include defining schemas for applications, creation of a database, writing SQL queries, to retrieve information from the database, use of host languages, interface with the embedded SQL, use of forms & report writing packages available with the chosen RDBMS product.

EMPLOYABILITY

Some sample applications, which may be programmed, are given below: Accounting package for a shop,
Database manager for a Magazine agency or a newspaper agency,
Ticket booking for performances,
Preparing greeting cards & birthday cards,
Personal accounts - Insurance, loans, mortgage payments, etc.,
Doctor's diary & billing system, Personal bank account,
Class marks management, Hostel accounting,
Video Tape library, History of cricket scores,
Cable TV transmission program manager,
Personal library.

IT4.1.1 Object Oriented Software Engineering Credits:4

(Common with CSE 4.1.1)

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30

Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1. Software Engineering:
Software related problems, software engineering, concepts, development activities
2. Modeling: Modeling
with UML
3. Project Communications: employability
Project communication, modes, mechanisms and activities
4. Requirements: employability
Requirements elicitation, concepts, activities & managing requirements elicitation
5. Analysis: employability
Analysis overview, concepts, activities and managing analysis
6. System Design:
Design overview, concepts, activities and managing system design
7. Object Design:
Object design overview, concepts, activities and managing object design
8. Rationale Management:
Rationale overview, concepts, activities and managing rationale
9. Testing; employability
Testing overview, concepts, activities and managing testing
10. Software Configuration Management: EMPLOYABILITY
Configuration Management overview, concepts, activities and managing configuration management
11. Project Management: EMPLOYABILITY
Project management overview, concepts, activities and managing project management models and activities.

Text Book:

Object-Oriented Software Engineering: Conquering Complex and Changing Systems
Bernd Bruegge and Allen H. Dutoit
Pearson Education Asia

Reference Book:

Object-Oriented Software Engineering: Practical software development using UML and Java
Timothy C. Lethbridge and Robert Laganiere
McGraw-Hill Higher education

IT4.1.2 NETWORK PROTOCOLS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

IP ADDRESSING: Decimal Notation-Classes- special addresses - A simple Internet-Unicast and Broadcast addresses - Applying for IP addresses-Private networks.
SUBNETTING AND SUPERNETTING: Subnetting- Masking-Examples of Subnetting – Variable length Subnetting- Supernetting.
INTERNET PROTOCOL: Data gram-Fragmentation-Options- Checksum- IP design.
ARP and RARP: ARP- ARP design – RARP
INTERNET CONTROL MESSAGE PROTOCOL: Types of Messages- Message formats- Error reporting-Query- Checksum- ICMP design.

Employability

INTERNET GROUP MANAGEMENT PROTOCOLS: Multicasting- IGMP-Encapsulation- Multicast Backbone- IGMP design.

USER DATAGRAM PROTOCOL: Process to process communication-User datagram – Checksum- UDP operation- uses of UDP – UDP design.

TRANSMISSION CONTROL PROTOCOL: Process to Process communication -TCP Services – Segment -Options- Checksum-Flow control- Error Control- TCP Timers-Connection-State Transition Diagram-Congestion Control-TCP operation- TCP Design.

APPLICATION LAYER AND CLIENT-SERVER MODEL: Client-server Model-Concurrency-Processes

Employability

BOOTP and DHCP: BOOTP-DHCP

DOMAIN NAME SYSTEM: Name Space-Domain name Space-Distribution of Name space-DNS in the Internet-Resolution- DNS Messages- Types of Records-Compression-DDNS-Encapsulation.

Employability

TELNET AND RLOGIN: Concept-Network Virtual Terminal- NVT character set -Embedding-Options-Option Negotiation-Sub option Negotiation-Controlling Server-Out of Band signaling –Escape character-Mode of Operation-Examples- User Interface- Rlogin-Security Issue.

FILE TRANSFER PROTOCOL: Connections- Communication-Command Processing-File Transfer-User Interface-Anonymous FTP.

TRIVIAL FILE TRANSFER PROTOCOL: Messages- Connection- Data Transfer-UDP ports- Tftp Example-TFTP options -Security-Applications.

HYPERTEXT TRANSFER PROTOCOL: HTTP overview-Proxy-Gateway-Tunnel-Cache-Messages-General Header Fields-Cache Control-Connection-Request Methods-Request Header Fields-Response Messages-Response Header Fields-Entity Header Fields-Client/Server Authentication.

SOCKET INTERFACE: Definitions-Sockets-Byte ordering- Address Transformation-Byte manipulation Function-Information about Remote Host- Socket System Calls- Connectionless Iterative server- UDP Client/Server Programs-Connection oriented Concurrent Server - TCP Client/Server Programs.

Employabilit

Text Book: TCP/IP Protocol Suite. Behrouz A. Forouzan (TMH edition)
Reference Book: Internetworking with TCP/IP. D. E. Comer (PHI publications).
IV/IV B. Tech (IT) 1st Semester

IT4.1.3 ADVANCED OPERATING SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

Introduction to Distributed Systems: Goals – Advantages of distributed systems over centralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled systems, network operating systems, Network file systems, design Issues – transparency – Flexibility – performance – scalability.

Em

Employability

Network and protocols: An introduction to Computer networking , Network technologies , LAN, WAN, Protocols, Technology case study, ATM, The Client – Server Model

Employability

Remote Procedure Calling: Introduction , Features of RPC, User package, Design issues, Classes of RPC system , Interface definition language, exception handling, delivery guarantees, implementation , interface processing , binding, Locating the binder, RPC in Unix system

Employability

bility

Synchronization in Distributed systems: Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms, Mutual exclusion, A centralized algorithms, A distributed algorithms, A token ring algorithms, comparison of the three algorithms, Election algorithms, The Bully algorithms, Ring algorithms, Dead Locks in distributed systems, Distributed deadlock detection.

Emplo

Process and Processors in distributed systems: Threads, Introduction, Usage, Design issues for thread packages, An example for thread packages, System models, The workstation model, The processor pool model, The hybrid model , Processor allocation, Allocation models, Design issues, Implementation issues.

Empl

Distributed File and Directory Services: Distributed file service requirements, File service components , Flat file service , Directory Service, Client module, Design issues, implementation techniques.

Distributed shared memory Introduction: Shared memory, Consistency models, Page based Distributed shared memory, Shared – variable Distributed shared memory, Object based Distributed Shared Memory.

TEXT BOOK: Distributed Operating systems, Andrew s.Tanenbanm
Reference Book: Advanced Concepts in Operating Systems, Singhal and Niranjan G.Shivaratna

IT4.1.4 MANAGEMENT PRINCIPALES Credits:4

(Common with CSE 4.1.4)

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks: **70**

1. Nature and functions of management:
   Importance of management – definition of management – management process – Roles of manager – management _ a science or art – management _ a profession.
2. Planning:
   Nature of planning – Importance of planning – Types of planning – Steps on planning.
   SKILL DEVELOPMENT
3. Decision – Making:
   Meaning of decision – Types of decisions.
4. Organization :
   Span of management – principles of organizing – departmentalization.
   SKILL DEVELOPMENT
5. Authority Delegation and Decentralization :
   Source of formal authority – difference between authority and power – line and staff authority – delegation of authority – decentralization of authority.
6. Coordination:
   Need for coordination – Types of coordination – Techniques of coordination.
   SKILL DEVELOPMENT
7. Direction:
   Requirements of effective direction – Motivation.
8. Importance of communication – Purposes of communication - Formal ommunication - Informal communication – Barriers to communication – Principles of effective Communication.
9. Leadership:
   Difference between a leader and a manager – Characteristics of leadership – Functions of a leader – Approaches to leadership – Effective leadership – Leadership style in Indian organizations.
   SKILL DEVELOPMENT
10. Managerial control :
    Steps in a control process – Need for control – Types of control methods – Essentials of Effective control systems.
11. Social Responsibilities of Business :
    Meaning of social responsibility – social responsibilities of business towards different groups.

Text Book:

Principles of Management , PC Tripathi, PN Reddy, Second Edition, Tata McGraw-Hill.

IT4.1.5 Elective -1 SATELLITE & MOBILE COMMUN ICATIONS Credits:4

Instruction: 3+1 Periods /Week Sessional Marks: 30
Univ Exam: 3 Hours Univ Exam Marks: 70

Principles of satellite communications: Evolution and growth of communication satellites, synchronous satellites, satellite frequency allocation and band spectrum, general and technical characteristics of satellite communication systems, advantage of satellite communication systems, active and passive satellites, advent of digital satellite communications.

Communication satellite link design: Introduction, General link design Equations, System Noise temperature, C/N and G/T ratio. Atmospheric and Ionospheric effects on link design, Uplink design, complete link design, interference effects on complete link design, earth station parameters.

Multiple Access Techniques: Introduction, TDMA, TDMA frame structure, TDMA Burst structure, TDMA frame efficiency, TDMA super frame. CDMA.

Satellite Subsystems and Global Mobile Satellite systems: Introduction, Electric power supply, attitude and orbit control, propulsion subsystem, repeaters, antenna systems, TTC subsystems, thermal control subsystems, structure subsystem, Reliability of satellite subsystems. IRIDIUM-System. The GlobalStar system, Teledesic system.

Cellular, Mobile and Personal communications: Introduction, Cellular concept and its initial implementation, Digital cellular mobile systems.

Text books:

1. Satellite communications
-- Dr. D.C Agarwal
khanna publishers
2. Mobile and personal communication systems and services
-- Rajpandya.
PHI publications

Reference Books:

1. Mobile Cellular Telecommunications
2nd edition
--WilliumC.Y.Lee

IT4.1.5 Elective-I EMBEDDED SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

Introduction to embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, EPROM). Tristate devices, Buses, DMA, UART and PLD‟s. Built-ins on the microprocessor.

Interrupts basics, ISR;Context saving, shared data problem. Atomic and critical section, Interrupt latency.

Survey of software architectures, Round Robin , Function queue scheduling architecture, Use of real time operating system.

RTOS, Tasks , Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore.

Inter task communication, message queue, mailboxes and pipes, timer functions, events. Interrupt routines in an RTOS environment.

Embedded system software design using an RTOS. Hard real-time and soft real time system principles, Task division, need of interrupt routines, shared data.

Employability

Embedded Software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system.

Employability

Debugging techniques. Testing on host machine, Instruction set emulators, logic analysers. In-circuit emulators and monitors.

Employability Employability

Text Books:

1. David A. Simon, An Embedded Software Primer, Pearson Education, Inc., 1999
2. Sriram V Iyer and Pankaj Gupta, Embedded Real Time Systems programming, TMH, 2004

Reference Books:

1. Frank Vahid/ Tony Givargis, Embedded Systems Design – A Unified Hardware/Software Introduction, John Wiley & Sons, Inc., 2002
2. Raj Kamal, Embedded Systems, Architecture, Programming and Design, TMH, 2003

IT4.1. Elective -1 VISUAL PROGRAMMING TECHNIQUES Credits:4

Instruction: 3+1 Periods /Week — Sessional Marks: 30
Univ Exam: 3 Hours — Univ Exam Marks: 70

Visual Basic Language: Variables, Constants, Arrays, Collections, Procedures, Arguments, Function return Values, Control Flow statements, Loop statements, Nested Control structures.

Working with Forms: Appearance of forms, Designing Menus, Building Dynamic forms at runtime, Drag and Drop Operations.

Basic ActiveX Controls: The Textbox Control, The List Box and Combo Box Controls, The scrollbar and Slider Controls, The File Controls.

Employability

Getting Started in Visual C++: Parts of Visual C++ program - application object – main window object , view object document object. Event oriented window programming , device context. Microsoft foundation classes an overview

Employability

Event Handling : Reading keystrokes, handling mouse , creating menus, tool bars, buttons, status bar prompts, dialog box, check box, radio buttons, list boxes, combo boxes, sliders, serialization , file handling , multiple documents.

File Handling: Understanding and working with objects, controls, file handling , debugging

Employability

Creating ActiveX controls: DLLs , OLE, Object technologies. Creating internet program‟s using visual C++ and visual basic. Creating Active X controls. Connecting to database using VC++ and visual basic.

Text Books:

Mastering Visual Basic 6 –Evangelos Petroutsos –BPB Publications

Visual C++ 6 - Steven Holzner –BPB publications

IT4.1.5 Elective- I **COMBINATORICS & GRAPH THEORY Credits:4**

Instruction: 3 Periods & 1 Tut./week | Sessional Marks: 30
Univ.-Exam : 3 Hours | Univ-Exam-Marks:70

PART I: COMBINATORICS

1.FOUNDATION: Basics- Sets- Relations- Proof methods- Problem-solving strategies- Mathematical Induction.
2.COMINATORICS: Basics of counting-Combinations and Permutations- Enumeration of Combinations & Permutations without repetitions and without repetitions- with constrained repetitions- Binomial Coefficients-Binomial and Multinomial theorems- Principle of Inclusion- Exclusion
3.RECURRENCE RELATIONS: Generating Functions of Sequences- Calculating Coefficients of Generating Functions- Recurrence Relations- Solving Recurrence Relations using Substitution and Generating Functions-Method of Characteristic Roots-Solutions of homogeneous and inhomogeneous recurrence relations.

PART II GRAPH THEORY

4.FUNDAMENTAL CONCEPTS: what is a Graph-Paths-Cycles-Trails-Vertex Degrees and Counting-Directed Graphs-Trees and Distance-Spanning Trees-Enumeration-Optimization and Trees.
5.MATCHINGS AND CONNECTIVITY : Matchings and Covers-Algorithms and applications of matching-Matchings in General graphs-Cuts and Connectivity-k-connected graphs-Network flow problems.
6.COLORING AND PLANAR GRAPHS: Vertex coloring and upper bounds-Structure of k-chromatic Graphs-Enumerative Aspects-Embeddings and Euler‟s formula-Characterization of Planar graphs-Parameters of Planarity-Edges and Cycles-Line Graphs and edge-coloring-Hamiltonian Cycles-Planarity-coloring and cycles.

TEXT BOOKS:

1.J.L. Mott, Abraham Kandel & Theodore P. Baker, " Discrete mathematics for Computer Scientists & Mathematics", Prentice-Hall of India Ltd. New Delhi. (Chapters 1,2,3)
2.Douglas B. West, "Introduction to Graph Theory", Pearson Education Asia, New Delhi. (Chapters 1,2,3,4,5,6,7)

REFFERENCE BOOKS:

1. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
2. Kenneth H Rosen. "Discrete Mathematics and Its Applications, Tata McGrahHill Publishing Company, New Delhi.
3. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.

IT4.1.5 Elective- I RANDOM PROCESSES IN ENGINEERING Credits:4

Instruction: 3 Periods & 1 Tut./week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1.STOCHASTIC PROCESSES:- Notion of Stochastic Process, Classification of Stochastic Process according to Time and State Space; Discrete time Morkovchains, n th step transition probabilities, stationery distribution of Morkovchains, Poisson process, Properties of Poisson; Birth and Death Process, Time dependent Birth and Death process, Renewal theory, Applications of elementary renewal theorem and key renewal theorem.

2. Stationary and Non Stationary processes:- AR Process; NA Process ; ARMA Process, ARIMA Process, Box and Jinkins Models, Correlogram analysis, Periodogram analysis, Spectrum of a Process.

3.QUEUEING THEORY:- Non Morkovchian queues, Phase type Technique, Embedded Markovchains Technique, GI/G/I Queues model, Polzak. Kintchins formula, queues with bulk arrivals queues with bulk services.

4. PRIORITY QUEUING MODELS:- Queues in Series, Queues in Parallel, Scheduling algorithms, Throughput analysis and waiting time distributions, Applications of Queuing theory in Communication Networks.

5.RELIABILITY ANALYSIS:- Concepts of Reliability, Failure Time distributions, Hazard rate functions, Reliability of a component, Bath- tub curve, System reliability, Series systems, parallel systems, Stand by redundancy, Availability , Maintainability, Fault tree constructions, Fault analysis.

REFERRENCES:

1. Probability, Statistics and Random Processes – By T.Veerarajan Tata McGraw – Hill
2. Probability and Statistics with Reliability , Queueing & Computer Science Applications – By Kishore S. Trivedi (Prentice Hall)

IT4.1.5 Elective- I ARTIFICIAL INTELLIGENCE Credits:4

Instruction: 3 Periods & 1 Tut. /Week **Sessional Marks: 30**
Univ.-Exam : 3 Hours **Univ-Exam-Marks:70**

Introduction to Artificial Intelligence, Artificial Intelligence Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics

Employability

Heuristic Search Technologies
Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means Endo Analysis

Predicate Logic
Proof with Backward Chaining, Resolution, question answering.

Representing Knowledge Using Rules:
Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

Employability

Symbolic Reasoning with uncertainty
Non-monotonic Reasoning, Dependency – Directed Backtracking TMS.
Statistical Reasoning with Bayes Theorem, certainty Factors & Rule Based System, DS- Theory.

Weak & Strong Slot Filler Structures
Semantic nets, Frames, Conceptual dependencies, Scripts

Planning
Block world, Components of a Planning System, Goal State Planning, Non Linear Planning, Hierarchical Planning.

Natural Language Processing
Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing.

Expert Systems
Representing and Using Domain Knowledge, Expert Systems Shells, Explanation

Text Books:
1. Artificial Intelligence, Rich E & Knight K – Tata Mcgrahill (1991)
2. Introduction to Artificial Intelligence & Expert Systems, Paterson. PHI

IT4.1.6 NETWORK PROGRAMMING LAB Credits:2

Instruction: 3 Periods /Week **Sessional Marks: 50**
Univ.-Exam : 3 Hours **Univ-Exam-Marks:50**

1.Identifying well known ports on a Local/Remote System:
By trying to listen to the various well-known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.

2.Writing a chat application:
i)One-One: By opening socket connection and displaying what is written by one party to the other.
ii)Many-Many (Broad cast): Each client opens a socket connection to that chat server and writes to the socket. What ever is written by one party can be seen by all other parties.

Employability

3.Data retrieval from a Remote database:
At the remote database a server listens for client connections. The server accepts SQL Queries from the client executes it on the database and sends the responses to the client.

4.Mail Client:
i)POP Client: Gives the server name, user name and password, retrieve the mails and allow manipulation of mailbox using POP commands.
ii)SMTP Client: Gives the server name, send email to the recipient using SMTP commands.

Employabi

5.Simulation of Telnet:
Provide a user interface to contact well known ports so that client server interaction can be seen by the user.

6.Simple file transfer between two systems (with out protocols):
By opening socket connection to our server on one system and sending a file from one system to another.

7.HTTP Server:
Develop a HTTP server to implement the following commands.
GET, POST HEAD, DELETE.
The server must handle multiple clients.

Employab

1)Downloading Image Files from HTTP server: Using Java URL connection class (Ref. Book: Java Network Programming-Orielly)

IT4.1.8 Object Oriented Software Engineering Laboratory Credits:2

Lab: 3 Periods/week Sessional Marks: 50
Univ.-Exam : 3 Hours Univ-Exam-Marks:50

Computing Platform:

Each student group chooses its own platform, subject to approval by the instructor

Course Objectives:

1. They can design and implement complex software solutions using state of the art software engineering techniques.
2. The have working knowledge of UML, source control, and project management.
3. They have deep knowledge of the technologies they used for implementing their project.
4. They know how to test and document software.
5. They are capable of working as part of a software team and develop significant projects under a tight deadline.
6. They are able to present their work in a professional manner.

Topics to beCovered:

1. Software Engineering Process. EMPLOYABILITY
2. Unified Modeling Language (UML). EMPLOYABILITY
3. Data Structures and Specification.
4. Object-oriented design.
5. Debugging EMPLOYABILITY

Syllabus Flexibility:

High. The students are free to chose a project based on the instructor's approval.

Assessment Methods:

1. Group meetings with faculty: initial proposal, code review, tracer-bullet implementation demo, final demo.
2. Design documents. Write-up.
3. Code documentation.
4. Presentations.

the students give their final presentations and demos.
Also, each project team meets individually with the instructor at least four times during the semester. The agenda for each of the four meeting is as follows:

1. Team presents project idea and has it approved by instructor. (first month)
2. design/code review. Instructor goes over design/code with the team to point out problems and formalize requirements. Instructor determines requirements for tracer-bullet implementation. (second month)

3. Tracer-bullet implementation demo. Team shows that it has achieved full vertical integration functionality. Instructor notices missed requirements and reminds students of requirements for final project.(beginning of third month).

Final meeting. Verify requirements, design, documentation, testing, write-up, division of labor, etc. (last month).

Sessional Marks Allotment: Monthly Meeting Participation: 10% Monthly Progress Reports: 15% Design/code

Document: 15% Presentation: 10%
Prototype Demonstration: 10% Final
Project Demonstration: 30% Final Project
Report: 10%

General Software Engineering Tips:

Be careful when making major modifications and keep backups! A good motto: There is no such thing as a safe software change.

One of the biggest mistakes that even professional software teams make is modifying code at the last minute. Either resist the urge to make last minute changes, or keep them isolated and well-marked so that they can be backed out easily if necessary.

Test, test, test!!! You must test your system thoroughly after making any change, no matter how small. Else you will not know if a bug was introduced! You will get no sympathy if you break your system at the last minute.

Regression Testing:

A good habit to get into: frequently run your program on an extensive test set.

Once you have a prototype, create a set of examples that your program handles correctly. Generate files of the input and the correct output as a *test set*.

When you make significant changes, run your program on the test set. If the output is different, then you will know that you‟ve introduced a bug. (Or if the output is improved, you should update the test set.)

Put together an extensive regression set! If it alerts you to one major bug (and it always does), then it is time well spent.

After verifying that a new change is "safe", save a version of your entire system! Never, EVER make changes to the saved version – it is a reliable version that you can recover in an emergency.

Documentation:

Get into the habit of documenting your code quickly as you go. If you think you‟ll remember why you did something, you are probably wrong.

Computer scientists typically hate to do documentation. One reason is that they leave it all for the end! Get into the habit of writing small comments as you go. A few comments, explaining what‟s happening and why, can make a world of difference.

When you make a change, mark it with your initials, the date, a brief explanation, and an example.

This will help enormously if the change needs to be removed or modified, and will prevent thrashing.

Working as a Team:

Be honest and realistic with your teammates when setting goals. If you fail to meet a promised deadline, it affects the whole team, not just you.

Communication is crucial! Don‟t make major decisions by yourself, and let people know when you are behind or ahead of schedule.

Try to exploit each other‟s strengths.

IT4.2.1 **E-Commerce** **Credits:4**

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

Electronic commerce environment and opportunities: Back ground – The Electronic commerce Environment – Electronic Market Place Technologies.
Modes of electronic commerce: Overview – EDI – Migration to open EDI – E commerce with WWW/Internet – Commerce Net Advocacy – Web commerce going forward.

Approaches to safe electronic Commerce – Overview – Source – Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol – Secure Electronic Transaction – Certificates for Authentication – Security on Web Servers and enterprise networks.
Electronic cash and electronic payment schemes – Internet Monitory Payment and Security requirements – payment and purchase order process – online electronic cash.

EMPLOYABILITY

Master card/ Visa Secure electronic transaction: Introduction – Business requirements - Concepts - Payment Processing. Email and Secure Email Technologies for Electronic Commerce: Introduction – The means of Distribution – A model for Message Handling – How Does a Email Work.

EMPLOYABILITY

Internet Resources for Commerce: Introduction – Technologies for Web Servers – Internet Applications for commerce – Internet Charges – Internet Access and Architecture – Searching the Internet.

EMPLOYABILITY

Text Books:
Web Commerce Technology Hand Book
Daniel Minoli, Emma Minoli
McGraw Hill

Reference:
Frontiers of Electronic Commerce
Ravi Kalakotar, Andrew B.Whinston
Addison-Wesley

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IT4.2.2 CRYPTOGRAPHY AND NETWORK SECURITY Credits:4

(Common with CSE 4.2.2)

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

INTRODUCTION: The need for security-security approaches-principles of security-Plain Text and Cipher Text-substitution and Transposition Techniques-Encryption and Decryption-Symmetric and Asymmetric Cryptography-Stenography-key range and key size-types of attacks
SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: Algorithm types and modes-overview of symmetric key cryptography-DES-IDEA-RC5-BLOWFISH-AES-Differential and Linear Cryptanalysis.

ASYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: Overview of asymmetric key cryptography- RSA algorithm-symmetric and asymmetric key cryptography together-digital signatures-knapsack algorithm-some other algorithms.
PUBLIC KEY INFRASTRUCTURE: Introduction-Digital certificates- Private Key management-The
PKIX model-Public Key Cryptography Standards- XML, PKI and Security

INTERNET SECURITY PROTOCOLS: Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET-3D
secure protocol-Electronic money-Email security-WAP security-security in GSM

USER AUTHENTICATION MECHANISMS: Introduction-Authentication basics-passwords- authentication tokens-certificate based authentication-biometrics authentication-kerberos- SSO approaches

PRACTICAL IMPLEMENTATIONS OF CRYPTOGRAPHY/SECURITY: Cryptographic solutions using
Java-Cryptographic solutions using Microsoft-cryptographic toolkits-security and operating systems NETWORK SECURITY: Brief Introduction to TCP/IP- firewalls-IP security-Virtual Private Networks- case studies on cryptography and security.

TEXT BOOK:

Cryptography and Network security, Atul Kahate, Tata McGraw-Hill Pub company Ltd., New Delhi

REFERENCE BOOKS:

1) Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi
2) Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi
3) Network Security: The Complete Reference by Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg

Tata Mcgraw-Hill

IT4.2.3 Elective-II WAP Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1.**Introduction:** What is WAP, History, Architecture and future of WAP.
2.**The user interface:** User interface basics, Text entry, using the cache, Types of WML cards, Graphics.
WAP development Tools and Software: Editors and Emulators, SDK‟s, Converting Images.
3.**Working with WML:** WML basics: Writing WML code, some examples, Graphics, Templates.
Forms and User input: The Options Menu, Events, Variables, Input Tag.
Adding Functionality with WML Script: The rules of WML Script, Variables, Operators, Control Constructs, Reserved Words, Functions, The Standard Libraries, Arrays, pragmas, General coding Principles.
4.**Database-Driven WAP:** ASP and WAP, ActiveX Data Objects (ADO), methods of converting existing HTML web site to WAP, M-Commerce and Security, Push Technology and Telematics.
5.**Sample Applications:** Currency Converter, User Directory, Scheduling, E-Commerce

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Text Books:
1. WAP „A beginners Guide‟--------- DALE BULBROOK
2.WAP Development with WML and WML Script------- BEN FORTA and KEITH

IT4.2.3 Elective-II MULTIMEDIA SYSTEMS Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

INTRODUCTION:
Definition - CD-ROM and multimedia.
Multimedia applications: business - schools - homes - public places and virtual reality. Introduction to making of multimedia: hardware - software - creativity - and organization.

MULTIMEDIA TOOLS:
Macintosh and windows production platforms - 3-d modeling and animation - image-editing tools - sound editing tools - animation - video - and digital movie tools - linking multimedia objects - office suites - word processors - spread sheets - databases - presentation tools. Authoring tools - Card and Page-based authoring tools - Icon Based authoring tools - time based authoring tools - object oriented authoring tools - cross platform-authoring tools

SKILL DEVELOPMENT

MULTIMEDIA BUILDING BLOCKS:
Text: About fonts and faces - text in multimedia - computers and text - Font editing and design tools - Hypermedia and Hypertext.
Sound: Multimedia system sounds - MIDI versus digital audio - digital audio - making MIDI audio - audio file format - working with sounds in windows - working with sounds on the Macintosh - NIFF - Adding sounds to multimedia - Towards professional sounds - production tips.
Images: -Making still images - Colors - Image file format. Animation: Principals of animation - Making animation that works. Video: How video works - Broadcast video standards - Integrating computers and television - Shooting and Editing - Video tips - Recoding formats - Digital video

SKILL DEVELOPMENT

MULTIMEDIA AND THE INTERNET:
Internet fundamentals: Internetworking - Connections - Internet services - The World Wide Web - Tools for the World Wide Web: Web serves - Web browsers - Web page makers and Site builders - Plug-ins and Delivery vehicles - Beyond HTML

DESIGNING FOR THE WORLD WIDE WEB:
Working on web - Text for web - Images for web - Sound for web - Animation for web.

TEXTBOOKS: Multimedia: Making It Work - Tay Vaughan

REFERENCE BOOKS:
1. Multimedia System Design- K. Andleigh and K. Thakkrar

2. Multimedia: Computing, Communication & Application - Ralf stein Metz and Klara Nahrstedt
3. Advanced multimedia programming - Steve Rimmer
4. Multimedia Literacy - Fred T.Hofstetter MGHill

IT4.2.3 Elective-II INTERNET AND ITS APPLICATION TECHNOLOGIES Credits:4

Instruction: 3 Periods Lec&1Tut/week — Sessional Marks: 30
Univ-Exam: 3 Hours — Univ-Exam-Marks: 70

Introducing ASP.NET: Problems with older versions of Active Server Pages, The Benefits of ASP.NET, Choosing the Appropriate Development Environment, Setting up the Development Environment.

Solutions, Projects, and the Visual Studio .NET IDE: Planning and Creating the Visual Studio .NET, Adding the Solution to Visual SourceSafe, The Visual Studio .NET integrated.

Exploring ASP.NET and Web Forms: Web Forms, Two ASP.NET Programming Models, Simple ASP.NET Page, Server Controls, View State, Post back, Responding to Events, Event Handler Procedure Arguments, Code-Behind page, life cycle of a web form and its controls, page layout.

The .NET Framework and Visual Basic .NET Object Programming: Definitions, The .NET Framework, Visual Basic .NET Object-Oriented Programming, Structures, Interfaces, Enumerations, Working with Collections, Referencing External Code Libraries.

Working with Web Server Controls: The Web server control hierarchy, Label Control, TextBox Control, Button and LinkButton Control, Hyperlink control, Image and ImageButton Control, CheckBox and RadioButton Controls, DropDownList and LIstBOx Controls, Validation Controls.

Using Data Bound Web Controls: Data-Binding Basics, Single Value Data Binding, Repeating Binding Control Methods, Repeating Bindin Control Events, Mapping Fields to the Control, Data Bound Controls.

Data Access with ADO.NET: Connected versus Disconnected Data, ADO.NET Data Provides, ADO. NET data Namespaces, Primary Data Objects, Modified Table Data, Using the DataGrid to modify Data, Updating the Data store, Paging the Datagrid, Storing data with the DataGrid.

Working with XML Data: XML in the .NET Framework, The XML Document Object Model, XML Namespace, XML Objects, Working with XML Documents, Validating XML Documents.

Streams, File Access and Serialization: Stream Classes, File Classes, Directory Classes, Serialization.

Text Book: ASP.NET BIBLE – Glenn Johnson- Wiley Dreamtech publications

IT4.2.3 Elective-II V H D L Credits:4

Instruction: 3 Periods & 1 Tut. /Week Sessional Marks: 30
Univ.-Exam : 3 Hours Univ-Exam-Marks:70

1. Overview of Digital Design with Vermilion HDL
2. Hierarchical Modeling Concepts
3. Basic Concepts
4. Modules and ports
5. Gate-Level Modeling
6. Dataflow Modeling
7. Behaviour Modeling
8. Tasks and Functions

Text Book:

1. Verilog HDL – A Guide to Digital Design and Synthesis, Samir Palnitkar, Pearson Education Pte. Ltd. (chapters: 1,2,3,4,5,6,7,8), 2001

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design, Stephen Brown and Zvonko Vranesic, Tata - McgrawHill, 2002
2. A Verilog HDL Primer, J. Bhasker, Second Edition, Star galaxy Pub., 1999

IT4.2.3 Elective-II DATA WARE HOUSING AND DATA MINING
Credits:4

Instruction: 3 Periods & 1 Tut. /Week — Sessional Marks: 30
Univ.-Exam : 3 Hours — Univ-Exam-Marks:70

1.Introduction to Data Mining:
Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.

2.Data Warehouse and OLAP Technology for Data Mining
What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Employability
Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining

3Data Preprocessing
Why Pre-process the Data? Data Cleaning, Data Integration and Transformation
Data Reduction, Discretization and Concept Hierarchy Generation

4Data Mining Primitives, Languages and system Architectures,Data Mining Primitives: What defines a Data Mining Task?, A Data Mining query language, Designing Graphical Use Interfaces Based on a Data
Mining Query language,Architectures of Data Mining Systems

5Concept Description: Characterization and comparison ,What is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases Employability

6Mining Association rule in large Databases, Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

7Classification and prediction,Concepts and Issues regarding Classification and Prediction, Classification Employability
by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor
Classifiers, Case- Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy Employability

8Cluster Analysis
What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods

Text Book:
Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications

Reference Books:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari, University Press

IT4.2.4 GRAPHICS & MULTIMEDIA LABORATORY Credits:2

Lab: 3 Periods/week Sessional Marks: 50
Univ. Exam : 3 Hours Univ-Exam-Marks:50

SKILL DEVELOPMENT

Graphics: using any graphic package.

1. Drawing various types of lines and curves.
2. Creating various types text and fonts.
3. Creating two dimensional objects using the lines and curves
4. Animating the two dimensional pictures using transformations.
5. Coloring the pictures and Zooming.
6. Creating an object and applying animation of key framing.
7. Creating three dimensional objects using wire frame modeling.
8. Rotation, scaling and translating the 3 D objects.
9. Coloring the 3 D objects.
10. Shading the 3 D objects
11. Rendering the objects
12. Creating smooth surfaces.
13. Creating rugged surfaces based on fractal geometry.

SKILL DEVELOPMENT

Multimedia:

1 Preproduction & Presentation Graphics: Create a 7-10 slide presentation in your favorite presentation graphics application. (Power point is suggested; Corel Presentations 9 is free and is acceptable.)
2. Typefaces and Graphics: Create 1 vector and 1 bitmap graphic; they must be your original work created in any of the acceptable tools.
3. Desktop Publishing: Create a 2-page desktop-published "newsletter," possibly using your "What is Multimedia?" text. Include graphics.
4. Production Planning and Design: Create a proposal of project. Include summary, flowchart, element and resource lists.
5. User Interface Design & Graphics II: Create a user interface for your final project. Include 2 backgrounds and 1 button set. Aim for a cohesive look.
6. Multimedia Sound: Create 2 soundtracks and 2 EFX sounds for a previous project.
7. Digital Video: Use video capture to digitize your video shoot ro another video source to create short production (15-45 seconds)
8. Create three basic Web pages using Dreamweaver / flash or other authoring package or write bare HTML if you are able; pages must be linked and must include at least one graphic per page.

Books:
2) Prabhat K. Andleigh & Kiran Thakrar, “ Mulitmedia Systems Design”, Prentice Hall of India, New Delhi.
3) Calleen Coorough, “Multimedia and the Web Creating digital Excitement”, Vikas Publishing House, New Delhi.

4) James E. Shuman, " Multimedia in Action", Vikas Publishing House, New Delhi.

IT4.2.5 **PROJECT WORK** **Credits:8**

Project: 6 Periods /week Sessional Marks: 50

Univ-Exam-Marks:50

GUIDELINES for preparing the report of the Project Work

FORMAT FOR PREPARATION OF PROJECT REPORT

FOR

B. TECH.(IT)

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page
2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

The table and figures shall be introduced in the appropriate places.

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be **printed in black letters** and the text for printing should be identical.

3. PREPARATION FORMAT:

3.1 Cover Page & Title Page – A specimen copy of the Cover page & Title page of the project report are given in **Appendix 1.**

3.2 **Bonafide Certificate –** The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14, as per the format in **Appendix 2.**

The certificate shall carry the supervisor‟s signature and shall be followed by the supervisor‟s name, academic designation (not any other responsibilities of administrative nature),

department and full address of the institution where the supervisor has guided the student. The term **„SUPERVISOR‟** must be typed in capital letters between the supervisor‟s name and academic designation.

3.3 **Abstract –** Abstract should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.

3.4 **Table of Contents –** The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head. A specimen copy of the Table of Contents of the project report is given in **Appendix 3.**

3.5 **List of Tables –** The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.

3.6 **List of Figures –** The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.

3.7 **List of Symbols, Abbreviations and Nomenclature** – One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.

3.8 **Chapters** – The chapters may be broadly divided into 3 parts (i) Introductory chapter, (ii) Chapters developing the main theme of the project work (iii) and Conclusion.

The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

- Each chapter should be given an appropriate title.
- Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
- Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

3.9 **Appendices** – Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
-

Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.

□ Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

3.10 List of References –The listing of references should be typed 4 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the year and other details.

A typical illustrative list given below relates to the citation example quoted above.

REFERENCES

1. Ariponnammal, S. and Natarajan, S. (1994) „Transport Phonomena of Sm Sel – X Asx‟, Pramana – Journal of Physics Vol.42, No.1, pp.421-425.

2. Barnard, R.W. and Kellogg, C. (1980) „Applications of Convolution Operators to Problems in Univalent Function Theory‟, Michigan Mach, J., Vol.27, pp.81–94.

3. Shin, K.G. and Mckay, N.D. (1984) „Open Loop Minimum Time Control of Mechanical Manipulations and its Applications‟, Proc.Amer.Contr.Conf., San Diego, CA, pp. 1231-1236.

3.10.1 Table and figures - By the word Table, is meant tabulated numerical data in the body of the project report as well as in the appendices. All other non-verbal materials used in the body of the project work and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

4. TYPING INSTRUCTIONS:

The impression on the typed copies should be black in colour.

One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style „Times New Roman‟ and Font size 14.

* * * * *

(A typical Specimen of Cover Page & Title Page)
<Font Style Times New Roman – Bold>

TITLE OF PROJECT REPORT

<Font Size 18><1.5 line spacing>

A PROJECT REPORT
<Font Size 14>

Submitted by
<Font Size 14><Italic>

NAME OF THE CANDIDATE(S)
<Font Size 16>

in partial fulfillment for the award of the degree

of

<Font Size 14><1.5 line spacing><Italic>

BACHELOR OF TECHNOLOGY
<Font Size 16>

IN

INFORMATION TECHNOLOGY
<Font Size 14>

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING
<Font Size 12>
ANDHRA UNIVERSITY AUTONOMOUS COLLEGE OF ENGINEERING
< Font Size 14>
ANDHRA UNIVERSITY : VISAKHAPATNAM - 530003

<Font Size 16><1.5 line spacing>

MONTH & YEAR

<Font Size 14>

SPECIMEN

SOME PERFORMANCE ASPECTS CONSIDERATIONS OF A CLASS OF ARTIFICIAL NEURAL NETWORK

A PROJECT REPORT

Submitted by

SANDHY. A

GAYATHRI. R

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

in

INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

ANDHRA UNIVERSITY AUTONOMOUS COLLEGE OF ENGINEERING

ANDHRA UNIVERSITY:: VISAKHAPATNAM-530 003

MAY 2005

(A typical specimen of Bonafide Certificate)
<Font Style Times New Roman>

ANDHRA UNIVERSITY : VISAKHAPATNAM-530 003

<Font Style Times New Roman – size -18>

BONAFIDE CERTIFICATE

<Font Style Times New Roman – size -16>

<Font Style Times New Roman – size -14>

Certified that this project report **"……….TITLE OF THE PROJECT……………..."** is the bonafide work of "**…………..NAME OF THE CANDIDATE(S)…………"** who carried out the project work under my supervision.

<<Signature of the Head of the Department>>	<<Signature of the Supervisor>>
SIGNATURE	**SIGNATURE**
<<Name>>	<<Name>>
HEAD OF THE DEPARTMENT	**SUPERVISOR**
	<<Academic Designation>>
<<Department>>	<<Department>>
<<Full address of the Dept & College >>	<<Full address of the Dept & College >>

(A typical specimen of table of contents)
<Font Style Times New Roman>

TABLE OF CONTENTS

APPLIED PHYSICS

(for ECE, EEE &Mech)

ECE122 **Credits :3**

Instruction: 3 Periods & 1 Tut/Week Sessional Marks :40

End .Exam :3 Hours End-Exam-Marks:60

CourseObjectives:

- To enhance student's knowledge of theoretical and modern technological aspects in physics and to introduce fundamentals of physics relevant to engineering applications
- To introduce advances in technology for engineering applications

Course Outcomes:

By end of the course, student will be able to:	
1.	Correlate the theoretical principles with experimental observations
2.	Identify engineering materials for specific engineering applications
3.	Apply the knowledge of advanced materials for engineering applications

SYLLABUS

UNIT I

Magnetic materials: Definition of magnetic permeability, magnetization and magnetic susceptibility, origin of magnetic moment, classification of magnetic materials, properties of diamagnetic and paramagnetic materials, ferromagnetic materials - hysteresis curve , domain theory of ferromagnetism, soft and hard ferromagnetic materials, anti-ferromagnetic and ferrimagnetic materials , ferrites and its applications

Superconductivity: Introduction, properties of superconductors, effect of temperature and magnetic field, Meissner effect, flux quantization , type – I and type – II superconductors high temperature superconductors, applications of superconductors, BCS theory (qualitative)

UNIT II

Dielectric materials: Definition of electric dipole moment, dielectric polarization and dielectric constant, types of polarization – electronic, ionic and oriental polarization, expression for polarisability, internal fields in solids, Classius – Mossotti equation, frequency dependence of electronic polarization ,properties of ferroelectric materials and their applications

UNIT III

Nanophase materials: Introduction to nanophase materials, properties of nanophase materials, synthesis of nanophase materials – chemical vapour deposition, sol-gel method, MEChanical attrition method, applications of nanophase materials. Principles of X-Ray florescence X-Ray Diffraction- Electron Microscopy (SEM and TEM)

UNIT IV

Crystal structure: Introduction, fundamental terms of crystallography – space lattice, , crystal lattice, unit cell, planes, seven crystal systems – Bravias lattices, cubic lattices, crystal directions and planes, Miller indices, interplanar spacing and interatomic distance , some simple crystal structures, body-centered cubic crystals, face-centered cubic crystals

UNIT V

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Fermi level, carrier concentration in intrinsic semiconductor, continuity equation, direct and indirect band gap semiconductors. Lorentz force, Hall effect and its applications.

Physics of semiconductor devices: open circuited p-n junction diode, energy diagram of p-n diode, working of a diode, volt-ampere characteristics of p-n junction, diode as a rectifier, light emitting diode (LED) , liquid crystal display (LCD), photodiode

TEXTBOOKS:

1. S.L Gupta and SanjeevGupta*Engineering physics*DhanpatRai publications.
2. M.N. Avadhanulu&P.G.Kshirasagar*A text book of engineering physics*, S.Chand publication

REFERENCE BOOKS:

1. V.Rajendran*Engineering physics* Tata McGraw Hill Education Private Limited
2. DattuRamanlal Joshi *Engineering Physics* Tata McGraw Hill Education Private Limited
3. A.Marikani*Engineering Physics* PHI Learning Private Limited

OBJECT ORIENTED PROGRAMMING WITH C++ LAB

(Common for all branches)

ECE 128 **Credits:3**

Instruction : 1Tut/Week & 3Practical / week Sessional Marks :50

End Exam:3Hrs End Exam. Marks : 50

Course Objective:

- To introduce Object Oriented Programming (OOP) using the C++ Language.
- To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS:

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics,
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction,
5. Objects,
6. Operator Overloading,
7. Inheritance,
8. Virtual Functions & Polymorphism,
9. I/O Streams,
10. Templates,
11. File Processing,
12. Exception Handling Concepts

REFERENCE BOOKS:

1. Mahesh Bhave , Sunil patekar*Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2nd Edition New Age International Publishers
3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999
4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition , McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.

2. Write a C++ program to find both the largest and smallest number in a list of integers.

3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments

4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation

5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions:
   void setlength(float) to set the length data member
   void setwidth(float) to set the width data member
   float perimeter() to calculate and return the perimeter of the rectangle
   float area() to calculate and return the area of the rectangle
   void show() to display the length and width of the rectangle
   intsameArea(Rectangle) that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.
   1. Write the definitions for each of the above member functions.
   2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.
   3. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following
   i. Veena, guitear, sitar, sarod and mandolin under string
   ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind
   iii. Table, mridangam, bangos, drums and tambour under perc

   It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

   - String instruments
   - Wind instruments
   - Percussion instruments

   The show method should display the relevant details according to user choice .the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to “blue” and “wagon”. there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message “Beautiful music fills the passenger compartment” execute the methods to show the messages
    1. Mycar is a blue wagon
    2. My father’s car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters -- a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively.
10. Write a C++ program to perform operations on complex numbers using operator overloading
11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT".
    Example:
    If the file "STORY.TXT" contains the following lines,
    The rose is red.
    A girl is playing there.
    There is a playground.
    An aeroplane is in the sky.
    Numbers are not allowed in the password.

    The function should display the output as 3

ENGINEERING MATHEMATICS –III	
ECE 211	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1.	Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrrotational vector fields.
2.	Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
3.	Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
4.	Understand the methods to solve the Laplace, heat, and wave equations.
5.	Gain good knowledge in the application of Fourier Transforms.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	2	-	-	-	-	-	-	-	-	-	2	2	-	3
	2	3	1	-	-	-	-	-	-	-	-	-	2	2	-	3
	3	3	1	-	-	-	-	-	-	-	-	-	2	2	-	3
	4	3	2	-	-	-	-	-	-	-	-	-	2	2	-	3
	5	3	2	-	-	-	-	-	-	-	-	-	2	2	-	3

SYLLABUS

UNIT-I VECTOR DIFFERENTIATION **12 Periods**

Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT-II VECTOR INTEGRATION **12 Periods**

Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS **12 Periods**

Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT –IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12 Periods**

Introduction – Method of separation of variables – Vibrations of a stretched string- Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT-V FOURIER TRANSFORMS **12 Periods**

Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2001.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

DATA STRUCTURES	
ECE 213	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Demonstrate the knowledge in problem solving techniques.
2	Write programs for different data structures
3	Implement different applications using tree structures.
4	Implement various sorting techniques
5	Apply and implement learned algorithm design techniques and data structures to solve problems using Graphs.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	2	1									2	-	-	2
	2	2	1	-									2	-	-	2
	3	1	-	1									2	-	-	2
	4	1	-	1									2	-	-	2
	5	2	2	1									2	-	-	2

SYLLABUS

UNIT I

ARRAYS AND STACKS **12-Periods**

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Sparse Matrices.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix & Prefix expressions using stack, Recursion, Towers Of Hanoi Problem.

UNIT II

QUEUES AND LINKED LIST **12 –Periods**

Queues: Array representation and implementation of queues, Operations on Queue: Insert, Delete, Full and Empty. Circular queue, De-queue, and Priority Queue, Applications of Queues.

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Insertion and deletion to/from Linked Lists, Doubly linked list, Circular Doubly linked list, Implementing priority queue using Linked List, Polynomial Representation using Linked list & addition.

UNIT III

TREES AND SEARCHING **12-Periods**

Trees: Basic terminology, Binary Trees, Binary tree representation, Almost Complete Binary Tree, Complete Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees.

Searching: Sequential search, binary search, Interpolation Search, comparison and analysis, Hash Table, Hash Functions.

UNIT IV

BINARY SEARCH TREES AND BASIC SORTING TECHNIQUES **12-Periods**

Sorting: Insertion Sort, Bubble Sort, Selection sort, Merge Sort.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL Trees.

UNIT V

GRAPHS **10-Periods**

Graphs: Terminology & Representations- Graphs, Directed Graphs, Adjacency Matrices, Path OR Transitive Closure of a Graph, Warshall's Algorithm, Shortest path Algorithm-Dijkstra's Algorithm, Connected Component and Spanning Trees, Minimum Cost Spanning Trees,Graph Traversals.

Text Books

1. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", Pearson Education, 2nd Edition, 1995.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.

References:

1. E.Horowitz and Sahani, "Fundamentals of Data Structures"
2. C Programming and Data structures, P. Padmanabham, 3rd Edition, BS publications..
3. S. Lipschutz, "Data Structures", McGraw Hill, 1986.
4. Programming in C , P. Dey & M. Ghosh, Oxford Univ. Press.
5. ISRD Group, "Data Structures through C++", McGraw Hill, 2011.

SIGNALS AND SYSTEMS	
ECE 214	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Apply transformations on the independent variable of the given CT and DT signals and analyze the properties of CT and DT signals and systems.
2	Represent mathematically the CT and DT LTI systems and determine the response of an LTI system for the given input signal using either convolution integral or convolution sum.
3	Represent CT and DT signals and systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
4	Represent the CT signals in terms of its samples and reconstruct using interpolation.
5	Represent DT signals in the Frequency domain and analyze DT systems using Z-Transforms and analyze CT signal and systems using Laplace transforms

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	1	-	-	-	-	-	-	-	-	-	-	2	2	-
	2	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
	3	2	1	-	-	-	-	-	-	-	-	-	-	3	2	-
	4	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
	5	2	1	-	-	-	-	-	-	-	-	-	-	2	2	-

SYLLABUS

Unit- I Introduction to Signals and Systems 10 Periods

Continuous-Time (CT) signals and Discrete-Time (DT) signals and their representation, commonly used CT and DT signals: impulse, step, pulse, ramp and exponentials, classification of CT and DT signals: periodic and aperiodic, even and odd, energy signals and power signals, operations on CT and DT signals- addition, subtraction, multiplication, differentiation and integration of CT signals, convolution and correlation of two signals (CT& DT), properties of convolution operation. Time-shifting and time-scaling of CT and DT signals, classification of CT and DT systems: static and dynamic, linear and non-linear,time- invariant and time-varying, basic concepts like causality,stability and invertability of systems.

Unit-II Linear Time-Invariant Systems 10 Periods

CT and DT type of LTI systems, impulse response function and unit-sample response sequence, Input-Output relation through convolution summation/ integral, characterization of CT and DT types of LTI systems, impulse response function/ sequence and causalitity of LTI systems, interconnectected LTI systems (CT and DT), CT type of LTI systems described by Linear constant coefficient differential equations, DT type LTI systems described by constant coefficient linear difference equations, BIBO stability of LTI systems (CT and DT types).

Unit III Analysis of CT Signals and Systems 12 Periods

Fourier series analysis of CT Signals, CT Fourier transform(FT) and its inverse; magnitude and phase spectra, FT using impulses, FT as a particular case of Laplace Transform(LT), FT and LT in CT system analysis, magnitude and phase responses of CT type LTI systems, block diagram representation of Linear Differential Equations with constant coefficients, pole-zero locations, causality (Paley- Wiener Criterion)and stability, distortionless transmission of signals through CT type LTI systems.

EMPLOYABILITY

Unit IV Analysis of DT Signals and Systems 15 periods

Discrete –time Fourier transform(DTFT) & inverse DTFT; convergence of DTFT and IDTFT; DTFT properties and theorems, discrete Fourier transform (DFT)& inverse DFT; properties and theorems, circular convolution, Z-Transform(ZT) & its properties & theorems, inverse ZT, inversion methods power series, PFE and Residue methods, solution of difference equations using ZT, distortionless transmition through DT type of LTI systems, ROCs of right-sided, left sided and finite duration sequences, relationship between ZT, DTFT and DFT.

Application of ZT, DTFT and DFT in DT signal and system analysis, DT system function, transfer function, poles and zeros, stability, block diagram representation of difference equations, processing of CT signals using DFT.

EMPLOYABILITY

Unit V Sampling of Lowpass and Bandpass Signals 10 periods

Lowpass sampling theorem and its proof, types of sampling: impulse sampling, natural sampling and flat-top sampling, spectra of sampled vertions, aliasing, Nyquist rate, anti-aliasing filter, reconstruction of band – limited lowpass signal from its samples, aperture effect due to flat- top sampling, reconstruction filters and zero – order hold(ZOH), sampling of bandpass signals and bandpass sampling theorem.

Text Books :

1. A.V. Oppenheim, AS Willsky and S.H. Nawab: Signals and Systems, Pearson.
2. S.Haykin and B.V Veen: Signals and Systems, John Wiley

References:

1. P. Ramakrishna Rao and Shankar Prakriya : Signals and Systems, second addition, McGraw Hill (India) pvt Ltd. 2013
2. Nagoor Kani: Signals and Systems, McGraw Hill
3. E.W Kamen and B.S.Heck: Fundamentals of Signals and Systems using the Web and Matlab, Pearson.
4. P. Ramesh Babu and R. Anandanatarajan: Signals and Systems 4/e, Scitech.
5. K. Raja Rajeswari and B. Visveswara Rao: Signals and Systems , PHI.

NETWORK ANALYSIS AND SYNTHESIS	
ECE 215	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Apply basic network theorems and analyze both D.C and A.C. circuits.
2	Determine various parameters of two port networks.
3	Analyze circuits under resonant condition.
4	Calculate natural and forced response of RL, RC & RLC circuits
5	Measure real, reactive, apparent power in three phase circuits.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	1	1										3	1	-
	2	3	1	2										1	1	-
	3	2	2	2										3	2	2
	4	3	1	2										1	-	1
	5	2	2	3										2	1	2

SYLLABUS

UNIT-I

ANALYSIS OF DC CIRCUITS **10 periods**

Active Element, Passive Element, Reference Directions For Current and Voltage, Kirchoff's Laws, Voltage and Current Division, Nodal Analysis, Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's Theorems, Source Transformation.

UNIT-II

DC TRANSIENTS **12 periods**

Inductor, Capacitor, Source Free RL, RC & RLC Response, Evaluation of initial Conditions, Application of Unit-Step Function to RL, RC & RLC Circuits, Concepts of Natural, Forced and Complete Response.

UNIT-III

SINUSOIDAL STEADY-STATE ANALYSIS **14 periods**

The Sinusoidal Forcing Function, Phasor, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to A.C. Circuits.

UNIT-IV

RESONANCE &COUPLEDCIRCUITS **12periods**

Balanced Three Phase Circuits, Resonance, Concept of Duality. Coupled Circuits: Magnetically Coupled Circuits, Dot Convention.

UNIT-V

NETWORK SYNTHESIS **10 periods**

Elementary synthesis operation, LC network synthesis, Properties of RC network functions, Foster and Cauer forms of RC and RL networks.

Text books:

1. W.H. HAYT Jr & J.E. KEMMERLY, "ENGINEERING CIRCUIT ANALYSIS, 5th Edition, Mc. Graw Hill Pub.
2. M.E. VAN VALEKNBURG, "NETWORK ANALYSIS", 3rd Edition, PHI Learning.

Reference book:

1. Circuits and Networks by A. Sudhakar Shyammohan S Palli, 4th Edition, TMH Publication.

ELECTRONIC CIRCUITS AND ANALYSIS-I	
ECE 216	**Credits:4**
Instruction: 4 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Determine the performance parameters like current gain, voltage gain, input impedance, output impedance using the models such as h-parameter model, simplified CE h – parameter model and **π-**model.
2	Analyze the frequency response characteristics of single stage and multistage amplifier circuits (i.e. given a lower cut off, upper cut-off frequencies of an amplifier determining the coupling and bypass capacitor values) and different circuit configurations for improving the transistor amplifier characteristics such input impedance, voltage gain etc.
3	Analyze the response of linear wave shaping circuits such as high pass and low pass filter circuits for different types of inputs such as step input, pulse input, square input ramp input.
4	Analyze the response of Non-linear wave shaping circuits such as clipping and clamping circuits when the sinusoidal input is applied and to design two level clipping circuits in order to select the desired portion of the input signal.
5	Determine the stable state voltages and currents and design the various multivibrators to meet the given specifications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	2	-	-	-	-	-	-	-	-	-	-		-	2
	2	3	2	2	-	-	-	-	-	-	-	-	-		-	2
	3	3	2	-	-	-	-	-	-	-	-	-	-		-	-
	4	3	2	-	-	-	-	-	-	-	-	-	-		-	-
	5	3	2	2	-	-	-	-	-	-	-	-	-		-	2

SYLLABUS

Unit-I

Transistor at low frequencies and high frequencies **12 periods**

Graphical analysis of CE configuration, Two port devices and hybrid model, Transistor hybrid model, h-parameters, conversion formulas of three transistor configurations, Analysis of transistor amplifier circuit using h-parameters, the emitter follower, Millers theorem and its dual, cascading transistor amplifiers, simplified CE hybrid model, high input resistance transistor circuits, hybrid- π CE transistor model, hybrid- π conductance, hybrid- π capacitances, validity and variation of hybrid- π parameters.

SKILL DEVELOPMENT

Unit-II

Multistage Amplifiers **8 periods**

Classification of amplifiers, Distortion in amplifiers, Frequency response of an amplifier, The RC coupled amplifier-low frequency response, high frequency response of two cascaded CE stages, Band- pass of cascaded stages, Cascode amplifiers, Multistage CE amplifier cascade at High frequencies.

Unit-III

Linear wave shaping **12 periods**

The high pass RC circuit, High pass RC circuit as a differentiator, Double differentiation, The low pass RC circuit, Low pass RC circuit as an integrator, attenuators, RL and RLC circuits.

Unit-IV

Clipping and Clamping Circuits **12 periods**

Diode Clippers, The transistor clipper, Clipping at two independent levels, Cathode coupled and emitter coupled clipper, Compensation for temperature changes, comparators, breakaway diode and amplifier, diode differentiator comparator, accurate time delays, applications of voltage comparator, The clamping operation, clamping circuit taking source and diode resistance into account, Clamping circuit theorem, Practical clamping circuits, effect of diode characteristics on clamping voltage, Synchronized clamping.

SKILL DEVELOPMENT

Unit-V

Multivibrators **12 periods**

Stable stages of a binary, fixed bias transistor binary, self bias transistor binary, commutating capacitors, methods of improving resolution, emitter coupled binary, Schmitt trigger circuit, the monostable multivibrator, emitter coupled monostable multivibrator, astable emitter coupled multivibrator.

SKILL DEVELOPMENT

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.[unit1,unit2]
2. Jacob Millman & Herbert Taub, “Pulse Digital & Switching Waveforms” McGraw-Hill Book Company Inc.[unit3,unit4,unit5]

References:

1. Donald A. Neamon, “Electronic Circuit Analysis and Design”, 2nd Edition. TMH publications.

ELECTRONIC CIRCUITS AND ANALYSIS-I LABORATORY	
ECE 217	**Credits:2**
Instruction: 3 Practical's / Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Course Outcomes:

By the end of the course student should be able to:	
1	Measure the important parameters of a PN diode and to implement for various Applications.
2	Design and construct different rectifier and voltage regulation circuits used in regulated Power supplies.
3	Design amplifier circuits for specific applications, based on their input and output Characteristics of BJT and FET.
4	Design and verify the output of linear wave shaping circuits for different inputs.
5	Design and analyze different multivibrator circuits.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	1	-	1	3	2	-	-	-	-	-	-	-	2	2	1
	2	2	-	2	3	2	-	-	-	-	-	-	-	2	2	1
	3	2	-	2	3	2	-	-	-	-	-	-	-	2	2	1
	4	2	-	2	3	2	-	-	-	-	-	-	-	2	2	1
	5	2	-	2	3	2	-	-	-	-	-	-	-	2	2	1

LIST OF EXPERIMENTS

Cycle-I Design and simulation using MultiSim software

1. Plot the V-I characteristics of a PN diode in forward and reverse bias and find the static, dynamic resistances and the reverse saturation current.
2. Plot the V-I characteristics and regulation characteristics of a Zener diode in reverse bias.
3. Plot the output waveforms of a halfwave rectifier and find the ripple factor.
4. Plot the output waveforms of a fullwave rectifier using 2 diodes.
5. Plot the output waveforms of a Bridge rectifier and find the ripple factor.
6. Low pass and High pass circuits
7. Clippers and Clampers circuit
8. Plot the input and output characteristics of CE configured transistor and to find the h-parameter values from the characteristics.
9. Plot the input and output characteristics of CB configured transistor and to find the h-parameter values from the characteristics.
10. Plot the input and output characteristics of CC configured transistor and to find the h-parameter values from the characteristics.
11. Plot the drain and transfer characteristics of a JFET.
12. Plot the frequency response of a single stage CE amplifier.

SKILL DEVELOPMENT

13. Plot the frequency response of a single stage CC amplifier.
14. Verify the working of a BJT as a switch.
15. Frequency Response of a RC coupled multistage amplifier
16. Study the operation of a Bistable multivibrator and observe the switching action.
17. Astable Multivibrator
18. Monostable Multivibrator
19. Observe the hysteresis loop of a Schmitt trigger circuit
20. Design and implement a DC regulated power supply.

Cycle-II (Hardware experiments)

1. Plot the V-I characteristics of a PN diode in forward and reverse bias and find the static, dynamic resistances and the reverse saturation current.
2. Plot the V-I characteristics and regulation characteristics of a Zener diode in reverse bias.
3. Plot the output waveforms of a halfwave rectifier and find the ripple factor.
4. Plot the output waveforms of a fullwave rectifier using 2 diodes.
5. Plot the output waveforms of a Bridge rectifier and find the ripple factor.
6. Plot the input and output characteristics of CE configured transistor and to find the h-parameter values from the characteristics.
7. Plot the input and output characteristics of CB configured transistor and to find the h-parameter values from the characteristics.
8. Plot the drain and transfer characteristics of a JFET.
9. Verify the working of a BJT as a switch.
10. Plot the frequency response of a single stage CE amplifier.
11. Plot the frequency response of a single stage CC amplifier.
12. Study the operation of a Bistable multivibrator and observe the switching action.
13. Observe the hysteresis loop of a Schmitt trigger circuit

SKILL DEVELOPMENT

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
2. Jacob Millman & Herbert Taub, “Pulse Digital & Switching Waveforms” McGraw-Hill Book Company Inc.

References:

1. Donald A. Neamon, “Electronic Circuit Analysis and Design”, 2nd Edition. TMH publications.

NETWORK & EM LABORATORY	
ECE 218	**Credits:2**
Instruction: 3 Practical's / Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Course outcomes:

By the end of the course student should be able to:	
1	Conduct the experiments based on basic network theorems.
2	Predict the characteristics of D.C machines and single phase transformers
3	Predict the regulation of an alternator.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	1	1	3	-	1	-	-	-	-	-	-	3	-	2
	2	3	2	-	3	-	2	-	-	-	-	-	-	2	1	1
	3	2	1	1	3	-	1	-		-	-	-	-	2	1	1

LIST OF EXPERIMENTS

CYCLE-I: Networks Lab

1. To obtain filament lamp characteristics.
2. Verification of KCL & KVL.
3. Verification of superposition theorem.
4. Verification of Thevenin's and Norton's theorem.
5. Determination of two port network parameters.

CYCLE-II: Electrical Machines Lab

1. O.C.C & Load characteristics of D.C shunt generator.
2. Swinburne's test on D.C. shunt machine.
3. Brake test on D.C. shunt motor.
4. O.C. & S.C test on a single phase transformer.
5. Brake test on 3-phase induction motor.
6. Regulation of alternator by e.m.f. method.

Textbooks:

1. W.H.Haytjr & J.E.Kemmerly , "Engineering Circuit Analysis" , 5th Edition, Mc. Graw Hill Pub.
2. J.B. Gupta, "Theory and Performance of Electrical Machines" ,S. K. Kataria& Sons, 2009

ENGINEERING MATHEMATICS –IV	
ECE 221	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Understand, interpret and use the basic concepts: Analytic function, harmonic function, Taylor and Laurent Series, Singularity, Residues and evaluation of improper integrals.
2	Familiarize the concepts of Finite Differences and Interpolation techniques.
3	Familiarize the concept of Differentiation and Integration by numerical methods.
4	Understand the characteristics and properties of Z-transforms and its applications.
5	Analyze the Statistical data by using statistical tests and to draw valid inferences about t population parameters.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	2	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	4	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	5	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1

SYLLABUS

UNIT-I FUNCTIONS OF A COMPLEX VARIABLE 14 Periods

Introduction –Limit of a Complex function- Derivative of $f(z)$ – Analytic functions-Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms (Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function - Residues - Calculation of Residues - Evaluation of Real Definite Integrals (Integration around the unit circle, Integration around the small semi circle , Indenting the Contours having poles on the real axis).

Geometric representation of $f(z)$, Some standard transformation

($w = z + c, w = cz , w = \frac{1}{z}$, $w = \frac{az+b}{cz+d}$) .

UNIT-II FINITE DIFFERENCES & INTERPOLATION 12 Periods

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNIT-III NUMERICAL DIFFERENTIATION AND INTEGRATION 10 Periods

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule , Simpson's Three-Eighth rule.

UNIT - IV Z – TRANSFORMS 12 Periods

Introduction – Definition - Some Standard Z-Transforms –Linearity Property –Damping Rule – Some Standard Results - Shifting U_n to the right , Shifting U_n to the left – Two basic theorems (Initial Value Theorem and Final Value Theorem) – Convolution Theorem – Convergence of Z-transforms – Two sided Z - transform of U_n - Evaluation of inverse Z- transforms (Power Series Method , Partial Fraction Method , Inverse integral method) - Applications to Difference equations.

UNIT-V SAMPLING THEORY 12 Periods

Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. N.P. Bali Etal, "A Text book on Engineering Mathematics", Laxmi pub.(p) Ltd , 2011.
2. H.K.Dass "Advanced Engineering Mathematics", S.Chand Publications, 2007.
3. Erwin kreyszig, "Advanced Engineering Mathematics", John Wiley Publications, 1999.

ELECTRONIC CIRCUITS AND ANALYSIS-II	
ECE 222	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Analyze negative feedback amplifiers and sinusoidal oscillators for different performance metrics such as input impedance, output impedance, voltage gain, condition for oscillations, frequency of oscillations etc.
2	Determine the resonant frequency for the tuned voltage amplifiers and analyze class-A, class-B, class-AB , class-C amplifiers for efficiency.
3	Analyze current mirror differential amplifier circuits using BJTs.
4	Design and analyze analog circuits like integrator, differentiator, comparator, instrumentation amplifier and logarithmic amplifier using op-amps.
5	Analyze the response of common source, common drain and common gate amplifiers with enhancement and depletion loads.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	2	-	-	-	-	-	-	-	-	-	-			1
	2	3	2	-	-	-	-	-	-	-	-	-	-			1
	3	3	2	-	-	-	-	-	-	-	-	-	-			1
	4	3	2	2	-	-	-	-	-	-	-	-	-			2
	5	3	2	-	-	-	-	-	-	-	-	-	-			1

SYLLABUS

Unit-I

Feedback Amplifiers **14 Periods**

Classification of amplifiers, the feedback concept, general characteristics of negative feedback, effect of negative feedback on input and output impedance, Method of analysis of feedback amplifiers,

Oscillators

Sinusoidal oscillators, Phase shift oscillators, Resonant circuit oscillators, General form of oscillator circuit, The wien bridge oscillator, crystal oscillators, Frequency stability.

SKILL DEVELOPMENT

Unit-II

Tuned voltage amplifiers **10 Periods**

Introduction, need for tuned voltage amplifiers, operation of single tuned, double tuned and stagger tuned amplifiers.

Power Amplifiers

Class A Large Signal amplifiers, Second Harmonic Distortion, Higher order Harmonic Distortion, The Transformer coupled audio power amplifier, Efficiency, Push-Pull amplifiers, Class B Amplifiers, Class AB operation, Class C amplifier.

Unit-III

Differential amplifiers **10 Periods**

The Differential amplifier, Basic BJT differential pair, DC transfer characteristic, small signal equivalent circuit analysis, differential and common mode gain, differential and common mode impedances, Bipolar transistor current sources, two transistor current sources, improved current source circuits, Widlar current source, multi transistor current mirrors.

SKILL DEVELOPMENT

Unit-IV

Applications of Operational Amplifiers: **10 Periods**

Review of basics of Op-Amp, Basic op-amp applications, Differential DC amplifier, Stable AC coupled amplifier, Analog Integration and differentiation, comparators, sample and hold circuits, Precision AC/DC converters, Logarithmic amplifiers, waveform generators, regenerative comparators, Instrumentation amplifier.

Unit-V

FET Amplifiers **12 Periods**

MOSFET DC circuit analysis, The MOSFET amplifier - small signal equivalent circuit, Common source amplifier, source follower amplifier, Common Gate amplifier, NMOS amplifiers with enhancement load, depletion load and PMOS load, CMOS source follower and common gate amplifiers.

SKILL DEVELOPMENT

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.[unit-1,unit-2,unit-4]
2. Donald A. Neamon, "Electronic Circuit Analysis and Design", 2nd Edition. TMG publications. [unit-3,unit-5]

References:

1. Ramakanth A Gayakwad, "Op-Amps and Linear Integrated Circuits"- 4th Edition.

DIGITAL ELECTRONICS	
ECE 223	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Perform number conversions between different number systems and codes and apply Boolean algebra to minimize logic expressions up to three variables.
2	Analyze the characteristics of logic families and compare their performance in terms of performance metrics.
3	Apply tabulation method to minimize logic expressions up to Five variables and design a combination logic circuit like decoders, encoders, multiplexers, and de-multiplexers etc. for a given specification and verify the correctness of the design.
4	Analyze the operation of sequential circuits built with various flip-flops by finding the Boolean function or truth table and design various sequential circuits like flip-flops, registers, counters etc.
5	Design of sequential detector by constructing a state/output tables or diagrams from a word description or flow chart specification of sequential behavior using either mealy and/or Moore machines.,,

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	1	1	1	-	-	-	-	-	-	-	-	-	3	-	2
	2	1	2	2	-	-	-	-	-	-	-	-	-	3	-	2
	3	1	2	2	-	-	-	-	-	-	-	-	-	3	-	2
	4	1	2	2	-	-	-	-	-	-	-	-	-	3	-	2
	5	1	2	2	-	-	-	-	-	-	-	-	-	3	-	2

SYLLABUS

UNIT-I **10 periods**

NUMBER SYSTEMS: Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers, Binary codes: weighted and non-weighted, Error detecting and correcting codes -- Hamming codes.

BOOLEAN ALGEBRA: Basic definitions, Axiomatic Definitions, Theorems and properties, Boolean Functions, Canonical and standard forms.

UNIT-II **10 periods**

LOGIC FAMILIES

Binary Logic, AND, OR, NOT, NAND, NOR, EX-OR and Equivalence gates. Introduction, Specifications of digital circuits, RTL and DTL circuits, Transistor-Transistor Logic (TTL), Emitter Coupled Logic (ECL), MOS, CMOS circuits, Performance comparison of logic families.

UNIT-III **14 periods**

GATE-LEVEL MINIMIZATION

The Map Method: Two variable map, Three variable map, four variable map, Prime Implicants, Don't care conditions, NAND and NOR implementation, Exclusive-OR Function, Parity Generation and Checking, Variable Entered Mapping (VEM): Plotting Theory, Reading Theory, Quine-Mccluskey (QM) Technique.

Skill Development

COMBINATIONAL LOGIC

Combinational circuits, Analysis Procedure, Design procedure, Binary Adder-Subtractor, Decimal adder, carry look ahead adder, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, ROM, PLA, PAL.

UNIT-IV Skill Development **14 periods**

SYNCHRONOUS SEQUENTIAL LOGIC

Block diagram of sequential circuit, Latches, Flip-flops, Triggering of Flip-flops, Flip-flop excitation tables, Analysis of clocked sequential circuits, State equations, state table, state diagram, analysis with D, JK and T-Flip-flops, state machines, state reduction and assignment, Design procedure.

Skill Development

REGISTERS AND COUNTERS

Registers, Shift registers, universal shift register Ripple counters, Synchronous counters, counter with unused states, Ring counters, Johnson counter.

UNIT-V **12 periods**

ASYNCHRONOUS SEQUENTIAL LOGIC

Analysis Procedure, Circuits with latches, Design procedure, Reduction of state and flow tables, cycles, Race-Free state Assignment, Hazards, Design example.

Text Books:

1. M. Morris Mano, Digital Design, 3rd Edition, Pearson Publishers, 2001.
2. Z Kohavi, Switching and Finite Automata Theory, 2nd edition, TMH, 1978

Reference Books:

1. William I. Fletcher, An Engineering Approach to Digital Design, PHI, 1980.
2. John F. Wakerly, Digital Design Principles and Practices, 3rd Edition, Prentice Hall, 1999.
3. Charles H Roth Jr and Larry L. Kinney, Fundamentals of Logic Design, Cengage learning, 7th Edition, 2013
4. R.P Jain, Modern Digital Electronics, 3rd Edition, TMH, 2003.

PROBABILITY THEORY AND RANDOM PROCESSES	
ECE 224	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Calculate probabilities and conditional probabilities of events defined on a sample space.
2	Compute statistical averages of one random variables using probability density and distribution functions and also transform random variables from one density to another
3	Compute statistical averages of two or more random variables using probability density and distribution functions and also perform multiple transformations of multiple random variables.
4	Determine stationarity and ergodicity and compute correlation and covariance of a random process.
5	Compute and sketch the power spectrum of the response of a linear time-invariant system excited by a band pass/band-limited random process.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3		3								2	2	2	1
	2	3	3		3								2	2	2	1
	3	3	3										2	2	2	1
	4	3	3										2	2	2	1
	5	3	3										1	2	2	1

SYLLABUS

UNIT-I Probability and Random Variable **12Periods**

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

UNIT –II Distribution & Density Functions and Operation on One Random Variable
12 Periods

Distribution & Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, and Properties.

Operation on One Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and

Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III Multiple Random Variables and Operations **12 Periods**

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV Random Process - Temporal Characteristics **12 periods**

Introduction, The Random Process Concept: Classification of Process, Deterministic and Nondeterministic Process. Stationary and Independence: Distributions and Density Functions, Statistical Independence, First-order Stationary Process, Second-Order and Wide-sense Stationary, N-Order and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Process, Correlation-Ergodic Process. Correlation Functions: Autocorrelation Functions and Its Properties, Cross-correlation Functions and its properties, Covariance Functions, Discrete-Time Process and Sequences. Measurement of Correlation Functions, Guassian Random Process, Poisson Random Process, Complex Random Process.

Employability

UNIT-V Spectral Analysis **12 periods**

The Power Spectrum, Linear System, Hilbert Transform, Discrete Time Process, Modulation: Rice's Representation, Band pass processes, Band limited Processes and Sampling Theory.

Employability

Text Book:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, McGraw Hill.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, McGraw Hill, 4th Edition, 2002.

Reference Book:

1. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand and Co. New Delhi, 1998 (2nd Edition).
2. Probability, Statistics, and Random Processes for Engineers- Henry Stark & John W. Woods, 4Ed, 2012, Pearson
3. Introduction to Random Signals and Noise, Davenport W. B. Jrs. and W. I. Root, McGraw Hill N.Y., 1954.

ELECTROMAGNETIC FIELD THEORY & TRANSMISSION LINES	
ECE 225	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Apply vector calculus to static electric fields in different engineering situations
2	Solve the problems related to magnetostatic fields by applying magnetostatic laws.
3	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
4	Analyze the phenomena of wave propagation in different media.
5	Apply the concepts of transmission line and use smith chart to find various parameters useful to design a matching circuits at radio frequency

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	2	1									2	2	2	1
	2	3	2	1									2	2	2	1
	3	3	2	1									3	2	2	2
	4	3	2	1									2	2	2	2
	5	3	2	3									3	2	2	3

SYLLABUS

UNIT I Electrostatics **14 periods**

Introduction to vector analysis, Fundamental of electrostatic fields, Different types of charge distributions, Coulomb's law and Electric field intensity**,** Potential function, Equi-potential surface, Electric field due to dipole; Electric flux density, Gauss's law and applications, Poisson's and Laplace's equations and its applications; Uniqueness theorem; Boundary conditions; Conductors & Dielectric materials in electric field; Current and current density, Relaxation time, Relation between current density and volume charge density; Dipole moment, Polarization, Capacitance, Energy density in an electric field.

UNIT II Steady Magnetic Fields **12 periods**

Introduction, Faradays law of induction, Magnetic flux density, Biot-Savart law, Ampere's circuit law, Magnetic Force, Magnetic Boundary conditions, Scalar and Vector magnetic potentials, Magnetization & Permeability in materials, Inductance, Energy density, Energy stored in inductor.

UNIT III Maxwell's Equations **10 periods**

Introduction, Faradays law, displacement current, Equation of continuity for the varying fields, inconsistency of Amperes circuit law, Maxwell's equations in integral form, Maxwell's equations in point form, retarded potentials Meaning of Maxwell's equations, conditions at a Boundary surfaces, Retarded potentials.

UNIT IV Electromagnetic Waves **10 periods**

Introduction, Applications of EM waves, solutions for free space condition ,; Uniform plane wave propagations uniform plane waves, wave equations conducting medium, sinusoidal time variations, conductors & dielectrics, Depth of penetration, Direct cosines, Polarization of a wave, reflection by a perfect conductor – Normal incidence, Oblique incidence, reflection by a perfect dielectric-Normal incidence, reflection by a perfect insulator – oblique, Surface impedance, Poynting vector and flow of power, Complex poynting vector.

Skill Development

UNIT V Transmission Lines **10 periods**

Types of transmission lines, Applications of transmission lines, Equivalent circuit of pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, lossless transmission lines, Distortionless line, Phase and group velocities, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient, Load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths - $\lambda/8, \lambda/4, \lambda/2$ lines, Losses in transmission lines, Smith chart and applications, Stubs, Double stubs.

Skill Development

Text Books:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Ed., 2000.

2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th Ed., 2006.

Reference Books:

1. G.S.N.Raju, Electromagnetic Field Theory And Transmission Lines, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2005.
2. M.N.O. Sadiku, " Principles of Electromagnetics", Oxford International Student edn., 4th edn., 2007.
3. G. Sasi Bhushana Rao, "Electromagnetic Field Theory andTransmission Lines", Wiley, India Pvt. Ltd, 2012.
4. Simon Ramo, et.al-, "Fields and waves in communication electronics", Wiley India Edn., 3rd Edn., 1994

CONTROL SYSTEMS	
ECE 226	**Credits:3**
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Course Outcomes:

By the end of the course student should be able to:	
1	Apply block reduction techniques and signal flow graphs
2	Apply mathematical modelling of mechanical and electrical systems
3	Analyze the given systems in time domain
4	Determine the relative and steady state stability of the systems
5	Analyze the systems in frequency domain

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	3	2	1	-	-	-	-	-	-	-	-	1	-	1	-	2
	4	2	1	-	-	-	-	-	-	-	-	1	-	1	-	2
	5	2	2	-	-	-	-	-	-	-	-	1	-	1	-	2

SYLLABUS

UNIT-I Introduction to Control Systems **12 Periods**

Transfer Functions of Linear Systems - Impulse Response of Linear Systems-Block Diagrams of Control Systems-Signal Flowgraphs (Simple Problems) - Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples).

UNIT-II Modeling of Control Systems **10 periods**

Introduction to Mathematical Modelling of Physical Systems - Equations of Electrical Networks - Modelling of Mechanical Systems - Equations of Mechanical Systems.

UNIT-III Time domain analysis **16 periods**

Time Domain Analysis of Control Systems - Time Response of First and Second Order Systems with Standard Input Signals-Steady State Performance of Feedback Control Systems-Steady State Error Constants-Effect of Derivative and Integral Control on Transient and Steadystate Performance of Feedback Control Systems.

UNIT-IV Concept of stability in time domain **12 periods**

Concept of Stability and Necessary Conditions for Stability - Routh - Hurwitz Criterion, Relative Stability Analysis, The Concept and Construction of Root Loci, Analysis of Control Systems With Root Locus (Simple Problems to Understand Theory)

UNIT-V Frequency domain analysis **14 periods**

Correlation Between Time and Frequency Responses - Polar Plots - Bode Plots - Log Magnitude Versus Phase Plots-All Pass and Minimum Phase Systems-Nyquist Stability Criterion-Assessment of Relative Stability-Constant M&N Circles.

Text books:

1. I.J. Nagrath & M.Gopal, "Control systems engineering", wiley eastern limited.
2. Benjamin C. Kuo, "Automatic control systems", prentice hall of India

References:

1. Ogata, "Modern control engineering", prentice hall of India.

ELECTRONIC CIRCUITS AND ANALYSIS-II LABORATORY	
ECE 227	**Credits:2**
Instruction: 3 Practical's /Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Course outcomes:

By the end of the course student should be able to:	
1	Design and identify the applications of feedback amplifiers and sinusoidal oscillators in different electronic circuits.
2	Design and implement different power amplifiers and tuned voltage amplifiers.
3	Calculate the parameters of BJT differential amplifier.
4	Apply op-amps fundamentals in design and analysis of op-amps applications.
5	Apply the MOSFET inverter in different electronic circuits.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	2	2	2	-	-	-	-	-	2	-	-	2	-	2
	2	2	2	2	2	-	-	-	-	-	2	-	-	2	-	2
	3	1	2	2	1	-	-	-	-	-	2	-	-	2	-	2
	4	2	2	3	2	-	-	-	-	-	2	-	-	2	-	2
	5	2	1	2	2	-	-	-	-	-	2	-	-	2	-	2

LIST OF EXPERIMENTS

1. Obtain the input and output impedance of a trans-conductance amplifier with and without feedback.
2. Obtain the frequency response of a voltage shunt negative feedback amplifier with and without feedback.
3. Generate a sinusoidal signal using Colpitts oscillator at a desired frequency.
4. Generate a sinusoidal signal using Wein bridge circuit.
5. Generate a sinusoidal signal using RC phase shift oscillator and observe the lissajous patterns at different phase shifts.
6. Plot the frequency response of a tuned voltage amplifier and find the resonant frequency.
7. Obtain the output waveforms of a class-B pushpull power amplifier and calculate the efficiency and distortion.
8. Obtain the output waveforms of a class-A transformer coupled power amplifier and calculate the power conversion efficiency.
9. Determine the gain and CMRR for the BJT differential amplifier.
10. Obtain the signals at the output junctions of multistage BJT differential pair.
11. Verify different applications of an Operational amplifier.
12. Verify different parameters of an operational amplifier.
13. Observe the working of an operational amplifier in inverting, non inverting and differential modes.
14. Plot the V-I characteristics of an n-channel enhancement MOSFET and verify its operation as an inverter.

SKILL DEVELOPMENT

SKILL DEVELOPMENT

15. Verify the working of a CMOS source follower amplifier.

Text books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
2. Donald A. Neamon, “Electronic Circuit Analysis and Design”, 2nd Edition. TMG publications.

References:

1. Ramakanth A Gayakwad, “Op-Amps and Linear Integrated Circuits”- 4th Edition.

SIMULATION LABORATORY	
ECE 228	**Credits:2**
Instruction: 3 Practical's /Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Course outcomes:

By the end of the course student should be able to:	
1	Calculate the convolution and correlation between signals
2	Plot magnitude and phase spectrum of a given signal using various transformation tools.
3	Generate random sequences for a given distribution.
4	Understand the basics of VHDL and describe the logic circuit using different types of models in the architecture of the body.
5	Design and simulate combinational and sequential circuits using VHDL

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	2	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	3	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	4	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	5	2	-	3	1	3	-	-	-	-	2	-	-	2	2	2

LIST OF EXPERIMENTS

Cycle-I (MATLAB)

1	Basic Operations on Matrices.
2	Write a program for Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3	Write a program to perform operations like addition, multiplication, scaling, shifting, and folding on signals and sequences and computation of energy and average power.
4	Write a program for finding the even and odd parts of signal/ sequence and real and imaginary parts of signal.
5	Write a program to perform convolution between signals and sequences.
6	Write a program to perform autocorrelation and cross correlation between signals and sequences.
7	Write a program for verification of linearity and time invariance properties of a given continuous/discrete system
8	Write a program for computation of unit samples, unit step and sinusoidal response of the given LTI system and verifying its physical realiazability and stability properties.
9	Write a program to find the Fourier transform of a given signal and plotting its magnitude and Phase spectrum.
10	Write a program for locating the zeros and poles and plotting the pole-zero maps in S plane and Z-plane for the given transfer function.
11	Write a program for Sampling theorem verification.

Skill development

12	Write a program for Removal of noise by autocorrelation / cross correlation.
13	Generation of random sequence
14	Write a program to generate random sequence with Gaussian distribution and plot its pdf and CDF .
15	Write a program for verification of winer- khinchine relations.
16	Let Z be the number of times a 6 appeared in five independent throws of a die. Write a program to describe the probability distribution of Z by: Plotting the probability density function Plotting the cumulative distribution function
17	Plot the probability mass function and the cumulative distribution function of a geometric distribution for a few different values of the parameter p. How does the shape change as a function of p?
18	Write a program to generate 10,000 samples of an exponentially distributed random variable using the simulation method. The exponential random variable is a standard one, with mean 10. Plot also the distribution function of the exponentially distributed random variable using its mathematical equation.
19	Write a program to determine the average value and variance of Y=exp(X), where X is a uniform random variable defined in the range [0, 1]. Plot the PDF of Y
20	Consider the random process defined as $X[n] = 2U[n] - 4U[n-1]$, where $U[n]$ is a white noise with zero mean and variance $\sigma 2 = 1$. Generate a realization of 1000 samples of X[n] by using MATLAB. Based on this realization, estimate the power spectral density and plot the estimate.

Cycle-II (VHDL modeling and simulation of the following experiments using ModelSim)

Skill development

1.	Realization of logic gates
2.	Verifying the functionality of half adder and full adder using basic gates and universal gates.
3.	Verifying the functionality of half subtractor and full subtractor using basic gates and universal gates.
4.	Design of 4-bit magnitude comparator
5.	Design of Multiplexers/De-multiplexers
6.	Decoders , Encoders
7.	Code converters
8.	Verifying the functionality of JK,D and T- Flipflops
9.	Design of synchronous counter using the given type of flip flop
10.	Design of asynchronous counter using the given type of flip flop

Note: A minimum of any ten experiments have to be done from cycle-I and any six experiments from cycle-II

Skill development

Text Books:

1. Rudra Pratap, "Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers " Oxford 2010.
2. J Bhaskar,"VHDL Primer" 3^{rd} Edition ,Prentice Hall 1999

References:

1. J G Proakis, VK Ingle, "Digital signal processing using MATLAB", 3^{rd} Edition, Cengage learning.

ECE 311 PULSE AND DIGITAL CIRCUITS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. Understand the response of linear circuits for different signals.
2. Determine the voltage transfer characteristics of nonlinear circuits and also learn about comparators.
3. Understand the operation and design steps of multivibrators.
4. Know about the principle of operation of time base generators and blocking oscillators.
5. Determine how to use synchronization for frequency division and to realize different logic gates using BJT & CMOS.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Determine the response of linear circuits for different input signals
2.	Design nonlinear circuits to get the desired output waveforms
3.	Analyse and design the multivibrators
4.	Understand the operation of blocking oscillator and can calculate errors present in sweep signals.
5.	Realize different logic gates and synchronizing circuits

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2	3	2	-	-	-	-	-	-	-	-	3	-	2
	2	3	2	3	2	-	-	-	-	-	-	-	-	3	-	2
	3	3	2	3	2	-	-	-	-	-	-	-	-	3	-	2
	4	3	2	2	1	-	-	-	-	-	-	-	-	3	-	2
	5	3	1	2	1	-	-	-	-	-	-	-	-	3	-	2

1. Linear Wave Shaping:

High Pass and Low Pass RC Circuits and their Response for Sinusoidal, Step Voltage, Pulse, Square Wave and Ramp Inputs. High Pass RC Circuit as a

Differentiator. Low Pass RC Circuit as an Integrator. Attenuators and their Application as CRO Probe. RL and RLC Circuits and their response for step input. Ringing circuit.

2. Non-Linear Wave Shaping:

Diode clippers. Transistor Clippers. Clipping at two independent levels. Skill D
Comparator – Applications of voltage Comparators – Diode Comparator. Clamping Operation. Clamping Circuits using Diode with Different Inputs. Skill D
Clamping Circuit Theorem. Practical Clamping circuits. Effect of diode Characteristics on Clamping Voltage.

3. Multivibrators:

Skill Development
Transistor as a Switch - Switching times of a transistor. Astable, Monostable and bistable Multivibrators using Transistors. Resolution time of a Binary. Methods of improving Resolution time – Methods of Triggering a binary. Schmitt Trigger.

4. Sweep Circuits:

Voltage sweep -- Simple Exponential sweep Generator. Errors that define Deviation from linearity, UJT Relaxation Oscillator – Methods of linearising a Voltage Sweep – Bootstrap and Miller Circuits – Current Sweep – Linearising a current Sweep by Adjusting the driving Waveform.

5. Synchronization and Frequency Division:

Principles of Synchronization – Synchronization of Astable Multivibrators. Synchronization of Sweep Circuits with Symmetrical Signals.

6. Logic Gates:

IC Families, TTL, CMOS, ECL, FFs and Circuits.

7. Blocking Oscillator: Employability

Base Timing. Emitter Timing, and Astable Blocking Oscillator.

Books:

1. Pulse, Digital and Switching Waveforms – Millman and Taub.
2. Wave Generation and Shaping – L. Strauss.

ECE 312 LINEAR ICS AND APPLICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. To study the basic principles, configurations and practical limitations of op-amp
2. To understand the various linear and non-linear applications of op-amp
3. To analyze and deign op-amp oscillators and frequency generators
4. To analyze, design and explain the characteristics and applications of active filters, including the switched capacitor filter.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Measure the parameters of op-amp and impart knowledge on data sheets of an op-amp LM 741.
2.	Design the circuits for applications of op-amp like adder, subtractor, integrator, differentiator, converters, analyzing circuits like logarithimatic amplifiers, instrumentation amplifiers.
3.	Design comparator circuits, waveform generators like sine wave, square wave, triangular wave, sawtooth wave. Using 555 timers designing multivibrators like astable & monostable.
4.	Analyze different analog IC's like IC 565 PLL, IC 566 VCO, IC 1486 Balanced Modulator
5.	Design active filters and generating an efficient frequency response compared to passive filters.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**2**
	2	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
	3	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
	4	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**1**
	5	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**2**

1. Operational Amplifiers: Employability

   Design Aspects of Monolithic Op-Amps, Ideal Characteristics, Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters,

2. Applications of Op-Amps, Inverting and Non-inverting Amplifiers,

Employability

Integrators, Function Generators, Logarithmic Amplifiers, Instrumentation Amplifiers,

3. Signal Conditioning Circuits, Multivibrators, Square Wave Generators, Rectifiers, Peak Detection and Voltage Regulation.

4. 555 Timers, 556 Function Generator ICs and their Applications. Three Terminal IC Regulators,

Employability

5. IC 1496 (Balanced Modulator), IC 565 PLL and its Applications.

6. Active Filters – LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison.

7. Op-Amp Phase Shift, Wein-bridge and Qudrature Oscillator, Voltage Controlled Oscillators, Voltage to Frequency and Frequency to Voltage Converters, Voltage to Current and Current to Voltage Converters. Switched Capacitance Filters, Analog Multiplexers, Sample and Hold Circuits.

Employability

Books:

1. Microelectronics, Jacob Millman
2. Op-Amps and Linear ICs, Ramakanth Gayakwad.
3. Integrated Circuits, Botkar, Khanna Publications.
4. Applications of Linear ICs, Clayton.

ECE 313 ANALOG COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) To understand how Fourier analysis can be used in communication Systems.
2) To understand basic concepts of modulation, demodulation and design of major building blocks of Communication system.
3) Modulation techniques will be analyzed both in time and frequency domains.
4) To understand the design of practical AM & FM transmitters and Receivers.
5) To understand effect of noise on different modulation techniques and different noise reduction techniques.

COURSE OUTCOMES

1.	Demonstrate and analyze about various blocks in a Communication System.
2.	Analyze and design the analog modulator and demodulator circuits.
3.	Analyze All Modulation techniques in time and frequency domains.
4.	Demonstrate about various blocks in Transmitters and Receivers.
5.	Calculate the effect of noise in analog modulations.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2	3	-	-	-	-	-	-	1	-	2	3	2	3
	2	3	3	3	-	-	-	-	-	-	1	-	3	3	3	3
	3	3	3	3	-	-	-	-	-	-	1	-	3	3	3	3
	4	3	3	3	-	-	-	-	-	-	1	-	2	3	3	2
	5	3	3	1	-	-	-	-	-	1	1	-	3	3	1	3

1. Linear Modulation Systems:

Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems.

2. Angle Modulation Systems:

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals,

3. FM Generation:

Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre – emphasis and De – emphasis, Comparison of FM and AM.

4. Noise In AM and FM Systems:

Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

5. Radio Transmitters:

Classification of Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Telephone Transmitters, SSB Transmitters.

6. Radio Receivers:

Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers.

7. Communication Receivers:

Extensions of the Super-heterodyne Principles, Additional Circuits.

Text Books:

1. Principles of Communication Systems, H. Taub and D. L. Schilling, McGraw Hill, 1971.
2. Communication Systems, Simon Haykins (2nd Edition).
3. Electronic Communication Systems, G. Kennedy, McGraw Hill, 1977 (2nd Edition).

References:

1. Modern Digital and Analog Communication Systems, B. P. Lathi (2nd Edition).
2. Electronic Communications Modulation and Transmission, Robert J. Schoenbeck, PHI N. Delhi, 1999.

ECE 314 COMPUTER ARCHITECTURE AND ORGANIZATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

To learn how computers work, how to analyze their performance , how computers are designed

COURSE OUTCOMES

C304.1	Understand the assembly language instruction set of a computer.
C304.2	Perform hardware design of CPU of a computer.
C304.3	To design CPU & control unit of a basic computer
C304.4	Use computing resources such as memory and I/O in an effective manner to improve performance of a computer

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:																
		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

1. **Register Transfer and Micro operations:**

   Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. **Basic Computer Organization:**

   Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input - Output and Interrupt, Complete Computer Description.

3. **CPU Organization:**

   Introduction, General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Stack Organization.

   EMPLOYABILITY

4. **Micro programmed Control:**

Control Memory, Address Sequencing, Microinstruction Formats, Micro program Example, Design of Control Unit.

5. Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

EMPLOYABILITY

6. Input - Output Organization:

Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA),

EMPLOYABILITY

7. Introduction to Multiprocessor System.

Text Book:

Computer System Architecture, M. Morris Mano, PHI Publications, (3rd Edition May 1996).

References:

1. Computer Organization, V. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, McGraw Hill International, (4th Edition).
2. Digital Computer Fundamentals, Thomas C. Bartee.

ECE 314–2 : IMAGE PROCESSING AND PATTERN RECOGNITION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

Introduction:
Digital Image Processing and Applications – Image Representation and Modeling – Image Enhancement – Image Restoration – Image Analysis – Image Data Compression.

Digital Image Fundamentals:
Elements of Visual perception – A simple Image Model – Sampling and Quantization – Some Basic Relationship between Pixels.

Image Transforms:
Two Dimensional Orthogonal and Unitary Transforms – Properties of Unitary Transforms – One Dimensional DFT - Two Dimensional DFT – Cosine Transforms – Sine transforms – Hadamard Transforms – Haar Transforms – Slant transforms.

Image Enhancement:
Point Operations – Histogram Modeling – Spatial Operations – Transform Operations.

Image Restoration and Compression:
Image observation models – Inverse and Wiener Filtering – Pixel Coding – Predictive techniques – Transform Coding of Images.

Statistical and Non – Parametric Decision Making:
Applications of Pattern Recognition – Baye's Theorem – Multiple Features – Conditionality Independent Features – Decision Boundaries – Unequal Costs of Error – Estimation of Error Rates – Kernel and Window Estimator – Nearest Neighborhood Classification Techniques – Adaptive Decision Boundaries – Adaptive Discriminant Functions.

Clustering:
Introduction – Hierarchical Clustering – Partitional Clustering.

Artificial Neural Networks:
Introduction – Nets without Hidden Layers – Nets With Hidden Layers – The Back Propagation Algorithms – Hopfield Nets – Classifying Sex From Facial Images.

Text Books:

Fundamentals of Digital Image Processing, Anil K. Jain, PHI.

Pattern Recognition and Image Analysis, Earl Gose and Richard Johnsonbaugh Steve Jost, PHI.

Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addinson – Wesley.

Image Processing Theory Algorithms and Architecture, M. A. SID – AHMED, McGraw Hill Inc.

ECE 314–3 : INFORMATION NETWORKS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

1. Information and Communication:

   Measure for Information, sources, source models and source encoding, coding for memory

   less sources, coding for analog sources, channel model and channel capacity.

   employability

2. Communication Networks:

   Existing Communications Networks, outlines of the associated hardware facilities,

   Modules of the interfacing facilities, brief outlines of the characteristics of the networks.

3. Communication Methodologies.

   employability

4. Information based services:

   Communication services, data analysis services, systems oriented services.

5. Information based forecasting MIS Establishing the Frame work, Information Research management, Data Base

   employability

Books:

1. Jevome Kanter: "Management Information Systems" Prentice-Hall, 1992
2. Andrew S. Tanenbaum: "Computer Networks" Prentice Hall, 1989
3. Taub and Schilling: Principles of Communication systems, McGraw Hill, 1971.

ECE 315 SWITCHING THEORY AND LOGIC CIRCUITS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

Course Objectives:

- To understand the concepts and techniques associated with the number systems and codes
- To understand the simplification methods (Boolean algebra & postulates, k-map method and tabular method) to simplify the given Boolean function.
- To understand the fundamentals of digital logic and design various combinational and sequential circuits.
- To understand the concepts of programmable logic devices
- To understand formal procedure for the analysis and design of synchronous and asynchronous sequential logic

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Understand the concepts and techniques of number systems and codes in representing numerical values in various number systems and perform number conversions between different number systems and codes.
2.	Apply the simplification methods to simplify the given Boolean function (Boolean algebra, k-map and Tabular method).
3.	Implement given Boolean function using logic gates, MSI circuits and/ or PLD's.
4.	Design and analyze various combinational circuits like decoders, encoders, multiplexers, and de-multiplexers, arithmetic circuits (half adder, full adder, multiplier etc).
5.	Design and analyze various sequential circuits like flip-flops, registers, counters etc.
6.	Analyze and Design synchronous and asynchronous sequential circuits.

Mapping of course outcomes with POs and PSOs

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	-	-	-	-	-	1	2	-	-	3	-	2
2	3	1	1	3	-	-	-	-	1	2	-	-	3	-	2
3	3	2	2	3	-	-	-	-	1	2	-	-	3	-	2
4	3	2	2	3	-	-	-	-	2	2	-	-	3	-	2
5	3	2	2	3	-	-	-	-	2	2	-	-	3	-	2
6	3	2	2	3	-	-	-	-	2	2	-	-	3	-	2

Correlation levels1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

1. **Introductory Concepts:**
   Number Systems, Base Conversion Methods, Complements of Numbers, Codes, Error detecting and Error Correcting Codes.

2. Minimization of Boolean Functions:
Standard forms of Boolean Functions, Simplification of Functions – Karnaugh map and Quine McClusky methods, multiple output functions.

3. Logic Gates:
Symbols and Truth Tables of Gates – AND, OR, NOT, NAND, NOR, XOR, Multiplexers, Demutiplexers, Encoders, Decoders, Flip-flops, Counters and Registers.

4. Combinational Logic:
Logic Design of Combinational circuits – Binary addition, Subtraction, Code Conversion, Priority Encoders, Decoders, Seven – segment Displays, Comparators, PLAs.

5. Sequential Machine Fundamentals:
The Flip-flop – RS, JK and D Flip-flops, the Design of Clocked Flip-flop, Flip-flop conversion from one type to another.

6. Traditional Approaches to Sequential Analysis and Design:
Analysis and Design of Finite State Machines, State Reduction, Design of Flip-flops, Counters and Shift Registers.

7. Asynchronous Finite State Machines:
Analysis and Design of Asynchronous Machines, Cycles, Races and Hazards.

Books:

1. Switching and Finite Automata Theory, 2nd Edition, Zvi Kohavi, Tata McGraw-Hill, 1978.
   (For syllabus items 1, 3, and 4)
2. Introduction to Switching Theory and Logical Design, 3rd Edition, Frederick J. Hill and Gerald R. Peterson, John Wiley and Sons, 1981.
   (For syllabus item 2)
3. An Engineering Approach to Digital Design, William I. Fletcher, PHI, 1980. (For syllabus items 5, 6, and 7)

ECE 316 ANTENNAS AND WAVE PROPAGATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) To identify the different latest antennas available for specific communication
2) To study various antennas, arrays and radiation patterns of antennas.
3) To learn the basics of antennas to understand various techniques involved in various antenna parameter measurements.
4) To understand the propagation of radio waves in the atmosphere

COURSE OUTCOMES

1.	Understand the basic concepts of radiation and reception mechanism & analyze the basic antenna parameters.
2.	Analyze, synthesize and Design antenna arrays.
3.	Develop the basic skills necessary to design and analyze a wide variety of practical antennas which operate at various frequencies.
4.	Perform measurements of various antenna parameters.
5.	Identify characteristics of radio wave propagation.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	2	2	-	-	-	-	-	-	-	-	1	1	2	2
	2	1	3	2	-	-	-	-	-	-	-	-	2	3	3	2
	3	1	3	3	-	-	-	-	-	-	-	-	2	3	3	1
	4	1	2	2	-	-	-	-	-	-	-	-	1	1	-	-
	5	1	2	2	-	-	-	-	-	-	-	-	1	1	1	3

1. Radiation and Antennas

Antenna definition, Functions of antennas , Network theorems, Properties of antennas, Antenna parameters , Polarization, Basic antenna elements , Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields, Hertzian dipole, Different current distributions in linear antennas, Radiation from half-wave dipole, Radiation from quarter wave monopole , Radiation characteristics of dipoles.

2. Analysis of Linear Arrays

Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas - FRIIS formula, Antenna temperature and signal-to-noise ratio.

3. Array Synthesis

Introduction, Synthesis methods, Fourier transform method, Linear array design by Woodward-lawson method, Dolph-chebychev method (Tschebyscheff distribution), Taylor method, Laplace transform method, Standard amplitude distributions.

Skill Development

4. HF, VHF and UHF Antennas

Introduction, Isotropic radiators, Directional antennas, Omni-directional antennas, Resonant antennas, Non-resonant antennas, LF antennas, Antennas for HF, VHF and UHF, Dipole arrays, Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna

Skill Development

5. Microwave Antennas

Introduction, Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Impedance of a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Microstrip antennas.

Skill Development

6. Antenna Measurements

Introduction, Drawbacks of measurements of antenna parameters, Methods to overcome drawbacks in measurements, Methods for accurate measurements, Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

Skill Development

7. Wave Propagation

Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight

(LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Effect of earth's magnetic field.

Text Book :

1. Antennas and Wave Propagation, G.S.N. Raju, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2007.

References:

1. EM Waves and Radiation Systems, E. C. Jordan and K. G. Balmain, PHI – N. Delhi, 1997.
2. Antennas, J.D. Kraus, McGraw Hill, NY.
3. Antenna theory, C.A. Balanis, John Wiley & Sons, NY, 1982.

ECE 318 LINEAR ICS AND PULSE CIRCUIT LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	3	3	50	50	100

COURSE OBJECTIVES

1) The main objective of this lab course is to gain the practical hands on experience by exposing the students to various linear IC applications.

2) Analyze the circuits of 555 timer and its applications, Linear & Non-Linear wave shaping circuits, various voltage regulators, and Sweep circuits.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Design the circuits for linear applications of op-amp like adder, subtractor, integrator, differentiator and non-linear applications like Schmitt trigger
2.	Design the circuits for linear and non-linear wave shaping like high pass RC, low pass RC, clippers and clampers
3.	Generate non-sinusoidal signal using UJT and observing the output of sweep circuit using op-amp
4.	Observe the multivibrator circuits using 555Timer and transistors
5.	Design active filters for required cut-off frequency and obtaining the frequency response and calculating the percentage of voltage regulation using IC voltage regulator

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**3**	**2**	**3**
	2	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**3**	**2**	**3**
	3	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**2**	**3**
	4	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**		**2**	**2**	**2**
	5	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**3**	**2**	**3**

List of expeiments

1. Applications of Op-Amps.
2. 555 Timer as Monostable and Astable Multivibrator. Skill Development
3. Three terminal IC Voltage Regulator.
4. Linear Wave Shaping – RC Circuits.
5. Non-linear wave Shaping – Clipping and Clamping Circuits. Skill Development

6. Fixed – Bias Binary.

Skill Development

7. Self – Bias Binary.
8. Schmitt Trigger.
9. UJT Sweep Generator.
10. Miller and Bootstrap Sweep Circuits.

ECE 319 DIGITAL ICS LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	3	3	50	50	100

COURSE OBJECTIVES

- To understand the simplification methods (Boolean algebra & postulates, k-map method and tabular method) to simplify the given Boolean function.
- To understand the fundamentals of digital logic and design various combinational and sequential circuits.
- To understand formal procedure for the analysis and design of synchronous and asynchronous sequential logic

COURSE OUTCOMES

	By the end of the course, the student will be able to:
1.	Simplify the given Boolean function and implement using logic gates and/ or universal gates
2.	Design, Analyze and Implement combinational circuits for given specifications
3.	Design, Analyze and Implement flip-flops and registers
4.	Design, Analyze and Implement counters to meet required specification.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	**3**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**1**		**_**	**3**	**-**	**2**
	2	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**1**		**_**	**3**	**-**	**2**
	3	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**1**		**_**	**3**	**-**	**2**
	4	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**1**		**_**	**3**	**-**	**2**

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

List of experiments

1. Minimization and Realization of a given Function using Basic Gates (AND, OR, NOR, NAND, EXOR).
2. Function Generation using Decoders and Multiplexers.
3. Experiments on Priority Encoder using 74LS148.
4. Application of Multiplexers.

5. Seven – segment Display experiments.
6. Four bit and eight bit adders and subtractors.
7. Experiments using 74LS181 and 74LS182 ICs (ALU and Carry Look Ahead Adders).
8. Experiments on SR Latch and Master – slave JK Flip-flops using SSI gates.
9. Design and testing of Ripple Counters using ICs.
10. Design and testing of Mod-K Synchronous Counters.
11. Design and testing of Shift Registers.
12. Experiments using ROMs.
13. A PCM Companded encoder using 27512.
14. PLAs to realize SOP function using IC828100.
15. To realize Binary – Select Multiplexer using PAL 16L8.

ECE 320 Soft Skills

COURSE OBJECTIVES

1) To prepare the students to function effectively in teams that would help them building a successful career.
2) To make the students aware of the importance of verbal and non-verbal communication skills
3) To enable the students to make successful presentations
4) To make students understand the purpose of group discussions in their professional life and expose the students to the different positive roles in group discussions
5) To make the students identify their strengths and pinpoint the areas where they should work on to enhance their time management skills
6) To help the students carry out self-analysis, self-motivation and build up confidence to set appropriate goals in life
7) To equip the students with all the skills for Campus recruitment

COURSE OUTCOMES

C310.1	Develop their personal traits.
C310.2	Understand and converse with their higher authorities/subordinates/other personal concerned.
C310.3	Expose their personality effectively
C310.4	Develop good relations/contacts with difference types of persons concerned
C310.5	Develop skill of impromptu speech as well public speech

EEE 321 CONTROL SYSTEMS

Credits	*Periods*			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) The block reduction techniques and signal flow graphs.
2) The mathematical modelling of mechanical and electrical systems.
3) The analysis of systems in time domain.
4) The relative and steady state stability of the systems.
5) The analysis of systems in frequency domain.

COURSE OUTCOMES

C311.1	Able to generate the transfer functions of mechanical and electrical systems.
C311.2	Can adjust the relative stability by using damping factor and un damped natural frequency of the system.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:																
		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**															
	2															
	3															
	4															
	5															

C311.3	Can find the stability by using root locus technique, polar plot, Nyquist plot, Bode plot or M&N circles.

1. Transfer Functions of Linear Systems – Impulse Response of Linear Systems – Block Diagrams of Control Systems – Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples).

Pages (65 – 100)

2. Introduction to Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems.

Pages (127 – 150)

3. Time Domain Analysis of Control Systems – Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

Pages (296 – 350)

4. Concept of Stability and Necessary Conditions for Stability – Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

Pages (355 – 428)

5. Correlation between Time and Frequency Responses – Polar Plots – Bode Plots – Log Magnitude versus Phase Plots – All Pass and Minimum Phase Systems – Nyquist Stability Criterion – Assessment of Relative Stability – Constant M and N Circles.

Pages (552 – 624)

Text Book:

Automatic Control Systems, Benjamin C. Kuo, PHI Publication (5th Edition).

Reference Books:

1. Modern Control Engineering, Ogata, PHI.
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, Wiley Eastern Ltd.

ECE 322 MICROPROCESSORS AND APPLICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) Understand architecture and programming of 8085 & architecture of 8086 Microprocessors.
2) Understand various interfacing circuits necessary for various applications understand various interfacing concepts.

COURSE OUTCOMES

C312.1	Student will acquire knowledge on the architecture of 8-bit Microprocessors, its interrupt structure and Stack operation.
C312.2	Able to understand instruction set & apply them to write assembly language programs.
C312.3	Able to interface 8085 microprocessor to semiconductor memory devices.
C312.4	Able to interface different peripheral devices with 8085 Microprocessor
C312.5	Knowledge on the architectures and features of advanced 16-bit & 32-bit microprocessors

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**															
	2															
	3															
	4															
	5															

1. Internal Architecture and Functional Description of INTEL 8085, Microprocessor Interrupt Structure of 8085, Instruction Set and Timing Diagrams.
2. Programming The 8085: Employability

   Introduction to 8085 Assembly Language Programming, Sample Programs - Stack and Subroutines.
3. Interfacing Semiconductor Memory Devices To 8085:

   nployability Classification and Internal Organization of Semiconductor Memory Devices, Interfacing of SRAMs, DRAMs and EPROMs.
4. Interfacing I/O Devices to 8085: Employability

   Parallel I/O (8255A), Timer/Counter (8253), Serial I/O (8251A), Keyboard/Display Interface.

Employability

5. Data Converters:

   ADC, DAC, and their Interfacing to 8085.

6. Elementary Concepts of 16Bit and 32Bit Microprocessors, like INTEL 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro.

Text Book:

Architecture Programming and Applications, Ramesh S. Gaonkar, New Age International Pvt. Ltd., (3rd Edition).

References:

1. Microcomputer and Microprocessors – The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting, John Uffenbeck, PHI (2nd Edition).
2. Introduction to Microprocessors, A. K. Mathur, TMH (3rd Edition).
3. The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor, Architecture, Programming and Interfacing, Barry B. Brey, 4th Edition, PHI.

ECE 323 DATA STRUCTURES (Common with Metallurgy)

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) To acquire knowledge on several data structures like stacks, queues, linked list, trees and graphs.
2) To have better insight into linear and nonlinear data structures.
3) To learn various sorting and searching techniques.
4) To exercise the applications of data structures.
5) To have a good understanding of problem solving using data structure tools and techniques

COURSE OUTCOMES

C313.1	At the end of the course the student will be able to Demonstrate the knowledge in problem solving techniques.
C313.2	At the end of the course the student will be able to Write programs for different data structures
C313.3	At the end of the course the student will be able to Implement different applications using tree structures
C313.4	At the end of the course the student will be able to Implement various sorting techniques.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

1. Revision of C Language Overview only (no questions to be set on this).
2. Arrays and Functions:

   Organization and use of One Dimensional, Two Dimensional and Multi Dimensional Arrays, Handling of Character Strings, String Operation, Concept of Function, Parameter Passing, Recursion.
3. Structures, Pointers and Files:

   Definition of Structure and Union, Programming examples; Pointers, Pointer Expressions, Programming examples; File Operations, Preprocessor.
4. Linear Data Structures:

Stack Representation, Operation, Queue Representation, Operations, Circular Queue, List, Representation, Operations, Double Linked and Circular Lists.

5. Non-Linear Data Structures:

   Trees, Binary Tree Representation, Tree Transversals, Conversion of a General Tree to Binary Tree, Representation of Graphs.

6. Searching Techniques:

   Basic Search Techniques, Tree Searching Graphics, Linked Representation of Graphics, Graph Transversal and Spanning Trees.

Text Books:

1. Programming In ANSI C, by E. Balaguruswamy.
2. Data Structures Using C, by A. M. Tanenbaum and others.

Reference Books:

1. An Introduction To Data Structures With Applications, Trembly and Sorenson.
2. The C – Programming Language, Kerningham and others.

ECE 324 COMPUTER NETWORKS ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. Network technologies
2. Internet Addressing and Routing
3. Socket interface and Internet security

COURSE OUTCOMES

C314.1	Explain the importance of data communications and the Internet in supporting business communications and daily activities.
C314.2	Explain how communication works in data networks and the Internet.
C314.3	Explain the role of protocols in networking. Analyze the services and features of the various layers of data networks.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:																
		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

C314.4	Design, calculate, and apply subnet masks and addresses to fulfill networking requirements

1. Introduction:

   Uses of Computer Networks, Network Structure, Architectures, Services, Standardization, Functions of Various Network Layers, Network examples.

2. Physical layer:

   Theoretical Basis for Data Communication, Transmission Media, Analog and Digital Transmission, Transmission and Switching ISDN.

3. Medium Access Sub-layer:

   LAN, MAN, Protocol, ALOHA, IEEE Standard for 802 for LANs, Fiber Optic Networks, Satellite Networks.

4. Data Link layer:

   Design Issues, Error Detection and Correction, Protocols and their

Performance, Specifications and Examples.

5. Network layers:

Design Considerations, Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Functions of Router, Congestion Control Internetworking and Examples, Details of IP addressing schemes, TCP/IP Protocol details.

Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill.

References:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi.
2. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill.

ECE 325 DIGITAL COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1) To understand the building blocks of digital communication system .
2) To understand and analyze the signal flow in a digital communication system.
3) To analyze error performance of a digital communication system in presence of noise and other interferences.
4) To understand concept of spread spectrum communication system.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Learn the elements of digital communications systems, fundamental concepts of sampling theorem, quantization and coding
2.	Analyze various methods of digital modulation techniques for the digital data transmission
3.	Understand the mathematical representation and spectral analysis of noise through various filters
4.	Calculate probability of error for various digital modulation techniques to analyze the performance of DCS in the presence of noise
5.	Understand the concepts of spread spectrum code acquisition and tracking circuits.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	2	1	2	-	-	-	-	-	-	-	-	-	3	-	1
	2	3	2	2	-	-	-	-	-	-	-	-	1	3	-	2
	3	3	2	1	-	-	-	-	-	-	-	-	1	3	-	2
	4	3	2	1	-	-	-	-	-	-	-	-	1	3	-	2
	5	1	1	1	-	-	-	-	-	-	-	-	1	3	-	1

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

1. Analog-to-Digital Conversion: Pulse modulation techniques, Sampling, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Digital Modulation Techniques: Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.

Employability

2. Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK

Employability

and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

3. Mathematical Representation of Noise:Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Mixing Involving Noise, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Power Spectral Density of n(t) and n(t), Probability Density of n(t), n(t), and their Time Derivatives, Representation of Noise Using Orthonormal Coordinates, Irrelevant Noise Components

4. Data Transmission: A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.

Employability

5. Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

Text Books:

1. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994;

2. Principles of Communications By Taub and Schilling

ECE 326 Elective – II(1) : EMI / EMC

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. Understand EMI/EMC Concepts, Definitions, military and commercial EMI/EMC requirements and standards.
2. Harden electronic systems using the appropriate EMC protection techniques like grounding, bonding, shielding, filtering, and printed circuit board designTo Explore EMC Methodology, Environments, and Measurements.

COURSE OUTCOMES

C316.1	Ability to understand the basic problems associated with the sources and coupling paths of electromagnetic interferences (radiated/conducted emission and susceptibility).
C316.2	Ability to have basic knowledge about standards and testing for EMC compliance
C316.3	Ability to estimate the emission levels for simple circuits
C316.4	Analyze potential EMI problems by identifying the source, the receptor, and the coupling path

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

1. Introduction to EMI/EMC:

   EMI Sources, EMI Coupling, Noise Path, Models of Noise Coupling, EMC Regulations, Designing for EMC, Compliance Tests, Elimination of EMI, EMI Testing, Compliance Test and Engineering Tests.

2. Grounding Techniques, Shielding Techniques, Cabling Techniques.

3. Conducted EMI/EMC:

   Origin of Conducted EMI, Common and Normal mode Noise, Noise from Power Electronic Systems, Spectra of Pulse Noise Sources, Modeling of EMI Noise Sources, Transient Disturbance Simulation Signals, EMI Filters for

Mains Noise.

4. Choice of Passive Components:

   EMC Design Components

5. EMI Measurement Technology:

   EMI Measuring Instruments, Pitfalls of EMI Measurements, Test Instrumentation Accessories and their Characteristics, Measurement of Pulsed EMF, EMI Patterns from Different List Objects, EMI Immunity Test System, Software in EMI/EMC Measurements, Recent Trends in Susceptibility Measurement, Cost Effective EMI/EMC Measurements, Setup and its Maintenance.

Employability

Text Books:

1. IMPACT Learning Material Series Modules 1 – 9, IIT New Delhi, Published by RSTE.
2. Electromagnetic Compatibility, R. C. Paul.

ECE 326 Elective – II(2) : MICROELECTRONICS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

Pre-requisite: ----

Course Objectives:

1. To understand the fundamental concepts that underlie the physical operation, analysis and design of integrated circuits and systems.
2. To provide an overview of the processes employed and the constraints imposed by fabrication on circuit design.
3. To understand the operation and performance of four major IC technologies.
4. To understand formal procedure for the analysis and design of combinational and sequential digital circuits.

Course Outcomes:

By the end of the course student will be able to	
1.	Understand the processes used to fabricate ICs specifically BJT and MOSFET fabrication.
2.	Understand the basic logic gate building blocks used in digital systems specifically BJT logic families (TTL and ECL) and FET logic families (NMOS and CMOS).
3.	Design and analyze various combinational logic circuits like Adders, subtractors, multiplexers, and de-multiplexers etc
4.	Design and analyze various sequential circuits like flip-flops, registers, counters etc.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	1	-										2	-	1
	2	3	1	1										2	-	1
	3	3	1	2										2	-	1
	4	3	1	2										2	-	1

1. Integrated- Circuit Fabrication:

   Monolithic Integrated - Circuit (microelectronics) technology- The planar processes - Bipolar Trasister Fabrication - Fabrication of FETs - CMOS

Technology - Monolithic Diods - The Metal - Semiconductor Contact - IC Resistor - IC Capacitors - IC Packaging - Characteristics of IC Components - Microelectronic circuit layout.

2. Basic Digital circuits:

Employability

MOS Technology - NMOS, CMOS, Iverters, Logic gates - ECL circuits.

3. Combinational Circuits:

Employability

Arithmetic functions - Comparators - Multiplexers - Demultiplexers - Memory - Memory applications - PAL - PLAs.

Employability

4. Sequential Circuits:

A1 - Bit memory - The circuits properties of biastable latch - The clocked SR Flip-Flop - J-K, T, and D-type Flip-flops. Shift-registers - Ripple -Counters - synchronous counters - Applications of counters.

Text Book:

Microelectronic by JocobMilliman, Arbin Grabel second edition, TMH.

Refereces:

1. Part 2 of Integrated Circuits, Design Principles and Fabrications by editors, Warner and Fordemwalt, 1965, Motorola Series, McGraw Hill.
2. MOS LSI Design and Applications by Dr. William N. Carr and Dr. Jack P. Mize, McGraw Hill, 1972.
3. Micro electronic circuits and devices second edition Horenstien, PHI.

ECE 326 Elective – II(3) : ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

Course objectives:

1) To learn the different terms used for characterizing the performance of an instrument/ measurement system and to identify the various types of errors in measuring instruments
2) To study about functioning of different meters associated with measurements of signal characteristics
3) To introduce the basic concepts related to operation of electronic measuring instruments
4) To acquire knowledge in different types of transducers with their operation

Course outcomes:

By the end of the course student will be able to	
1.	Measure various parameters with accuracy, precision and resolution and understand the operation of PMMC and EMMC with their applications
2.	Select appropriate passive or active transducers for measurement of physical phenomenon
3.	Understand the principle of operation, working of different electronic instruments like digital voltmeters, q-meter and vector meter.
4.	Can apply the knowledge of cathode ray oscilloscopes and understand the functioning, specification, applications of signal analyzing instruments
5.	Identify the modulation techniques suitable for real time applications involving serial data transmission

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	1	1	1	2	-	-	-	-	-	-	-	2	-	3
	2	1	1	2	2	1	-	-	-	-	-	3	3	1	2	1
	3	1	1	2	2	1	-	-	-	-	-	1	-	2	1	1
	4	1	1	1	3	2	-	-	-	-	-	2	2	1	2	1
	5	1	1	1	2	2						1	1	1	-	1

1. Measurement of Physical Systems:

   Objectives of Engineering Measurement - Types of Data, Analog vs. Digital Measurement – measurement of Accuracy, Precision and Uncertainty.

2. Transducers:

   Electrical Transducers – Selecting a Transducer – Strain Gauges, Linear Variable Differential Transducer (LVDT), Piezo Electric Transducers, Photo Electric Transducer, Frequency Generating Transducers, Digital Transducers.

Employability

3. Data Indication and Recording:

   Analog Display and Recorders, Digital Input – Output Devices – Displays – Display Multiplexing and Zero Suppression.

4. Signal Transmission and Processing:

   Data Transmission Systems, Modulation Techniques for Digital and Data Transmission, Serial Data Communication – Telemetry Systems, Digital Signal Processing.

References:

1. Instrumentation For Engineering Measurement, R. H. Cerni and L. E. Foster.
2. Electronic Instrumentation, H. S. Kalsi, TMH.
3. Instrumentation Devices and Systems, 2nd Edition, C. S. Rangan, G. R. Sarma and V. S. V. Mani, TMH.
4. Intelligent Instrumentation, Microprocessor Application in Measurement and Control, 2nd Edition, George C. Barney, PHI.
5. Transducers and Instrumentation, D.V.S. Murthy, PHI.

ECE 327 ANALOG COMMUNICATION LABORATORY

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
2	-	-	3	3	50	50	100

COURESE OBJECTIVES

1) To realize a practical modulator and demodulator circuit.
2) To design a practical high pass and low filters
3) Analyze AM and FM signals in time and frequency domains
4) To realize a practical pre-emphasis and de- emphasis circuits.
5) To understand the effect of noise on various modulation techniques.

COURSE OUTCOMES

C317.1	Analyze practical circuits for different modulation schemes
C317.2	Design various filters for communication systems
C317.3	Analyze AM and FM in frequency domain
C317.4	Implement a practical pre-emphasis and De-Emphasis and design a practical noise reduction system.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	-	1	3	-	-	-	-	-	-	-	-	1	2	-
	2	1	-	1	3	-	-	-	-	-	-	-	-	1	2	-
	3	1	-	1	3	-	-	-	-	-	-	-	-	1	2	-
	4	1	-	1	3	-	-	-	-	-	-	-	-	1	2	-

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

List of experiments

1. Generation of AM Signal and measurement of Modulation Index.
   Diode Detector for AM Signals.
2. Generation of FM Signal.
   FM Detector.
   Receiver Measurements.
3. Balanced Modulator.
4. Passive Filters (LPF, HPF, BPF).
   Active Filters.
5. Attenuator.

6. Equalizer and Twin-T-Network.
7. Frequency Multiplier/Limiter.

   SSB Generation and Detection.
8. Pre-emphasis and De-emphasis.

   PLL.
9. IF Amplifier.
10. Spectrum analyzer

ECE 328 MICROPROCESSORS & APPLICATIONS LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	3	3	50	50	100

COURESE OBJECTIVES

1) To make the student understand the programming of 8085 Microprocessor and also to interface with Keyboard, A/D & D/A converters and other I/O Devices.

COURSE OUTCOMES

C318.1	The knowledge gained by the student will help him to do the projects using microcontrollers and various Embedded systems applications
C318.2	Design a microcomputer to meet the requirements of user
C318.3	Interface peripherals such as switches, LEDs, keypad..etc
C318.4	Program 8085 to meet the requirements of user

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**															
	2															
	3															
	4															
	5															

List of experiments

Skill development & Employability

1) Write a program, which loads Registers, A, B, C, and D with the same constant. Try to optimize t he program in such a way that the smallest numbers of program bytes are used. Test the program in single step mode. After each step, test the register of interest.

   Assume that 4 bytes of data are stored at consecutive locations of the data-memory starting at (x). Write a program, which loads Registers E with (x), D with (x+l), C with (1+2) and A with (x+3).

   a. Assume that l byte of data is stored at data memory location (x). Write a program which tests bit 5 of (X). Write 'FF' in (x+1), if bit 5=0 and write '00' at the same location if bit 5=1.
   b. Write a program which tests the zero-condition of a data byte specified at data memory location (x). If it is zero '00' should be stored at (x+1) location, if non-zero 'FF' should be stored at the same location.
   c. A binary number is stored at data-memory location (x) Compute the number of its logical 1's and store the result at y.
   d. Comment on the instructions used in the above three programs and write

about the effect of flags with the instructions used.

2) Two unsigned binary numbers are stored at data-memory locations (x) and (x+1).
   a) Compute the sum of the two numbers and store the result at y, ignoring the possible overflow.
   b) Write a program to compute (x+1) - (x). The magnitude of the result should be stored at (y) and the sign (00 if positive, 01 if negative) at (y+1). Understand the 2's compliment Arithmetic.
3) a) A double precision number is stored at (x) and (x+1) (lower order byte at (x). Add another double precision number stored at (y) and (y+1) (lower order byte at (y)]. Store the result at (w) and (w+1).
   b) Same as above: subtract the number (y+1) (y) from (x+1) (x) and store the result at (w) and (w+1).
4) a) Two 2-digit BCD numbers are stored at consecutive memory locations (x) and (x+1). Write a program for computing the sum and store the result at loc. (y)
   b) Write a program to compute the difference and store the result at (y).
5) Implement a time-delay loop for the generation of milli seconds. Determine the exact time-delay by adding the states of the instructions executed in the program.
6) a) Write a program for a decimal counter (00-99) with programmable clock frequency [Eg. Frequency specified at data memory locations (x)] and display the count in the data field using the corresponding monitor subroutine.
   b) Reset the decimal counter at a predefined number and start the count again.
7) N binary numbers stored at consecutive data memory locations starting at (x) where N is defined at data memory location 'NUMBER'.
   a) Find the largest number and display it in the data field and arrange them in ascending order.

b) Find the smallest number and display it in the data field and arrange them in descending order.

8) Two 8-bit binary numbers are stored at data memory locations (x) and (x+1) compute the product of the two numbers using, a). Successive addition method. b). Shifting and adding method store the result in (y) and (y+1).

9) Divide the l6-bit unsigned number in memory location (x) and (x+1) [Most significant byte in (x+1)] by the 8-bit unsigned number in memory location (x+2). Store the quotient in memory location (x+3) and reminder in memory location (x+4). [Choose the data such that the quotient must be contained in 8 bits].

10) a) A 2-digit BCD number is stored at data-memory location (x). Convert the number into binary and display the result in data field.

b) Convert a binary number in memory location (x) to two BCD digits in memory locations (x+1) and (x+2) [most significant digit in (x+1)]. The number in memory location (x) is unsigned and less than $(64)_H$+1.

11) Write a program to do the operation specified at a data memory location (x). The operations are specified as follows:

00-Test the parity of the data at (x+1) and store DD for odd parity, EE for even parity at (y).

01-To operate a staircase lamp, 02-Test the zero condition of the data and store 00 if zero and FF if not, 03-Test if the data is positive or negative.

12) Hardware experiments:

a) A/D and D/A Converters.
b) DPSK Modulator and Demodulator.
c) Seven Segment Display interface.
d) Keyboard interface.

B.E. 4th Year 1st Semester (Credit Based Grading System) with effect from the admitted batch of 2006 - 2007

ECE 411 DIGITAL SIGNAL PROCESSING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. This course will introduce the basic concepts and techniques for processing signals on a computer.
2. The most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
3. The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Acquire knowledge about discrete-time sequences, concept of energy and power, periodicity.
2.	Acquire knowledge about DFT and FFT
3.	Design and realize FIR and IIR using different techniques.
4.	Acquire knowledge on various applications of Digital Signal Processors in speech processing and radar signal processing.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	2	-	-	_	_	_	_	-	-	1		3	1
	2	3	3	3	-	-	_	_	_	_	-	-	1		3	1
	3	3	3	2	-	-	_	_	_	_	-	-	1		3	1
	4	3	3	2	-	-	_	_	-	-	-	-	1		3	1
	5	3	3	2	-	-	_	_	_	_	-	-	1		3	1

1. Discrete - Time Signals and Systems:

   Discrete - Time Signals – Sequences, Linear Shift – Invariant Systems, Stability and Casuality, Linear Constants – Coefficient Difference Equations, Frequency Domain Representation of Discrete – Time Signals and Systems.

2. Applications of Z – Transforms:

   System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects.

3. Discrete Fourier Transform (DFT):

   Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences.

4. Fast – Fourier Transforms (FFT):

   Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.

5. IIR Digital Filter Design Techniques:

   Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique.

6. Design of FIR Filters:

   Fourier Series Method, Window Function Techniques, Comparison of IIR and FIR Filters.

7. Applications:

   Applications of FFT in Spectrum Analysis and Filtering, Application of DSP in Speech Processing.

Text Book:

1 Alan V. Oppenheim and Ronald W. Schafer: Digital Signal Processing, PHI.

References:

1. Sanjit K. Mitra, Digital Signal Processing "A – Computer Based Approach", Tata Mc Graw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S. P. Eugene Xavier, Signals, Systems and Signal Processing, S. Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill.

ECE 412 INFORMATION THEORY AND CODING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1 To understand the Information capacity of channel by studying the concept of Information theory

2 To know the efficient representation sources by providing source coding techniques.

3 To provide knowledge about error detection and correction, different types of channel coding techniques such as linear block codes, cyclic codes and convolution codes are to be discussed.

COURSE OUTCOMES

By the end of the course student will be able to	
1	Understand the fundamental concepts of information theory, channel capacity and error control coding.
2	Solve the source coding problems and understand the compact description of sources.
3	Solve the various channel coding and decoding problems.
4	Analyze the performance of various coding techniques applied in communication systems.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	-	2	2	-	-	-	-	-	-	-	2			
	2	2	-	2	3	-	-	-	-	-	-	-	2			
	3	2	-	2	3	-	-	-	-	-	-	-	2			
	4	2	-	2	2	-	-	-	-	-	-	-	2			
	5	2	-	2	2	-	-	-	-	-	-	-	2			

1. Information measure and source coding, Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

   Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons , continuous information, continuous channel capacity, Ideal communication system , system comparisons.

2. Rationale for coding , and types of codes, Discrete memory less channels, linear block codes , cyclic codes, convolution codes, Maximum likely hood Decoding of Convolution codes, Distance properties of convolution codes.

   Sequential Decoding of Convolution codes, Trellis codes, Applications , Algebraic codes, Burst error correcting, Parity check bit coding for error detection, comparison of error rates in coded and un coded transmission, Automatic repeat request.

Employabi

Text Books:

1) Communication Systems,3/e, by A.B. Carlson, Mc. Graw Hill Publishers(for topic1)
2) Digital Communications by Simon Haykin , John Wiley & Sons(for topic 2)

References:

1) Principles of Digital Communications, Signal representation, Detection , Estimation &Information
2) Coding by J Das, S.K. Mullick, P.K.Chatterjee, New Age Int. Ltd.
3) Principles of Communication Systems, Taub &Schilling, 2/e, TMH Publishers

ECE 413 TV AND SATELLITE COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. To familiarize the students about the TV Principles and Broadcasting requirements.
2. To study the analysis and synthesis of TV pictures, composite video signal, camera tubes and picture tubes.
3. To familiarize the students about the satellite orbits, its launching methods, earth segment and space segment components.
4. To provide knowledge about the overview of satellite systems in relation to other terrestrial systems & its contribution to overall technical growth.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Understand the Television principles.
2.	Describe about different camera tubes & picture tubes.
3.	Explain television broadcasting.
4.	Implement the satellite link budgets and describe the orbital aspects and tracking of the communication satellites.
5.	Distinguish various multiple access techniques used in space communication & discuss about earth station technology.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	1	2	-	-	-	-	-	-	1	-	1	1	-	-
	2	1	1	2	-	-	-	-	-	-	1	-	1	-	-	-
	3	1	1	2	-	-	-	-	-	-	1	1	2	1	-	-
	4	2	3	3	-	-	-	-	-	-	1	1	3	1	1	-
	5	1	1	1	-	-	-	-	-	-	1	-	1	1	-	-

Television

Basic Television System:

Sound and Picture Transmission, the Scanning Process, Interlaced Scanning, Number of Scanning Lines, Vertical and Horizontal Resolution, Bandwidth of the Baseband Picture Signal.

Television Cameras:

Principle of working and constructional details of Image Orthicon, Vidicon, Plumbicon and Silicon diode array Vidicon and Solidstate Image Scanners.

Composite - Video Signal:

Video signal levels, Need for Synchronization, Details of Horizontal and Vertical Sync Pulses, Equalizing Pulses.

Signal Transmission and Channel Bandwidth:

AM and FM Channel Bandwidth, VSB Transmission, Complete Channel Bandwidth, Reception of Vestigial Sideband Transmission, Television Standards, Block Schematic study of a typical TV Transmitter.

The TV Picture Tube:

Monochrome Picture Tube, Picture Tube Characteristics and Picture Tube Control Circuits, Gamma Correction.

Television Receiver:

Block Schematic and Functional Requirements, VSB Correction, Vertical and Horizontal Deflection Circuits, E.H.T. Generation, Study of Video IF Amplifier Video Detector, Sound Channel Separation, Sync Separation Circuits.

Colour Television:

Principles of Additive and Subtractive Colour Mixing, Chromaticity Diagram, Compatibility and Reverse Compatibility of Colour and Monochrome TV Requirements, Colour Signal Transmission, Bandwidth for Colour Signal Transmission, Sub-carrier Modulation of Chroma Signals, NTSC Encoding (Y, I, Q signals), PAL Encoding (Y, U, V signals), NTSC and PAL Decoders, Types of Colour TV Picture Tubes (Delta-gun, PIL and Trinitron Picture Tubes), Convergence Techniques.

Satellite Communication

Orbital Aspects, Tracking and Control of Communication Satellites, Launch Vehicles, Propagation Characteristics: Attenuation and Noise, Frequency Bands, Satellite Transponders, Earth Station: Configuration, High Power Amplifiers, Antennas, LNA, Link Design, Multiple Access: FDMA, TDMA, CDMA, SPADE, INTELSATs, INSAT.

Text Books:

1. Monochrome and Colour Television, R. R. Gulati, Wiley Eastern.

References:

1. Television Engineering, A. M. Dhake, Tata - McGraw Hill.
2. Satellite Communication, D. C. Agarwal, Khanna Publishers.
3. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.

ECE 414 MICROWAVE ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. To understand the theoretical principles underlying microwave devices and networks.
2. To calculate the 'S' matrix for different microwave devices and circuits.
3. To work with different microwave bench setups and to perform different microwave measurements.
4. To understand various microwave sources and amplifiers.

COURSE OUTCOMES

C404.1	Able to apply electromagnetic theory to calculations regarding w transmission lines.
C404.2	Able to understand different microwave amplifiers and sources
C404.3	Able to describe, analyze and design simple microwave circuits and devices S- parameters.
C404.4	Able to understand the necessity of MMICS and their fabrication procedure
C404.5	Able to handle microwave equipment and make measurements

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

1. Microwave Components:

   Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

2. Microwave Signal Generators and Amplifiers:

   Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two – Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT,

Employability

Employability

Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

3. Microwave Circuits:

   Scattering Matrix and its Properties, Scattering Matrix of directional coupler, circulator, E Plane Tee, H plane Tee and Magic Tee.

   Employability

4. Microwave Integrated Circuits:

   Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

   Employability

5. Microwave Measurements:

   VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.

   Employability

Text Books:

1. "Microwave and Radar Engineering" by Gottapu Sasi Bhushana Rao, ISBN – 978813179944 Pearson Education Chennai 2013.
2. Microwave Engineering, G.S.N. Raju, IK International Publishers,

References:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill.
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices and Circuits, S. Y. Liao, PHI.

4. Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

ECE 415 Elective – III (1) : CELLULAR AND MOBILE COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. To have an overview of analog and digital cellular systems in wireless and mobile communications in different generations with the role of techno-political aspects in allocation of the limited wireless spectrum.
2. To understand the cellular radio concepts such as frequency reuse, handoff and how interference between mobiles and base stations affects the capacity of cellular systems.
3. To understand of different propagation models, and different antennas used in mobile environment.
4. To develop the ability to present information on current and future cellular mobile communication systems based on dropped calls and operational techniques.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Solve problems related to principle of operation of cellular mobile systems, interference, types of handoffs and dropped calls
2.	Solve problems related to Cell coverage of signal and traffic, cell size antennas and mobile antennas
3.	Design and analyze real time co-channel and non-co channel interference types, operational techniques
4.	Design and analyze frequency management and channel assignment, Elements of cellular radio system design

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	1	1								1	1	3	1	1
	2	2	1	1								1	1	3	1	1
	3	2	2	1								2	2	3	2	1
	4	2	2	1								3	3	1	2	1

Introduction to Cellular Mobile Systems:

A basic Cellular System, Performance Criteria, Uniqueness of Mobile Radio Environment, Operation of Cellular Systems, Planning and Cellular Systems, Analog & Digital Cellular Systems.

Elements of Cellular Radio System Design:

General description of the problem, Concept of Frequency Channels, Co-channel interference Reduction factor, Desired C/I from a normal case in an Omni-directional Antenna system, Cell splitting, consideration of the components of

Cellular Systems.

Interference:

Introduction to Co-channel interference, Real time Co-channel interference, Co-channel measurement, Design of Antenna system, Antenna parameters and their effects, Diversity Receiver, Non Co-channel interference - different types.

Cell Coverage for Signal and Traffic:

General introduction, Obtaining the Mobile Point - to - Point model, Propagation over water or flat open area, Foliage loss, Propagation in near in distance, Long distance Propagation, Point - to - Point predication model - characteristics, Cell site, Antenna heights and signal coverage cells, Mobile - to - Mobile Propagation.

Cell Size Antennas and Mobile Antennas:

Characteristics, Antennas at Cell site, Mobile Antennas.

Frequency Management and Channel Assignment:

Frequency management, Fixed Channels assignment, Non Fixed Channel assignment, Traffic and Channel Assignment.

Hand Off, Dropped Calls:

Why Hand-Off, Types of Hand-Off and their characteristics, Dropped call rates and their evaluation.

Operational Techniques:

Parameters, Coverage hole filter, Leaky feeders, Cell Splitting and small cells, Narrow Beam concept.

Text Books:

Mobile Cellular Communication by Gottapu Sasibhushana Rao,

Pearson International, 2012.

Reference Books:

Cellular and Mobile Communications by Lee, McGraw Hill.
Wireless Digital Communication by Dr. Kamilo Feher, PHI.

ECE 415 Elective – III (2) : VLSI DESIGN AND EMBEDDED SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. Outline the mathematical methods and circuit analysis models in analysis of NMOS, CMOS digital electronics circuits, including logic components and their interconnect.
2. Description of the characteristics of NMOS, CMOS circuit construction.
3. Introduce the concepts and techniques of modern integrated circuit design and testing.
4. Description about NMOS, CMOS combinational and sequential logic at the transistor level, including mask layout.
5. Description about general steps required for processing of NMOS, CMOS integrated circuits.
6. Students have knowledge about Designing of functional units including adders, multipliers, ROMs, SRAMs, and PLAs.
7. Students have knowledge about the basic functions, basic structure, basic concepts and applications of embedded systems.

COURSE OUTCOMES

C405.1	Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
C405.2	Be able to create models of moderately sized CMOS circuits that realize specified digital functions.
C405.3	Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
C405.4	Have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
C405.5	Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.
C405.6	An ability to design a system, component, or process to meet desired

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:																
		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

	needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

1. Review of microelectronics and an introduction to MOS technology:
   Introduction to IC technology, MOS and related VLSI technology, NMOS, CMOS, BiCMOS Technologies, Thermal aspects of processing, Production of E beam marks.
2. MOS and BiCMOS circuit design processes:
   MOS layers, ,Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter CMOS rules, Layout diagrams, Symbolic diagram. Employability
3. Basic Circuit concepts:
   Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances, Choice of layers.
4. Scaling of MOS Circuits:
   Scaling models, Scaling function for device parameters, Limitations of scaling.
5. Sub system design and Layout:
   Architectural issues, Switch logic, Examples of Structural design(Combinational logic). Employability
6. Sub system design process:
   Design of ALU subsystem, Some commonly used storage elements, Aspects of design tools, Design for testability, Practical design for test guidelines, Built in self test, CMOS project-an incrementer / decrementer, a comparator for two n-bit numbers. Employability

   Ultra fast systems, Technology development, MOSFET based design.
7. Introduction to Embedded Systems
   Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System, Examples of Embedded Systems, Embedded Systems on Chip, Complex Systems Design and Processors, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills required for an Embedded

System Designer.

8. Embedded Software Development Process and Tools

   Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design

Text books:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rd Edition.
2. Embedded Systems Architecture, Programming and Design, second edition by Raj Kamal, Tata McGraw Hill Publication (Chapter 1, Chapter 13)

References:

1. Mead, C.A and Conway, LA, "Introduction to VLSI Systems", Addison-Wesley, Reading, Massachusetts, 1980.

ECE 415 Elective – III(3) : ADVANCED MICROPROCESSORS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

8086 / 8088 microprocessor, architecture and addressing modes.

Employability

Instructions and assembly language programming.

Macroassembler MASM and advanced programming.

Interrupts of 8086 / 8088 and DOS Interrupt 21h functions.

Interfacing A/D converters to the PC and data acquisition. Interfacing D/A converters and waveform generation.

nployability

80286, 80386, 80486 and Pentium microprocessors.

Motorola 68000, 68020 and 68030 microprocessors.

Text Books:

1. Microprocessor and Interfacing by Douglas V. Hall, McGraw Hill International Edition, 1992.

2. The Intel Microprocessor 8086 / 8088, 80186, 80286, 80386 and 80486 by Barry B. Brey, PHI, 1998.

3. 68000 Microprocessors by Walter A. Tribel and Avtar Singh, PHI, 1991.

Reference Books:

Assembly Language Programming the IBM PC by Alan R. Miller, Sybex INC, 1987.

ECE 416 DIGITAL COMMUNICATION LABORATORY

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
2	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. The main objective of this lab course is to gain the practical hands on experience by exposing the students to various digital modulation technique generation and demodulation.
2. Analyze the circuits of natural sampler, time division multiplexing and demultiplexing.
3. To provide hands-on sessions to use software tools like Matlab .

COURSE OUTCOMES

C406.1	At the end of the course the student will be able to analyze and verify sampling theorem
C406.2	At the end of the course the student will be able to generate of pulse analog and pulse digital modulated signals
C406.3	At the end of the course the student will be able to generate of FSK,PSK waveforms .
C406.4	At the end of the course the student will be able to generate digital modulated signals and TDM signals using Matlab

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

List of experiments

1. Sample the given input signal for different sampling rates and recover the signal by means of appropriate low – pass filter.

2. Study the Pulse – Width Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

3. Study the Pulse – Position Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

4. Study the functioning of a given Analog to Digital Converter.

5. Study the functioning of a given Digital to Analog Converter.

Skill Development / Employability

6. Encode the given 4-Bit Data Word into 16-Bit Orthogonal Encoded Word using Hadamard Code.

7. Decode the 16-Bit Orthogonal Encoded Word to 4-Bit Data Word.

8. Study the performance of the given Continuously Variable Slope Delta Modulation (CVSD).

9. Obtain the characteristics of the Phase Shift Keying (PSK) Modulator.

10. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator.

ECE 417 DIGITAL SIGNAL PROCESSING LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. This course will introduce the basic concepts and techniques for processing signals on a computer.
2. The most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
3. The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Apply fundamental concepts related to switching theory using VHDL.
2.	Design the sequential and combinational circuits using VHDL
3.	Apply fundamental concepts of Signal processing using MATLAB.
4.	Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital filter types like IIR-Butterworth, Chebyshev, Bilinear, Impulse invariant, FIR window-design using MATLAB.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	-	2	2	3	2	_	_	_	2	-	-	2		3	
	2	-	2	2	3	2	_	_	_	2	-	-	2		3	
	3	-	2	2	3	2	_	_	_	2	-	-	2		3	
	4	-	2	2	3	2	_	_	-	2	-	-	2		3	
	5	-	2	2	3	2	_	_	_	2	-	-	2		3	

Cycle – I: Signal Processing with MATLAB

1. Generation of Discrete-Time Sequences
2. Implementation of Discrete-Time Systems
3. Frequency Analysis of Discrete Time Sequences

Employability

4. Frequency Analysis of Discrete Time Systems
5. Infinite Impulse Response Filter Design
6. Finite Impulse Response Filter Design

Employability

Cycle – II: VHDL Experiments

1. Logic Gates
2. Full Adder
3. SR Latch and D Latch
4. 8 x 1 Multiplexer and Demultiplexer
5. Up/Down Counter, Universal Shift Register
6. Mealy & Moore Counters

Employability

B.E. 4th Year 2nd Semester (Credit Based Grading System) with effect from the admitted batch of 2006 - 2007

ECE 421 ENGINEERING ECONOMICS AND MANAGEMENT

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. The objective of this course is to provide the students with the management skills to enable them to assess investment and project management decisions. To demonstrate the sources of costs and explain how these affect price decisions.
2. To identify sources of risk and discuss ways to manage risk.
3. To understand private and public sources of finance for investment projects and the distinctions between criteria for private investment and public investment

COURSE OUTCOMES

C409.1	Able to comprehend macro and micro economics, law of demand, elasticity of demand, and utility.
C409.2	Able to explain the features, advantages and disadvantages of different market structures and types of business organizations.
C409.3	Able to comprehend managerial concepts like functions and principles of management, scientific and administrative management, and basic functions of human resource management.
C409.4	Able to explain how to plan and control production, how to select suitable location for a plant and break - even analysis.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1															
	2															
	3															
	4															
	5															

C409.5	Able to explain how to manage capital, functions of marketing and entrepreneurship.

1. Fundamentals of Economics – Scarcity and Efficiency Market, Command and Mixed Economics.
   Basic Elements of Supply and Demand – Law of Demand – Elasticity of Demand.
2. Business Organizations – Individual Proprietorship – Partnership – The Corporation.
   Statement of Profit and Loss – The Balance Sheet – Break-Even Analysis – Cost Concepts – Elements of Costs.
3. Principles and Functions of Management – Evolution of Management Thought – Decision Making Process.
   Organization Theory and Process – Leadership – Motivation – Communication – Conflict Management in Organization.
4. Plant Location – Plant Layout – Production Planning and Control – Product Design and Development – Channels of Distribution. Materials Management – Inventory Control.
5. Industrial Disputes and their Settlement – Provision of Factories Act and Industrial Disputes Act.
   Recent Trends in Contemporary Business Environment.

References:

1. Economics – Paul A. Samuelson and William D. Nordhaus.
2. Engineering Economics – Vol. 1 – Tara Chand.
3. Financial Management – S. N. Maheswari.
4. Essentials of Management – Koontz and O' Donnel.
5. Production and Operation Management – B. S. Goel.
6. Modern Production / Operation Management – Elwood S. Buffa, Rakesh K. Sarin.
7. Industrial Law - S. P. Jain.
8. Industrial Law - R. P. Maheswari and S. N. Maheswari.
9. Labour and Industrial Laws – Singh, Agarwal and Goel.

ECE 422 RADAR ENGINEERING AND NAVIGATIONAL AIDS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. Define and Describe working principles of different types of radars,
2. Describe and Analyze Radar Range equation, Doppler Effect.
3. Apply and analyze tracking radars and special Radars (SAR, MST, Phased Array)
4. Recognize and significance of counter measures, mixers, protectors, displays and design aspects of radar receiver
5. Describe significance of radars for navigational aids
6. Provide strong fundamental knowledge to pursue their higher education in Radar engineering.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Solve problems related to principle of operation of basic Radar, Pulsed Radar & MTI Radar and Range equation and Doppler.
2.	Analyze principle of operation, applications of tracking radar, special Radars (SAR, Phased Array & MST).
3.	Analyze different types of Radars, Mixers & Protectors, displays, Tracking Radars, Counter Measures.
4.	Analyze Radars Applications for Navigational Aids.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2		1							1	1	3		2
	2	3	2		1							2	2	3		2
	3	3	2		1							1	2	3		2
	4	3	2		1							1	2	3		1

1. Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

   Employability

2. MTI and Pulse Doppler Radar: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar

3. Tracking Radar, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low

Employability

angle tracking, Pulse compression,

Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars,. MST Radar, ECM, ECCM

Employability

4. Radar Receiver, Mixers, Radar Displays, Receiver Protectors.
5. Principles of Direction Finders, Aircraft Homing and ILS, Radio Altimeter, LORAN, DECCA, OMEGA, Inland Shipping Aids.

Employability

Text Book:

1. "Microwave and Radar Engineering" by Gottapu Sasi Bhushana Rao, ISBN – 9788131799444 Pearson Education Chennai 2013.
2. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008

References

1. Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.

ECE 423 DATA COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

The objective is to provide the concepts of various data transmission modes, transmission mediums used for communications, Introduction to LANS, Data link layers and Network layers.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Understand the concept and basic terminology of Data Communication System.
2.	Understand and explain concepts of Transmission media and telephone networks.
3.	Identify and correct different errors occurred during data transmission.
4.	Enumerate the layers of the OSI model, TCP/IP and Explain the function(s) of each layer.
5.	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	2	-	-	_	_	_	_	-	-	1	-	2	3
	2	3	3	3	-	-	_	_	_	_	-	-	1	-	2	3
	3	3	3	2	-	-	_	_	_	_	-	-	1	-	2	3
	4	3	3	2	-	-	_	_	-	-	-	-	1	-	2	3
	5	3	3	2	-	-	_	_	-	-	-	-	1	-	2	3

Data Communication Concepts and Terminology:

Data Representation, Data Transmission, Modes of Data Transmission, Signal Encoding, Frequency Spectrum, Transmission Channel, Data Communication

Transmission Media:

Transmission Line Characteristics, Transmission Line Characteristics in Time Domain, Cross talk, Metallic Transmission Media, Optical Fiber Base-band Transmission of Data Signals, Telephone Network, Long Distance Network

Employability

Modems and Data Multiplexers:

Digital Modulation Methods, Multilevel Modulation, Differential PSK, Standard Modems, Limited Distance Modems and Line Drivers, Group Band Modems, Data Multiplexers, Statistical Time Division Multiplexers

Employability

Error Control:

Transmission Errors, Coding for Error Detection and Correction, Error Detection Methods, Forward Error Correction Methods, Reverse Error Correction

The Physical Layer, The Data Link Layer:

Need for Data Link Control, The Data Link Layer 196, Frame Design Considerations, Flow Control, Data Link Error Control, Data Link Management, HDLC-HIGH-LEVEL DATA LINK CONTROL

The Network Layer:

The Sub network Connections, Circuit Switched Sub networks, Store and Forward Data Sub networks, Routing of Data Packets, Internetworking, Purpose of the Network Layer, Title of X.25 Interface, Location of X.25 Interface, Addressing in X.25, Packet Assembler and Disassembler (PAD), Asynchronous Character Mode Terminal PAD

Employability

Local Area Networks:

LAN Topologies, Media Access Control and Routing, MIEDIA ACCESS CONTROL IN LOCAL AREA NETWORKS, INTERNETWORKING, THE TRANSPORT AND UPPER OSI Layer, The Session Layer, The Presentation Layer, The Application Layer.

Text Book:

Employability

Praksh C. Gupta 'DATA COMMUNICATIONS' Prentice Hall of India 1996.

ECE 423-2 BIOMEDICAL SIGNAL PROCESSING

Unit I

Signal processing: Review of Discrete time signals and systems - LTI systems - Response of LTI systems – Convolution - Difference equation representation of discrete systems Z transform - Transform analysis of LTI system – DFT. STFT

Unit II

Introduction to wavelets - CWT and DWT with Haar wavelet. Introduction to biosignals: Computers in medicine. Human anatomy and physiology - Cell structure - Origin of bioelectric potentials - Biomedical signals - The Brain and its potentials. Electrophysiological origin of brain waves. EEG signal and its characteristic- ECG signal origin and characteristics.

Unit III

Neurological signal processing: EEG analysis - Parametric modelling - Linear prediction theory; Autoregressive (AR) method; Recursive estimation of AR parameters. Cardiological signal processing: ECG parameters and their estimation - Arrhythmia analysis monitoring - ECG data reduction techniques

Unit IV

Digital filters - IIR and FIR - Notch filters - Optimal and adaptive filters. Weiner filters - steepest descent algorithm - LMS adaptive algorithm

Unit V

Adaptive interference / Noise cancellation: Types of noise in biosignals; Adaptive noise canceller - cancellation of 50 Hz signal in ECG - Cancellation of maternal ECG in foetal electrocardiography.

TEXTBOOKS

1. D. C Reddy, "Biomedical Signal Processing, Principles and Techniques", Tata McGraw Hill Publishing Company Limited, First Edition, 2005
2. Willis J Tompkins, "Biomedical Digital Signal Processing", Prentice Hall India Private Limited, First Edition, 2006.

TEXTBOOKS

1. Rangaraj M Rangayyan "Biomedical Signal Analysis – A case study approach" IEEE press series in biomedical engineering, First Edition, 2002.
2. John G Proakis, Dimitris and G. Manolakis, "Digital Signal Processing Principles algorithms, applications" PHI Third Edition. 2006

ECE 423-3 MICROWAE NETWORKS

UNIT-I Microwave Circuits: One port junction, Terminal voltages and currents in multi port junctions, Poynting's energy theorem, Normalized waves and scattering matrix, Properties of [S] matrix, Wave amplitude transmission matrix [A], Impedance matching techniques: Quarter-wave and Tapered line Impedance transformers, Two Port Networks analysis with Transmission matrices, S-Parameter and signal flow graphs

UNIT-II Microwave Waveguide Components: Microwave junctions, Bends, Scattering matrix E and H plane tee junctions, Magic-T , Applications of Magic-T, Microwave propagation in ferrites, Principles of Faraday rotation, Gyrator, Isolator and Circulator,

UNIT-III Waveguide Components: Mode transducers, Waveguide discontinuities, Terminations, Attenuators and Phase shifters, Rotary joints, Mechanical and gas type switches.

UNIT-IV Microwave Passive Components: Wave meters, Attenuators, Directional coupler, Scattering matrix of directional couplers, Coaxial and Strip line components : Terminations, Connectors and Transitions, Attenuators and phase shifters, Transmission line discontinuations, DC Returns and blocks, Low pas filters, MICS.

UNIT-V Microwave Resonators and Filters : Review of resonant circuits, Principles of microwave resonators, Field analysis of cavity resonators, Narrow band microwave filters, Wideband microwave filters, Some applications, Introduction to YIG filter, Scattering matrix of two-port gyrator networks.

Text Books:

1. "Microwave and Radar Engineering" by Gottapu Sasi Bhushana Rao, ISBN – 978813179944 Pearson Education Chennai 2013.
2. Microwave Engineering, G.S.N. Raju, IK International Publishers,

References:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill.
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices and Circuits, S. Y. Liao, PHI.

ECE 424 FIBER-OPTIC COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES

1. To illustrate the basic optical laws, definitions and fiber structures.
2. To describe the signal degradation in optical fibers: Attenuation and dispersion.
3. To explain how the LED's, LASER's works as optical sources and pin photo detectors, avalanche photodiodes as optical detectors.
4. To describe the power launching and coupling to optical fibers through cables and connectors.
5. To illustrate optical link design methods.

COURSE OUTCOMES

By the end of the course student will be able to	
1.	Understand the propagation of optical signal in step and graded index optical fibers and Signal degradation in fibers.
2.	Explain the operation of various components associated with optical fibers & their application in WDM system.
3.	Understand the characteristics of LASERs and LEDs & photo detectors & their application in Fiber optic system.
4.	Apply the knowledge of Transmitter & Receiver in the design of Optical Fiber Link.
5.	Design of analog & Digital fiber optic link and understands the concepts of WDM.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	1	1	-	-	-	-	-	-	-	-	1	1	1	1
	2	2	2	2	-	-	-	-	-	-	-	-	1	2	2	1
	3	2	2	-	-	-	-	-	-	-	-	-	-	1	1	2
	4	1	2	2	1	-	-	-	-	-	-	-	2	2	1	1
	5	1	1	2	-	-	1	1	-	-	-	-	2	2	2	1

1. Propagation: in Fibers:

   Elementary discussion of propagation in

   fibers Attenuation in Optical Fibers

   E M wave propagation in step-Index Fibers

E M wave propagation in graded-Index Fibers.

2. Optical Fibers and Associated

   Components: Fiber Properties

   Splices, connectors, Couplers, and Gratings.

3. Transmitting and Receiving Devices:

   Injection laser Characteristics

   LED structures, Characteristics and modulation

4. Optical Transmitters, Receivers and Fiber-optic Link Design:

5. Concepts of Fiber-Optic Networks and wavelength – Division Multiplexing:

Employability

Employability

Books:

For syllabus items 2,4 and 5

An Introduction to Fiber Optic Systems by John Powers, 2nd Edition, Irwin, 1997.

For syllabus item 1

Optical Communication Systems by John Gowar, PHI

1994 For syllabus item 3

Optical Fiber Communications, Principles and Practice by John M. Senior, Second Edition, PHI 1996.

ECE 426 MICROWAVE ENGINEERING AND ANTENNAS LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	4	-	50	50	100

COURSE OBJECTIVES

1. Characteristics of Reflex Klystron.
2. Study of power distribution in Directional coupler, E & H plane and Magic tee.
3. Wavelength and Frequency measurement.
4. Impedance measurement by slotted line method.
5. Gain and radiation pattern of Horn antenna.

COURSE OUTCOMES

C414.1	An ability to find the bench set up before start of the experiment. Identifying the required apparatus and procedure of doing the experiment.
C414.2	Ability to measure frequency, wave length of Microwave signal, VSWR and impedance of unknown load and characteristics of MW sources using bench set up
C414.3	An ability to plot the radiation pattern of horn antenna and other antennas using antenna trainer system
C414.4	Ability to measure and record the experimental data, plot it and analyze the results, and prepare a formal laboratory report.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

		PO												PSO		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**															
	2															
	3															
	4															
	5															

List of experiments

1) Measurement of VSWR

Employability

2) V-I Characteristics of GUNN Diode

3) Measurement of Coupling Factor and Directivity of a 4-Port directional coupler

Skill Developement

4) Measurement of Microwave frequency

5) Reflex Klystron Characteristics

Employability

6) Radiation Pattern of Horn Antenna

7) Fiber Optic Analog Link

Skill Developement

8) Fiber Optic Digital Link

Other four experiments from the choice either from Microwave Engineering or from Antenna Theory

ECE 427 PROJECT – II

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
8	-	-	12	-	50	50	100

COURSE OBJECTIVES

1. To inculcate leadership qualities in students and enable them to work in groups to complete the given project within a stipulated period.
2. To understand the impact of professional engineering solutions in societal and environmental contexts.
3. To prepare them to present their work in front of panel in a way developing their soft skills and ability to face the examiners.
4. To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.
5. To prepare graduates to recognize the need for and engage in life-long learning process.
6. To produce graduates as responsible citizens equipped with best human values and technological excellence.

COURSE OUTCOMES

C415.1	Upon completion of the course the students will be familiar with Identification of real world problems
C415.2	Upon completion of the course the students will be familiar with Awareness of design methodologies & its implementation
C415.3	Upon completion of the course the students will be familiar with Advanced programming techniques
C415.4	Upon completion of the course the students will be familiar with Technical report writing

APPLIED PHYSICS

(for EEE, ECE & Mech)

EEE 124	**Credits:3**
Instruction : 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

Course Objectives:

- ➢ To enhance student's knowledge of theoretical and modern technological aspects in physics and to introduce fundamentals of physics relevant to engineering applications
- ➢ To introduce advances in technology for engineering applications

Course Outcomes:

By end of the course, student will be able to:	
1	Understand the properties of magnetic materials and superconductivity.
2	Understand the dielectric nature of materials, properties and its applications.
3	Aware about nano material properties, synthesis and characterization tools.
4	Familiar with fundamentals of crystal structures.
5	Learn the basic phenomenon involved in semiconductors and semiconductor devices.

SYLLABUS

UNIT I 12 Periods

Magnetic materials: Definition of magnetic permeability, magnetization and magnetic susceptibility, origin of magnetic moment, classification of magnetic materials, properties of diamagnetic and paramagnetic materials, ferromagnetic materials - hysteresis curve , domain theory of ferromagnetism, soft and hard ferromagnetic materials, anti-ferromagnetic and ferrimagnetic materials , ferrites and its applications

Superconductivity: Introduction, properties of superconductors, effect of temperature and magnetic field, Meissner effect, flux quantization , type – I and type – II superconductors high temperature superconductors, applications of superconductors, BCS theory (qualitative)

UNIT II 10 Periods

Dielectric materials: Definition of electric dipole moment, dielectric polarization and dielectric constant, types of polarization – electronic, ionic and oriental polarization, expression for polarisability, internal fields in solids, Classius – Mossotti equation, frequency dependence of electronic polarization ,properties of ferroelectric materials and their applications

UNIT III 10 Periods

Nanophase materials: Introduction to nanophase materials, properties of nanophase materials, synthesis of nanophase materials – chemical vapour deposition, sol-gel method, MEChanical attrition method, applications of nanophase materials. Principles of X-Ray florescence X-Ray Diffraction- Electron Microscopy (SEM and TEM)

UNIT IV 10 Periods

Crystal structure: Introduction, fundamental terms of crystallography – space lattice, , crystal lattice, unit cell, planes, seven crystal systems – Bravias lattices, cubic lattices, crystal directions and planes, Miller indices, interplanar spacing and interatomic distance , some simple crystal structures, body-centered cubic crystals, face-centered cubic crystals

UNIT V 12 Periods

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Fermi level, carrier concentration in intrinsic semiconductor, continuity equation, direct and indirect band gap semiconductors. Lorentz force, Hall effect and its applications. Physics of semiconductor devices: open circuited p-n junction diode, energy diagram of p-n diode, working of a diode, volt-ampere characteristics of p-n junction, diode as a rectifier, light emitting diode (LED) , liquid crystal display (LCD), photodiode

TEXTBOOKS:

1. S.L Gupta and SanjeevGupta*Engineering physics*DhanpatRai publications.
2. M.N. Avadhanulu&P.G.Kshirasagar*A text book of engineering physics*, S.Chand publication

REFERENCE BOOKS:

1) V.Rajendran*Engineering physics* Tata McGraw Hill Education Private Limited
2) DattuRamanlal Joshi *Engineering Physics* Tata McGraw Hill Education Private Limited
3) A.Marikani*Engineering Physics* PHI Learning Private Limited

FUNDAMENTALS OF EEE

EEE 125 **Credits:3**

Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

- To analyze circuits by using basic network theorems and reduction techniques.
- To understand operation of various basic electronic components.
- To understand the principle of operation of electrical machines.

Course Outcomes:

By end of the course, student will be able to:	
1.	Apply KVL, KCL, Source Transformation, Mesh and Nodal Analysis.
2.	Find Energy and Power Equations of a given circuit.
3.	Apply network reduction techniques.
4.	Operate different types of electronic components like diode, transistor, FET, MOSFET.
5.	Use the basic concepts of Magnetic Circuits and Electro Mechanical Energy conversion.

SYLLABUS

UNIT I 14 Periods

The Fundamental Laws of Electrical Engineering: Units, Electric Current, Coulomb's law, Ohm's Law, Kirchhoff's laws, Ampere's Law Faraday's Law of Electromagnetic Induction, Lenz's Law.

Circuit Elements: Current and Voltage Sources, Source transformation, Reference Directions and Symbols, Resistance, Inductance and Capacitance Parameters, Series and parallel Combinations of Resistance, Inductance and Capacitance, Energy and Power, Network Reduction by Delta-Star transformation.

UNIT II 12 Periods

Elementary Network Theory: Mesh Analysis and Nodal Analysis, Superposition Theorem, Thevenin's and Norton's Theorems, Maximum Power Transfer Theorem, Tellegen's Theorems for DC Circuits. AC Circuits – Definitions of Average and Effective Values of Periodic Functions, Instantaneous, Complex, Real and Reactive Powers, Power Factor, Phasor diagrams of 1-ph R, RL, RC, RLC Circuits.

UNIT III 12 Periods

Magnetic Theory and Circuits: The Magnetic Circuit: Concept and Analogies, Units, Magnetic Circuit Computations, Hysteresis and Eddy-Current Losses in Ferromagnetic Materials.

Skill Development

UNIT IV 12 Periods

Electronic Devices: The Boltzmann Relation and Diffusion Current in Semiconductors, The Semiconductor Diode, The Transistor, The Junction Field-Effect Transistor (JFET), The Insulated-Gate FET (or MOSFET), the Silicon-Controlled Rectifier (SCR).

UNIT V 10 Periods

Skill Development

Electromechanical Energy Conversion: Analysis of Induced Voltages, Analysis of Electromagnetic Torque, Constructional Features of Electric Machines, (Elementary Treatment only).

Skill Development

TEXT BOOK:

1. Vincent Del Toro, “Electrical Engineering Fundamentals”, PHI publications.

REFERENCE BOOKS:

1. Jimmie J. Cathey and Syed A. Nasar “Basic Electrical Engineering”, McGraw-Hill publications.
2. M.E. VanValkenburg, “Network Analysis”, PHI publications.
3. V K Mehta, “Principles of Electrical Engineering” S. Chand & Co.

OBJECT ORIENTED PROGRAMMING WITH C++LAB

(Common for all branches, except for Civil & Chemical branches)

EEE 128	**Credits :3**
Instruction : 2 Periods/Week Practicals : 3 Periods/week	Sessional Marks : 50
End Exam : 3Hrs	End Exam Marks : 50

Course Objectives:

- To introduce Object Oriented Programming (OOP) using the C++ Language.
- To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction
5. Objects
6. Operator Overloading
7. Inheritance
8. Virtual Functions & Polymorphism
9. I/O Streams
10. Templates
11. File Processing
12. Exception Handling Concepts

REFERENCE BOOKS:

1. Mahesh Bhave, Sunil patekar*Object Oriented Programming in C++* Second edition, Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2nd Edition New Age International Publishers

3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999

4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition , McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.

2. Write a C++ program to find both the largest and smallest number in a list of integers.

3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments

4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation

5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: **void setlength(float)** to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **intsameArea(Rectangle)** that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

   i. Write the definitions for each of the above member functions.

   ii. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.

   iii. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following

   i. Veena, guitear, sitar, sarod and mandolin under string

   ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind

   iii. Table, mridangam, bangos, drums and tambour under perc

   It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

- o String instruments
- o Wind instruments
- o Percussion instruments

The show method should display the relevant details according to user choice the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to "blue" and "wagon". there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message "Beautiful music fills the passenger compartment" execute the methods to show the messages

   i. Mycar is a blue wagon

   ii. My father's car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters — a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively.

10. Write a C++ program to perform operations on complex numbers using operator overloading

11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT".
    Example:
    If the file "STORY.TXT" contains the following lines,
    The rose is red.
    A girl is playing there.
    There is a playground.
    An aeroplane is in the sky.
    Numbers are not allowed in the password.
    The function should display the output as 3

2016-17/255,2017-18/249,2018-19/263,2019-20/265

ENGINEEERING MATHEMATICS-III

EEE 211 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

At the end of the course student should be able to:

CO1: Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrrotational vector fields.
CO2: Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
CO3: Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
CO4: Understand the methods to solve the Laplace, heat, and wave equations.
CO5: To gain good knowledge in the application of Fourier Transforms.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	0	2	0	1	0	1	0	1	1	1	1
CO2	2	2	1	0	2	0	1	0	1	0	2	1	1	1
CO3	3	2	1	0	1	0	1	0	1	0	1	1	1	1
CO4	2	2	1	0	2	0	1	0	1	0	2	1	1	0
CO5	2	2	1	0	1	0	1	0	1	0	2	1	1	1

SYLLABUS

UNIT-I:

VECTOR DIFFERENTIATION **(12 Periods)**

Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT-II :

VECTOR INTEGRATION **(12 Periods)**

Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT-III:

PARTIAL DIFFERENTIAL EQUATIONS **(12 Periods)**

Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT –IV:

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **(12 Periods)**

Introduction – Method of separation of variables – Vibrations of a stretched string- Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT-V:

FOURIER TRANSFORMS **(12 Periods)**

Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2001.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

2016-17/256,2017-18/250,2018-19/264,2019-20/266

EEE 212 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam.: 3 Hours End Exam Marks : 60

Course Objectives:

To make the students to understand the principles of the effect of forces under the static and dynamic conditions and apply them to some practical applications. To make the students to understand the principles of the effect of forces on deformable rigid bodies under various loading conditions, and thus measure various types' stresses such as direct stresses, bending stresses, torsional stresses

Course Outcomes:

Students will be able to:

CO1: Evaluate the forces in concurrent and coplanar force systems, using various principles and also under different conditions of equilibrium. Analyze the forces in various applications and apply the concepts of friction to some basic applications of Electrical engineering.
CO2: Understand and apply principles of parallel force systems to find centroid and moment of inertia of different objects.
CO3: Apply the concepts of kinematics and kinetics to analyze force on particles under rectilinear.
CO4: Distinguish between various mechanical properties like yield strength, ultimate strength etc., of a given material and also to determine various types of direct stresses. Analyze the effect of shear force & bending moment on various beams.
CO5: Determine the bending stresses in different beams of various cross sections and to find torsional stresses in shafts.

Mapping of course outcomes with program outcomes and program specific outcomes :

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	3	0	0	0	3	0	2	0	0	0	0	0
CO2	0	2	0	0	0	0	1	0	3	0	0	0	0	0
CO3	0	2	0	3	0	0	1	0	2	0	0	0	0	0
CO4	0	2	0	3	1	0	2	0	1	0	0	0	0	0
CO5	0	1	0	3	0	0	2	0	0	0	0	0	0	0

SYLLABUS

Part –A : **Engineering Mechanics**

Unit – I **(12 Periods)**

Statics:

Fundamentals of Mechanics: Basic Concepts, Force Systems and Equilibrium, Moment and Couple, Principle of Superposition & Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, concept of free body diagram, applications in solving the problems on static equilibrium of bodies.

Friction Concept of dry friction, limiting friction, angle of friction, Friction problems related to connecting bodies and ladder.

Unit – II **(10 Periods)**

Properties of bodies:

Center of Gravity: Center of Gravity of Plane figures, Composite Sections and shaded areas.

Area Moment of Inertia: Parallel and Perpendicular axis theorem, Moment of Inertia of symmetrical and unsymmetrical sections

Unit – III **(08 Periods)**

Dynamics:

Kinematics – Introduction to kinematics, Equations of motion for uniform and variable motion; Projectiles.

Kinetics – D'Alemberts principle, Work energy method, Impulse momentum methods.

Part – B : **Strength of Materials**

Unit – IV **(15 Periods)**

Simple Stresses and Strains: Stresses and Strains, stress-strain curve, Bars of uniform, varying and tapered cross –sections, Poisons ratio, volumetric strain and relation between moduli of elasticity

Shear Force and Bending Moment: Cantilever, Simply Supported and Overhanging beams subjected to point loads and uniformly distributed loads.

Unit – V **(15 Periods)**

Bending stresses in beams: Theory of pure bending, Flexure formula, Section modulus for cantilever and simply supported beams having symmetrical and unsymmetrical sections

Torsion of Shafts: Torsion equation for circular shaft, polar modulus and related problems.

Text Books:

1. Engineering mechanics by Bhavikatti. New age international.
2. Engineering mechanics by A.K. Tayal.
3. S. Ramamrutham & R, Narayanan, Strength of Materials, Dhanpat Rai publications.
4. R.K. Bansal "A Text Book of Strength of Materials, Lakshmi Publications Pvt. Ltd,New Delhi

References:

1. Engineering Mechanics by S.Timoshenko and D.H. Young McGraw-Hill.
2. Mechanics of Materials by E P Popov
3. Dr Sadhu Singh, Strength of Materilas.

2016-17/257,2017-18/251,2018-19/265,2019-20/267

ELECTROMAGNETICS

EEE 213 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

At the end of the course student should understand

- Static Electric Fields
- Static Magnetic Fields
- Time Varying fields and coloration of electric and magnetic field.
- Wave propagation & Poynting theorem

Course Outcomes:

Upon the completion of this course, students will be able to

CO1: Understand the static electric fields

CO2: Understand the properties of conductors and dielectrics

CO3: Understand the static magnetic fields

CO4: Understand the Faraday's laws (time varying fields)

CO5: Understand the wave propagation & Poynting theorem

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	0	1	0	0	1	0	1	0	0	1	1	1
CO2	3	2	1	1	0	0	1	0	1	0	0	1	1	1
CO3	3	2	0	1	0	0	1	0	1	0	0	1	1	1
CO4	3	2	0	1	0	0	1	0	1	0	0	1	1	1
CO5	3	1	0	1	0	0	1	0	1	0	0	1	1	1

SYLLABUS

UNIT-I: **(14 periods)**

Co-ordinate systems: Cartesian, Cylindrical and Spherical coordinate systems, Coordinate transformations, **Static electric fields:** various types of charge distribution, The experimental law of Coulomb, Electric field intensity, Electric field intensity due to infinite line, infinite surface charge distributions. Electric flux density, Gauss law and its applications, point form Gauss law.

Skill Development

UNIT-II: **(14 periods)**

Absolute Electric potential, Potential difference, potential gradient, Calculation of potential differences for point charge, infinite line charge distribution. Electric dipole, Energy density in electrostatic field, Current, current density, continuity equation of current, point form of ohm's law, properties of conductors and boundary conditions, properties of dielectrics and boundary conditions, capacitance, parallel plate capacitor, composite parallel plate capacitor, energy stored in capacitor.

Skill Development

UNIT-III: **(12 periods)**

Poisson's and Laplace's equations, one-dimensional solutions of Laplace's equations, applications of Poisson's and Laplace's equations, method of images, **Static magnetic fields:** types of current distributions (line current, surface current and volume current), Biot-Savart law, magnetic field intensity due to straight conductor, circular loop, infinite sheet of current. Ampere's circuital law and applications, point form of Ampere's circuital law, magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

Skill Development

UNIT-IV: **(10 periods)**

Integral and differential forms of Maxwell's equations for static fields, Lorentz force equation, Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetic boundary conditions, energy stored in magnetic field, Inductance and mutual inductance, Inductance evaluation for solenoid, toroid, coaxial cables

Skill Development

UNIT-V: **(10 periods)**

Time varying fields: Faraday's law of Electromagnetic induction, statically induced e.m.f, dynamically induced e.m.f, modified ampere's circuital law for time varying fields, displacement current, integral form and differential forms of Maxwell's equations for time varying fields, wave equation in free space, wave equation for harmonically varying fields, uniform plane wave equation, intrinsic impedance, Poynting theorem and power considerations.

Employability

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics" , Tata Mc GrawHill Publishing Company Ltd, New Delhi, 2008
2. Sadiku MH, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009
3. Narayana Rao N., "Elements of Engineering Electromagnetics" Fourth Edition Prentice Hall of India, New Delhi 1998.
4. Vector fields by Boast, Mc Graw Hill.

REFERENCES:

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005.
3. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi,2006.
4. K.A. Gangadhar "Electromagnetics Field Theory" Khanna Publishers, Delhi, 2013.

2016-17/258,2017-18/252,2018-19/266,2019-20/268

NETWORK THEORY

EEE 214 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam.: 3 Hours End Exam Marks : 60

Course Objectives:

The main objectives of the course are:
- Analysis of D.C and A.C. circuits using basic network theorems and topologies.
- Analysis of transients in RLC and coupled circuits.
- Understanding the concept of resonance.
- Analysis of 3-phase circuits.

Contribution to Outcomes:
At the end of the course the student will be able to:
CO1: Apply basic network theorems and analyze both D.C and A.C. circuits.
CO2: Determine various parameters of two port networks.
CO3: Find natural and forced response of RL, RC & RLC circuits.
CO4: Analyze circuits under resonant condition.
CO5: Synthesize the networks and apply network topologies.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	3	0	0	0	1	0	0	1	1	1
CO2	3	3	3	3	3	0	0	0	1	0	0	1	1	1
CO3	3	3	1	1	3	0	0	0	1	0	0	1	1	1
CO4	3	3	3	3	3	0	0	0	1	0	0	1	1	1
CO5	3	3	2	1	3	0	0	0	1	0	0	1	1	1

SYLLABUS

UNIT-I: **(15 periods)**

Independent & Dependent Sources, Mesh Analysis, Nodal Analysis, Application of Superposition, Thevenin's, Norton's, Maximum power transfer and Milman's theorems to both D.C and A.C circuits.

skill development

UNIT-II: **(11 periods)**

Coupled Circuits: Magnetically coupled circuits, dot convention.

Two-port Networks: Z, Y, H, T Parameters of two port networks, reciprocity theorem.

Skill Development

UNIT-III: **(14 periods)**

DC Transients: Source free RL & RC circuits, Driven RL & RC circuits, Natural and forced response of RL & RC circuits. Source free and driven RLC circuits, Natural and forced response of RLC circuits.

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Skill Development

UNIT-IV: **(12 periods)**

Resonance: Series and parallel resonant circuits, bandwidth and Q-factor.

Three phase circuits: Balanced and unbalanced circuits.

Employability

UNIT-V: **(12 periods)**

Concept of Duality, initial and final value theorems in s-domain, Application of Laplace transforms to electrical circuits.

Network Topology: Definitions – Graphs, Tree, Basic cut set and basic tie set matrices for planar or non-planar networks**.**

Network Synthesis: Elementary Synthesis Operation, LC Network Synthesis, Properties of RC Network Functions, Foster and Cauer Forms of RC and RL Networks.

Skill Development

Text books:

1. W. H. Hayt jr & J. E. Kemmerly, Engineering circuit analysis, 7th edition, Mc.graw hill publications 2006.
2. M. E. Vanvalkunberg, Network analysis, 3rd edition, prentice Hall of India 1974.
3. M. E. Van valkunberg, Modern Network analysis.

REFERENCES:

1. C K Alexander & M. N. O. Sadiku, Fundamentals of Electric Circuits, 5th Edition, Published by McGraw-Hill.
2. Engineering Network Analysis & Filter Design by GOPAL.G. BHISE, Umesh Publications, publishers of science and technical books.

2016-17/259,2017-18/253,2018-19/267,2019-20/269

ELECTRONIC DEVICES & CIRCUITS

EEE 215 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

COURSE OBJECTIVES

- To know about the basics of Semi conductor Physics and PN Junction.
- To gain knowledge about various types of diodes and their applications.
- To understand the working of rectifier circuits.
- To know the basic working of BJT, FET.
- To understand the various biasing techniques.

COURSE OUTCOMES

By the end of this course, student will be able to
CO1: Design simple electronic circuits to accomplish a specific function.
CO2: Understand the voltage regulation.
CO3: Understand the working of transistors.
CO4: Design and analyze the basic amplifier circuits with proper bias stabilization.
CO5: Choose an appropriate device for given applications and use it satisfactorily.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	1	0	1	0	1	0	0	1	0	1
CO2	2	2	2	1	1	0	1	0	1	0	0	1	0	1
CO3	2	2	2	1	1	0	1	0	1	0	0	1	1	1
CO4	2	2	2	1	1	0	1	0	1	0	0	1	1	1
CO5	2	2	2	1	1	0	1	0	1	0	0	1	0	1

SYLLABUS

Unit1: PN junction diode and its applications **(10 periods)**

Open circuited p-n junction, biased p-n junction diode, energy band diagram of PN junction Diode, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Transition and Diffusion capacitance of diode.

Skill Development

Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

Unit 2: Special Semiconductor Devices **(8 periods)**

Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Varactor diode, Tunnel Diode, Schottky barrier diode, UJT. Construction, operation and characteristics of all the diodes.

Unit 3: Transistor Characteristics **(12 periods)**

Junction transistor, transistor current components, transistor as an amplifier, transistor configurations, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Comparison of CE, CB and CC Configurations. α, β and γ Parameters and the relation between them, typical transistor junction voltage values.

Skill Development

Unit 4: FET **(10 periods)**

FET types, construction, operation, characteristics, parameters, FET as a Voltage variable resistor, MOSFET-types, construction, operation, characteristics, comparison between BJT,JFET and MOSFET.

Unit 5: Transistor Biasing and Thermal Stabilization **(10 periods)**

Need for biasing, operating point, load line analysis, BJT biasing methods-fixed bias, collector to base bias, self bias. Bias compensation, Thermal runaway, Thermal stability. FET Biasing-methods and stabilization.

Text Books:

1. Electronic Devices and Circuits, Jacob Millman and D. Halkias, McGraw Hill.
2. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.

References:

1. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, Tata Mc-Graw Hill, 2009.

DIGITAL LOGIC DESIGN

EEE 216 **Credits:3**

Instruction: 3 Periods & 1Tut/week Sessional Marks:40

End- Exam :3Hours End-Exam-Marks:60

Prerequisite:

Computer fundamentals.

Course Objective:

- To provide knowledge and understanding of Boolean algebra and digitalconcepts.
- To provide the knowledge of analyzing and designing of combinational and sequential logicnetworks.
- HDL in this course provides the ability to synthesize the designs in Verilog HDL or VHDL.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Analyze and synthesize logic circuits by applying the knowledge of number systems, codes, Boolean algebra and digital logic circuits to solve typical problems on the same.
2.	Minimize the given Switching function in SOP and POS forms using K-Map & Design of different types of combinational logic circuits using various logic gates.
3.	Design and analyze synchronous sequential logic circuits including registers & counters using gates & flip-flops
4.	Design combinational logic circuits using different types of PLDs, namely, PROM, PLA and PAL.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2								3		3		2	2
	2	3								3		3		3	3
	3	3								3		3		2	2
	4	3								3		3.		3	3

SYLLABUS

UNIT-I: Binary Systems, Boolean Algebra andLogicGates **10 Periods**

Digital Systems, Binary Numbers, Number Systems, Base Conversion Methods, Complements, Signed Binary Numbers, Binary Codes, BinaryLogic.

Skill Development

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra. Boolean Functions, Canonical and Standard Forms, Different Logic Operations, Digital Logic Gates.

Skill Development

UNIT-II:Gate-LevelMinimization **4Periods**

The Map Method, Minimal Functions and their properties, Don't-Care Conditions, Tabulation Method, NAND and NOR Implementation, Other Two- Level Implementations, Verilog Hardware Description Language (Verilog HDL).

Skill Development

CombinationalLogicDesign: **6Periods**

Combinational Circuits, Analysis Procedure, Design Procedure, Design of adders, subtractors, adder-subtractor circuit, BCD adder circuit, applications of adders, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Verilog HDL For CombinationalCircuits.

Skill Development

Skill Development

UNIT-III: SequentialLogicCircuits **5 Periods**

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits,Flip-Flop Conversions, Verilog HDL for SequentialCircuits.

Skill Development

RegistersandCounters **6Periods**

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Johnson and Ring counters, Verilog HDL for Registers and Counters.

UNIT-IV: SynchronousSequentialLogic **4Periods**

Basic Design Steps, Serial Adder Example, State Reduction & Assignment Problem

Skill Development

Fundamentals of AsynchronousSequentialLogic **5 Periods**

Introduction, Analysis Procedure, Design Procedure, circuits with latches, Races andHazards.

Skill Development

UNIT-V: ProgrammableLogicDevices **8 Periods**

Programmable Logic Devices : PROM, PLA, PAL, realization of switching functions using PROM, PLA and PAL; comparison of PROM, PLA and PAL, Programming tables of PROM, PLA and PAL, Sequential ProgrammableDevices.

Text Books :

1. M. Morris Mano, Digital Design, Pearson Education, Inc., 2008, 4thEdition.

Reference Books:

2. ZviKohavi, Switching and Finite Automata Theory, Tata McGraw-Hill, 1978, 2ndEdition.
3. Frederick,IntroductiontoSwitchingTheoryandLogicalDesign,2011&J.HillandGerald R. Peterson, John Wiley and Sons, 2011, 3rd Edition.
4. William I. Fletcher, An Engineering Approach to Digital Design, PHI,2008.

2016-17/261,2017-18/255,2018-19/269,2019-20/270

NETWORKS LAB

EEE 217 — **Credits: 2**
Instruction: 3 periods / Week — Sessional Marks: 50
End Exam : 3 Hours — End Exam Marks : 50

Course Objectives:

At the end of the Course, Students are able to understand

- Can analyze theorems using Mesh and Nodal analysis methods.
- Can find equivalent circuits for theorem using D.C. source.
- Can find equivalent circuits for theorem using A.C. source.
- Calculation of power and network parameters.
- Able to calculate resonant frequency, quality factor for Series & Parallel resonance circuits.

Contribution to Outcomes:

Upon the completion of this course, students should demonstrate the ability to

CO1: Can Understand and verify the network theorems.
CO2: Understood the Series & Parallel resonance, importance of quality factor.
CO3: Calculate two port network parameters for a given network.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	0	0	1	1	0	1	1	1
CO2	3	2	1	1	1	1	0	0	1	1	0	1	1	1
CO3	3	2	1	1	1	1	0	0	1	1	0	1	1	1

List of Experiments:

1. Verification of ohm's law and filament lamp characteristics.
2. Verification of Kirchhoff's Laws.
3. Verification of superposition theorem.
4. Verification of Thevenin's and Norton's Theorems.
5. Verification of Maximum power transfer theorem.
6. Verification of Compensation theorem.
7. Verification of Milliman's and Tellegen's Theorems.
8. Verification of reciprocity theorem.
9. Resonance of series and parallel R-L-C circuits.
10. Two Port network parameters.
11. Calculation of self & mutual inductances, Co-efficient of coupling.
12. Transient response of an series R-L-C circuit with different R,L,C values.

Skill Development

2016-17/262,2017-18/256,2018-19/270,2019-20/271

ELECTRONIC DEVICES & CIRCUITS LAB

EEE 218 **Credits: 2**
Instruction: 3 periods / week Sessional Marks: 50
End Exam : 3 Hours End Exam Marks : 50

COURSE OBJECTIVES

- To observe the characteristics of different diodes and transistors practically.
- To Design and construct simple electronic circuits to accomplish a specific function, e.g. designing rectifiers, designing amplifiers etc.

COURSE OUTCOMES

At the end of the course the student will be able to

CO1: Understand the use of RPS and CRT.
CO2: Verify the working of diodes, transistors and their applications.
CO3: Set up a bias point in a transistor
CO4: Design simple hardware circuits using diodes and transistors.
CO5: Design simple DC power supply circuits.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	1	0	1	0	1	0	0	1	0	1
CO2	2	2	2	1	1	0	1	0	1	0	0	1	0	1
CO3	2	2	2	1	1	0	1	0	1	0	0	1	0	1
CO4	2	2	2	1	1	0	1	0	1	0	0	1	0	1
CO5	2	2	2	1	1	0	1	0	1	0	0	1	0	1

LIST OF EXPERIMENTS

1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. Half-wave rectifier without and with filter
6. Full-wave rectifier without and with filter
7. Characteristics of BJT in CB configuration, h-parameters
8. Characteristics of BJT in CE configuration, h-parameters
9. Drain and transfer characteristics of JFET
10. Transistor as a switch
11. Implementation of logic gates using diodes and transistors.
12. SCR Characteristics

Skill Development

ENGINEERING MATHEMATICS-IV

EEE 221 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

Course Objective :

- The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects.
- Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

At the end of the course student should be able to:

CO1: Understanding the characteristics and properties of Z-transforms and apply the concepts of Z-Transform in Digital Systems.

CO2: Familiarize the formation of Difference Equations and method of solving difference equations.

CO3: Understand, interpret and use the basic concepts: analytic function, harmonic function, Taylor and Laurent series, singularity.

CO4: Study the concepts of Residues, evaluating definite integrals using technique of residues and understand the concepts of conformal mappings.

CO5: Analyze the Statistical data by using statistical tests (based on small sample and large sample) and to draw valid inferences based on the analysis of statistical data.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	0	0	1	0	3	0	0	1	0	0	1	1
CO2	3	2	0	0	1	0	2	0	0	1	0	0	1	0
CO3	3	1	0	0	1	0	2	0	0	1	0	0	1	0
CO4	3	1	0	0	1	0	2	0	0	1	0	0	1	1
CO5	3	1	0	0	1	0	3	0	0	1	0	0	1	1

SYLLABUS

UNIT -I :
FUNCTIONS OF A COMPLEX VARIABLE (14 Periods)

Introduction –Limit of a Complex function- Derivative of (z) – Analytic functions-Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms (Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function - Residues - Calculation of Residues - Evaluation of Real Definite Integrals (Integration around the unit circle, Integration around the small semi circle , Indenting the Contours having poles on the real axis).
Geometric representation of f , Some standard transformation $(w = z + c, w = cz , w = \frac{1}{z} , w = \frac{az+b}{cz+d})$.

UNIT –II :
FINITE DIFFERENCES & INTERPOLATION (12 Periods)

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNIT-III:
NUMERICAL DIFFERENTIATION AND INTEGRATION (10 Periods)

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule , Simpson's Three-Eighth rule.

UNIT–IV:
Z – TRANSFORMS (12 Periods)

Introduction – Definition - Some Standard Z-Transforms –Linearity Property –Damping Rule – Some Standard Results - Shifting U_n to the right , Shifting U_n to the left – Two basic theorems (Initial Value Theorem and Final Value Theorem) – Convolution Theorem – Convergence of Z-transforms – Two sided Z - transform of U_n - Evaluation of inverse Z- transforms (Power Series Method , Partial Fraction Method , Inverse integral method) - Applications to Difference equations.

UNIT -V :
SAMPLING THEORY (12 Periods)

Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2011.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

2016-17/264,2017-18/258,2018-19/272,2019-20/273

ELECTRICAL MEASUREMENTS

EEE 222 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

At the end of the Course, Students are able to understand

- Construction details of various measuring instruments like moving coil, moving iron, dynamometer and electrostatic instruments.
- Extension of range of instruments.
- Various AC & DC bridge methods for the measurement of R, L and C.
- Testing of Ring Specimens.
- Operation of D.C & A.C potentiometers.

Contribution to Outcomes:

Upon the completion of this course, students should demonstrate the ability to

CO1: Design the shunts and multipliers required to extend the range of instruments.
CO2: Understand the operational features of various measuring devices
CO3: Understand and design bridges for the measurement of R, L & C.
CO4: Understand the determination of B-H curve and Hysteresis loop of ring specimens.
CO5: Understand the operation of AC and DC potentiometers and their applications.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	0	0	2	0	0	1	0	1
CO2	3	3	3	3	2	2	0	0	2	0	0	1	3	0
CO3	3	3	3	3	1	2	0	0	2	0	0	1	0	0
CO4	3	2	1	3	1	2	0	0	2	0	0	1	1	1
CO5	3	3	3	3	2	2	0	0	2	0	0	1	3	1

SYLLABUS

UNIT-I **(10 periods)**

Instruments: Objectives of Measurements, Analog Versus Digital Measurements, Sources of Measurement Error, Static characteristics of Measuring Instruments, Instruments: Ammeter, Voltmeter, Expression for Torque of Moving Coil, Moving Iron, Dynamometer, and Electrostatic Instruments. Extension of range of Instruments.

Skill Development

UNIT-II **(10 periods)**

Measurement of Power and Energy: Dynamometer type Wattmeter's and Torque Expression. Measurement of reactive Power. Single Phase Induction type Energy Meters. Driving Torque and Braking Torque Equations, Errors and Compensation, Power Factor Meters, Frequency Meters, Electrical Resonance and Weston type of SynchroScope.

Employability

UNIT-III **(18 periods)**

Bridge Methods: Measurement of Resistance by Using Wheatstone's bridge, Kelvin's Double Bridge, Loss of Charge Method and Megger. Measurement of Inductance by Using Maxwell's Inductance, Maxwell's Inductance-Capacitance, Anderson's, Owen's and Hays Bridge, Measurement of Frequency by Using Wien's bridge. Measurement of Capacitance by Using Desauty's and Schering's Bridges. Wagner's Earthing Device.

Skill Development

UNIT-IV **(12 periods)**

Magnetic Measurements: Calibration of Ballistic Galvanometer using Hibbert's magnetic standard, Flux Meter operation, extension range of Flux meters, Determination of Leakage Factor by using Flux Meter. Determination of B-H Curve and Hysteresis Loop Using CRO.

Skill Development

Skill Development

UNIT-V **(10 periods)**

Potentiometers: Basic slide wire potentiometer, Crompton's D.C. Potentiometer, A.C. Polar and co-ordinate Type Potentiometers Applications of DC and AC potentiometers. Use of potentiometer in Frequency, Phase and Amplitude measurements.
Instrument Transformers: CTs, PTs - Ratio and Phase angle errors and their reduction.

Skill Development

Text Book:

1. A.K. Sawhney, Electrical and Electronic Measurements and Instrumentation, DhanpatRai & Sons, Delhi, 19th Edition, 2011.

Reference Books:

1. E.W. Golding & Widdis, Electrical Measurements, 5th Edition, Wheeler Publishing.
2. J.B Gupta, Electrical Measurements and Measuring Instruments.
3. Electronic Measurements by Hellfric & Cooper.

2016-17/265,2017-18/259,2018-19/273,2019-20/274.

PERFORMANCE OF ELECTRICAL MACHINES–I

EEE 223 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

At the end of the Course, Students are able

- To understand the construction and operation of DC Machines.
- To study the various starting and testing methods of DC machine
- To analyze different speed control techniques of DC Machine.
- To understand the working and equivalent circuit parameters of single phase transformer.
- To analyze the performance of three phase transformers.

Contribution to Outcomes:

Upon the completion of this course, students should demonstrate the ability to

CO1: Understand the construction, principle of operation of DC Machines.
CO2: Performance and testing of DC Motors.
CO3: Speed control of DC Motors.
CO4: Constructional details, principle of operation and equivalent circuit parameters of Transformers.
CO5: Understand different connections of Poly phase transformers and auto transformer.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	2	2	0	0	0	0	0	2	1	0
CO2	3	3	1	3	2	2	0	0	0	0	0	2	1	2
CO3	3	3	1	3	2	2	0	0	0	0	0	2	1	0
CO4	3	3	1	3	2	2	0	0	1	0	0	2	3	3
CO5	3	2	1	2	2	2	0	0	0	0	0	2	3	3

SYLLABUS

UNIT – I **(14 Periods)**

DC Generators: principles of operation, constructional features, generated e.m.f., voltage induced in d.c. machine, collection and flow of current from armature, commutation process and interpoles, armature reaction and effect on main flux and commutation, compensating winding, methods of excitation, open circuit characteristics, external characteristics of generators, parallel operation

Skill Development

UNIT – II **(10 Periods)**

D.C. Motors: torque expression**,** torque and speed equations, characteristics of different motors, speed control of d.c. motors, starting and starters.

Skill Development

UNIT – III **(16 Periods)**

Testing of D.C. Motors: losses and efficiency, brake test, Swinburne's test, Hopkinson's test, Retardation test, field's test, separation of losses.

Skill Development

UNIT – IV **(12 Periods)**

Single phase Transformers: principles of operation, constructional features, equivalent circuit, vector diagram, voltage regulation and efficiency, parallel operation and load sharing,

Skill Development

UNIT – V **(12 Periods)**

Polyphase transformers:
Three winding transformers, poly phase connections and scott connection, tap changing, cooling methods and transformer oil, Auto transformers.

Employability

TEXT BOOKS:

1. Nagarath and Kotari, Electrical Machines, TMH Publishers.
2. Dr. P.S. Bimbhra, " Electrical Machinery", Khanna publishers 2004.
3. Clayton and Hancock, "Performance and Design of Direct Current Machines", CBS publishers 2004.
4. M .G Say, "The Performance and Design of Alternating Current Machines", CBS Publishers.

REFERENCE BOOKS:

1. S.K. Bhattacharya, "Electrical Machines", Tmh, 1998

2016-17/266,2017-18/260,2018-19/274,2019-20/275.

ANALOG ELECTRONIC CIRCUITS

EEE 224 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam : 3 Hours End Exam Marks : 60

COURSE OBJECTIVES

The aim of this course is to familiarize the student with the analysis and design of basic transistor amplifier circuits. This course relies on elementary treatment and qualitative analysis and makes use of simple models and equations to illustrate the concepts involved.

The main objectives of this course are:

- To provide an overview of amplifiers, feedback amplifiers and oscillators.
- To gain the knowledge on existing and future analog circuits.
- To Analyze various tuned amplifiers

COURSE OUTCOMES

At the end of the course the student will be able to

CO1: Perform the analysis of small signal and low frequency hybrid model circuits.

CO2: Determine various parameters of an amplifier like gain, input impedance and output impedance and bandwidth.

CO3: Know about various distortions that occur in amplifiers.

CO4: To apply the concepts of feedback analysis to the design of amplifiers to meet or exceed stated specifications.

CO5: To design and analyze tuned amplifiers and oscillators to meet or exceed stated specifications.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	0	0	0	0	0	0	0	0	0	1
CO2	3	1	1	3	0	0	0	0	1	0	0	0	0	1
CO3	3	1	1	3	0	0	0	0	1	0	0	0	0	1
CO4	3	2	1	2	0	0	0	0	0	0	0	0	0	1
CO5	3	3	3	1	0	0	0	0	2	0	0	0	0	1

SYLLABUS

Unit 1: Single stage Amplifiers **(12 Hrs)**

Transistor hybrid model, determination of h parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis. FET small signal model. Analysis of Common source amplifier.

Unit 2: Multi stage Amplifiers **(10Hrs)**

RC Coupled Amplifiers using BJT and FET- Low and High Frequency Response of an RC coupled stage, Band width of multistage amplifiers, Concept of gain bandwidth product, Distortion in Amplifiers.

Unit 3: Feedback Amplifiers **(10Hrs)**

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Unit 4: Tuned Amplifiers **(10 Hrs)**

Introduction, Q-Factor, small signal tuned amplifier, capacitance coupled single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers.

Unit 5:
Sinusoidal Oscillators **(10 Hrs)**

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators Crystal Oscillators – RC Oscillators -- RC Phase Shift and Wein Bridge Oscillators.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw- Hill, 1972.
2. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

References

1. Electronic Devices and Circuits – Mottershead
2. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
3. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

SIGNALS & SYSTEMS

EEE 225 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

Coverage of continuous and discrete-time signals and systems, their properties and Knowledge of time-domain representation and analysis concepts as they relate to Difference equations, impulse response and convolution, etc. Knowledge of frequency-domain representation and analysis concepts using Fourier Analysis tools, Z-transform Concepts of the sampling process.

Course Outcomes:

At the end of the course the student will be able to

CO1: Characterize and analyze the properties of CT and DT signals and systems.
CO2: Analyze CT and DT systems in Time domain using convolution.
CO3: Represent CT and DT systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT
CO4: Conceptualize the effects of sampling a CT signal.
CO5: Analyze CT and DT systems using Laplace transforms and Z Transforms.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	1	0	0	0	1	1	0	1	0	1
CO2	2	2	2	3	1	0	0	0	1	1	0	1	0	1
CO3	2	2	2	3	1	0	0	0	1	1	0	1	0	1
CO4	2	2	2	3	1	0	0	0	1	1	0	1	0	1
CO5	2	2	2	3	1	2	0	0	1	1	0	1	0	1

SYLLABUS

UNIT-I Signals and systems: **(12 periods)**

Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, random signals, CT systems and DT systems, Basic properties of systems .

UNIT-II Linear Time Invariant Systems: **(12 periods)**

Discrete Time Linear Time Invariant Systems, Convolution Sum , Continuous Time Linear Time Invariant Systems, Convolution Integral ,properties of LTI systems , LTI systems described by linear constant coefficient differential and difference equations.

UNIT-III -Analysis of CT Signals: **(12 periods)**

Fourier series analysis – Spectrum of CT signals – Fourier transform and Laplace transform in signal analysis, Differential equation – Block diagram representation – Impulse response – Convolution integral – Frequency response – Fourier transform and Laplace transform in analysis.

UNIT-IV- Analysis of DT Signals: **(12 periods)**

Spectrum of DT signals – Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Z-transform and its Properties in signal analysis, Inverse Z-Transforms, Difference equations – Block diagram representation – Impulse response – convolution SUM – Frequency response - Fourier transform and Laplace transform in analysis.

UNIT-V Sampling: **(12 periods)**

Sampling Theorem: Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals using Fourier’s Transform, sampling of band pass signals.

Text Books:

1. A.V. Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson . [UNIT-1, UNIT-2,UNIT-5]
2. S. Haykin & B.V.Veen, Signals and Systems- John Wiley. [UNIT-3,UNIT-4]

References:

1. J.G. Proakis & D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
2. A. Nagoor Kani- Signals and Systems- McGraw Hill
3. E W Kamen &BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson.
4. Rajeswari K.Raja, Rao B.Visvesvara -Signals and systems , PHI.

2016-17/268,2017-18/262,2018-19/276,2019-20/277

MICROPROCESSORS AND MICRO CONTROLLERS

EEE 226 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam : 3 Hours End Exam Marks : 60

COURSE OBJECTIVES

- To understand the basic concepts of Microprocessors.
- Knowledge on instruction-set & implementing them for many applications.
- Knowledge on different Interfacing techniques of processor.
- Differentiation between Processors &Controller.
- Architecture, Instruction –set & Interfacing of microcontroller.

COURSE OUTCOMES

CO1: Students will be able to analyze the architectures of 8085 .
CO2: Understands the addressing modes and interfacing with CPU.
CO3: Students will be able to analyze the architectures of 8086.
CO4: Understands the basic interfacing peripherals to 8085.
CO5: Analyze the architecture of 8051 microcontroller.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	2	2	3	0	0	0	3	0	0	2	2	2
CO2	0	0	2	2	3	0	0	0	3	0	0	2	2	2
CO3	0	0	2	2	3	0	0	0	3	0	0	2	2	2
CO4	0	0	2	2	3	0	0	0	3	0	0	2	2	2
CO5	0	0	2	2	3	0	0	0	3	0	0	2	2	2

SYLLABUS

UNIT-I: **(14 periods)**

INTRODUCTION TO MICROPROCESSOR ARCHITECTURE (8085): Introduction, internal architecture and functional description of 8085 processor-instruction set and timing diagrams.

Skill Development

UNIT-II : **(08 periods)**

MEMORIES: RAM, ROM, PROM, static and dynamic memories-memory addressing-interfacing memory to cpu.

Skill Development

UNIT-III: **(12 periods)**

INTRODUCTION TO MICROPROCESSOR ARCHITECTURE (8086):

Introduction and evolution of microprocessor architecture of 8086, register organization of 8086, memory organization of 8086, general bus operation of 8086.

Skill Development

UNIT-IV: **(12 periods)**

INTERFACING WITH ADVANCED DEVICES:

Stepper motor interfacing, key board/display device: 8279 block diagram and its operation, 8251 (USART), block diagram and functions of each block, timer-8253 block diagram and modes of operation.

Employability

UNIT-V: **(14 periods)**

INTERFACING AND INDUSTRIAL APPLICATIONS OF 8051:

Applications of micro controllers, interfacing 8051 to led's, push button, relay's and latch connections, keyboard interfacing, interfacing seven segment display, adc and dac interfacing.

Skill Development

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V Hall, Mc-Graw Hill, 2nd Edition.
2. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
3. R.S. GAONKAR: Processor Architecture, Programming and Applications With The 8085/8080A, Wiley Eastern Ltd.

REFERENCE BOOKS:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw-Hill Companies –2005.

2016-17/269,2017-18/263,2018-19/277,2019-20/278

ELECTRICAL MEASUREMENTS LAB

EEE 227 | **Credits: 2**
Instruction: 3 periods / Week | Sessional Marks: 50
End Exam : 3 Hours | End Exam Marks : 50

Course Objectives:

The main objectives of the course are to enable the students to understand

- Calibrate the Dynamometer type wattmeter and Dynamometer type power factor meter.
- Calibrate the single phase Energy meter.
- Measurement of Inductance and Capacitance by using various bridge methods.
- Measurement of single phase and three phase Power by using different methods.
- Calibrate the ammeter and voltmeter by using AC Potentiometer.

Contribution to Outcomes:

Upon the completion of this course, students will be able to

CO1: Understand the operational features of various measuring devices

CO2: Understand and design bridges for the measurement of R, L & C.

CO3: Understand the operation of AC potentiometers and their applications.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	0	1	0	0	1	2	0	1	0	0
CO2	3	3	2	3	0	1	0	0	1	2	0	1	2	0
CO3	3	3	2	3	0	1	0	0	1	2	0	1	0	0

List of Experiments:

Skill Development/Employability

1. Calibration and testing of single phase Energy Meter.
2. Calibration of Single phase Energy Meter by using Phantom Loading.
3. Calibration of Dynamometer type wattmeter by using Direct Loading (through CTs and / or PTs).
4. Measurement of 3 phase power by using two wattmeter method.
5. Calibration of Dynamometer type wattmeter by using Phantom Loading.
6. Calibration of Dynamometer type Power Factor meter.
7. Measurement of 3 Phase Reactive Power by using single wattmeter.
8. Measurement of Inductance by using Anderson's bridge.
9. Measurement of Inductance by using Maxwell's Inductance-Capacitance bridge.
10. Measurement of Inductance by using Kelvin's Double bridge.

11. Measurement of Capacitance by using Schering bridge.
12. Measurement of Capacitance by using Desaugty’s bridge.
13. Power Measurement by using 3 ammeter and 3 voltmeter method.
14. Calibration of ammeter and voltmeter by using AC Potentiometer.
15. Finding the parameters of a choke coil.

2016-17/270,2017-18/264,2018-19/278,2019-20/279

ANALOG ELECTRONIC CIRCUITS LAB

EEE 228 **Credits: 2**
Instruction: 3 periods / Week Sessional Marks: 50
End Exam : 3 Hours End Exam Marks : 50

COURSE OBJECTIVES

The aim of this course is to

1. Analyze amplifiers for frequency response
2. Identify, select, and handle transistors.
3. Analyze feedback circuits , amplifier circuits and oscillator circuits
4. To provide an overview of amplifiers, feedback amplifiers and oscillators.
5. Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers

COURSE OUTCOMES

At the end of the course the student will be able to

CO1: Acquire a basic knowledge in solid state electronics including voltage transistor, power transistors and operational amplifier.
CO2: Design analog electronic circuits using discrete components.
CO3: Observe the amplitude and frequency responses of common amplification circuits.
CO4: Measure various parameters of analog circuits and compare experimental results in the laboratory with theoretical analysis.
CO5: Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, oscillators.

Mapping of course outcomes with program outcomes and program specific outcomes:

CO's No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	0	1	1	0	0	0	0	0	0	1
CO2	1	2	3	2	0	1	1	0	0	0	0	0	0	1
CO3	1	2	3	2	0	1	1	0	0	0	0	0	0	1
CO4	1	2	3	2	0	1	1	0	0	0	0	0	0	1
CO5	1	2	3	2	0	1	1	0	0	0	0	0	0	1

LIST OF EXPERIMENTS

1. Design of CE amplifier and obtain its frequency response.
2. Design of CC amplifier and obtain its frequency response.
3. Frequency response of two stage -RC coupled amplifier.
4. Frequency response of Common source FET amplifier.
5. Current series feedback amplifier.
6. Voltage shunt feedback amplifier.
7. Hartley oscillator.
8. Colpitt's oscillator.
9. RC Phase - Shift Oscillator.
10. Wein - Bridge Oscillator.
11. Tuned Voltage Ampl ifier.

2015-16/269,2016-17/271

EEE 311-PULSE AND DIGITAL CIRCUITS
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

LINEAR WAVE SHAPING:
HIGH PASS AND LOW PASS RC CIRCUITS AND THEIR RESPONSE FOR SINUSOIDAL, STEP VOLTAGE, PULSE, SQUARE WAVE AND RAMP INPUTS. HIGH PASS RC CIRCUIT AS A DIFFERENTIATOR. LOW PASS RC CIRCUIT AS AN INTEGRATOR. ATTENUATORS AND THEIR APPLICATION AS CRO PROBE. RL AND RLC CIRCUITS AND THEIR RESPONSE FOR STEP INPUT. RINGING CIRCUIT.

NON-LINEAR WAVE SHAPING:
DIODE CLIPPERS. TRANSISTOR CLIPPERS. CLIPPING AT TWO INDEPENDENT LEVELS. COMPARATOR – APPLICATIONS OF VOLTAGE COMPARATORS – DIODE COMPARATOR. CLAMPING OPERATION. CLAMPING CIRCUITS USING DIODE WITH DIFFERENT INPUTS. CLAMPING CIRCUIT THEOREM. PRACTICAL CLAMPING CIRCUITS. EFFECT OF DIODE CHARACTERISTICS ON CLAMPING VOLTAGE.

Skill Developmer

Skill Developmer

MULTIVIBRATORS:
TRANSISTOR AS A SWITCH - SWITCHING TIMES OF A TRANSISTOR. ASTABLE, MONOSTABLE AND TRISTABLE MULTIVIBRATORS USING TRANSISTORS, RESOLUTION TIME OF A BINARY. METHODS OF IMPROVING RESOLUTION TIME – METHODS OF TRIGGERING A BINARY. SCHMITT TRIGGER.

Skill Development

SWEEP CIRCUITS:
VOLTAGE SWEEP SIMPLE EXPONENTIAL SWEEP GENERATOR. ERRORS THAT DEFINE DEVIATION FROM LINEARITY, UJT RELAXATION OSCILLATOR – METHODS OF LINEARISING A VOLTAGE SWEEP - BOOTSTRAP AND MILLER CIRCUITS – CURRENT SWEEP – LINEARISING A CURRENT SWEEP BY ADJUSTING THE DRIVING WAVEFORM.

SYNCHRONISATION AND FREQUENCY DIVISION:
PRINCIPLES OF SYNCHRONISATION – SYNCHROISATION OF ASTABLE MULTIVIBRATORS. SYNCHRONISATION OF SWEEP CIRCUITS WITH SYMMETRICAL SIGNALS.

LOGIC GATES:
IC FAMILIES, TTL, CMOS, ECL, FFS AND CIRCUITS.

Employability

BLOCKING OSCILLATOR:
BASE TIMING. EMITTER TIMING, AND ASTABLE BLOCKING OSCILLATOR.

TEXT BOOKS:

1. PULSE, DIGITAL AND SWITCHING WAVEFORMS – MILLMAN & TAUB, TMH PUB.
2. WAVE GENERATION AND SHAPING – L. STRAUSS.

2015-16/270, 2016-17/272.

EEE 312-LINEAR ICS AND APPLICATIONS
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

Skill development

OPERATIONAL AMPLIFIERS:
DESIGN ASPECTS OF MONOLITHIC OP-AMPS, IDEAL CHARACTERISTICS, SPECIFICATIONS, OFFSET VOLTAGES AND CURRENTS, FREQUENCY COMPENSATION TECHNIQUES, MEASUREMENT OF OP-AMP PARAMETERS, APPLICATIONS OF OP-AMPS, INVERTING AND NON-INVERTING AMPLIFIERS, INTEGRATORS, FUNCTION GENERATORS, LOGARITHMIC AMPLIFIERS, INSTRUMENTATION AMPLIFIERS, SIGNAL CONDITIONING CIRCUITS, MULTIVIBRATORS, SQUARE WAVE GENERATORS, RECTIFIERS, PEAK DETECTION AND VOLTAGE REGULATION.

Skill development

555 TIMERS, 556 FUNCTION GENERATOR ICS AND THEIR APPLICATIONS. THREE TERMINAL IC REGULATORS, IC 1496 (BALANCED MODULATOR), IC 565 PLL AND ITS APPLICATIONS.
ACTIVE FILTERS – LPF, HPF, BPF, BEF, ALL-PASS FILTERS, HIGHER ORDER FILTERS AND THEIR COMPARISON. OP-AMP PHASE SHIFT, WEIN-BRIDGE AND QUDRATURE OSCILLATOR, VOLTAGE CONTROLLED OSCILLATORS, VOLTAGE TO FREQUENCY AND FREQUENCY TO VOLTAGE CONVERTERS, VOLTAGE TO CURRENT AND CURRENT TO VOLTAGE CONVERTERS. SWITCHED CAPACITANCE FILTERS, ANALOG MULTIPLEXERS, SAMPLE AND HOLD CIRCUITS.

Skill development

BOOKS:
1.MICROELECTRONICS, JACOB MILLMAN, TMH INC.
2. OP-AMPS AND LINEAR ICS, RAMAKANTH GAYAKWAD, PEARSON EDUCATION
3. INTEGRATED CIRCUITS, BOTKAR, KHANNA PUBLICATIONS.
4. APPLICATIONS OF LINEAR ICS, CLAYTON.

2015-16/271, 2016-17/273.

EEE 313-LOGIC DESIGN AND MICROPROCESSORS

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

PART-A: LOGIC DESIGN

NUMBER SYSTEMS: BINARY, DECIMAL, OCTAL AND HEXADECIMAL-BINARY ARITHMATIC-BINARY CODES

Skill development

BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUIT DESIGN: TRUTH FUNCTIONS-OPERATORS-LAWS OF BOOLEAN ALGEBRA-BOOLEAN EXPRESSIONS-LOGIC DIAGRAMS-UNIVERSAL BUILDING BLOCKS-MAP METHOD OF SIMPLIFICATION FOR POS AND SOP FORMS (ONLY UPTO 4 VARIABLES)-WIRED OR AND WIRED AND GATES-PLAs AND PALs.

SEQUENTIAL CIRCUITS AND DESIGN: SEQUENTIAL LOGIC-FLIP-FLOPS-DIGITAL COUNTERS-RIPPLE COUNTER DESIGN, SYNCHRONOUS COUNTER DESIGN WITH T,D AND J.K. FLIPFLOPS. SHIFT REGISTERS AND OPERATION MODES.

Skill development

PART-B: MICROPROCESSORS

MICROPROCESSORS: INTRODUCTION, INTERNAL ARCHITECTURE AND FUNCTIONAL DESCRIPTION OF 8085 PROCESSOR-INSTRUCTION SET AND TIMING DIAGRAMS.

MEMORIES: RAM, ROM, PROM, STATIC AND DYNAMIC MEMORIES-MEMORY ADDRESSING-INTERFACING MEMORY TO CPU.

PERIPHERAL ICs: PIO-8255A (PPI) BLOCK DIAGRAM AND OPERATING MODES, SIO-8251 (USART) BLOCK DIAGRAM AND FUNCTIONS OF EACH BLOCK. TIMER-8253 BLOCK DIAGRAM AND MODES OF OPERATION.

Skill development

KEY BOARD/DISPLAY DEVICE: 8279 BLOCK DIAGRAM AND ITS OPERATION.

Employability

DATA CONVERTERS: VARIOUS TYPES OF D/A AND A/D CONVERTERS.

TEXT BOOKS:

1. T.C. BARTEE: DIGITAL COMPUTER FUNDAMENTALS, TMH Pub.
2. MICROPROCESSORS & ITS APPLICATIONS BY THEAGARAJAN, R., DHANPAL, S. & DHANASETURAN, S., New Age India Ltd., 1998.
3. R.S. GAONKAR: MICROPROCESSOR ARCHITECTURE, PROGRAMMING AND APPLICATIONS WITH THE 8085/8080A, WILEY EASTERN Ltd.

Course Objectives:

At the end of the course students should understand

- D.C machines concepts and their designing part
- Principle of operations & construction details of both D.C Generator & Motor
- Testing of D.C Machines & speed control techniques
- Performance and operation of transformer

Contribution to Outcomes:

This course used lectures assignments and class tests to enable the students to

- .(CO 1)
- Performance of 1-ph Transformer , Connections of Three winding Transformers. (CO 2)
- Various types of Starting methods of D.C Motor
- Design of Armature winding ,field winding & Armature slots
- Assess the efficiency and regulation of transformer with and without loading.

2015-16/272, 2016-17/274

EEE 314 - PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES – II

INSTRUCTION **: 4 Periods per Week**
UNIVERSITY EXAMINATION **: 3 Hours**
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS **: 30**
CREDITS : 4

TRANSFORMERS: PRINCIPLES OF OPERATION, CONSTRUCTIONAL FEATURES, EQUIVALENT CIRCUIT, VECTOR DIAGRAM, VOLTAGE REGULATION AND EFFICIENCY, PARALLEL OPERATION AND LOAD SHARING, THREE WINDING TRANSFORMERS, POLY PHASE CONNECTIONS AND SCOTT CONNECTION, TAP CHANGING, COOLING METHODS AND TRANSFORMER OIL.

Skill development

INDUCTION MOTOR: PRINCIPLES OF OPERATION OF THREE PHASE INDUCTION MOTOR, ROTATING MAGNETIC FIELD, TYPES OF ROTOR, TORQUE EXPRESSION, VECTOR DIAGRAM, EQUIVALENT CIRCUIT AND PERFORMANCE EQUATIONS AND CALCULATIONS, SLIP-TORQUE CHARACTERISTIC , CIRCLE DIAGRAM AND PERFORMANCE CALCULATIONS. STARTING OF INDUCTION MOTORS, CRAWLING AND COGGING, DOUBLE SQUIRREL CAGE INDUCTION MOTOR AND EQUIVALENT CIRCUIT, METHODS OF SPEED CONTROL OF INDUCTION MOTORS, INDUCTION GENERATOR AND PRINCIPLE OF OPERATION, SELF EXCITATION OF INDUCTION GENERATOR, SCHRAGE MOTOR, TWO PHASE MOTORS.

Skill development

SINGLE PHASE INDUCTION MOTORS: TYPES, DOUBLE REVOLVING FIELD THEORY, EQUIVALENT CIRCUIT, PERFORMANCE ANALYSIS AND CHARACTERISTICS OF CAPACITOR START MOTORS, SHADED POLE, REPULSION TYPE, RELUCTANCE, HYSTERISIS AND AC SERIES MOTORS.

Employability

DESIGN OF TRANSFORMERS: MAIN DIMENSIONS, SINGLE PHASE AND THREE PHASE TRANSFORMERS, WINDING AND ARRANGMENT OF COILS, NO LOAD CURRENT ESTIMATION FOR SINGLE PHASE AND THREE PHASE TRANSFORMERS. TEMPERATURE RISE And DESIGN OF TANK AND COOLING TUBES. DESIGN OF WELDING TRANSFORMERS.

Employability

TEXT BOOKS:

1. " ELECTROMECHANICAL ENERGY CONVERSION WITH DYNAMICS OF MACHINES. " BY R. D. BEGAMUDRE.

2." PERFORMANCE AND DESIGN OF ALTERNATING CURRENT MACHINES " BY M. G. SAY

3. " ELECTRICAL MACHINES" BY S.K. BHATTACHARYA, TMH, 1998.

Course Objectives:
At the end of the course students should understand
- D.C machines concepts and their designing part
- Principle of operations & construction details of both D.C Generator & Motor
- Testing of D.C Machines & speed control techniques
- Performance and operation of transformer

Contribution to Outcomes:
This course used lectures assignments and class tests to enable the students to
- Construction details , Principle of operations & equivalent circuit of 1-ph Transformer .(CO 1)
- Performance of 1-ph Transformer , Connections of Three winding Transformers. (CO 2)
- Various types of Starting methods of D.C Motor
- Design of Armature winding ,field winding & Armature slots
- Assess the efficiency and regulation of transformer with and without loading.

2015-16/273, 2016-17/275

EEE 315 –COMPUTER ARCHITECTURE AND ORGANIZATION
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

1. **REGISTER TRANSFER AND MICRO OPERATIONS:**
   REGISTER TRANSFER LANGUAGE, REGISTER TRANSFER, BUS AND MEMORY TRANSFERS, ARITHMETIC MICRO OPERATIONS, LOGIC MICRO OPERATIONS, SHIFT MICRO OPERATIONS, ARITHMETIC LOGIC SHIFT UNIT.

2. **BASIC COMPUTER ORGANIZATION**:
   INSTRUCTION CODES, COMPUTER REGISTERS, COMPUTER INSTRUCTIONS, TIMING AND CONTROL, INSTRUCTION CYCLE, MEMORY REFERENCE INSTRUCTIONS, INPUT - OUTPUT AND INTERRUPT, COMPLETE COMPUTER DESCRIPTION.

3. **CPU ORGANIZATION**:
   INTRODUCTION, GENERAL REGISTER ORGANIZATION, INSTRUCTION FORMATS, ADDRESSING MODES, DATA TRANSFER AND MANIPULATION, PROGRAM CONTROL, REDUCED INSTRUCTION SET COMPUTER (RISC), STACK ORGANIZATION.

4. **MICRO PROGRAMMED CONTROL:**
   CONTROL MEMORY, ADDRESS SEQUENCING, MICROINSTRUCTION FORMATS, MICRO PROGRAM EXAMPLE, DESIGN OF CONTROL UNIT.

5. **MEMORY ORGANIZATION:**
   MEMORY HIERARCHY, MAIN MEMORY, AUXILIARY MEMORY, ASSOCIATIVE MEMORY, CACHE MEMORY, VIRTUAL MEMORY.

6. **INPUT - OUTPUT ORGANIZATION:**
   PERIPHERAL DEVICES, INPUT - OUTPUT INTERFACE, ASYNCHRONOUS DATA TRANSFER, MODES OF TRANSFER, PRIORITY INTERRUPT, DIRECT MEMORY ACCESS (DMA), INTRODUCTION TO MULTIPROCESSOR SYSTEM.

TEXT BOOKS:

1. COMPUTER SYSTEM ARCHITECTURE, M. MORRIS MANO, PEARSON EDUCATION (3^{RD} EDITION).

REFERENCES:

1. COMPUTER ORGANIZATION, V. CARL HAMACHER, ZVONKO G. VRANESIC AND SAFWAT G. ZAKY, MCGRAW HILL INTERNATIONAL, (4^{TH} EDITION).

2.DIGITAL COMPUTER FUNDAMENTALS, THOMAS C. BARTEE,TMH.

2015-16/274,2016-17/276

EEE 316 - FLUID MECHANICS & HYDRAULIC MACHINERY

INSTRUCTION	: 5 Periods per Week
UNIVERSITY EXAMINATION	: 3 Hours
UNIVERSITY EXAMINATION MARKS	: 70
SESSIONAL MARKS	: 30
CREDITS	: 4

I.(A) INTRODUCTION TO FLUID MECHANICS, PRINCIPLE OF CONTINNIUM -FLUID PROPERTIES-MASS DENSITY,SPECIFIC WEIGHT, SPECIFIC GRAVITY,VISCOSITY,SURFACE TESNSION,CAPILLARITY,COMPRESSIBILITY&BULK MODULUS OF ELECTRICITY,VAPOUR PRESSURE.

(B) FLUID STATICS – FLUID PRESSURE AND ITS MEASUREMENT, PASCAL'S LAW,HYDRO-STATIC PRESSURE DISTRIBUTION, MANOMETERS-MICROMANOMETERS-MECHANICAL GAUGES,HYDROSTATIC FORCES ON PLANE SURFACES, RELATIVE EQUIVILIBRIUM UNDER TRANSLATION.

II.(A) FLUID KINEMATICS-DEFINITION OF STEADY AND UNSTEADY, UNIFORM AND NON UNIFORM, COMPRESSIBLE AND INCOMPRESSIBLE, ROTATIONAL AND IRRATIONAL, 1-D,2-D AND 3-D, LAMINAR AND TURBULENT FLOWS, STREAM LINE, PATH LINE, STREAK LINE,STREAM FUNCTION VELOCITY POTENTIAL FUNCTION,LOCAL AND CONVELATIVE ACCELERATIONS- FLOW NETS, PRINCIPLE OF CONSERVATION OF MASS, 3-D CONTINUITY EQUATION IN CARTESIAN COORDINATES, CONTINUITY EQUATION FOR STREAM TUBE.

(B) FLUID DYNAMICS-DERIVATION OF BERNAULLI'S EQUATION FROM THE CONCEPTS OF WORK DONE, TOTAL HEAD, LIMITATIONS OF BERNAULLI'S PRINCIPLE, APPLICATION OF BERNAULLI'S EQUATION, VENTURI METER, ORIFICE METER,FLOW NOZZLE,PITOT TUBE. MOMENTUM PRINCIPLE-IMPULSE MOMENTUM EQUATION AND ITS APPLICATION TO PIPE BENDS AND REDUCERS, IMPACT OF JETS ON SINGLE STATIONERY PLATES

III. FLOW THROUGH PIPES- LAWS OF FRICTION,REYNOLDS EXPERIMENT, DARCY-WEICHBACH EQUATION, MAJOR AND MINOR LOSSES, PIPES IN SERIES, PIPES IN PARALLEL, PIPES CONNECTING TWO RESERVOIRS, SIPHON, POWER TRANSMISSION THROUGH PIPES AND NOZZLES, CONCEPTS OF WATER HAMMER.

IV.(A) HYDRAULIC MACHINES- IMPACT OF JETS ON SERIES OF STATIONERY AND MOVING VANES, VELOCITY TRIANGLES, WORKDONE- TURBINES- HYDRAULIC, MECHANICAL AND OVERALL EFFICIENCY, CLASSSIFICATION, COMPONENT PARTS AND WORKING PRINCIPLES OF PELTON, FRANCIS AND KAPLAN TURBINES, UNIT QUANTITIES, SPECIFIC SPEED, CHARACTERISTIC CURVES.

(B) PUMPS : CLASSIFICATION OF PUMPS,POSITIVE DISPLACEMENT AND ROTODYNAMIC PUMPS, CENTRIFUGAL PUMPS- COMPONENT PARTS, WORKING PRINCIPLES, MANOMETRIC, STATIC AND OVERALL EFFICIENCY, WORK DONE PUMPS IN PARALLEL AND SERIES, SPECIFIC SPEED AND PUMP CHARACTERISTIC CURVES.

RECIPROCATING PUMPS-WORKING PRINCIPLES, ACCELERATION, FRICTION HEAD, INDICATOR DIAGRAMS, WORKDONE, MODIFIED INDICATOR DIAGRAM CONSIDERING AIR VESSELS.

TEXT BOOKS:

1. FLUID MECHANICS AND HYDRAULIC MACHINERY BY A.K. JAIN
2. FLUID MECHANICS AND HYDRAULIC MACHINERY BY P.N.MODI & SM SETHI

2015-16/275, 2016-17/277

EEE317-ELECTRICAL MACHINES LABORATORY-I

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 4

TEN EXPERIMENTS BASED ON EEE-222 AND PARTLY BASED ON EEE 315 SYLLABUS

2015-16/276, 2016-17/278.

EEE 318-L I.C.S & PULSE CIRCUITS LABORATORY

All Experiments:Skill Development

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 4

TEN EXPERIMENTS BASED ON E-311 & E312 SYLLABI

2015-16/277, 2016-17/279.

EEE 319- SOFT SKILLS LABORATORY

INSTRUCTION : 3 PERIODS PER WEEK
UNIVERSITY EXAM. : --
SESSIONAL MARKS : --
CREDITS : 1

(Common for all Branches of Engineering)

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, Analysing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

2015-16/278, 2016-17/280.

E321 CONTROL SYSTEMS

(Common with ECE)

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

TRANSFER FUNCTIONS OF LINEAR SYSTEMS-IMPULSE RESPONSE OF LINEAR SYSTEMS-BLOCK DIAGRAMS OF CONTROL SYSTEMS-SIGNAL FLOW GRAPHS(SIMPLE PROBLEMS)-REDUCTION TECHNIQUES FOR COMPLEX BLOCK DIAGRAMS AND SIGNAL FLOW GRAPHS(SIMPLE EXAMPLES)

Skill development

INTRODUCTION TO MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS-EQUATIONS OF ELECTRICAL NETWORKS-MODELLING OF MECHANICAL SYSTEMS- EQUATIONS OF MECHANICAL SYSTEMS

Skill development

TIME DOMAIN ANALYSIS OF CONTROL SYSTEMS- TIME RESPONSE OF FIRST AND SECOND ORDER SYSTEMS WITH STANDARD INPUT SIGNALS-STEADY STATE PERFORMANCE OF FEEDBACK CONTROL SYSTEMS-STEADY STATE ERROR CONSTANTS-EFFECT OF DERIVATIVE AND INTEGRAL CONTROL ON TRANSIENT AND STEADYSTATE PERFORMANCE OF FEEDBACK CONTROL SYSTEMS.

Skill development

CONCEPT OF STABILITY AND NECESSARY CONDITIONS FOR STABILITY-ROUTH-HURWITZ CRITERION, RELATIVE STABILITY ANALYSIS, THE CONCEPT AND CONSTRUCTION OF ROOT LOCI, ANALYSIS OF CONTROL SYSTEMS WITH ROOT LOCUS (SIMPLE PROBLEMS TO UNDERSTAND THEORY)

Skill development/Employability

CORRELATION BETWEEN TIME AND FREQUENCY RESPONSES- POLAR PLOTS- BODE PLOTS-LOG MAGNITUDE VERSUS PHASE PLOTS-ALL PASS AND MINIMUM PHASE SYSTEMS-NYQUIST STABILITY CRITERION-ASSESSMENT OF RELATIVE STABILITY-CONSTANT M&N CIRCLES.

Skill development/Employability

TEXT BOOKS:

1. CONTROL SYSTEMS ENGINEERING BY I.J. NAGRATH & M.GOPAL, WILEY EASTERN LIMITED.
2. AUTOMATIC CONTROL SYSTEMS BY BENJAMIN C. KUO, PRENTICE HALL OF INDIA

REFERENCE BOOK:

1. MODERN CONTROL ENGINEERING BY OGATA, PRENTICE HALL OF INDIA

2015-16/279, 2016-17/281.

EEE322 – ADVANCED NETWORK THEORY

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

FOURIER TRANSFORMS : DEFINITIONS AND PROPERTIES, TRANSFORMS FOR SIMPLE TIME DOMAIN FUNCTIONS, TRANSFORMS OF GENERAL PERIODIC TIME FUNCTIONS, CONVOLUTION AND RESPONSE IN TIME DOMAIN, RESPONSE IN FREQUENCY DOMAIN, RELATIONSHIP BETWEEN FOURIER AND LAPLACE TRANSFORMS.

NETWORK FUNCTIONS : NETWORK FUNCTIONS FOR SINGLE PORT AND TWO PORT, CALCULATION OF NETWORK FUNCTIONS FOR LADDER AND GENERAL NETWORKS, POLES AND ZEROS, RESTRICTION OF POLES AND ZEROS FOR DRIVING POINT ASND TRANSFER FUNCTIONS, TIME DOMAIN BEHAVIOUR FROM POLE ZERO PLOT, TRANSFER FUNCTIONS INTERMS OF Y AND Z FUNCTIONS, SCALING NETWORK FUNCTIONS.

Skill development

POSITIVE REAL FUNCTIONS AND OTHER PROPERTIES, HERWITZ POLYNOMIALS, COMPUTATION OF RESIDUES, EVEN AND ODD FUNCTIONS, TEST FOR POSITIVE REAL FUNCTIONS.

Skill development

NETWORK SYNTHESIS : ELEMENTARY SYNTHESIS OPERATION, LC NETWORK SYNTHESIS,PROPERTIES OF RC NETWORK FUNCTIONS, FOSTER AND CAUER FORMS OF RC AND RL NETWORKS.

RLC NETWORKS : MINIMUM POSITIVE REAL FUNCTION, BRUNE'S METHOD OF RLC SYNTHESIS, REALIZATION DIFFICULTIES.

TEXT BOOKS :

1. NETWORK ANALYSIS BY M.E. VAN VALKUNBERG, PHI/EEE

2. MODERN NETWORK SYNTHESIS BY M.E. VAN VALKUNBERG, WILEY EASTERN Ltd., (Chapters 1,2 & 3)

3. ENGINEERING CIRCUIT ANALYSIS BY W.H. HAYAT Jr & J.E. KEMMERLY, Mc Graw Hill Int.Ltd.

2015-16/280, 2016-17/282. **EEE323 – POWER ELECTRONICS**

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

THYRISTORS : INTRODUCTION, PRINCIPLE OF OPERATION, TWO TRANSITOR MODEL, GATE CHARACTERISTICS,TURN ON METHODS, TURN OFF METHODS, THYRISTOR RATINGS, MEASUREMENT OF THYRISTER PARAMETERS, PROTECTION CIRCUITS.

Skill development

GATE TRIGGERING CIRCUITS : FIRING OF THYRISTORS, PULSE TRANSFORMERS, OPTO ISOLATORS, GATE TRIGGERING CIRCUITS, RESISTANCE FIRING, RESISTANCE-CAPACITOR FIRING, UJT, PROGRAMMABLE UJT(PUT), UJT AS AN SCR TRIGGER, SYNCHRONIZED UJT TRIGGERING.

SERIES AND PARALLEL OPERATION OF THYRISTORS : EQUALIZING NETWORKS, TRIGGERING, STRING EFFICIENCY,DERATING.

Skill Development

PHASE CONTROLLED RECTIFIERS : SINGLE PHASE -HALF WAVE, FULLWAVE & BRIDGE CONTROLLED RECTIFIERS. THREE PHASE HALF WAVE AND FULLWAVE CONTROLLED RECTIFIERS. THREE PHASE FULLY CONTROLLED BRIDGE RECTIFIER.

Skill Development

INVERTERS : CLASSIFICATION, SERIES AND PARALLEL INVERTERS, SELF COMMUTATED INVERTERS, THE Mc MURRAY INVERTER, THE Mc MURRAY–BEDFORD INVERTER, HARMONIC REDUCTION, CURRENT SOURCE INVERTERS.

Employability

CHOPPERS : PRINCIPLE OF OPERATION, STEPUP CHOPPERS, STEPUP/STEPDOWN CHOPPER, JONES CHOPPER, MORGAN CHOPPER.

Employability

CYCLO CONVERTERS : PRINCIPLE OF OPERATION, SINGLE PHASE TO SINGLE PHASE CYCLO CONVERTER,CYCLOCONVERTER CIRCUITS FOR THREE PHASE OUTPUT, CONTROL CIRCUITS.

MODERN POWER SEMICONDUCTOR DEVICES: BASIC STRUCTURE AND STATIC CHARACTERISTICS OF POWER DIODE, POWER TRANSISTOR, POWER MOSFET, IGBT, GTO, BASIC STRUCTURE , PRINCIPLE OF OPERATION AND STATIC CHARACTERISTICS OF DIAC AND TRIAC.

TEXT BOOKS:

1.M.D.SINGH, K.B.KHANCHANDANI – POWER ELECTRONICS. TATA MCGRAW –HIILL PUBLISHING COMPANY LIMITED.

REFERENCE BOOKS:

1.MUHAMMAD.H.RASHID – POWER ELECTRONICS, CIRCUIOTS, DEVICES & APPLICATIONS. PEARSON EDUCATION.

2. ASHFEQ AHMED – POWER ELECTRONICS FOR TECHNOLOGY , PEARSON EDUCATION.
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TEXT BOOKS:

1. POWER ELECTRONICS BY M.D. SINGH & K.B. KARAN CHANDANI, TMH, 1998

2015-16/281, 2016-17/283.

EEE324 – TRANSMISSION & DISTRIBUTION

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

A SINGLE LINE DIAGRAM OF A .C. POWER SUPPLY SYSTEM COMPARISON OF A.C. & D.C. TRANSMISSION.
Skill development
EHVAC TRANSMISSION: NECESSITY & PROBLEMS INVOLVED
HVDC TRANSMISSION:SINGLE LION DIAGRAM OF HVDC TRANSMISSON PRINCIPLES OF **HVDC OPERATION & CONTROL, TYPES OF D.C.LINKS**

POWER SUPPLY SYSTEMS: COMPARISON BETWEEN VARIOUS SYSTEMS AND COPPER EFFICIENCIES, EFFECT OF SYSTEM VOLTAGE ON TRANSMISSION EFFICIENCY, EFFECT OF SYSTEM VOLTAGE ON TRANSMISSION EFFICIENCY, CHOICE OF TRANSMISSION VOLTAGE, CONDUCTOR SIZE AND KELVIN'S LAW.

POWER DISTRIBUTION SYSTEMS: RADIAL AND RING MAIN SYSTEMS, DIFFERENT TYPES OF A.C. DISTRIBUTORS WITH CONCENTRATED AND DISSTRIBUTED LOADS.

TRANSMISSION LINE CONSTANTS: INDUCTANCE AND CAPACITANCE OF SINGLE PHASE AND THREE PHASE LINES, CONCEPT OF SELF GMDR MUTUAL GMD DOUBLE CIRCUIT LINE, INDUCTANCE OF COMPOSITE CONDUCTORS, TRANSPOSITION, SKIN EFFECT AND PROXIMITY EFFECT.
Skill development

TRANSMISSION LINE MODELLING: GENERALIZED NETWORK CONSTANTS, MODELLING OF SHORT, MEDIUM AND LONG TRANSMISSION LINES, RIGOROUS LINE MODELLING, CIRCLE DIAGRAMS.
Skill development

MECHANICAL DESIGN OF TRANSMISSION LINES: SAG AND TENSION CALCULATIONS, LINE SUPPORTS, CONDUCTOR MATERIALS, OVERHEAD LINES Vs UNDERGROUND CABLES.
Employability

OVERHEAD LINE INSULATORS: TYPES OF INSULATORS, POTENTIAL DISTRIBUTION OVER A STRING OF INSULATORS AND METHODS OF EQUALIZING POTENTIAL.
Skill development

UNDER-GROUND CABLES: TYPES OF CABLES, INSULATION IN CABLES, ARMONNING & COVERING OF CABLE, INSULATION RESISTANCEE OFR CABLES, STRESS IN INSULATION, SHECTHING IN CABLE, USE OF INTER SHEATHS, CAPACITANCE GRADING, CAPACITANCE IN 3-CORE CABLES.
Employability

CORONA: PPHENOMENON OF COROBNA, CRITICAL VOLTAGES, POWER LOSS DUE TO CORONA, FACTORS AFFECTING CORONA LOSS, RADIO IINTERFERENCE.

TEXT BOOKS:

1. A TEXT BOOK ON POWER SYSTEM ENGINEERING BY SONI, GUPTA, BHATNAGAR & CHAKRABARTI, DHANPATRAI & Co., 1998
2. ELECTRICAL POWER SYSTEMS BY C.L. WADHWA
3. ELECTRICAL POWER BY S.L. UPPAL
4. PRINCIPLES OF POWER SYSTEMS BY V.K.MEHATA

2015-16/282, 2016-17/284.

EEE325 – GENERATION AND UTILIZATION

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

Employability

INTRODUCTION: POWER GENERATION, COMPARISON OF DIFFERENT SOURCES OF ENERGY.

THERMAL POWER STATIONS: LINE DIAGRAM, LOCATION, COAL HANDLING, DRAUGHT, CONDENSERS, COOLING WATER SYSTEMS.

Employability

HYDRO ELECTRIC PLANTS: CHOICE OF SITE, HYDROLOGY, CLASSIFICATION OF PLANTS, GENERAL ARRANGEMENT, FUNCTIONS OF DIFFERENT COMPONENTS OF A HYDRO PLANT.

Skill development

NUCLEAR POWER PLANTS: SCHEMATIC ARRANGEMENT, COMPONENTS OF NUCLEAR REACTOR, CLASSIFICATION OF REACTORS, DIFFERENT POWER REACTORS.

GAS TURBINE PLANTS: LAYOUT, COMPONENTS OF A GAS TURBINE PLANT, OPEN CYCLE AND CLOSED CYCLE PLANTS.

MAGNETO HYDRO DYNAMIC (MHD) POWER GENERATION: BASIC CONCEPTS, PRINCIPLE, CLASSIFICATION,COAL BURNING MHD STEAM POWER PLANT, GAS COOLED NUCLEAR MHD POWER, LIQUID METAL MHD GENERATOR.

Employability

OPERATIONAL ASPECTS OF GENERATING STATIONS: LOAD CURVES AND ASSOCIATED DEFINITIONS, SELECTION OF UNITS, LOAD DURATION CURVES.

ECONOMIC CONSIDERATIONS: CAPITAL AND RUNNING COSTS OF GENERATING STATIONS, DIFFERENT TARIFFS, COMPARISON OF COSTS.

Employability

HEATING AND WELDING: INTRODUCTION, POWER FREQUENCY AND HIGH FREQUENCY METHODS OF ELECTRIC HEATING, ARC FURNACE. RESISTANCE WELDING,ARC WELDING, MODERN WELDING TECHNIQUES.

Employability

ILLUMINATION: DEFINITIONS, LAWS OF ILLUMINATION, POLAR CURVES, PHOTOMETRY, THE ELECTRIC LAMPS, COLD CATHODE LAMPS, LIGHT FITTINGS, ILLUMINATION FOR DIFFERENT PURPOSES, REQUIREMENTS OF GOOD LIGHTING.

Employability

TEXT BOOKS:

A TEXT BOOK ON POWER SYSTEM ENGINEERING BY SONI, GUPTA, BHATNAGAR & CHAKRABARTI, DHANPAT RAI & Co, 1998

REFERENCE BOOKS:

1. GENERATION & UTILIZATION BY C.L.WADHWA

2. ELECTRICS POWER BY S.L.UPPAL, KHANNA PUBLISHERS

2015-16/283, 2016-17/285.

EEE326-PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES – III

INSTRUCTION : **4 Periods per Week**
UNIVERSITY EXAMINATION : **3 Hours**
UNIVERSITY EXAMINATION MARKS : **70**
SESSIONAL MARKS : **30**
CREDITS : 4

(SYNCHRONOUS MACHINES AND DESIGN OF SYNCHRONOUS MACHINES AND INDUCTION MACHINES)

SYNCHRONOUS GENERATORS: BASIC CONCEPTS, TYPES OF MACHINES AND CONSTRUCTION, ARMATURE WINDINGS, EMF EQUATION,EFFECT OF CHORDING AND WINDING DISTRIBUTION, ARMATURE REACTION, REGULATION BY SYNCHRONOUS IMPEDANCE, MMF AND POTIER TRIANGLE METHODS, PARALLEL OPERATION OF SYNCHRONOUS GENERATORS, SYNCHRONIZING CURRENT AND SYNCHRONIZING POWER. SYNCHRONIZING TO INFINITE BUS-BARS AND OPERATION OF INFINITE BUS , POWER TRANSFER EQUATIONS, CAPABILITY CURVE, TWO REACTION MODEL OF SALIENT POLE SYNCHRONOUS MACHINE AND POWER ANGLE CHARACTERISTICS, DETERMINATION OF X_d AND X_q BY SLIP TEST, SHORT CIRCUIT TRANSIENTS IN SYNCHRONOUS MACHINE.

Skill development

Skill development

SYNCHRONOUS MOTOR: PRINCIPLES OF OPERATION, METHODS STARTING, POWER FLOW, POWER DEVELOPED BY SYNCHRONOUS MOTORS, EFFECTS OF CHANGING LOAD AT CONSTANT EXCITATION, AND CHANGING EXCITATION AT CONSTANT LOAD, EXCITATION AND POWER CIRCLES FOR SYNCHRONOUS MACHINE, V – AND INVERTED V – CURVES, HUNTING AND DAMPER WINDINGS.

Skill development

DESIGN OF INDUCTION MOTORS : OUTPUT EQUATION, MAIN DIMENSIONS, AIRGAP LENGTH, SELECTION OF STATOR AND ROTOR SLOTS, DESIGN OF WINDINGS.

Employability

DESIGN OF SYNCHRONOUS MACHINES : OUTPUT EQUATION, MAIN DIMENSIONS FOR SALIENT POLE AND NON-SALIENT POLE MACHINES, ARMATURE WINDINGS AND DESIGN, SELECTION OF STATOR SLOTS, AIRGAP LENGTH, DESIGN OF ROTOR FOR SALIENT POLE AND TURBO ALTERNATORS.

Employability

TEXT BOOKS:

1. "ELECTROMECHANICAL ENERGY CONVERSION AND DYNAMICS OF MACHINES" BY R. D. BEGAMUDRE.NEWAGE INTERNATIONAL PUBLISHERS, NEW DELHI.
2. " ELECTRICAL MACHINES " BY S. K . BHATTACHARYA, TATA Mac GRAW - HILL CO., 1998

2015-16/284, 2016-17/286.

EEE327-DIGITAL ELECTRONICS & MICROPROCESSORS LABORATORY

INSTRUCTION	**: 3 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 50**
SESSIONAL MARKS	**: 50**
CREDITS	: 3

TEN EXPERIMENTS BASED ON EEE313 SYLLABUS

2015-16/285, 2016-17/287.

EEE 328 - Fluid Mechanics & Hydraulic Machines Laboratory

Instruction	**:**	**3 periods per week**
University Examination	**:**	**3 hours**
University Examination Marks	**:**	**50**
Sessional Marks	**:**	**50**
Credits	**:**	**3**

(Ten experiments based on EEE 316 syllabus)

2015-16/287, 2016-17/289,2017-18/284

ELECTIVE-1

EEE411 – 1 INSTUMENTATION

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30

CREDITS : 4

INTRODUCTION TO INSTRUMENTATION: TYPICAL APPLICATIONS OF INSTRUMENT SYSTEM, FUNCTIONAL ELEMENTS OF MEASURING SYSTEM,CLASSIFICATION OF INSTRUMENTS, DEFINITIONS OF ACCURACY, PRECISION, FIDILITY, RESOLUTION, LINEARITY, DIGITAL COMPUTERS, STANDARDS AND CALIBRATION.

STATIC AND DYNAMIC CHARACTERISTICS OF INSTRUMENTS: INTRODUCTION, ERRORS AND UNCERTAINITIES IN PERFORMANCE PARAMETERS, PROPAGATION OF UNCERTAINITIES IN COMPOUND QUANTITIES, STATIC PERFORMANCE PARAMETERS, IMPEDANCE LOADING AND MATCHING, SPECIFICATION OF STATIC CHARACTERISTICS, SELECTION OF THE INSTRUMENT. FORMULATION OF THE SYSTEM DYNAMIC EQUATIONS, DYNAMIC RESPONSE COMPENSATION.

TRANSUDUCERS AND INTERMEDIATE ELEMENTS: INTRODUCTION, CLASSIFICATION OF ANALOG, DIGITAL, ACTIVE, PASSIVE, INTERMEDIATE ELEMENTS LIKE AMPLIFIERS COMPENSATORS, DIFFERENTIATING AND INTEGRATING ELEMENTS, FILTERS, A-D AND D-A CONVERTERS, DATA TRANSSIMISION ELEMENTS.

Skill development

INDICATING AND RECORDING ELEMENTS: INTRODUCTION, DIGITAL VOLTMETERS, , CATHODE RAY OSCILLOSCOPES, GALVONOMETRIC RECORDS, SERVO TYPE POTENTIOMETRIC RECORDS, MAGNETIC TAPE RECORDING, DIGITAL RECORDER, MEMORY TYPE DATA ACQUISITION SYSTEMS, DATA DISPLAY AND STORAGE.

MEASUREMENT OF NON-ELECTRICAL QUANTITIES WITH ELECTRICAL TRANSDUCERS: VELOCITY, ACCELERATION, FORCE, TORQUE, PRESSURE, FLOW, TEMPERATURE AND ACCOUSTICS.

BIOMEDICAL MEASUREMENTS AND BIOMETRICS: INTRODUCTION, MEASUREMENT OF BLOOD PRESSURE AND BIO ELECTRIC POTENTIALS, ECG RECORDING, PHYSIOLOGICAL EFFECTS OF ELECTRIC CURRENT, SHOCK HAZARDS, METHODS OF ACCIDENT PREVENTION.

Skill development/Employability

Skill development/Employability

TEXT BOOK :

1. "INSTRUMENTATION, MEASUREMENT AND ANALYSIS" BY B. C. NAKRA AND K.K. CHAUDARY.

REFERENCE BOOKS :

1. "BIOMEDICAL INSTRUMENTATION AND MEASUREMENT" BY I. CROMWELL, F. J. WEIBALI, AND E.A.PFEIFFER.
2. "ELECTRICAL AND ELECTRONIC MEASUREMENTS AND INSTRUMENTATION" BY A. K. SAWHANEY
3. " ELECTRONIC INSTRUMENTATION" BY H.S. KALSI.

2015-16/288, 2016-17/290,2017-18/285. **ELECTIVE-1**

EEE411-2 OPERATIONS RESEARCH

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30

CREDITS : 4

INTRODUCTION TO OPTIMIZATION: ENGINEERING APPLICATIONS OF OPTIMIZATION, STATEMENT OF PROBLEM, CLASSIFICATION OF OPTIMIZATION PROBLEM TECHNIQUES.

LINEAR PROGRAMMING : INTRODUCTION, REQUIREMENTS FOR A LP PROBLEM, EXAMPLES ON THE APPLICATION OF LP, GRAPHICAL SOLUTION OF 2-VARIABLE LP PROBLEMS, SOME EXCEPTIONAL CASES, GENERAL MATHEMATICAL FORMULATION FOR LPP, CANONICAL AND STANDARD FORMS OF LP PROBLEM, SIMPLEX METHOD, EXAMPLES ON THE APPLICATION OF SIMPLEX TECHNIQUES.

Skill development

ARTIFICIAL VARIABLE TECHNIQUE: BIG-M METHOD AND TWO PHASE TECHNIQUES.

TRANSPORTATION PROBLEM: MATRIX TERMINOLOGY, DEFINITION AND MATHEMATICAL REPRESENTATION OF TRANSPORTATION MODEL, FORMULATION AND SOLUTION OF TRANSPORTATION MODELS (BASIC FEASIBLE SOLUTION BY NORTH-WEST CORNER METHOD, INSPECTION METHOD. VOGELL'S APPROXIMATION METHOD)

Skill development

ASSIGNMENT PROBLEM: MATRIX TERMINOLOGY, DEFINITION OF ASSIGNMENT MODEL, COMPARISON WITH TRASPORTATION MODEL, MATHEMATICAL REPRESENTATION OF ASSIGNMENT MODEL, FORMULATION AND SOLUTION OF ASSIGNMENT MODELS.

PERT NETWORK: INTRODUCTION, PHASES OF PROJECT SCHEDULING, NETWORK LOGIC, NUMBERING THE EVENTS (FULKERSON'S RULE), MEASURE OF ACTIVITY.

Skill development

PERT NETWORK COMPUTATIONS: FORWARD PASS AND BACKWARD PASS COMPUTATIONS, SLACK CRITICAL PATH, PROBABILITY OF MEETING THE SCHEDULED DATES.

Employability

INVENTORY MODELS: INTRODUCTION, NECESSITY FOR MAINTAINING INVENTORY, CLASSIFICATION OF INVENTORY MODELS, INVENTORY MODELS WITH DETERMINISTIC DEMAND, DEMAND RATE UNIFORM-PRODUCTION RATE INFINITE, DEMAND RATE NON-UNIFORM PRODUCTION RATE FINITE, DEMAND RATE UNIFORM-PRODUCTION RATE FINITE.

Employability

GAME THEORY: USEFUL TERMINOLOGY, RULES FOR GAME THEORY, SADDLE POINT, PURE STRATEGY, REDUCE GAME BY DOMINANCE, MIXED STRATEGIES, 2X2 GAMES WITHOUT SADDLE POINT.

Skill development

TEXT BOOKS:

1. "OPERATIONS RESEARCH-AN INTRODUCTION' BY H.TAHA, PRENTICE HALL OF INDIA Pvt. Ltd.
2. "ENGINEERING OPTIMIZATION-THEORY & PRACTICE" BY S.S. RAO, NEW AGE INTERNATIONAL (P) Ltd.
3. "OPERATIONS RESEARCH – AN INTRODUCTION" BY P.K.GUPTA & D.S.HIRA, S.Chnd & Co. Ltd.

2015-16/286, 2016-17/288,2017-18/283 **ELECTIVE-1**

EEE411-3 DIGITAL SIGNAL PROCESSING

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

1. **DISCRETE - TIME SIGNALS AND SYSTEMS:**
   DISCRETE - TIME SIGNALS – SEQUENCES, LINEAR SHIFT – INVARIANT SYSTEMS, STABILITY AND CASUALITY, LINEAR CONSTANTS – COEFFICIENT DIFFERENCE EQUATIONS, FREQUENCY DOMAIN REPRESENTATION OF DISCRETE – TIME SIGNALS AND SYSTEMS.
2. **APPLICATIONS OF Z – TRANSFORMS:**
   SYSTEM FUNCTIONS H(Z) OF DIGITAL SYSTEMS, STABILITY ANALYSIS, STRUCTURE AND REALIZATION OF DIGITAL FILTERS, FINITE WORD LENGTH EFFECTS.
3. **DISCRETE FOURIER TRANSFORM (DFT):**
   PROPERTIES OF THE DFS, DFS REPRESENTATION OF PERIODIC SEQUENCES, PROPERTIES OF DFT, CONVOLUTION OF SEQUENCES.
4. **FAST – FOURIER TRANSFORMS (FFT):**
   RADIX – 2 DECIMATION – IN – TIME (DIT) AND DECIMATION – IN – FREQUENCY (DIF), FFT ALGORITHMS, INVERSE FFT.
5. **IIR DIGITAL FILTER DESIGN TECHNIQUES:**
   Skill development
   DESIGN OF IIR FILTERS FROM ANALOG FILTERS; ANALOG FILTERS APPROXIMATIONS (BUTTERWORTH AND CHEBYSHEV APPROXIMATIONS), FREQUENCY TRANSFORMATIONS, GENERAL CONSIDERATIONS IN DIGITAL FILTER DESIGN, BILINEAR TRANSFORMATION METHOD, STEP AND IMPULSE INVARIANCE TECHNIQUE.
6. **DESIGN OF IIR FILTERS:**
   FOURIER SERIES METHOD, WINDOW FUNCTION TECHNIQUES, COMPARISON OF IIR AND FIR FILTERS.
   Skill development
7. **APPLICATIONS:**
   APPLICATIONS OF FFT IN SPECTRUM ANALYSIS AND FILTERING, APPLICATION OF DSP IN SPEECH PROCESSING.

TEXT BOOKS:

ALAN V. OPPENHEIM & RONALD W. SCHAFER: DIGITAL SIGNAL PROCESSING, PHI.

REFERENCES:

1. SANJIT K. MITRA, DIGITAL SIGNAL PROCESSING “A – COMPUTER BASED APPROACH”, TATA MC GRAW HILL.
2. RADDAE & RABINER, APPLICATION OF DIGITAL SIGNAL PROCESSING.
3. S. P. EUGENE XAVIER, SIGNALS, SYSTEMS AND SIGNAL PROCESSING, S. CHAND & CO. LTD.
4. ANTONIO, ANALYSIS AND DESIGN OF DIGITAL FILTERS, TATA MC GRAW HILL.

2015-16/289, 2016-17/291,2017-18/286.

EEE412 POWER SYSTEM ANALYSIS & STABILITY

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

P.U. REPRESENTATION: SINGLE LINE DIAGRAM, PER UNIT QUANTITIES, P.U. IMPEDANCE OF 3-WINDING TRANSFORMERS, P.U. IMPEDANCE DIAGRAM OF A POWER SYSTEM.

LOAD FLOW STUDIES: FORMULATION OF NETWORK MATRICES, LOAD FLOW PROBLEM, GAUSS-SEIDEL METHOD, NEWTON-RAPHSON METHOD & FAST DECOUPLED METHOD OF SOLVING LOAD FLOW PROBLEM.

Skill development

SYMMETRICAL FAULT ANALYSIS: 3-PHASE SHORT CIRCUIT CURRENTS AND REACTANCES OF A SYNCHRONOUS MACHINE, FAULT LIMITING REACTORS.

SYMMETRICAL COMPONENTS: THE SYMMETRICAL COMPONENTS, PHASE SHIFT IN DELTA/STAR TRANSFORMERS, 3-PHASE POWER INTERMS OF SYMMETRICAL COMPONENTS.

UN-SYMMETRICAL FAULTS: VARIOUS TYPES OF FAULTS – LG, LL, LLG ON AN UNLOADED ALTERNATOR, SEQUENCE IMPEDANCES AND SEQUENCE NETWORKS.

Skill development

POWER SYSTEM STABILITY: CONCEPTS OF STABILITY (STEADY STATE AND TRANSIENT), SWING EQUATION, EQUAL AREA CRITERION, CRITICAL CLEARING ANGLE AND TIME FOR TRANSIENT STABILITY, STEP BY STEP METHOD OF SOLUTION, FACTORS AFFECTING TRANSIENT STABILITY.

Skill development

TEXT BOOKS:

1. POWER SYSTEM ANALYSIS BY HADI SADAT, Mc Graw Hill, 1999.
2. ELEMENTS OF POWER SYSTEM ANALYSIS, WILLIAM D. STEVENSON, Jr, Mc Graw Hill Pub.
3. POWER SYSTEM ENGINEERING BY J.G. NAGARATH & D.P. KOTHARI, TMH Pub.

2015-16/290, 2016-17/292,2017-18/287.

EEE 413- ELECTRIC DRIVES AND TRACTION

INSTRUCTION : **4 Periods per Week**
UNIVERSITY EXAMINATION : **3 Hours**
UNIVERSITY EXAMINATION MARKS : **70**
SESSIONAL MARKS : **30**
CREDITS : 4

ELECTRIC DRIVE: CONCEPT AND CLASSIFICATION OF ELECTRIC DRIVES, FOUR QUADRANT OPERATION, TYPES OF LOADS, DYNAMICS OF MOTOR LOAD COMBINATION, STEADY STATE AND TRANSIENT STABILITY OF DRIVE.

Skill development

CHARACTERISTICS OF MOTORS: BASIC RELATIONS AND CHARACTERISTICS AND MODIFIED SPEED-TORQUE CHARACTERISTICS OF D.C SHUNT AND SERIES MOTORS, CHARACTERISTICS OF 3- PHASE INDUCTION AND SYNCHRONOUS MOTORS AND MODIFICATION OF THEIR SPEED – TORQUE CHARACTERISTICS.

Skill development

STARTING: EFFECT OF STARTING ON POWER SUPPLY, MOTOR AND LOAD, METHODS OF STARTING, ACCELERATION TIME, ENERGY RELATIONS DURING STARTING, AND METHODS TO REDUCE ENERGY LOSS DURING STARTING.

Skill development

ELECTRIC BRAKING: TYPES OF BRAKING, BRAKING OF D.C MOTORS DURING LOWERING OF LOADS, BRAKING WHILE STOPPING, BRAKING OF INDUCTION AND SYNCHRONOUS MOTORS, ENERGY RELATIONS DURING BRAKING.

Skill development

RATING AND HEATING OF MOTORS: HEATING EFFECTS, LOADING CONDITIONS AND CLASSES OF DUTY, DETERMINATION OF POWER RATINGS OF MOTORS FOR DIFFERENT APPLICATIONS, EFFECT OF LOAD INERTIA, LOAD EQUALIZATION AND FLY-WHEE, CALCULATIONS, ENVIRONMENTAL FACTORS. GENERAL FACTORY DRIVE, PAPER MILL DRIVE, STEEL MILL DRIVE, COAL MINING DRIVE.

Skill development

ELECTRICAL TRACTION: GENAL FEATURES AND SYSTEMS OF TRAC ELECTRIFICATION, TRACTION MOTORS, LOCO WHEEL ARRANGEMENT AND RIDING QUALITIES, TRANSMISSION OF DRIVE, TRACTION MOTOR CONTROL (SERIES-PARALLEL CONTROL), TRAC EQUIPMENT AND COLLECTION GEAR, TRAIN MOVEMENT, SPEED-TIME CURVE AND SPEED DISTANCE CURVE, SPECIFIC ENERGY CONSUMPTION (SEC) AND FACTORS AFFECTING IT.

Employabilty

TEXT BOOKS:

1. " A FIRST COURSE ON ELECTRIC DRIVES " BY S. K. PILLAI, WILEY ESASTREN LTD.
2. " UTILISATION OF ELECTRICAL ENERGY " (S.I. UNITS) BY E. OPEN SHAW TAYLOR AND V.V.L. RAO ORIENTLONG MAN.

REFERENCE BOOK:

1. " MODERN ELECTRIC TRACTION " BY H. PARTAB. DHANPAT ROY & Co.
2. " ELECTRIC DRIVES" BY VEDAM SUBRAMANYAM, TMH Pub.

2015-16/291, 2016-17/293,2017-18/288.

EEE414 POWER SYSTEM PROTECTION

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

FUSES: TYPES, HIGH VOLTAGE HRC FUSES, APPLICATIONS, SELECTION. FAULT CLEARING AND CIRCUIT BREAKERS, TRANSIENT RECOVERY VOLTAGE, SINGLE & DOUBLE FREQUENCY TRANSIENTS, RESISTANCE SWITCHING, CURRENT CHOPPING, SWITCHING OF CAPACITOR BANKS AND UN-LOADED LINES, RATINGS AND CHARACTERISTICS OF CIRCUIT BREAKERS, FORMATION OF ARC, METHODS OF ARC EXTINCTION.

CIRCUIT BREAKERS: CLASSIFICATION, PRINCIPLE OF OPERATION, CONSTRUCTIONAL FEATURES OF AIR CIRCUIT BREAKERS, OIL CIRCUIT BREAKERS, AIR BLAST CIRCUIT BREAKERS, SF-6 CIRCUIT BREAKERS AND VACCUM CIRCUIT BREAKERS, TESTING OF CIRCUIT BREAKERS.

Employabilty

RELAYING: DIFFERENT TYPES, PRINCIPLE OF OPERATION AND CHARACTERSTICS, OVER CURRENT, EARTH FAULT, DIFFERENTIAL AND DISTANCE PROTECTION WITH SIMPLE APPLICATIONS TO ALTERNATORS, TRANSFORMERS, SINGLE AND PARALLEL FEEDERS. INTRODUCTION TO SOLID STATE RELAYING, STATIC RELAYS FOR TIME LAG OVER CURRENT AND DIFFERENTIAL PROTECTION.

Employabilty

PROTECTION AGAINST OVER VOLTAGES: CAUSES OF OVER VOLTAGES, OVER VOLTAGES DUE TO LIGHTNING. PROTECTION AGAINST LIGHTNING AND TRAVELLING WAVES – EARTH WIRE, EFFECTS OF SERIES INDUCTANCES, SHUNT CAPACITANCE, SPARK GAP, SURGE ARRESTERS, LIGHTNING ARRESTERS ETC., INSULATION CO-ORDINATION.

Skill development

SUB-STATION LAYOUT & BUS BARS: SCHEMES OF LAYOUT AND BUS-BAR DESIGN.

Employabilty

TEXT BOOKS:

1. ELECTRICAL POWER SYSTEMS BY C.L. WADHWA
2. ELECTRICAL POWER BY S.L. UPPAL
3. POWER SYSTEM PROTECTION & SWITCH GEAR BY B. RAVINDRANATH & M. CHANDA, NEW AGE Pub., 1996

2015-16/292, 2016-17/294,2017-18/289.

EEE415 DIGITAL CONTROL SYSTEMS

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

Skill development

SIGNAL CONVERSION AND PROCESSING: INTRODUCTION, BLOCK DIAGRAM REPRESENTATION OF S/H DEVICE, MATHEMATICAL MODELLING OF THE SAMPLING PROCESS, FINITE-PULSE WIDTH SAMPLER, FOLDING FREQUENCY. THE SAMPLING THEOREM, MATHEMATICAL MODELLING OF THE SAMPLING, IDEAL SAMPLER, SAMPLE AND HOLD DEVICES, EXPRESSIONS OF F*(S), S-PLANE PROPERTIES OF F*(S), ZERO-ORDER HOLD, FREQUENCY-DOMAIN CHARACTERISTICS OF ZOH, FIRST ORDER HOLD, FRACTIONAL HOLD DEVICE.

THE Z-TRANSFORM: THE Z-TRANSFORM DEFINITION, RELATIONSHIP WITH LAPLACE TRANSFORM, ALTERNATE EXPRESSION FOR F(Z), EVALUATION OF Z-TRANSFORM, RELATIONSHIP BETWEEN S-PLANE AND Z-PLANE, INVERSE Z-TRANSFORM, NON UNIQUENESS OF THE Z-TRANSFORM, DEFINING EQUATIONS OF THE INVERSE Z-TRANSFORM, THEOREMS OF THE Z-TRANSFORM, LIMITATIONS OF THE Z-TRANSFORM.

Skill development

TRANSFER FUNCTION, BLOCK DIAGRAMS & SIGNAL FLOW GRAPHS: TRANSFER FUNCTIONS, BLOCK DIAGRAMS, SIGNAL FLOW GRAPHS, THE PULSE TRANSFER FUNCTION AND Z-TRANSFORM FUNCTION, SYSTEMS WITH CASCADED ELEMENTS SEPARATED BY A SAMPLER & NOT SEPARATED BY A SAMPLER, PULSE TRANSFORM FUNCTION OF ZOH AND RELATION BETWEEN G(S) AND G(Z), CLOSED LOOP SYSTEMS, CHARACTERISTIC EQUATION, PHYSICAL REALIZABILITY.

Skill development

THE STATE VARIABLE TECHNIQUES: THE STATE VARIABLE TECHNIQUES, STATE EQUATION AND STATE TRANSITION EQUATIONS OF CONTINUOUS DATA SYSTEMS. STATE TRANSITION MATRIX SOLUTIONS, PROPERTIES OF STATE TRANSITION MATRIX, SOLUTION OF NON-HOMOGENEOUS STATE EQUATIONS, STATE EQUATIONS OF DESCRETE SYSTEMS WITH SAMPLE AND HOLD DEVICES, STATE TRANSITION EQUATIONS, THE RECURSIVE METHOD, THE Z-TRANSFORM METHOD, STATE EQUATIONS AND TRANSFER FUNCTION, CHARACTERISTIC EQUATION, EIGEN VALUES, EIGEN VECTORS, DIAGONALIZATION OF THE 'A' MATRIX, JORDAN CANONICAL FORM COMPUTING STATE TRANSITION MATRIX.

Skill development

CONTROLLABILITY, OBSERVABILITY, STABILITY: DEFINITION OF CONTROLLABILITY, THEOREM ON CONTROLLABILITY, DEFINITION OF OBSERVABILITY, THEOREM ON OBSERVABILITY, RELATIONSHIPS BETWEEN CONTROLLABILITY AND OBSERVABILITY AND TRANSFER FUNCTION, STABILITY OF LINEAR DIGITAL CONTROL SYSTEMS, DEFINITION & THEOREM, STABILITY TESTS, BI-LINEAR TRANSFORMATION METHOD, JURY'S STABILITY TEST.

Skill development

TEXT BOOKS:

1. DIGITAL CONTROL SYSTEMS BY B.C. KUO, SECOND EDITION, SAUNDERS COLLEGE PUBLICATION-1992
2. DIGITAL CONTROL SYSTEMS BY OGATA
3. DIGITAL CONTROL SYSTEMS (SOFTWARE & HARDWARE) BY LAYMOUNT & AZZO

2015-16/293, 2016-17/295,2017-18/290.

EEE 416 ADVANCED CONTROL SYSTEMS

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

CONTROL SYSTEMS COMPONENTS: D.C. & A.C. TACHOMETERS-SYNCHROS, A.C. AND D.C. SERVO MOTORS-STEPPER MOTORS AND ITS USE IN CONTROL SYSTEMS, AMPLIDYNE-METADYNE-MAGNETIC AMPLIFIER –PRINCIPLE, OPERATION AND CHARACTERISTICS-WARD-LEONARD SYSTEMS.

Skill development

STATE VARIABLE ANALYSIS: CONCEPT OF STATE VARIABLES & STATE MODELS, STATE MODEL FOR LINEAR CONTINUOUS TIME SYSTEMS, SOLUTION OF STATE EQUATION, STATE TRANSITION MATRIX, CONCEPT OF CONTROLLABILITY & OBSERVABILITY (SIMPLE PROBLEMS TO UNDERSTAND THEORY)

INTRODUCTION TO DESIGN: INTRODUCTION-PRELIMINARY CONSIDERATIONS OF CLASSICAL DESIGN-LEAD COMPENSATION-LAG COMPENSATION-REALIZATION OF COMPENSATING NETWORKS-CASCADE COMPENSATION IN TIME DOMAIN AND FREQUENCY DOMAIN (ROOT LOCUS AND BODE PLOT TECHNIQUES)- POLE PLACEMENT BY STATE FEED-BACK, STATE VARIABLES AND LINEAR DISCRETE-TIME SYSTEMS.

Skill development

TEXT BOOKS:

1. CONTROL SYSTEMS COMPONENTS BY G.J. GIBSON & TUETOR
2. CONTROL SYSTEMS BY R.C. SUKLA, DHANPATHRAI PUBLICATIONS
3. AUTOMATIC CONTROL SYSTEMS BY B.C. KUO, PRENTICE HALL PUBLICATION

REFERENCE BOOK:

1. CONTROL SYSTEM PRINCIPLES & DESIGN BY M. GOPAL, TMH, 1998.

EEE 417 POWER ELECTRONICS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 50
SESSIONAL MARKS : 50
CREDITS :2

EEE 418 ELECTRICAL MACHINES LABORATORY–II

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 50
SESSIONAL MARKS : 50
CREDITS :2

EEE 419 INDUSTRIAL TRAINING

2015-16/297, 2016-17/299,2017-18/294.

E421-ENGINEERING ECONOMICS & MANAGEMENT

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

1. **FUNDAMENTALS OF ECONOMICS**- SCARCITY AND EFFICIENCY MARKET, COMMAND AND MIXED ECONOMICS. BASIC ELEMENTS OF SUPPLY AND DEMAND- LAW OF DEMAND- ELASTICITY OF DEMAND.

2. **BUSINESS ORGANIZATIONS**- INDIVIDUAL PROPRIETORSHIP- PARTNERSHIP- THE CORPORATION.

   STATEMENTS OF PROFIT AND LOSS- THE BALANCE SHEET- BREAK-EVEN ANALYSIS- COST CONCEPTS- ELEMENTS OF COSTS.

3. **PRINCIPLES AND FUNCTIONS OF MANAGEMENT**- EVOLUTION OF MANAGEMENT THOUGHT- DECISION MAKING PROCESS.
   ORGANIZATION THEORY AND PROCESS- LEADERSHIP- MOTIVATION- COMMUNICATION- CONFLICT MANAGEMENT IN ORGANIZATION.

4. **PLANT LOCATION**- PLANT LAYOUT- PRODUCTION PLANNING AND CONTROL- PRODUCT DESIGN AND DEVELOPMENT- CHANNELS OF DISTRIBUTION. MATERIALS MANAGEMENT- INVENTORY CONTROL.

5. **INDUSTRIAL DISPUTES AND THEIR SETTLEMENTS**- PROVISION OF FACTORIES ACT AND INDUSTRIAL DISPUTES ACT. RECENT TRENDS IN CONTEMPORARY BUSINESS ENVIRONMENT.

REFERENCES:

1. ECONOMICS- PAUL A. SAMUELSON AND WILLIAM D. NORDHAUS.
2. ENGINEERING ECONOMICS- VOL..1, TARA CHAND.
3. FINANCIAL MANAGEMENT- S.N. MAHESWARI.
4. ESSENTIALS OF MANAGEMENT- KOONTZ & O’ DONNEL.
5. PRODUCTION & OPERATION MANAGEMENT- B.S. GOEL.
6. MODERN PRODUCTION/OPERATION MANAGEMENT- ELWOOD S. BUFFA, RAKESH K. SARIN.
7. INDUSTRIAL LAW- S.P. JAIN.
8. INDUSTRIAL LAW- R.P. MAHESWARI & S.N. MAHESWARI.
9. LABOUR & INDUSTRIAL LAWS- SINGH, AGARWAL & GOEL.

2015-16/298, 2016-17/300,2017-18/295.

EEE422 POWER SYSTEM OPERATION & CONTROL

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

LOAD FLOW STUDIES:
REVIEW OF LOADFLOW MODELS, DECOUPLED LOADFLOW, FAST DECOUPLED LOADFLOW (FDLF), APPLICATION OF SPARSE TECHNIQUES TO LOAD FLOW MODELS.

OPTIMAL SYSTEM OPERATION:
OPTIMAL OPERATION OF GENERATORS OF A BUS BAR, OPTIMAL UNIT COMMITMENT, OPTIMAL GENERATION SCHEDULING, OPTIMAL LOADFLOW PROBLEM, OPTIMAL LOADFLOW SOLUTION, OPTIMAL SCHEDULING OF HYDRO-THERMAL SYSTEMS, POWER SYSTEM SECURITY

Employability

AUTOMATIC GENERATION & VOLTAGE CONTROL:
LOAD-FREQUENCY CONTROL, CONCEPTS, LOADFREQUENCY CONTROL OF A SINGLE AREA SYSTEM, LOADFREQUENCY CONTROL OF A TWO AREA SYSTEM, LOADFREQUENCY CONTROL AND ECONOMIC DISPATCH CONTROL, SPEED GOVERNOR DEAD-BAND AND ITS EFFECT ON AUTOMATIC GENERATION CONTROL

Skill developement

EMERGENCY CONTROL:
CONCEPTS, PREVENTIVE AND EMERGENCY CONTROL, COHERENT AREA DYNAMICS, STABILITY ENHANCEMENT METHODS, LONG TERM FREQUENCY DYNAMICS, AVERAGE SYSTEM FREQUENCY, CENTRE OF INERTIA.

Employability

TEXT BOOKS:

1.POWER SYSTEM ENGINEERING BY I.G. NAGARATH & D.P. KOTHARI (TMH PUBLICATIONS)
2.ELECTRIC ENERGY SYSTEMS THEORY-AN INTRODUCTION BY OLLE I. ELGERD (TMH EDITION)

REFERENCE BOOKS:

1. ADVANCED POWER SYSTEM ANALYSIS AND DYNAMICS BY L.P. SINGH , WILEY EASTERN LIMITED, THIRD EDITION
2. POWER SYSTEM ANALYSIS BY HADI SADAT, Mc GRAW Hill Pub.

2015-16/299, 2016-17/301,2017-18/296. **ELECTIVE-II**

EEE 423-3 HIGH VOLTAGE ENGINEERING

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

Unit 1: Generation of high voltages: Direct voltages - A.C. to D.C. conversion, Electrostatic generators, Alternating voltages - Testing transformers, Series resonant circuits, Impulse voltages - Impulse voltage generator circuits, Operation, design and construction of impulse generators.

Unit 2: Measurement of High Voltages & Currents: Measurement of high DC voltages, AC Voltages and Impulse Voltages. Measurement of high Currents – direct, alternating and impulse. CRO for impulse voltage and current measurements.

Unit 3: Non-destructive testing of Materials and Electrical apparatus: Measurement of direct current resistivity, Measurement of dielectric constant and loss factor, Partial discharge measurements.

Unit 4: High voltage testing of Electrical Apparatus: Testing of insulators, bushings, isolators, circuit breakers, cables, transformers, and surge arrestors. Radio interference measurements.

Employability

Unit 5: Design, Planning and Layout of high voltage laboratories: Test facilities provided in HV laboratories, activities and studies in HV and UHV labs, Classification of HV labs, Size and ratings of large size HV labs, Grounding of impulse testing laboratories, Insulation coordination.

Employability

TEXT BOOKS:

1. High Voltage Engineering Fundamentals, E. Kuffel, W.S. Zaengl, J. Kuffel (Second edition), Newnes
2. High Voltage Engineering, M.S.Naidu & V.Kamaraju, (Third Edition), TMH.

REFERENCE BOOKS:

1. C.L.Wadhawa – High Voltage Engineering.
2. High Voltage Laboratory techniques by J.D.Craggs & Meak Butter Worths scientific publications, London.
3. High Voltage measurement techniques by Schawab, M.I.T Press Cambridge, Massachusetts

ELECTIVE II

EEE 423 Non- Conventional Energy sources

Instruction	:	4 periods per week
University Examination	:	3 hours
University Examination Marks	:	70
Sessional Marks	:	30

Introduction to energy sources: Conventional, non –Conventional renewable energy sources advantages prospects

Employability

Solar energy: Basic principles components of wind energy conversion system (wecs) classification of wecs, applications.

Employability

Bio-energy: Introduction, biomass-energy conversion wet & dry processes, classification of biogas plants, constructional details of few main digesters, biogas form wastes, applications.

Geo-thermal energy: Introduction, sources, prime movers, for Geo-thermal energy, applications.

Energy from the oceans: Introduction, ocean –thermal electrical conversion (otec) open and closed cycles. Tidal energy principles, single and double basin arrangements, wave energy conversion devices.

Employability

Fuel Cells: Introduction, classification, types, conversion efficiency, applications.

Text Books:

1. Non-Conventional Energy sources, by G.D. Rai, Khanna pub.

References Books:

Energy technology Non- Conventional, Renewable & Convectional By S. Rao Khanna pub.

Future sources of electrical power by M.P. Agarwal First ed. S. Chand & Co, 1999.

2015-16/302, 2016-17/304,2017-18/299

ELECTIVE-II
EEE423 DATA STRUCTURES

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

REVISION OF 'C' LANGUAGE: OVER-VIEW ONLY(no questions to be set on this)

ARRAYS AND FUNCTIONS: ORGANIZATION AND USE OF ONE DIMENSIONAL, TWO DIMENSIONAL AND MULTI DIMENSIONAL ARRAYS, HANDLING OF CHARACTER STRINGS, STRING OPERATIONS, CONCEPT OF FUNCTION, PARAMETER PASSING, RECURSION.

STRUCTURES, POINTERS & FILES: DEFINITION OF STRUCTURE AND UNION, PROGRAMMING EXAMPLES, POINTER, POINTER EXPRESSIONS, PROGRAMMING EXAMPLES, FILE OPERATIONS AND PREPROCESS.

LINEAR DATA STRUCTURES: STACK REPRESENTATION, OPERATION, QUEUE REPRESENTATION, OPERATIONS, CIRCULAR QUEUES, LIST REPRESENTATION, OPERATIONS, DOUBLE LINKED AND CIRCULAR LISTS.

NON-LINEAR DATA STRUCTURE: TREES, BINARY TREE REPRESENTATION, TREE TRANSVERSALS, CONVERSION OF A GENERAL TREE TO BINARY TREE, REPRESENTATION OF GRAPHS.

SEARCH TECHNIQUES: BASIC SEARCH TECHNIQUES, TREE SEARCHING GRAPHICS, LINKED REPRESENTATION OF GRAPHS, GRAPH TRANSVERSAL AND SPANNING TREES.

TEXT BOOKS:

1. PROGRAMMING IN ANSI C BY E. BALAGURUSWAMY
2. DATA STRUCTURES USING C BY A.M. TANENBAUM AND OTHERS.

REFERENCE BOOKS:

1. AN INTRODUCTION TO DATA STRUCTURES WITH APPLICATIONS BY TRMBLY & SORENSON
2. THE 'C'-PROGRAMMING LANGUAGE BY KERNIGAN & WRITCHI

2015-16/303, 2016-17/305,2017-18/300.

EEE424 – POWER SYSTEM SIMULATION LAB

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 50
SESSIONAL MARKS : 50
CREDITS : 4

2015-16/304, 2016-17/306,2017-18/301.

EEE425-CONTROL SYSTEMS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 50
SESSIONAL MARKS : 50
CREDITS :2

TEN EXPERIMENTS BASED ON E-321, EEE-415 & EEE-422 SYLLABI

2015-16/305, 2016-17/307,2017-18/302.

EEE426-PROJECT WORK

INSTRUCTION : 6 Periods per Week
UNIVERSITY EXAMINATION : VIVA-VOCE
UNIVERSITY EXAMINATION MARKS : 100
SESSIONAL MARKS : 100
CREDITS : 8

APPLIED PHYSICS
(forEEE,ECE&Mech)

MEC 124	**Credits:3**
Instruction : 3 Periods & 1 Tut/Week	Sessional Marks :40
End Exam : 3 Hours	End Exam Marks:60

Course Objectives:

- To enhance student's knowledge of theoretical and modern technological aspects in physics and to introduce fundamentals of physics relevant to engineering applications
- To introduce advances in technology for engineering applications

Course Outcomes:

By end of the course, student will be able to:	
1	Understand the properties of magnetic materials and superconductivity.
2	Understand the dielectric nature of materials, properties and its applications.
3	Aware about nano material properties, synthesis and characterization tools.
4	Familiar with fundamentals of crystal structures.
5	Learn the basic phenomenon involved in semiconductors and semiconductor devices.

SYLLABUS

UNITI 12 Periods

Magnetic materials: Definition of magnetic permeability, magnetization and magnetic susceptibility, origin of magnetic moment, classification of magnetic materials, properties of diamagnetic and paramagnetic materials, ferromagnetic materials - hysteresis curve , domain theory of ferromagnetism, soft and hard ferromagnetic materials, anti-ferromagnetic and ferrimagnetic materials , ferrites and its applications

Superconductivity: Introduction, properties of superconductors, effect of temperature and magnetic field, Meissner effect, flux quantization , type – I and type – II superconductors high temperature superconductors, applications of superconductors, BCS theory (qualitative)

UNITII 10 Periods

Dielectric materials: Definition of electric dipole moment, dielectric polarization and dielectric constant, types of polarization – electronic, ionic and oriental polarization, expression for polarisability, internal fields in solids, Classius – Mossotti equation, frequency dependence of electronic polarization ,properties of ferroelectric materials and their applications

UNIT III 10 Periods

Nanophase materials: Introduction to nanophase materials, properties of nanophase materials, synthesis of nanophase materials – chemical vapour deposition, sol-gel method, MEChanical attrition method, applications of nanophase materials. Principles of X-Ray florescence X-Ray Diffraction- Electron Microscopy (SEM and TEM)

UNITIV 10 Periods

Crystal structure: Introduction, fundamental terms of crystallography – space lattice, , crystal lattice, unit cell, planes, seven crystal systems – Bravias lattices, cubic lattices, crystal directions and planes, Miller indices, interplanar spacing and interatomic distance , some simple crystal structures, body-centered cubic crystals, face-centered cubic crystals

UNIT V 12 Periods

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Fermi level, carrier concentration in intrinsic semiconductor, continuity equation, direct and indirect band gap semiconductors. Lorentz force, Hall effect and its applications. Physics of semiconductor devices: open circuited p-n junction diode, energy diagram of p-n diode, working of a diode, volt-ampere characteristics of p-n junction, diode as a rectifier, light emitting diode (LED) , liquid crystal display (LCD), photodiode

TEXTBOOKS:

1. S.L Gupta and SanjeevGupta*Engineering physics*DhanpatRai publications.

2. M.N. Avadhanulu&P.G.Kshirasagar*A text book of engineering physics*, S.Chand publication

REFERENCE BOOKS:

1) V.Rajendran*Engineering physics* Tata McGraw Hill Education Private Limited

2) DattuRamanlal Joshi *Engineering Physics* Tata McGraw Hill Education Private Limited

3) A.Marikani*Engineering Physics* PHI Learning Private Limited

ADVANCED ENGINEERING DRAWING

MEC 125	**Credits : 3**
Instruction : 3Periods& 1Tut/Week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:

- To make the student familiar to the drawing practices and convection
- To familiarize the student about various engineering curves and various layouts used in industry
- To enable the student draft simple engineering components and analyze basing on different views of components.

Course Outcomes:

By end of the course, student will be able to:	
1.	Draw orthographic projections for sections of solids.
2.	Draw the development of surface for solids.
3.	Prepare orthographic projections for intersections of solids.
4.	Convert isometric projections into orthographic projections and vice-versa.
5.	Develop 2-D and 3-D models using Auto-CAD.

LIST OF EXERCISES: Skill development

1. Sections of solids – Sectional views of prism, cylinder, pyramid and cone in simple positions Skill development
2. Sectional views of prism, cylinder pyramid and cone inclined to both the planes Skill development
3. Development of surfaces of prisms. Cylinder
4. Development of surfaces of pyramid, cone
5. Intersection of prism & prism, cylinder to cylinder, cylinder to cone, when two axes are perpendicular to each other
6. Intersection of cylinder to cylinder when axes are in inclined position
7. Conversion of orthographic views to isometric views (simp Employability
8. Conversion of isometric views to orthographic views.
9. 3D – Modeling using Auto CAD

a. Prisms and Cylinders

b. Pyramids and Cones

c. Combination of Solids

TEXT BOOK:

1. N. D. Bhatt *Engineering Drawing*Charotar Publishing House Pvt. Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. K. L. Narayana& P. Kanniah*Engineering Drawing*
2. R. B. Choudary*Engineering Graphics with Auto CAD*
3. TrymbakaMurty*Computer Aided Engineering Drawing*

OBJECT ORIENTED PROGRAMMING WITH C++ LAB

(Common for all branches, except for Civil & Chemical branches)

MEC-128 **Credits :3** Instruction : 2 Periods/Week & 3 Practicals/week
Sessional Marks :50 End Exam:3 Hrs, End Exam Marks : 50

Course Objectives :

- To introduce Object Oriented Programming (OOP) using the C++ Language.
- To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction
5. Objects
6. Operator Overloading
7. Inheritance
8. Virtual Functions & Polymorphism
9. I/O Streams
10. Templates
11. File Processing
12. Exception Handling Concepts

REFERENCE BOOKS:

1. Mahesh Bhave , Sunil patekar*Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2nd Edition New Age International Publishers

3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999

4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition, McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
2. Write a C++ program to find both the largest and smallest number in a list of integers.
3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments
4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation
5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: **void setlength(float)** to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **intsameArea(Rectangle)** that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

1. Write the definitions for each of the above member functions.
2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.
3. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following

   i. Veena, guitear, sitar, sarod and mandolin under string

   ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind

   iii. Table, mridangam, bangos, drums and tambour under perc

   It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

- o String instruments
- o Wind instruments
- o Percussion instruments

The show method should display the relevant details according to user choice .the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to “blue” and “wagon”. there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message “Beautiful music fills the passenger compartment” execute the methods to show the messages

1. Mycar is a blue wagon
2. My father’s car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters — a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively.

10. Write a C++ program to perform operations on complex numbers using operator overloading

11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet ‘A’ present in a text file “STORY.TXT”.
    Example:
    If the file “STORY.TXT” contains the following lines,
    The rose is red.
    A girl is playing there.
    There is a playground.
    An aeroplane is in the sky.
    Numbers are not allowed in the password.
    The function should display the output as 3

II YEAR – I SEMESTER

ENGINEERING MATHEMATICS-III

(COMMON TO EEE, ECE , CHEMICAL , CIVIL & MECHANICAL)

Course Code: MEC211	**L**	**T**	**P**	**C**
	3	**1**		**3**

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes :

The student will be able to :

CO - 1	Understanding the concepts of Gradient ,Divergence and Curl and finding scalar potential function of irrotational vector fields.
CO - 2	Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface integrals and flux integrals.
CO - 3	Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
CO - 4	Apply the method of separation of variables to solve the heat flow and wave equations.
CO - 5	Understand the principles of Fourier transforms and apply them to Boundary value problems.

Mapping of course outcomes with program outcomes :

Course Outcomes	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO - 1	**3**	**2**	**2**	**1**					**2**		**1**	
CO - 2	**3**	**2**	**2**	**1**					**2**		**1**	
CO - 3	**3**	**2**	**2**	**1**					**2**		**1**	
CO - 4	**3**	**2**	**2**	**1**					**2**		**1**	
CO - 5	**3**	**2**	**2**	**1**					**2**		**1**	

Course Outcomes	PSO1	PSO2
CO-1	2	2
CO-2	2	2
CO-3	2	2
CO-4	2	2
CO-5	2	2

UNIT-I : VECTOR DIFFERENTIATION (12 Periods)

Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT-II : VECTOR INTEGRATION (12 Periods)

Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT-III : PARTIAL DIFFERENTIAL EQUATIONS (12 Periods)

Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT –IV : APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

(12 Periods)

Introduction – Method of separation of variables – Vibrations of a stretched string-Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT-V : FOURIER TRANSFORMS (12 Periods)

Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2001.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

MATERIAL SCIENCE AND METALLURGY

Course Code: MEC212	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

Course Objectives:

To give an insight to the student on the fundamentals of materials, their structure, properties, applications and failure mechanisms. Besides, introduce the different heat treatment methods, classify and study ferrous and non-ferrous alloys, composites and basics of Powder Metallurgy and NDT.

Course Outcomes:

Students will be able to:

CO-1	Gain knowledge of fundamental structures of materials and their properties.
CO-2	Understand the fundamentals of various phases of alloys and heat treatment methods.
CO-3	Classify and understand the properties and applications of ferrous and non-ferrous alloys.
CO-4	Understand the modes of plastic deformation and failure mechanisms and basic principles of powder metallurgy.
CO-5	Understand the principles and synthesis of composite materials and powder Metallurgy components

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	1	3	2			1					1
CO-2	3	2	1	3			3					1
CO-3	1	2	3	2			1					
CO-4	3	3	3	2			2					1
CO-5	2	3	3	3	1	3	3	1	2	3	3	3

Course Outcomes	PSO1	PSO2
CO-1	2	2
CO-2	2	1
CO-3	2	2
CO-4	3	2
CO-5	3	3

UNIT-I

Engineering Materials: Properties , classification of materials, Advanced Materials.
Crystalline Solids:
Unit cells, crystal systems, Bravais Lattices, Atomic packing factor, Miller Indices for Crystallographic planes and directions. Crystal Defects: point, line and surface defects.

UNIT-II

Binary Phase Diagrams.
Gibbs Phase rule. Lever rule. Invariant reactions. Iron-Iron Carbide phase diagram. **Heat treatment of steel.** Isothermal transformation curves. Annealing, Normalizing, Hardening, Tempering, Austempering and Martempering of steels. Surface hardening of steels. Carburizing, Nitriding, Cyaniding, Flame and induction hardening methods.

Employability

UNIT-III

Steels and Cast Irons:
AISI-SAE classification of steel, Structure and properties of plain-carbon steels, low alloy steels, Tool steels, Stainless steels. Types of Cast irons. Grey CI, White CI, Malleable and Spheroidal Graphite irons, Alloy cast irons.
Non-ferrous metals and alloys: Brasses and Bronzes, Bearing metals, Titanium alloys

Employability

UNIT-IV
Plastic Deformation: Slip, Twinning, critical resolved shear stress. Strain hardening and other strengthening mechanisms
Material Failure Mechanisms: Ductile and Brittle fracture, Ductile to Brittle transition, fundamental concepts of creep and fatigue failure, creep curve.
UNIT-V
Composite Materials
Classification, Matrices and reinforcements, polymer matrix composite, ceramic matrix composite and metal matrix composites. Fabrication methods of composites.
Powder Metallurgy: Principles of Powder Metallurgy Process, Basic steps in Powder

Metallurgy , Powder Manufacture, Powder Blending, Powder Compaction, Sintering. Advantages & limitations.

Employability

Text Books:

1. Material Science and Metallurgy for Engineers, V.D. Kodgire & S.V. Kodgire, Everest Publishing House.
2. Introduction to Physical Metallurgy, S.H. Avner, Tata McGraw Hill edition.

Reference Books:

1. Material Science and Engineering, L.H.Van Vleck, 5th edition, Addison Wealey (1985).
2. Structure and Properties of Materials, R.M. Rose, L.A. Shepard and J. Wulff Vol.1, John Willey (1966).
3. Essentials of Material Science, A.G. Guy ,McGraw-Hill (1976).
4. Material Science and Engineering, V. Raghavan ,Printice Hall of India.

ENGINEERING MECHANICS

Course Code: MEC 213

L	T	P	C
4	1	0	4

Course Objectives: To enable the students understand and distinguish different force systems, evaluate the conditions required for their equilibrium, apply the concepts of dry friction, determine the properties of surfaces and solids, distinguish between particle and rigid body mechanics and further apply the principles of dynamics to bodies in motion.

Course Outcomes: At the end of the course the student will be able to:

CO-1	Classify the force systems, evaluate their resultant and draw the free body diagram of any practical problem and determine the conditions required for equilibrium using the principles of mechanics.
CO-2	Analyze and determine the forces in trusses and also apply the concepts of dry friction to some basic applications of Mechanical engineering.
CO-3	Evaluate the properties of plane surfaces including composite areas like centroid, moment of inertia & extend the concepts to solids.
CO-4	Distinguish between particle and rigid body and apply the concepts of kinematics and kinetics to analyze forces on particles under rectilinear and curvilinear motions.
CO-5	Apply the principles of dynamics to rigid bodies and also understand the concepts of Simple harmonic motion & compound pendulum.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	3	2	_	_	_	_	_	_	_	1
CO-2	3	3	3	2	_	_	_	_	_	_	_	1
CO-3	3	3	3	2	_	_	_	_	_	_	_	1
CO-4	3	3	3	2	_	_	_	_	_	_	_	1
CO-5	3	3	3	2	_	_	_	_	_	_	_	1

Course Outcomes	PSO1	PSO2
CO-1	3	2
CO-2	3	2
CO-3	3	2
CO-4	3	2
CO-5	3	2

UNIT –I

STATICS :

Introduction to Engineering mechanics, Scalar and vector quantities, vector operations

Statics of Particles: Fundamental concepts and principles- Resultant of coplanar concurrent forces and non-concurrent forces, Free body diagrams, Equilibrium of particles. Resultant of concurrent and non-concurrent forces in space (vector method only).

Employability

Statics of rigid bodies: Moments and Couples-Varignon's theorem – Free body diagram- Equivalent force and couple – Types of supports and their reactions – Equilibrium of Rigid bodies in two dimensions. Principles of superposition and transmissibility.

Employability

UNIT –II

Employability

ANALYSIS OF TRUSSES AND FRICTION:

Trusses: Definition of a truss - Simple Trusses - Analysis of planar Trusses - Method of joints- Method of sections.

Friction: Characteristics of Dry Friction, Problems related to dry friction - Wedges –ladders

Employability

UNIT - III

PROPERTIES OF SURFACES AND SOLIDS:

Employability

Centroids & Centre of Gravity: Centroids of lines & areas, C.G of volumes –determination by first principles, composite areas- Theorem of Pappus-Guldinus.

Moment of Inertia: Moment of inertia of an area- Radius of gyration - Parallel and perpendicular axis theorems – Polar moment of inertia - Mass moment of inertia.

Employability

UNIT –IV

Skill development

DYNAMICS OF PARTICLES:

Displacements, Velocity and acceleration, their relationship – relative motion – Rectilinear and Curvilinear motion.
Newton's laws – D'Alembert's Principle-Work-Energy Equation of particles – Impulse and Momentum –Impact of elastic bodies- Impact - direct and central impact – coefficient of restitution.

UNIT - V

DYNAMICS OF RIGID BODIES:

Rotation of rigid body, General plane motion –Velocity and Acceleration- Absolute and Relative motion method.
Equilibrium of rigid bodies in plane motion- Newton's Laws- D'Alembert's Principle-Work Energy Principle-Principle of impulse momentum for rigid bodies in plane motion. Simple harmonic motion - Compound pendulum.

Text Books:

1. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill
2. Vector Mechanics for Engineers: Statics and Dynamics by Ferdinand P.Beer & E. R. Johnston (9th Edition), Tata McGraw-Hill International Edition.
3. Engineering Mechanics by S.S.Bhavikatti, New age international publishers

Reference Books:

1. Engineering Mechanics – STATICS by J. L. Meriam and L. G. Kraige, Wiley India edition
2. Engineering Mechanics – DYNAMICS by J. L. Meriam and L. G. Kraige, Wiley India edition
3. Engineering Mechanics – Statics and Dynamics by Irving Shames, Prentice Hall of India
4. Engineering Mechanics by K.L.Kumar, McGraw-Hill.
5. Engineering Mechanics – Statics and Dynamics by A.K.Tayal.

Web resources:

NPTEL lectures

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

MECHANICS OF SOLIDS

Course Code: MEC214

L	T	P	C
4	**1**	**0**	**4**

Prerequisite: Mathematics-I & II

Course Objectives:

To make the students understand the effect of forces on deformable bodies under various loading conditions, and thus calculate various types of stresses such as direct stresses, bending stresses, torsional stresses and evaluate deflection of beams. The objective is also to provide the fundamental principles involved in strength of materials to enable them to apply in the study of advanced subjects.

Course Outcomes:

Students will be able to:

CO-1	Distinguish between various mechanical properties like yield strength, ultimate strength etc., of a given material and also to determine various types of stresses.
CO-2	Analyze the effect of shear force & bending moment on various beams
CO-3	Evaluate the slope and deflection induced in the beams by various methods.
CO-4	Determine the torsional stresses in shafts and buckling stresses in columns.
CO-5	Differentiate between thick and thin shells and determine the stresses induced and strains when subjected to internal and external pressure.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**2**	**1**	**1**	**1**	**1**							**1**
CO2	**3**	**3**	**3**	**2**	**1**							**1**
CO3	**3**	**3**	**2**	**1**	**1**							**1**
CO4	**2**	**2**	**3**	**2**	**1**							**1**
CO5	**3**	**3**	**3**	**3**	**1**							**1**

Course Outcomes	PSO1	PSO2
CO-1	2	1
CO-2	3	2
CO-3	3	2
CO-4	2	2
CO-5	3	2

Unit-I –Stresses and Strains:

Stress –Strain, Stress Strain diagram, Poisson's ratio, Elastic constants and their relationship ,Generalized Hook's law, Factor of safety, Strain energy, Impact loading ,Deformation of simple and compound bars.

Employability

Thermal stresses , Stresses on an inclined plane under uni-axial, bi-axial, pure shear & combined loading, principal stresses & strains, Mohr's circle for plane stresses.

Employability

Unit-II- Analysis of Beams:

Types of beams and loads, Shear Force and Bending Moment diagrams for cantilever, simply supported and over hanging beams,

Theory of pure bending, flexural formula, shear stress distribution in beams (rectangle, circular, I, T & L sections).

Employability

Employability

Unit-III -Deflection of beams:

Relation between curvature, slope and deflection, deflection of simply supported, cantilever and overhanging beams by double integration method, Macaulay's method, moment area method.

Employability

Unit-IV -Torsion and columns:

Introduction to pure torsion, torsional formula, torsion of circular and hollow shafts.

Theory of columns – long and short columns, Euler's theory, crippling load, Rankine's theory, columns carrying eccentric load, empirical formulae.

Employability

Employability

Unit-V-Thin & Thick cylinders:

Stress & Strains in thin cylinders & spherical shells.

Introduction to thick cylinder –Lame's equation, cylinder subjected to internal and external pressures.

Employability

Text Books:

01. Mechanics of Materials, Gere & Timoshenko ,CBS Publishers.
02. Strength of Materials, S.S.Ramamrutham & R, Narayanan ,Dhanpat Rai publications.

References:

01. Strength of Materials, Dr Sadhu Singh,Khanna publications

02. Strength of materials, R.K.Rajput ,S.Chand Ltd.publications
03. "Engineering Mechanics of solids" Egor P.Popov ,second edition, prentice hall of India pvt. Ltd, New Delhi, .
04. "A Text Book of Strength of Materials, R.K.Bansal ,Lakshmi Publications Pvt. Ltd,New Delhi
05. Mechanics of materials, Jhonston Beer and Mazurek Dewol 6 th Edition

Web References:

1) http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/strength%20of%20materials/homepage.htm
2) http://www.aboutcivil.org/solid-mechanics.html
3) http://web.mit.edu/emech/dontindex-build/
4) http://web.aeromech.usyd.edu.au/AMME2301/Documents/
5) http://www.faadooengineers.com/threads/9673-Mechanics-of-Solids-Lecture-Notes-Pdfs-Full-Notes-All-Units-Download
6) http://www.ijee.ie/OnlinePapers/Interactive/Philpot/philpot_media_mm.htm

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

ENGINEERING THERMODYNAMICS-I

Course Code: MEC215	**L**	**T**	**P**	**C**
	4	**1**	**0**	**4**

Prerequisite: Engineering Physics-I

Course Objectives:

To provide the student with a simplistic and practical approach to the fundamental subject of thermodynamics and create an interest and intuitive understanding of the nuances of this core subject which deals with energy and its different forms and to solve any real time engineering problems.

Course Outcomes:
The student will be able to:

CO-1	Understand the basic concepts of thermodynamics and identify the interaction between system and surroundings.
CO-2	Understand the basic laws of thermodynamics and apply these laws to analyze various flow and non flow systems.
CO-3	Understand and apply the concept of 2^{nd} law of thermodynamics, ideal process & availability to evaluate the performance of cyclic devices, flow and non flow systems.
CO-4	Evaluate the properties of gas mixtures and apply gas laws to compute energy transfers and change in properties of the flow and non-flow systems during a process.
CO-5	Evaluate the air standard efficiency of various air standard cycles and compare the relative merits and demerits.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	1	2	1	1			3			1	1	
CO-2	3	3	2	2			3	1			1	
CO-3	3	3	3	3		2	3	2		1	1	
CO-4	3	3	3	3			2		1			
CO-5	3	3	3	3		2	3	2		1		

Course Outcomes	PSO1	PSO2
CO-1	2	1
CO-2	3	2
CO-3	3	2
CO-4	3	2
CO-5	3	2

UNIT – I

Basic Concepts-System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle, Quasi – static Process, Energy in State and in Transition, Work and Heat, Path and Point functions.

Employability

UNIT II

Zeroth Law of Thermodynamics – Concept of equality of Temperature –Reference Points – PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a flow system – Steady Flow Energy Equation, throttling & free expansion processes. Limitations of the First Law.

UNIT – III

Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, Corollaries, PMM-II, Carnot's principle, Reversibility and Irreversibility, Causes of Irreversibility, Carnot cycle, Clausius Inequality, Entropy, Principle of Entropy Increase – Availability and Irreversibility –Quality of energy , Dead state, Availability in non-flow & flow processes, Gouy–stodola equation.

Employability

UNIT -IV

Perfect Gas & Gas mixtures: – Equation of State, Characteristic and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy and enthalpy – Deviations from perfect Gas Model – Vander Waals Equation of State. Gas mixtures-Daltons law and Gibbs-Dalton law, apparent molecular weight and gas constant, specific heats of gas mixture, volumetric & gravimetric analysis of gas mixtures, adiabatic mixing of perfect gases.

Employability

UNIT - V

Power Cycles: Otto, Diesel, Dual Combustion cycles, Stirling & Ericcson Cycles – Description and representation on P–V and T-S diagram, Thermal Efficiency.

Text books:

1. Engineering Thermodynamics, P.K.Nag ,Tata McGraw Hill publication.
2. Thermal Science & Engineering, Dr.D.S.Kumar ,S.K.Kataria & sons publication.

Reference Books:

1. Engineering Thermodynamics, Cengel & Boles,TMH publications
2. Thermal Engineering, R.K.Rajput S.Chand & Co.

Web sources:

1. http://nptel.ac.in/courses/112108148/
2. http://nptel.ac.in/courses/112105123/
3. http://nptel.ac.in/courses/112104113/
4. http://highered.mheducation.com/sites/007352932x/student_view0/index.html
5. http://physics-animations.com/Physics/English/thermo.htm
6. https://www.youtube.com/watch?v=CmaTnV4m93E
7. http://wps.prenhall.com/wps/media/objects/2688/2752944/Web_Tutorials/06_A01.swf

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

MANUFACTURING TECHNOLOGY - I

Course Code: MEC216	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

Course Objective:

To make the students learn about fundamental manufacturing concepts and understand various manufacturing processes such as casting, forming and fabrication.

Course Outcomes:

Students will be able to:

CO-1	Describe and illustrate various casting processes and their components
CO-2	Design molding system and evaluate the defects in casting
CO-3	Define and design various forming and forging processes
CO-4	Understand the principles of sheet metal operations and basics of metal joining processes
CO-5	Explain advanced welding processes and able to analyze weld defects

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

COURSE OUTCOMES	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	1	1	1		1		1		1	1
CO2	3	3	3	2	1		1		1		1	1
CO3	3	2	3	2	1		1		1		1	3
CO4	2	3	2	1	1		1		1		1	1
CO5	2	3	3	2	1		1		1		1	3

Course Outcomes	PSO-1	PSO-2
CO-1	1.4	0
CO-2	2.4	1.2
CO-3	2.6	1.8
CO-4	2.4	2
CO-5	2.6	1.8

UNIT - I

Introduction to Manufacturing:

Product cycle; Job, batch and mass production; Primary and secondary manufacturing processes.

Employability

Principles of metal casting:

History of metal casting, applications and limitations, Terminology in casting, sand mould making procedure, Patterns, Classification of patterns, pattern materials, pattern allowances, core prints. Moulding materials, moulding sand composition, sand properties testing procedures, moulding sand preparation and its classification, Sand moulding machines, core sands, types of cores, chaplets. Gating system design - Elements of gating system, Risering design – Caine's method and Modulus method, feeding distances, chills.

Employability

UNIT - II

Metal Casting Processes & N.D.T Techniques:

Classification of Furnaces, fettling, defects in castings, Types of mould - Chemical sand moulding, Permanent moulding processes, Special casting processes – Centrifugal casting, Precision investment casting, Continuous casting, Plaster mould casting, Squeeze casting, Evaporative casting, Vacuum sealed casting. Casting Defects, Non-destructive testing methods – Visual inspection, Liquid penetrant and die penetrant test, magnetic particle inspection test, Ultrasonic inspection and radiography tests.

Employability

UNIT - III

Introduction to Metal Forming & Bulk Forming Processes:

Nature of plastic deformation, hot working and cold working. Rolling – Principle, Rolling stand arrangement, Rolling load. Forging – Principle, Forging operations – Smith forging, drop forging, press forging and machine forging. Forging pressure distribution and forging force, Extrusion – hot and cold extrusions, tube extruding, wire drawing, rod and tube drawing, swaging.

Employability

UNIT - IV

Sheet Metal Forming & Basics of Metal Joining Processes:

Sheet metal operations,– shearing, drawing, bending, squeezing, press working and its classification, types of dies, press tool operations – cutting operations (blanking, punching, notching, etc.), shaping operations (embossing, coining, spinning, stretch forming, etc.), high energy rate forming processes, Classification of fabrication processes, types of joints, Soldering, brazing and braze welding,

Employability

Employability

UNIT - V

Employability

Metal Joining Processes:

welding terminology, Principles and processes – gas welding and cutting, Electric arc welding (MMAW, CAW, TIG, GMAW, SAW, PAW, AHW, SW, fire cracker welding),. Resistance welding (spot, seam, projection, upset and flash welding techniques), Solid state welding – Cold or roll welding, explosion welding, friction welding, friction stir welding, ultrasonic welding. Thermit welding, electro slag welding, laser beam welding, forge welding, diffusion welding. Welding defects.

Text Book:

1. Manufacturing Technology-Foundry, Forming and Welding, P.N. Rao, 4th Edition, Tata McGraw-Hill Publishing Company.

2. Manufacturing Engineering & Technology, Kalpak Jain, 7th Edition, Addition Wesley Edition.

Reference Books:

1. Materials and Processes in Manufacturing, De Garmo, Black and Kohsen 4th Edition, Prentice Hall of India.

2. Manufacturing Science (English) 2nd Edition, Amithaba Ghosh and Asok Kumar Mallik ,East West Press Pvt. Ltd.

3. Principles of Metal Casting, Hein and Rosenthol, 5th Edition, Tata McGraw Hill India.

Web sources: www.wri.org.in

4. Hein and Rosenthol, Principles of Metal Casting, 5th Edition, Tata McGraw Hill India.

Web sources: www.wri.org.in

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

STRENGTH OF MATERIALS LAB

Course Code: MEC217

L	T	P	C
0	0	3	2

Course Objectives:

The objective is also to make the students observe the response of the material under different loads and measure the properties which include tensile strength, impact strength, hardness, stiffness and elastic constants.

Course Outcomes:

Students will be able to:

CO-1	Measure and analyze the various properties of materials under tensile/compressive loads.
CO-2	Determine the modulus of rigidity of a material by subjecting it to a twisting moment and also for a given spring material.
CO-3	Determine the hardness and impact strength of a given material.
CO-4	Determine modulus of elasticity of a given beam material.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**2**	**2**	**1**			**1**		**1**		
CO2	**1**		**1**	**1**	**1**			**1**		**1**		
CO3	**1**		**1**	**1**	**1**			**1**		**1**		
CO4	**1**		**1**	**1**	**1**			**1**		**1**		

Course Outcomes	PSO1	PSO2
CO-1	2	2
CO-2	1	1
CO-3	1	1
CO-4	1	1

List of Experiments:

(any 10 Experiments)

1. To study the stress- strain characteristics of materials under tensile load by using UTM.
2. Determination of compressive strength of wood by using UTM.
3. Determination of hardness using Brinnels hardness tester.
4. Determination of hardness using Rockwell's hardness tester.
5. Determination of Vickers hardness number by using Vickers hardness tester.
6. Impact test by using Izod method.
7. Impact test by using Charpy method.
8. To find stiffness and modulus of rigidity by conducting compression tests on springs.
9. Torsion tests on circular shafts.
10. To conduct shear test on mild steel bar using UTM.
11. To determine modulus of elasticity of given wooden bar by using the principle of simply supported beam
12. To determine modulus of elasticity of given mild steel bar by using the principle of simply supported beam
13. To determine modulus of elasticity of given wooden bar by using the principle of cantilever beam.
14. To determine modulus of elasticity of given mild steel bar by using the principle of cantilever beam.

skill development

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – I SEMESTER

MECHANICAL ENGINEERING LAB – I

Course Code: MEC218	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

Course Objectives:

To make the students conversant with the experimentation involved in measuring the properties of fuels and lubricants, giving an insight into the construction and operation of two stroke and four stroke engines, air compressor & Boilers and further using kinematic principles to determine mass moment of inertia of connecting rod and flywheel.

Course Outcomes:

The students will be able to:

CO-1	Draw the port timing and valve timing diagrams for 2S and 4S I.C engines.
CO-2	Analyze the properties like flash point, fire point, calorific value and viscosity of various fluids.
CO-3	Calibrate measuring instruments like pressure gauge.
CO-4	Evaluate the volumetric efficiency of single stage reciprocating air compressor.
CO-5	Explain the working of various types of boilers & their accessories
CO-6	Evaluate the moment of inertia for flywheel & connecting rod.
CO-7	Determine the modulus of rigidity of the given material using torsional pendulum principle.
CO-8	Disassemble & assemble an I.C engine & identify its components.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	0	0	1	0	1	1	0	1
CO2	2	1	1	2	0	0	1	0	1	1	1	1
CO3	1	1	1	2	0	0	0	0	1	1	0	1
CO4	2	1	1	2	0	0	0	0	0	1	0	0
CO5	0	0	1	0	0	0	1	0	0	1	0	1
CO6	2	2	2	2	0	0	0	0	0	1	0	0
CO-7	2	1	1	2	0	0	1	0	1	1	1	1
CO-8	0	0	1	0	0	0	1	0	0	1	0	1

Course Outcomes	PSO1	PSO2
CO-1	1	1
CO-2	2	1
CO-3	1	1
CO-4	2	1
CO-5	1	1
CO-6	2	2
CO-7	2	1
CO-8	1	1

List of Experiments:

(any 10 Experiments)

1. To draw valve timing diagram for four-stroke & port timing diagram for two-stroke engines.
2. Determination of volumetric efficiency of the given air compressor by plate orifice method.
3. Determination of volumetric efficiency of the given air compressor by tank capacity method.
4. Calibration of the given pressure gauge.
5. Determination of flash and fire points of fuel oils.
6. Determination of calorific value of gaseous fuel by using Junker's gas calorimeter.
7. Determination of the kinematic and absolute viscosity of the given lubricating oil samples.
8. Determination of moment of inertia of a given flywheel.
9. Determination of moment of inertia of a given connecting rod.
10. Determination of modulus of rigidity of the material of the wire using the principle of torsional pendulum.
11. Study of boilers, various mountings and accessories.
12. Disassembling & assembling of a two-stroke/ four-stroke engine.

Skill Development

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

MATHEMATICS - IV
(COMMON TO CHEMICAL & MECHANICAL)

Course Code: MEC221	L	T	P	C
	3	1	0	3

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

The student will be able to:

CO - 1	Understand the characteristics and properties of Z-transforms and apply them in engineering problems
CO - 2	Familiarize with the formation of Difference Equations and method of solving them.
CO - 3	Understand, interpret and use the basic concepts like analytic functions, harmonic functions, Taylor and Laurent series and singularity.
CO - 4	Understand the concepts of Residues , evaluate definite integrals using the technique of residues and further understand the concepts of conformal mappings.
CO - 5	Analyze the Statistical data by using statistical tests (based on small sample and large sample) and draw valid inferences based on the analysis of statistical data.

Mapping of course outcomes with program outcomes:

Course Outcomes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO - 1	3	2	2	1					2		1	
CO - 2	3	2	2	1					2		1	
CO - 3	3	2	2	1					2		1	
CO - 4	3	2	2	1					2		1	
CO - 5	3	2	2	1					2		1	

Course Outcomes	PSO1	PSO2
CO-1	2	2
CO-2	2	2
CO-3	2	2
CO-4	2	2
CO-5	2	2

UNIT-I : FUNCTIONS OF A COMPLEX VARIABLE (12 Periods)

Introduction –Limit of a Complex function- Derivative of f(z) – Analytic functions- Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms (Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function .

UNIT-II : FINITE DIFFERENCES & INTERPOLATION (12 Periods)

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNIT-III: NUMERICAL DIFFERENTIATION AND INTEGRATION (12 Periods)

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule , Simpson's Three-Eighth rule.

UNIT-IV: PROBABILITY AND DISTRIBUTIONS **(12 Periods)**

Introduction – Basic Terminology – Probability and set notations – Addition Law of Probability – Independent events – Baye's Theorem – Random variable – Discrete Probability Distribution – Continuous Probability Distribution – Binomial Distribution - Poisson distribution - Normal Distribution. (Mean , Variance , Standard Deviation and their properties without proofs).

UNIT-V: SAMPLING THEORY **(12 Periods)**

Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (3^2) Test – Goodness of fit.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2011.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

FLUID MECHANICS

Course Code: MEC223

L	T	P	C
4	**1**	**0**	**4**

Prerequisites:

Engineering Mathematics – I, Engineering Mechanics.

Course Objective:

To acquaint the student with the fundamental & advanced principles of fluid mechanics and their application to any practical problem involving fluids to find a solution.

Course Outcomes:

The student will be able to:

CO-1	Understand and apply the basic concepts of physical parameters like viscosity, surface tension, capillarity etc. in practical fluid flow problems.
CO-2	Apply the concepts of continuity, Impulse-momentum equation and Angular momentum principle to fluid flow problems.
CO-3	Determine the loss of energy in flow through pipes under various configurations and further critically analyze viscous flows.
CO-4	Get an overall view of boundary layer theory and its related concepts and further apply the principles of dimensional analysis to any physical phenomena.
CO-5	Analyze flow over submergible bodies like sphere, cylinder, airfoil and the forces exerted on them.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1								1
CO2	3	3	3	2	1	1	1				1	1
CO3	3	3	3	2	1	1	1				1	1
CO4	3	3	3	3	1		1			1	1	2
CO5	3	3	3	3	1		2		1		1	2

Course Outcomes	PSO1	PSO2
CO-1	2	2
CO-2	3	2
CO-3	3	2
CO-4	3	2
CO-5	3	3

UNIT-I

Fluid Statics:

Properties of fluids - Fluid Pressure and its measurement - Manometers, Simple manometers, Differential manometers. Hydrostatic forces on surfaces.

Total Pressure and Centre of pressure - Horizontal, Vertical, Inclined and Curved plane surfaces submerged in liquid - Buoyancy and Floatation, Applications.

Employability

UNIT-II

Fluid Kinematics & Dynamics:

Types of fluid flow - velocity and acceleration - continuity equation - velocity potential and Stream Function - Flow net Analysis. Types of Motion, Linear translation, Linear deformation, Angular deformation, Rotation, vorticity and circulation.

Forces acting on fluid in motion - Equation of Motion - Euler's equation - Navier–Stokes equation - Order of magnitude analysis - Bernoulli's equation and its applications - Venturimeter, Orifice Meter, Pitot tube - Momentum Equation - Impulse-Momentum equation - Angular momentum principle - Forces on pipe bend - Vortex flow, forced and free vortex.

UNIT-III

Flow through pipes: Reynolds Experiment - Laws of fluid friction - Darcy weisbach equation, Major Losses and Minor losses - Hydraulic gradient line, Total energy line, Pipes in series and pipes in parallel - Equivalent pipe - Branched pipes - siphon, Transmission of power through pipes.

Laminar Flow: Introduction, Relation between shear and pressure gradient - Laminar flow in circular pipes - Hagen–Poiseuille law - couette flow analysis.

UNIT-IV

Boundary layer theory: Introduction to Boundary layer concepts - Thickness of Boundary layer - Boundary layer equations - Momentum integral equation, Laminar and Turbulent boundary layer, Separation of boundary layer and methods of controlling.

Dimensional and Modeling Analysis: Fundamental and derived dimensions - Dimensionless groups - Rayleigh method - Buckingham method - Model Analysis - Types of similarity-Geometric, Kinematic and Dynamic similarities - Dimensionless numbers - Model Laws.

Employability

UNIT-V

Drag & Lift: Introduction - Types of drag - drag on a sphere, cylinder, flat plate and airfoil, Variation of coefficient of drag.

Development of lift on immersed bodies - circular cylinder and airfoil.

Employability

Text Book:

1. Hydraulics and fluid Mechanics by Modi and Seth, 12th ed. 1998, Standard Book House, Delhi

2. Fluid Mechanics and Fluid Power Engineering by Dr. D.S. Kumar, S.K. Kataria &Sons.

References:

1. Fluid Mechanics and Hydraulic machines by R.K. Bansal, 8th ed. 2002, Laxmi publication (P) Ltd.
2. Fluid Mechanics by V.L. Streeter & E.B. Wylie, 1st SI metric ed. 1981, McGraw Hill Book Company.
3. Foundations of Fluid Mechanics, by Yuan, Prentice Hall of India.
4. Fluid Mechanics by Yunus Cengel and Cimbala.

5. Fluid Mechanics Franck .M White Tata Mc GrawHill Publication 2011.

Web Resources:

http://www.science-animations.com/fluidmechanics.html

https://iitbmechdamp.wordpress.com/me-203-fluid-mechanics/

http://nptel.ac.in/courses/112105171/1

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

THEORY OF MACHINES-I

Course Code: MEC224 **L T P C**
4 1 0 4

Prerequisite: Engineering Mechanics

Course Objectives:

To acquaint the students with the fundamentals of mechanisms and their kinematic analysis. Further this study is extended to specific applications like steering mechanisms, Hooke’s joint, cams, gears and gear trains.

Course Outcomes:

The Student will be able to:

CO-1	Understand the basic concepts of different mechanisms and their inversions.
CO-2	Understand and analyze mechanisms like straight line motion mechanisms & steering gear mechanisms and Hooke’s joint.
CO-3	Perform kinematic analysis of any given simple mechanisms.
CO-4	Design cam profiles based on the prescribed follower motion and perform kinematic analysis on cams with specified contours.
CO-5	Get acquainted with gear terminology, distinguish gears & perform kinematic analysis of gears & gear trains.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**2**	**3**			**2**			**2**		**2**
CO2	**3**	**3**	**1**	**3**					**2**	**1**	**1**	**2**
CO3	**3**	**3**	**2**	**3**						**2**	**2**	**2**
CO4	**3**	**2**	**3**	**2**						**2**	**2**	**1**
CO5	**3**	**3**	**3**	**3**			**2**			**2**	**2**	**2**

Course Outcomes	PSO1	PSO2
CO-1	3	2
CO-2	3	1
CO-3	3	2
CO-4	3	2
CO-5	3	2

UNIT – I

Mechanisms and Machines: Introduction; Mechanism and machine; Rigid and resistant bodies; Link; Kinematic pair; Degrees of freedom; Classification of kinematic pairs; Kinematic chain; Linkage, mechanism and structure; Mobility of mechanisms. Application of Kutzbach Criterion to Plane Mechanisms. Grubler's Criterion for Plane Mechanisms. Grashof 's law.

Inversions of Mechanisms: The four-bar chain; Mechanical advantage; Transmission angle; The slider-crank chain; Double slider-crank chain.

Employability

Employability

UNIT-II

Mechanism with lower pairs: Pantograph – straight line motion mechanisms – exact straight line motion mechanisms- Peaucellier mechanism, Approximate straight line motion mechanisms-Watt mechanism. Condition for correct steering-Davis & Ackerman's steering gear mechanisms. **Hooke's joint:** Ratio of shaft velocities – maximum and minimum speed of driven shaft – condition for equal speeds – Angular acceleration of driven shaft – Double Hooke's joint.

Employability

Employability

UNIT – III

Velocity Analysis: Relative velocity method – velocity of point on a link- application of relative velocity method to simple mechanisms – rubbing velocity of a joint – Instantaneous centre method –body centrode and space centrode - velocity of point on a link by Instantaneous centre method, location of Instantaneous centre - three centres in line theorem and application of the method for simple mechanisms.

Employability

Acceleration Analysis: Acceleration diagrams of a link - acceleration diagrams for simple mechanisms-coriolis component of acceleration - acceleration diagram for slotted lever quick return mechanism- Klein's Construction.

Employability

UNIT -IV

Cams: Classification of followers and cams – terms used in radial cams – displacement, velocity and acceleration diagrams when the follower moves with uniform velocity, uniform acceleration and retardation, simple harmonic motion – construction of cam profiles.

Employability

Cams with specified contours: Tangent cam with roller follower – circular arc cam with flat faced follower.

Employability

UNIT-V

Toothed gearing: Classification of toothed wheels – terms used in gears - law of gearing – velocity of sliding of teeth – forms of teeth – Cycloidal and involute teeth– length of path of contact-arc of contact– contact ratio- interference in involute teeth - minimum number of teeth to avoid interference.

Gear trains:-Simple, compound and reverted gear trains – epicyclic gear train – velocity ratio of epicyclic gear train-sun and planet wheels – torques in epicyclic gear train-Differential of an automobile.

Employability

TEXT BOOKS:

1. Theory of Machines, S. S. Rattan ,3rd edition, McGraw-Hill Publications, New Delhi.
2. Theory of Machines, Thomas Bevan 3rd edition, CBS Publishers & Distributors, New Delhi.

REFERENCES:

1. Theory of Machines and Mechanisms, Shigley J. E. and John Joseph Uicker, 2nd edition McGraw-Hill international edition.
2. Theory of Machines, Dr.R.K. Bansal & Dr. J.S. Brar, 5th edition, Laxmi publications(P) LTD, New Delhi.
3. Theory of Machines, R.S.Khurmi & J.K.Gupta, 14th edition, S Chand & CO Ltd Publisher.
4. Mechanism and Machine Theory, J. S. Rao and R. V. Dukkipati, 2nd edition New Age International.

WEB REFERENCES:

1. www.mekanizmalar.com
2. www.museum.kyoto-u.ac.jp
3. Makezine.com

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

MANUFACTURING TECHNOLOGY-II

Course Code: MEC225 **L T P C**
4 0 0 3

Course Objective:

To make the students acquainted with the basic concepts of metal cutting, tool nomenclature, standards and tool performance. Further giving them an overall idea of constructional features of different machine tools such as lathe, drilling, milling, shaping, broaching and grinding and parameters related to the machining processes. The course further deals with non-conventional machining process and their relative advantages over conventional machining processes.

Course Outcomes:
Students will able to:

CO-1	Obtain knowledge on metal cutting tools, cutting parameters, chip formation and other variables influencing metal cutting.
CO-2	Acquire the knowledge of cutting tool's geometry, tool life and metal cutting economics
CO-3	Understand the construction, working and various work and tool holding attachments of machine tools like lathe, shaping, planning, slotting and drilling, boring, milling and broaching machines.
CO-4	Understand the construction, working of various abrasive machining processes and their applications in generating fine surface textures.
CO-5	Understand the principle and working of various nontraditional machining processes and their applications.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		**3**	**3**	**3**	**2**			**1**	**2**		**1**	
CO2	**3**		**3**	**3**	**2**	**1**		**1**	**2**		**1**	
CO3	**3**		**3**	**3**	**2**	**1**		**1**	**2**		**1**	
CO4	**2**	**3**	**3**	**3**	**1**			**1**	**2**		**1**	
CO5	**2**		**3**	**3**	**3**			**1**	**2**		**1**	

Course Outcomes	PSO1	PSO2
CO-1	2	3
CO-2	2	3
CO-3	2	3
CO-4	2	3
CO-5	1	3

UNIT-I

Mechanics of Metal Cutting:

Classification of machining processes, machine tools, cutting conditions, cutting parameters, production of geometrical shapes, types of chips, orthogonal and oblique cutting, forces in metal cutting, measurement of cutting forces – Dynamometers, Merchant circle diagram, shear angle, velocity relationships, specific cutting energy, stress and strain in chip.

EMPOLYABILITY

UNIT –II

Cutting Tool & Tool Life

Friction in metal cutting, temperature in metal cutting, measurement of interface temperature, tool wear, tool life, tool failure, cutting fluids, machinability, surface finish, economics of machining, geometry of single-point (ASA, ORS (ISO Old) & NRS (ISO New) systems) and multi-point cutting tools, tool materials, kinematics of machine tools.

EMPOLYABILITY

UNIT-III

Machine Tools (lathe, shaping, planning, slotting, drilling, boring, milling and broaching machines)

Introduction, working principle and functions, classification, construction, kinematic system, work holding, tool holding devices, attachments, operations, cutting tools and their nomenclature, comparison's, cutting parameters, machining time, forces on cutting tool, power consumed, reaming – cutting tools, operations and their applications, systems of measurement for hole location in boring machines and indexing methods in milling machines.

EMPOLYABILITY

UNIT-IV

Grinding and Abrasive machining processes

Working principle of grinding machines, merits and de-merits, types of abrasives, bond materials, grit grade and structure of grinding wheels, specifications of grinding wheels, wheel shapes and sizes, selection of grinding wheels. Classification of grinding machines, work holding devices, grinding fluids, grinding wheel, cutting parameters and machining time.

Finishing Operations – lapping, honing, super finishing, polishing, burnishing, buffing, tumbling, abrasive belt grinding.

UNIT-V

Non-Traditional Machining Processes
Introduction, classification, ultrasonic machining (USM), abrasive jet machining (AJM), electro discharge machining (EDM), laser beam machining (LBM), electron beam machining (EBM), electro chemical machining (ECM), and chemical milling (machining).

EMPOLYABILITY

Text Books:

1. Fundamentals of Metal Machining and Machine Tools by Geoffrey Boothroyd, International Student Edition, Mc Graw-Hill Book Company.

2. Workshop Technology (Machine Tools) Vol II, (10th Edition) by B.S.Raghu Vamshi, Dhanpat Rai & Co (P) Ltd.

Reference books:

1. Production Engineering by P.C. Sharma, S. Chand and Company

2. Metal cutting and Machine Tool Engineering, Pakirappa, Durga Publishing House.

3. Metal Cutting Principles by M.C. Shaw, MIT Press, Cambridge.

4. Advanced Methods of Machining by J. A. Mc Geough, Chapman & Hall Publishers.

5. Metal Cutting-Theory and Practice by Amitabha Bhattacharya, Central Book Publishers.

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

MACHINE DRAWING

Course Code: MEC226	**L**	**T**	**P**	**C**
	1		**3**	**3**

Pre- Requisite: Engineering Drawing

Course Objectives:

Introducing the practice of representing the inner details of machine elements through sectional views. Similarly introducing screw threads, screwed fasteners and riveted joints with their standard empirical formulae through drawings and further extending this to the drawing of temporary fasteners like Keys, Cotter-joints, Pin-joints, couplings, shaft bearings, machine elements and their assembly drawings. The course also includes the introduction to limits, fits, tolerances and surface roughness which form a pivotal role in production drawings.

Course Outcomes:

Students will be able to

CO-1	Understand and draw the orthographic views, isometric views and sectional views of mechanical components.
CO-2	Draw various thread profiles, Screwed fasteners, locking arrangements, foundation bolts and riveted joints.
CO-3	Draw various temporary fasteners such as cotter joints, pin joints and couplings.
CO-4	Draw Assembly drawings of various engine components and machine tool components.
CO-5	Draw the production drawings indicating limits, geometrical tolerances and surface roughness and also prepare process sheets.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	1	2	3	1	3	-	-	-	-	1	-	1
CO-2	1	2	3	1	2	-	-	-	-	-	-	-
CO-3	1	2	3	1	2	-	-	-	-	-	-	-
CO-4	1	3	3	2	3	-	-	-	-	-	-	1
CO-5	1	3	3	2	3	-	-	-	1	1	-	1

Course Outcomes	PSO1	PSO2
CO-1	2	3
CO-2	2	3
CO-3	2	3
CO-4	2	3
CO-5	2	3

UNIT-I

Introduction to machine drawing and production drawing. Orthogonal views, Half sectional and full sectional views of machine parts

Skill development

UNIT-II

Screw Threads, Screw Fasteners, Locking arrangements, Foundation bolts and Riveted joints using standard Empirical formulae

Employability/Skill development

UNIT-III

Keys, Cotter-joints, Pin-joints, Shaft couplings: Box and split muff couplings, Flanged couplings, Flexible couplings, Universal and Oldham couplings

Employability/Skill development

UNIT-IV

Drawings of assembled views for the part drawings of the following
a) Engine parts : Stuffing box, Cross head, Eccentric, Petrol Engine connecting rod
b) Other machine parts : Screws jack, Shaper tool head slide, Tailstock, Clutch
c) Valves : Gate valve, Non-Return valve, feed check valve and air cock

Employability/Skill development

Employability/Skill development

UNIT-V

Limits, Fits and Tolerances, Geometrical Tolerances, Surface Roughness
Production drawings of Spur, Bevel and Helical gears. Swivel bracket, Crank, Revolving Centre. Preparation of process sheets

Text Books:

1. Machine Drawing by N. D. Bhatt, V. M. Panchal, Charotar Publishing House Pvt. Ltd
2. Production Drawing by K.L.Narayana, P.Kannaiah and K.VenkataReddy, New age international Publishers

Reference:

1. Textbook of Machine Drawing by K.C. John, PHI Learning
2. Machine Drawing by K.L Narayana, P. Kannaiah and K. Venkata Reddy, New age international Publishers
3. A Text Book of Machine Drawing by Dr. R.K. Dhawan, S.Chand Publications

Web Reference:

1. http://www.rajaroy.co.in/p/machine-drawing.html
2. http://nptel.ac.in/syllabus/112106075/

MECHANCIAL ENGINEERING DEPARTMENT

II YEAR – II SEMESTER

MANUFACTURING TECHNOLOGY – I LAB

Course Code: MEC227	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

Course Objective:

To demonstrate manual arc welding through the practice of fabricating various weld joints and using NDT methods to identify the defects. The course also gives an opportunity to the student in preparing moulds for different patterns and further for determining the characteristics of moulding sand.

Course Outcomes:

The students will be able to:

CO-1	Prepare sand mould for different patterns in casting process.
CO-2	Evaluate the properties of moulding sand to check its suitability.
CO-3	Gain proficiency in manual arc welding process by fabricating a spectrum of weld joints.
CO-4	Identify the defects in welding through NDT.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

COURSE OUTCOMES	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**2**			**3**	**2**	**3**		**2**	**3**		**3**	
CO2	**2**			**3**	**2**	**3**		**2**	**3**		**3**	
CO3	**2**			**3**	**2**	**3**		**2**	**3**		**3**	
CO4	**2**			**3**	**2**	**3**		**2**	**3**		**3**	

Course Outcomes	PSO1	PSO2
CO-1	1	1
CO-2	1	1
CO-3	1	1
CO-4	1	1

List of Experiments:

1) Preperation of sand mould for solid flange
2) Preperation of sand mould for stepped cone pulley
3) Preperation of sand mould for hallow pipe
4) Moisture content test
5) Clay content test
6) Green compression and Shear Strength test
7) Sieve analysis
8) V-Butt joint in manual arc welding
9) Corner weld joint in manual arc welding
10) Double lap weld joint in manual arc welding
11) Die Penetrant test
12) Permeability test

Employability

References: Manufacturing Technology, P.N.Rao, Mc Graw-Hill Book Company.

B.E. (MECH.) - III/IV-(I-SEMESTER)

MEC 311 – INDUSTRIAL ELECTRONICS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Devices: Semi-conductor diode, Zener diode - Transistor - Silicon control rectifier. Rectifiers, Amplifiers, Oscillators, Cathode ray oscilloscope.

Industrial Applications: Poly-phase rectifiers - Control circuits - Motor speed control voltage control, Time delay relay circuits - Photo electric circuits. Resistance welding, inducting heating - Dielectric heating.

Servomechanism: Open loop and closed loop systems (Elementary treatment only).

Introduction to Digital Electronics: Fundamentals of digital electronics, Number system and codes, Logic gates, Boolean algebra, Arithmetic-logic units, Flip-flops, Registers and counters, Memories: ROM, PROM, EPROM and RAM.

Introduction to Microprocessors: The Intel-8085 microprocessor; Architecture, Instruction set, Execution of instructions, Addressing structures, Timing and machine cycles of 8085 and programming I/O operations, Interrupts, Serial input and serial output, Programming the I/O ports, Programming the timer.

Text Books:

1. Industrial Electronics by Mithal (Khanna Publications).
2. Digital Computer Electronics - An Introduction to Micro Computer by Albert Paul Malvino, Tata McGraw-Hill Publishing Co. Ltd., New Delhi-2.

References:

1. Engineering Electronics by Ryder-McGraw Hill.
2. Micro Processors by Leventhal.
3. Industrial Electronics by Bhatacharya, Tata Mc-Graw Hill.
4. Industrial Electronics and Control by S.K. Bhatacharya and S. Chatarjee, 1995 Ed., Tata Mc-Graw Hill Pub. Co. Ltd.

MEC 312 – MECHNICS OF SOLIDS – II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

The objective is to make students learn and analyze continuous and fixed beams, columns and struts under different loading conditions, stresses in rotating discs, curved bars, thin and thick shells.

Course Outcomes:

The students will be able to:

CO-1	Understand the advanced concepts of strength of materials like curved bars, applications of theories of failures in the design of thick cylindrical vessels and pressure vessels etc.
CO-2	Analyze the effect of various loading conditions on a mechanical/structural member.
CO-3	Analyze and design columns, long mechanical members under compression and pressure vessels.
CO-4	Develop an understanding of methods of analysis used in treating statically indeterminate loading conditions of the beams.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	1	3	3	1	2					2	1	3
CO-2		3	2	1							2	1
CO-3	2	3	3	3	2						3	
CO-4	3	2	3							2		2

Fixed Beams: Fixing moments for a fixed beam of uniform and variable sections, Effect of sinking support, slope and deflection.

Employability

Continuous beams: Analysis of continuous beam, Reactions at the supports, Effect of sinking of supports.

Employability

Energy Methods - Castigliano's theorems I & II applications.

Employability

Columns and Struts: Columns with one end free and the other fixed, Both ends fixed, One end fixed and other hinged, Limitation of Euler's formula, Column with initial curvature, Column carrying

Employability

eccentric load, Laterally loaded columns with Central point load and Uniformly distributed load, Empirical formulae.

Bending of Curved Bars: Stresses in bars of circular, rectangular and trapezoidal sections.

Employability

Stresses due to rotation: Wheel rim, disc of uniform thickness, disc of uniform strength.

Thick cylinders subjected to internal and external pressure and compound cylinders.

Employability

Text Books:

1. Analysis of Structures, Vol. 1, 1993 edition, by Vazirani and Ratwani.
2. Chapter VI from Advanced Topics in Strength of Materials, by Prof. L.B.Shah and Dr.R.T.Shah.

References:

1. Strength of Materials, by Timoshenko.

MEC 313 ENGINEERING THERMODYNAMICS – II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To introduce the concepts involved in the formation of steam its properties and applications.
- To give an insight into the thermodynamic cycles on which steam power plants function and also the methods of improving its performance.
- To provide the students with a knowledge based on different types of steam turbines, their function and their relatives merits and demerits.
- To give an expose on nozzles, their applications and thermodynamic analysis of their working.
- To impart the student about the importance of a condenser in steam power plant and also the factors which retrograde its functioning and also overall view on evaluating its performance.

Course Outcomes:

The student will be able to

CO-1	Delineate the types of steam turbines and the mechanical principles involved and their functioning.
CO-2	Represent the phenomena of formation of steam on a thermodynamic chart using any properties.
CO-3	Use steam tables and moller diagram for reading the properties of steam and use them in solving problems of thermodynamic process involving steam.
CO-4	Understand and explain the vapor power cycles including the significance of reheating and regeneration and the effect of thermodynamic variables on their performance.
CO-5	Select and design a nozzle for a given application based on the principles he has studied.
CO-6	Analyze the functioning of steam turbine both thermodynamically and mechanics point of view and also draw velocity triangles their off.
CO-7	Identify the problems associated with the malfunctioning of condenser and devise ways of rectifying them.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	1	1	1	2	1	1						
CO-2	2				1							1
CO-3	2	2	1	1								
CO-4	2	3	3	2	1		1		1	1		1
CO-5	1	2	2	2	1							1
CO-6	3	2	2	2	2	1	1		1	1	1	1
CO-7	1	3	1	1	1	1	2	1		1	2	1

Properties of Pure Substance: Definition of pure substance, phase change of a pure substance, p-T (Pressure-Temperature) diagram for a pure substance, p-V-T(Pressure-Volume-Temperature) surface, phase change terminology and definitions, property Diagrams in common use, Formation of steam, Important terms relating to steam formation, Thermodynamic properties of steam and steam tables, External work done during evaporation, Internal latent heat, Internal energy of steam, Entropy of water, Entropy of evaporation, Entropy of wet steam, Entropy of superheated steam, Enthalpy-Entropy (h-s) charts for Mollier diagram, Determination of dryness fraction-Tank or bucket calorimeter, throttling calorimeter, separating and throttling calorimeter.
Gases and Vapour Mixtures and Vapor Power Cycles : Introduction, Daltons law and Gibbs-Dalton law, Volumetric Analysis of gas mixtures, Apparent molecular weight and gas constant, specific heats of gas mixture, Adaibatic mixing of perfect gases, Gas and vapour mixtures.Vapor power cycle- Rankine cycle- Reheat cycle- Regenerative cycle- Thermodynamic variables effecting efficiency and output of Rankine and Regenerative cycles- Improvements of efficiency, Binary vapor power cycle.**Steam Nozzles**: Type of nozzles- Flow through nozzles- Condition for maximum discharge- Nozzle efficiency- Super saturated flow in nozzles- Relationship between area velocity and pressure in nozzle flow- Steam injectors.

Employability

Steam Turbines: Classification of steam turbines- Impulse turbine and reaction turbine-Compounding in turbines- Velocity diagrams in impulse and reaction turbines- Degree of reaction-Condition for maximum efficiency of reaction turbines- Effect of friction on turbines constructional features governing of turbines.

Condensers: Classification of condenser- Jet, Evaporative and surface condensers- Vacuum and its measurement- Vacuum efficiency- Sources of air leakage in condensers- Condenser efficiency-Daltons law of partial pressures- Determination of mass of cooling water- Air pumps.

Refrigeration: Bell Colemen cycle, Vapor compression cycle- effect of suction and condensing temperature on cycle performance, Properties of common refrigerants, Vapor absorption system, Electrolux refrigerator. Principles of psychrometry and Air conditioning - Psychrometric terms, psychrometric process, air conditioning systems.

Employability

Text Books:

1. A Treatise on Heat Engineering by Vasandhani and Kumar.
2. Applied Thermodynamics-II by R. Yadav.
3. Fundamentals of Engineering Thermodynamics by E. Radhakrishna, PHI.

References:

1. Thermal Engineering, by R. K. Rajput.
2. Fluid Flow Machines, by M.S. Govinda Rao, Tata McGraw Hill publishing company Ltd.
3. Refrigeration and Air-conditioning, by C.P.Arora and Domokundwar.
4. Thermal Science and Engineering by D.S. Kumar, S.K. Kataria and Sons
5. Refrigeration and Air-conditioning, by Ahamadul Ameen, PHI.

MEC 314 - THEORY OF MACHINES – II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To help students to understand the gyroscopic effect on vehicles, ships and planes.
- To make students analyze cam-follower motion, gears and gear train configurations
- To teach students the balancing procedures for rotating and reciprocating masses.
- To teach students the fundamentals of vibrations.

Course Outcomes:

Student will be able to

CO-1	Apply the knowledge of gyroscopic couple
CO-2	Solve practical problems related to gears and gear trains in industries..
CO-3	Design cams for any application
CO-4	Solve balancing problems in IC engines and automobiles.
CO-5	Analyze vibrations in engines.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3			2			2	2	2
CO2	2	2	2	2						2	2	1
CO3	3	3	3	3			2			2	2	2
CO4	3	3	3	3			2			2	2	2
CO5	3	3	3	2			2			2	2	2

Gyroscopic Couple and Precessional Motion: Precessional and angular motion- gyroscopic couple- effect of gyroscopic couple on an aero plane and on a naval ship, stability of a four wheel vehicle moving in a curved path, stability of a two-wheel vehicle taking a turn.

Employability

Cams: Classification of followers and cams- Definitions- Motions of the follower- Uniform velocity- Simple harmonic motion- Uniform acceleration and retardation- Displacement- Velocity and acceleration diagrams. Construction of cam profiles- Cam with knife edged follower and roller follower- Cams with specified contours- Tangent cam with roller follower- Circular arc cam with flat faced follower.

Toothed gearing: Classification of toothed wheels, technical terms, conditions for constant velocity ratio of toothed wheels- Law of gearing- Velocity of sliding of teeth, forms of teeth- Length of contact, arc of contact, interference in involute gears, minimum number of teeth required on pinion to

Employability

Employability

avoid interference- Methods of avoiding interference- Helical gears, Spiral gears- Efficiency of spiral gears.

Gear Trains: Types of gear trains- Simple, compound, reverted and epicyclic gear trains- Velocity ratio of epicyclic gear train- Tabular method- Algebraic method- Torques and tooth loads in epicyclic gear trains.

Balancing of Rotating and Reciprocating Masses: Balancing of a single rotating mass in the same plane and by two masses in different planes, balancing of several masses revolving in the same plane- Balancing of several masses revolving in different planes- Primary and secondary unbalanced forces of reciprocating masses, Partial balancing of unbalanced primary forces in a reciprocating engine, Partial balancing of locomotives- Effect of partial balancing of reciprocating parts of two cylinder locomotives- Variation of tractive force, Swaying couple and hammer blow- Balancing of primary and secondary forces in multi cylinder in-line engines- Direct and reverse cranks- Balancing of V-Engines.

Employability

Vibrations: Definitions- Types of vibrations- Natural frequencies of free longitudinal vibrations of systems having single degree of freedom- Equilibrium method- Energy method and Rayleghy's method. Frequency of damped vibration and forced vibration with damping- Magnification factor or dynamic magnifier.

Employability

Employability

Transverse and Torsional Vibrations: Natural frequency of free transverse vibrations due to point load and uniformly distributed load acting over a simply supported shaft- Transverse vibrations for a shaft subjected to number of point loads- Energy method- Dunkerley's method, Critical speed of a shaft. Natural frequency of free torsional vibrations- Free torsional vibrations of single rotor system, two rotor system, three rotor system and gear system.

Employability

Text Book:

1. Theory of Machines by R.S.Khurmi & J.K.Gupta.

Reference books:

3. Theory of Machines by Thomas Bevan.
4. Theory of Machines by S.S. Rattan.

MEC 315 - PRODUCTION DRAWING

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 3 Pr. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 2

Course Objectives:

- ➢ To teach students about sectional views and how represent internal parts of machine elements.
- ➢ To introduce standards about Screw threads and Screwed Fasteners and their standard Empirical formulae. Various Permanent joints such as Riveted joints and Welded Joints.
- ➢ To teach students about To teach students about temporary fasteners like Keys, Cotter- joints, Pin-joints, and different types of couplings and shaft bearings.
- ➢ To educate students about assembly drawings and production drawings of various components and machine tool components.
- ➢ To give make understand process sheets, stock strip layouts in sheet metal drawing for analysis of problems in industry.

Course Outcomes:

Upon completion of the subject, students will be able to

CO-1	Understand process sheets, stock strip layouts in sheet metal drawing.
CO-2	Recognize the importance and value of production drawings in industry.
CO-3	Skillfully use modern engineering tools and techniques such as CAD- CAM softwares for mechanical engineering design, analysis and application

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	3	3	1	2	2	-	2	2	3	1	2
CO-2	3	3	3	2	-	2	-	3	3	3	3	2
CO-3	2	3	3	3	3	2	3	2	2	2	1	3

Skill development/ Employability

Skill development/ Employability

Introduction to Production drawing, Component drawing, Assembly drawing, Machine shop drawing, Pattern-shop drawing, Sheet metal drawing. Limits, Tolerances and Fits- Indication of surface roughness, preparation of process sheets.

Production drawings of Spur, Bevel and Helical gears, swivel bracket, main spindle, crank, revolving centre, jigs and fixtures.

Drawing of Dies. Sheet metal dies. Forging dies, stock strip layouts in sheet metal work, process layout for forge and press operations.

Cutting tool layout. Single point, multi point cutting tools for conventional and CNC machine tools.

Skill development/ Employability

Skill development/ Employability

Text Book:

1. A Text Book on Production Drawing by K.L.Narayana, P.Kannaiah and K.Venkata Reddy, New age international.

References:

1. Manufacturing technology Foundry, Forming and Welding by P.N.Rao, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Production Technologies, HMT.

MEC 316 - ELECTIVE - I

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

(A) REFRIGERATION AND AIR CONDITIONING

Course Objectives:

- To acquaint the student with different types of refrigeration systems available commercially, their working and necessity.
- To give the necessary inputs to differentiate between ideal and actual refrigeration cycles and analyze the effect of various parameters on the performance of the refrigeration system.
- To make the student have firm grasp of this interesting subject so that any real time engineering problem encountered can be solved with ease.

Course Outcomes:

The student will:

CO-1	Possess the knowledge on the applications of refrigeration and different refrigeration systems and their relative advantages and disadvantages.
CO-2	Represent refrigeration cycles on T-S and P-h plots and analyze the influence of various parameters on the system.
CO-3	Select a proper refrigeration system for a given application and evaluate its performance.
CO-4	Have a thorough understanding on the types of refrigerants, nomenclature and their selection.
CO-5	Become conversant with psychrometric properties like DBT, WBT, DPT, specific and relative humidity etc. and various psychrometric processes.
CO-6	Become familiar with types of air conditioning systems and calculation of air conditioning loads and will be able to choose proper system for a given application.
CO-7	Be able to design an air conditioning or a refrigeration system using non-conventional energy sources, like solar energy or through waste heat recovery.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1		3	3	3		1	1	1
CO2	3	3	3	3		2	2			1		1
CO3	2	3	3	3	1	3	3	2		1	1	1
CO4	1	1	3	2		3	3	2		1	1	1
CO5	2	2	3	3								
CO6	2	3	3	3	1	3	3	2		1	1	1
CO7	3	3	3	3	1	3	3	2	1	1	1	1

Employability

Principles of Refrigeration: Refrigeration and II law of thermodynamics- Methods of Refrigeration- Unit of Refrigeration- Applications of Refrigeration. Air cycle Refrigeration: Reversal Carnot cycle- Bell Colman cycle- Selection of Refrigeration systems for air crafts- Boot strap system- Regenerative cycle- Reduced ambient type- Comparisons of different systems.
Vapour Compression Refrigeration: Wet versus Dry compression- Effect of evaporator pressures and temperatures. Simple vapour compression Refrigeration cycle and its analysis. Advantages and disadvantages of vapour compression Refrigeration system over Air compression Refrigeration system- Methods of improving C.O.P.- Multi compression system- Multiple evaporators expansion valves- Flash inter cooler- Defrosting- Hot gas defrosting.
Classification of Refrigerants: Nomenclature- Properties- Secondary refrigerants- Selection of refrigerants- **Condensers-** Air cooled, Water cooled and evaporative type- Evaporators- Once through, flooded, shell and tube Baudelot cooler- **Expansion devices-** Capillary expansion device, Thermostatic expansion device.
Absorption Refrigeration System: Basic absorption system- Aqua ammonia absorption system- Li-Br absorption refrigeration system- Electrolux refrigeration- C.O.P. of absorption refrigeration system- Comparison of vapour compression and vapour absorption system. Steam jet refrigeration system and analysis- Advantages and limitation- Ejector compression system.
Psychrometry: Psychrometric properties and relations- Psy chart- Psy processes- Human comfort and comfort chart- Effective temperature and factors governing effective temperature. **Air conditioning**: Summer, Winter and year round air conditioning- Different types of Air conditioning load - By pass factor, RSHP, GSHF- Fresh air quantity- Cooling coils and Dehumidity- Air washers.

Employability

Text Books:

1. Refrigeration and Air conditioning, by C.P.Arora.
2. Refrigeration and Air conditioning, by P.L.Bellany.

References:

1. Refrigeration and Air conditioning, by Jordan R.C. and Priester G.B.
2. Principles of Refrigeration, by Dossat.
3. Refrigeration and Air-conditioning, by W.P.Stoecky.

(B) ADVANCED FOUNDRY AND WELDING TECHNOLOGY

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objective:

To demonstrate basic principles of metal casting, mould and pattern design, preparation of mould. Learn various types of dye casting processes and their applications. To understand the solidification mechanism of molten metal and phases involved in it. To acquire knowledge about foundry equipment and their applications. To understand advanced welding processes and their applications. To study weld bead geometry, weld defects and nomenclature used in industry.

Course Outcomes:

CO-1	Students will able to learn mould and pattern design.
CO-2	Students will understand solidification mechanism of molten metal
CO-3	Students will learn about various foundry equipment.
CO-4	Students will acquire knowledge about modern welding processes
CO-5	Students will be able to identify weld defects and reasons for the defects.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	3		3	2	1	2		2	
CO2	1	3	2	3		3	2	1	2		2	
CO3	1	3	2			3	2	1	2		2	
CO4	1	3	1			3	2	1	2		2	
CO5	1	3	1			3	2	1	2		2	

Moulding: Development of metal castings- Materials for moulding- Foundry sand control- Different types of cores- Core making processes- Materials for core making- Moulding and core making machines. Recent developments in core mould making- Cold set process- Investment process- Shell moulding- Hot box method- Shaw process. Vacuum moulding- moulding for mass production.
Melting and Solidification: Furnaces used in foundry for melting ferrous and nonferrous metals- principals of operation of cupola and charge calculations. Family of cast irons- Production of malleable and S.G. Irons- Methods of alloying and inoculants and their effects on the structure and properties of cast iron. Principles of Solidification: Nucleation- Crystal growth- Morphology and structure of cast metals and alloys- Pure metals- Single phase alloys and eutectics. Solidification in sand and chill moulds.
Foundry Mechanization: Layout for ferrous and nonferrous foundries- Description of equipment used for mechanization- Sand conditioners- Conveyors- Cranes- Equipment for handling moulds, Cores and molten metal- Knock out of moulds- Fettling equipment.

Employability

Special Welding Processes: Resistance welding processes- Spot, Seam, Projection, Flash butt welding - Machine cycle for resistance welding- Parameters in resistance welding- Electrodes for resistance welding – Solid State Welding: Cold welding – Forge welding - Ultrasonic welding Diffusion welding – Radiation welding: Laser Beam Welding, Electron Beam Welding – Automatic welding systems.

Employability

Weldability of Metals: Factors influencing weldability of metals- Welding of Cast steels, Carbon steels, Stainless steels and Cast iron. Weldability of Cu and its alloys, Al and its alloys- Ti and its alloys- Mg and its alloys- Temperature changes in welding and their effects on mechanical properties. Absorption of gases by welds and their effects- Residual stresses and distortion- Heat treatment of welded parts.

Welding Joints, Weld Symbols and Joint Design principles: Types of joints – types of welds – Variants of joints and weld types - Welding symbols – principles of weld joint design and evolving of good weld designs.

Text Books:

1. Foundry Technology, by Jain P.L.
2. Welding Engineering and Technology, by R.S. Parmar.

Employability

References:

1. Foundry Engineering, by Agarwal.
2. Foundry Engineering, by Taylor F. & Others.
3. Principles of Metal Castings, by Heine & Others.
4. Modern Welding Technology, by H.B. Cary.
5. Welding Technology, by Koenisburger.
6. Welding Metallurgy, S.Kou, 2ndedition, John Wiley and Sons, New York, NY (2003).

(C) WORK STUDY

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Employability

Introduction to work study: Scientific management – Productivity - Advantages of work study to management, Supervisors and workers.

Method Study: Introduction - Process charts, Critical Examination, Identification of key activities on process charts, Diagrams and Templates - Therbligs, Micro motion analysis, Memo motion study. Developing new method - Job survey report writing.

Employability

Principles of Motion Economy: Related to human body, work place, equipment.

Work Measurement: Work measurement techniques – Rating - Measuring the job – Allowances - Standard time - Synthetic data - Analytical estimating – PMTS ,Work factor, MTM, Activity sampling, Its applications.

Employability

Job Evaluation, Techniques of job evaluation - Merit rating - Incentive plans.

Ergonomics: Basics of Ergonomics**,** Anthropometry.

Text Books:

1. Introduction to Work Study - International Labour Organisation.
2. Elements of Work Study and Ergonomics by Dalela et al, Standard Publications.

References:

1. Motion and Time Study, by Barnes, John Wiely.

(D) POWER PLANT ENGINEERING

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- The course is intended to provide overall view of all types of power plants.
- To provide a clear cut understanding of the working principles of the power plants and the main components.
- The course also provides an insight into the performance related parameters of all power plants.
- It creates a clear cut understanding of the economies of the power plants and the related topics like fixation of tariff rates.

Course Outcomes:

The student will be able to

CO-1	Understand the working of different types of Boilers, mountings and accessories and Boiler performance.
CO-2	Get an exposure on the accessory systems which work in Tandom with IC engines in internal combustion power plants.
CO-3	Differentiate between different arrangements of gas turbine power plants and their relative merits and demerits.
CO-4	Determine the mass flow rate of water from catchment areas taking into account the losses due to perculasion, evaporation and transportation.
CO-5	Gauge the distinction between various kinds of hydraulic power plants and factors considered in selection of site for hydropower plants.
CO-6	Understand the relative advantages of nuclear power plants in comparison with other power plants.
CO-7	Classify the nuclear reactors, understand their working and get an idea on the different components that a nuclear power plant comprises off.
CO-8	Understand the significance of direct energy conversion devices in comparison with conventional ones.
CO-9	Analyse the economies involved in the operation of power plants, and other factors like cost of erection and maintenance of power plants.

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	3	3		1	3	1		1	2	1
CO-2	2	1		1			3	2	2	2		2
CO-3		2	1	1		3	3	1	2	2	1	2
CO-4	1	2	1	1	2	1	1		1	2	2	2
CO-5	3	3	2	2	2	3	3	2	1	1	1	1
CO-6	1		1	1				1				1
CO-7	1	1	1	2		1	1		2		1	2
CO-8	2	2		1	2	1	2	1	1	2	1	1
CO-9	2	2		2	2	2	1	2	1	2	1	2

Employability

Steam Power Plants: General Layout, Power plant cycles, Fuels-handling, storing, preparation and supply. Various stokers. Draft systems, chimney including calculations. Boilers: Construction and Heating surfaces. Mountings and accessories. High pressure and high duty forced circulation boilers land modern trends in Boiler design. Flue chambers and dampers. Steam piping–fittings–logging. Boiler performance, Flue gas testing and indicators (mechanical, electrical and chemical).

Internal Combustion Power Plants: Types of engines for power generation, Super charging, Exhaust heating fuel tanks and oil supply systems. Air supply for starting, Lubricating oils and systems of lubrication, Modern trends and design in diesel engines, Performance of engines, Care of diesel plants. Gas Turbine and other Propelled Power Plants: Introduction – Gas turbine plant–Classification and comparison of different types of gas turbine power plants – Components and different arrangements of the gas turbine plants – Indian gas turbine power plants–Governing system of gas turbine plant–Marine, Aero and Rocket Propulsion power plants.

Hydro Electric Plants: Hydrology, Hydrometric survey rainfall, Catchment, Reservoir, Run-off flow and fall, Storage and pondage, Losses due to percolation, Evaporation and transpiration. Mass–duration and flood discharge. Frequency studies and gauging. Different types of plants. Selection of site. Low, medium and high head plants and pumped storage plants. General layout of the plant – Head works, Spillways, Canals, Tunnels, Governing, Lubrication, Penstock, Anchorages and relief valves, different types of surge tanks, intakes, Gates and Valves.

Employability

Nuclear Power Plants: Classification of reactors, Thermal utilization, Fuels, Fuel moderator and coolant, Control and safety rods, Special properties of structural materials required, Induced radio-activity, Gas cooled reactors, Radiation hazards and shielding, Radio active waste disposal.

Direct Energy Conversion: Solar Energy–Introduction, Solar radiation, Solar collectors, Energy storage. Wind Energy–Wind mills. Thermo Electric–MHD and other non conventional energy sources. Power Plant Economics: Capacity factor, Load actor, Diversity factor, Peak load consideration, Factors governing capacity of plants. Cost of power plant, Cost of erection. Operating & maintenance expenses, Cost of production, distribution of power & determination of rates.

Employability

Text Books:

1. Power Station Engineering and Economy by Benhaedt G.A.Skrotzki, William A. Vopat, MGH Book , Inc.
2. Heat Engineering, I.T. Shvets et al, MIR Pub Moscow.
3. A Course in Power Plant Engineering,S.C.Arora&S.Domdundwar.

References:

1. Solar Power Engineering by B.S. Magal, TMGHPub Co..
2. Solar Energy by S.P. Sukhatme, T MGH pub. Co.
3. Modern Power Plant Engineering by Joel Weisman, Roy Eckart, PHI.
4. Atextbook of Power Plant Engineering by P.C. Sharma,S.K. Kataria&Sons, ND.
5. Fundamentals of Nuclear Power Engineering by D.K. Singhai,Khanna Pub.

(E) FINITE ELEMENT ANALYSIS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To introduce students to the basics of theory of elasticity.
- To enable the students understand the mathematical and physical principles underlying the Finite Element Method (FEM) as applied to solid mechanics
- To teach students the characteristics of various elements in structural analysis and selection of suitable elements for the problems being solved.
- To make the students derive finite element equations for different elements.

Course Outcomes:

Student will be able to:

CO-1	Apply the knowledge of Mathematics and Engineering to solve problems in structural mechanics by approximate methods.
CO-2	Derive the finite element equations for different elements.
CO-3	Solve the one dimensional and two dimensional problems in solid mechanics using FEM.
CO-4	Derive the shape functions for higher order isoparametric elements.
CO-5	Do the modal analysis of bars and beams

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1			1		1	1	
CO2	1	2		2	1			1		1		1
CO3	3	3	2	2	1			1		1	1	
CO4	1	2		2	1			1		1		1
CO5	3	2	2	2	1			1		1	1	

Fundamental Concepts: Introduction, Historical background, Outline of presentation, Stresses and Equilibrium, Boundary conditions, Strain-Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Temperature effects, Potential energy and equilibrium. The Rayleigh-Ritz method, Hamilton's principle. Galerkin's method, Saint Venant's principle.

One-dimensional Problems: Introduction, Finite element modeling, Coordinates and Shape functions. The potential energy approach. The Galerkin approach, Assembly of the global stiffness matrix- mass matrix and load vector, Treatment of boundary conditions, Quadratic shape functions, Temperature effects. Trusses: Introduction, Plane trusses, Three-dimensional trusses, Assembly of global stiffness matrix for the Banded and Skyline solutions.

Employability

Employability

Employability

Employability

Two-dimensional Problems Using Constant Strain Triangles: Introduction, Finite element modeling, Constant strain triangle, In plane and Bending, problem modeling and boundary conditions.

Axisymmetric Solids Subjected to Axisymmetric Loading: Introduction, Axisymmetric formulation, Finite element modeling, Triangular element, Problem modeling and boundary conditions.

Two-dimensional Isoparametric Elements and Numerical Integration: Introduction, The four-node quadrilateral, Numerical integration, Higher-order elements. Beams and Frames: Introduction, Finite element formulation, Load vector, Boundary considerations, Shear force and bending moment, Beams on elastic supports, Plane frames.

Employability

Employability

Text Book:

1. Introduction to Finite Elements in Engineering, by Tirupathi R. Chandrupatla, Ashok D.Belegundu (chapters 1 to 8 only).

References:

1. Introduction to Finite Element Method, by S.S.Rao
2. Finite Element Method, by O.C. Zienkiewicz.
3. Concepts and Applications of Finite Element Analysis, by Robert D. Cook.
4. Introduction to Finite Element Method, by J.N.Reddy.

(F) COMPUTER GRAPHICS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs. Credits : 4

Course Objectives:

To make the student Understand

- ➢ This course able to discuss hardware system architecture for computer graphics and Basics of colour raster scan display devices and draw lines and circles on it.
- ➢ Know and be able to design and implement model and viewing transformations.
- ➢ To introduce the concept of rendering and shading of objects.
- ➢ To explain the higher order curves like B-spline and Bezier curves.
- ➢ Be able to discuss the application of computer graphics concepts in the development of visualization, and CAD/CAM applications.

Course Outcomes:

The students will be able to:
Upon successful completion of this course, the students will be able to learn

CO-1	Learn the Principles and commonly used paradigms and techniques of computer graphics.
CO-2	Draw lines and circles on colour raster scan display devices
CO-3	Develop a facility with the relevant mathematics of computer graphics
CO-4	Fill Polygons and clip lines and polygons against a window, transform, render and shade objects
CO-5	Eliminate Hidden lines and surfaces using algorithms

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1		3							2
CO2	1	1			3							
CO3	3	1	1	1								
CO4	1	1	1	1	2							
CO5	1	1	1	1	2							

Geometry and line generation: Line segments, Pixels and frame buffers, Bresenham's algorithms: line, circle, ellipse generation.

Skill development

Graphics primitives: Primitive operations, The display-file interpreter, Display-file structure, Display-file algorithms.

Skill development

Polygons: Polygons representation, An inside test, Filling polygons, Filling with a pattern.

Transformations: Scaling transformations, Reflection and zooming, Rotation, Homogeneous coordinates and translation, Rotation about an arbitrary point.

Segments: The segment table, Segment creation, Closing a segment, Deleting a segment.

Windowing and clipping: The viewing transformation, Clipping, The clipping of polygons, Generalized clipping.

Skill development

Skill development

Three dimensions: 3D geometry, 3D primitives, 3D transformations, Parallel projection, Perspective projection, Isometric projections, Viewing parameters, Special projections.
Hidden surfaces and lines: Back-face removal, Back-face algorithms, The Painter's algorithm, Warnock's algorithm, Franklin algorithm, Hidden-line methods.
Light, color and shading: Point-source illumination, Shading algorithms, Shadows, Color models.
Curves and fractals: Curve generation, Interpolation, B splines, Curved surface patches, Bezier curves, Fractals, Fractal lines, Fractal surfaces.

Skill development

References:

1. Computer Graphics - A Programming Approach by Steven Harrington, McGraw-Hill International Edition, 1987.
2. Schaum's Outline of Theory and Problems of Computer Graphics by Roy A. Plastock and Gordon Kalley, McGraw-Hill Companies, Inc., 1986.
3. Mathematical Elements for Computer Graphics by David F. Rogers adn Adams.

MEC 317 - MECHANICAL ENGINEERING LAB-II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50
Examination (Practical): 3hrs. Credits: 2

Course Objectives:

- To impart training to the student on the basics of internal combustion engines
- Construction, operation and performance assessment.
- To apply the theoretical concepts learned in the classroom on the thermodynamic
- Devices like engines, compressors etc. through conducting different tests.
- To study various mechanisms and apply the kinematic principles to them.

Course Outcomes:

The student will be able to

CO-1	Get conversant with different types of engines-their anatomy, working and general Problems encountered in their functioning.
CO-2	Perform various kinds of tests on engines which would give a thorough idea on the Methodology followed in evaluating the performance of I.C.Engines.
CO-3	Make a comparison between graphical and analytical methods adopted in the Analysis of some simple mechanisms.
CO-4	Understand gyroscopic principle and its applications.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	1	3		1	2		3	2	2	2
CO-2	2	2	1	3	2	1	2	1	2	2	1	1
CO-3	3	1	3	1					1			1
CO-4	3	1	1	2	1						1	1

Skill Development

1. Load test and smoke test on I.C. Engines.
2. Morse test on multi-cylinder engine.
3. Heat balance sheet on I.C. Engines.
4. Study of multi-cylinder engines and determination of its firing order.
5. Calculations of efficiencies of the given air compressor.
6. Determination of pressure distribution around the given (1) cylinder and (2) airfoil specimens kept in a uniform flow wind-tunnel.
7. Study of automobile mechanisms.
8. Verification of laws of balancing.
9. a) Determination of ratios of angular speeds of shafts connected by Hooke's joint.
   b) Determination of the ratio of times and ram velocities of Withworth quick return motion mechanism.

10. To draw curves of slider displacement and crank angle and linear velocities w.r.t. time for a slider crank mechanism and compare with theoretical values.
11. To determine the relation of gyroscopic couple and compare with the theoretical values.
12. To draw the crank angle vs. pressure diagram for an I.C. engine using pressure transducer and cathode ray oscilloscope.

Skill Development

MEC 318 - MANUFACTURING TECHNOLOGY LAB – II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50
Examination (Practical): 3hrs. Credits: 2

Course Objective:

To measure cutting forces in machining processes like during, milling and milling. Able to study the chip formation and surface roughness during machining and carry out various tests on moulding sand.

Course Outcomes:

CO-1	Students will have hands on experience in operating the lathe, drilling and milling machines.
CO-2	Students will be able to understand the factors effecting the surface roughness and forces acting on various types of cutting tools.
CO-3	Students will be able to measure torque and trust force in drilling and cutting forces in milling and turning process.
CO-4	Students will be able to calculate properties of moulding sand.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	3	2	3		2	3		3	
CO2		3	3	3	2	3		2	3		3	
CO3		3	3	3	2	3		2	3		3	
CO4		3	3	3	2	2		2	3		3	

1. Experiments on Lathe to establish the following curves
    a) Depth of cut Vs Cutting force.
    b) Feed Vs Cutting force.
    c) Cutting speed Vs Cutting force.
2. Grinding of single point cutting tool as per given specifications (to check the tool angles).
3. Study of chip formations on shaping machine (with lead sample).
4. Torque measurement on drilling/milling machine.
5. Effect of speed and feed on surface roughness.
6. Measurement of cutting tool temperature in turning.
7. Sieve analysis to evaluate G.F.No.
8. Moisture and clay content test.
9. Green compression and shear test.
10. Shatter Index & Hardness Testing

Employability

MEC 319 – SOFT SKILLS LAB.

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr Credits: 1

(Common for all Branches of Engineering)

Objectives Of The Course

- To prepare the students to function effectively in teams that would help them building a successful career.
- To make the students aware of the importance of verbal and non-verbal communication skills
- To enable the students to make successful presentations
- To make students understand the purpose of group discussions in their professional life and expose the students to the different positive roles in group discussions
- To make the students identify their strengths and pinpoint the areas where they should work on to enhance their time management skills
- To help the students carry out self-analysis, self-motivation and build up confidence to set appropriate goals in life
- To equip the students with all the skills for Campus recruitment

Course Outcomes

At the end of the course students should be able to:

CO-1	Work effectively in teams and emerge as assertive leaders.
CO-2	Practice positive postures and gestures and communicate with others effectively.
CO-3	Present a topic confidently using positive body language and appropriate material aids.
CO-4	Participate in group discussions and give a proper direction to the discussion by playing a few positive roles.
CO-5	identify successfully time wasters and barriers and could plan his schedules profitably
CO-6	Set a few short term and long term goals for himself which would give him direction for his successful career.
CO-7	Face the different stages of campus recruitment successfully.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1									3			
CO-2										3		
CO-3										3		
CO-4									3	3		
CO-5											3	
CO-6												3
CO-7										3		

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behavior, Analyzing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

skill development

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

B.E. (MECH.) - III/IV
(II-SEMESTER)
MEC 321 - FLUID MECHANICS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5 Th. Ses. : 30 Exam : 70
Examination (Theory): 3hrs. Credits: 4

Course Objectives:

- To acquaint the student with the fundamental principles of fluid mechanics and their significance and also to enable them to analyse any practical problem involving fluids and find a solution to it.
- To make the student conversant with the devices used for measuring pressure, determining hydro static forces on surfaces, classification of fluid flows and their analysis.
- To introduce the concept of boundary layer and its effect on the flow over submerged bodies.

Course Outcomes:
The student will be able to:

CO-1	Understand and apply the basic concepts of physical parameters like absolute viscosity, kinematic viscosity, surface tension, capillarity etc. in practical fluid flow problems.
CO-2	Have a thorough knowledge of different types of fluid flows and analyze the forces acting on a fluid in motion.
CO-3	Derive the equation of motion –continuity equation, momentum equation and apply them to practical problems like flow through pipes.
CO-4	Get a overall view of boundary layer concepts, flow separation and methods of controlling it.
CO-5	Utilise a strong mathematical tool called dimensional analysis to form dimensionless groups of the parameters effecting any physical phenenonenon .Further the student will be able to use dimensionless numbers like Reynolds number, Weber number etc.. in model analysis
CO-6	Differentiate between compressible and in compressible fluid flows and get an idea on stagnation properties which are relevant to solving compressible fluid flow problems

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

Outcomes												
CO1	2	2		1								1
CO2	3	3	3	2	1	1	1				1	1
CO3	3	3	3	2	1	1	1				1	1
CO4	3	3	3	3	1		1			1	1	2
CO5	3	3	3	3	1		2		1		1	2
CO6	3	3	3	3	1		1				1	2

Employability

Properties of fluids- Introduction-Viscosity- Pressure and its measurement , Absolute, Gauge, Atmospheric and Vacuum pressure – Manometers, Simple manometers, Differential manometers. Hydrostatic forces on surfaces- Total Pressure and Pressure Centre- Vertical, Horizontal, inclined and Curved plane surfaces submerged in liquid- Buoyancy and Floatation.

Employabili

Fluid Kinematics & Fluid Dynamics: Types of fluid flow- Continuity equation- Velocity potential function and Stream Function- Types of Motion, Linear Translation, Linear deformation,Angular deformation, Rotation, Vorticity and circulation-Vortex flow, forced and Free Vortex – Equation of Motion- Euler's equation - Bernoulli's equation and its applications- Venturimeter, Orifice Meter, Pitot tube-Momentum Equation-Momentum of momentum Equation- Free Liquid Jet- Flow net analysis.

Employabilit

Viscous Flow: Couette flow- Plane Couette flow, Favourable pressure gradient and adverse pressure gradient-Power absorbed in Viscous Flow- Flow through pipes- Hagen Poiseulle flow- Fannigs friction factor- Darcy's Weisbach friction factor- Loss of head due to friction in pipes, Minor Losses and Major losses - Flow through branched pipes- Power transmission through pipes-Two dimensional viscous flow: Navier -Stokes equations and solutions- Order of magnitude analysis- Boundary layer equations.

Employabilit

Laminar Boundary Layer: Definition- Laminar Boundary Layer- **Turbulent Boundary Layer** - Laminar Sub layer- Boundary Layer thickness-Displacement thickness, Momentum thickness and Energy thickness-Momentum integral equation- Flow over a flat plate.

Turbulent Boundary Layer: Laminar- Turbulent transition- Momentum equations and Renold's stresses- Fully developed turbulent flow through a pipe- Turbulent boundary layer on a flat plate- Laminar sub-layer- Boundary layer separation and control.

Dimensional and Modeling Analysis: Fundamental and derived dimensions- Dimensionless groups- Rayleigh method- Buckingham π-theorem- Model Analysis - Types of similarity- Geometric, Kinematic and Dynamic similarities- Dimensionless numbers- Modal Laws- Hydraulic diameter.

Employabi

Compressible Fluid Flow: Thermodynamic relations- Continuity, Momentum and Energy equations- Velocity of sound in a compressible fluid- Mach number and its significance- Limits of incompressibility- Pressure field due to a moving source of disturbance- Propagation of pressure waves in a compressible fluids- Stagnation properties- Stagnation pressure, Temperature and density- Area velocity relationship for compressible flow- Flow of compressible fluid through nozzles- Condition for maximum discharge through nozzles- Variation of mass flow with pressure ratio- Compressible flow through a venturimeter- Pitot static tube in a compressible flow.

Text Book:

1. Fluid Mechanics and Hydraulic Machines, by R. K. Bansal, Laxmi publications.
2. Fluid Mechanics, by A.K. Mohanty, Prentice Hall of India Pvt.Ltd.

References:

1. Fluid Mechanics and Fluid Power Engineering by Dr. D.S. Kumar, S.K. Kataria &Sons.
2. Foundations of Fluid Mechanics, by Yuan, Prentice Hall of India.
3. Fluid Mechanics and its Applications, by S. K.Gupta and A.K.Gupta, Tata McGraw Hill, New Delhi.
4. Fluid Mechanics and Hydraulic Machines by R. K. Rajput, S.Chand & Co.
5. Fluid Mechanics by Kothandaraman and Rudramoorthy.

MEC 322 - DESIGN OF MACHINE ELEMENTS – I

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5 Th. Ses. : 30 Exam : 70

Examination (Theory): 3hrs. Credits: 4

Course Objectives:

To make the students

- To be competent in the field of design to formulate a new plan or modify the existing design
- Develop an ability to apply knowledge of mathematics, science, and engineering to Real time Problems
- To develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
- To identify the type of materials used to design a system and predict the failure of Mechanical component
- To develop an ability to identify, formulate, and solve engineering problems.
- To develop an object or component subjected to static and fluctuating loads.

Course Outcomes:

Students will be able to

CO-1	Design a competitive product by following all the design considerations
CO-2	Analyze the type of failure and determine the geometrical dimensions of the component based on the various Criterion of the design
CO-3	Analyze the various types of stresses on mechanical components subjected to both static and dynamic loads.
CO-4	Design threaded and welded joints, subjected to Eccentric & fluctuating loads.
CO-5	Design shafts, keys and couplings and spring subjected to static and dynamic loads.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3	2	3						1	1
CO2	3	2	1	2	2						1	1
CO3	3	2		1	2						1	1
CO4	3	2	3	1							1	1
CO5	3	1	3	1	2						1	1

Employability Employability Employability

Introduction to Mechanical engineering design: traditional design methods, different design models, Problem formulation, Design considerations, engineering materials and processes and their selection, BIS designation of steels, Mechanical properties, Load determination, manufacturing considerations in design.

Design against static loads: Modes of failure, Factory of safety, Axial, bending and torsional stresses, Stress concentration factors. Static failure theories.

Fluctuations and fatigue stresses, Soderberg, Goodman and modified Goodman diagrams, fatigue failure, design consideration in fatigue

Employability

Threaded and welded joints: forms of threads, basic types of screw fastenings, ISO metric screw threads, eccentrically loaded bolted joints, Torque requirement for bolt tightening, Fluctuations loads on bolted joints, fasteners, Joints with combined stresses. Power screws, Force analysis. Collar friction, Differential and compound screws design. Types and strength of weld joints subjected to bending and fluctuating loads, cotter and knuckle joints, welded joints, different types welded joints and their design aspects, welding inspection

Employability

Shafts, keys and couplings: shafts design on strength basis, torsional rigidity basis, Design of hollow shafts, flexible shafts, ASME codes for shafts, Keys and cotter design, Flat, square keys, Splines, Rigid and flange couplings, Flexible couplings

Employability

Spring Design: classification and spring materials, Spring end formation, Design of helical compression springs, helical extension springs, torsion springs, laminated springs, Protective coatings, Equalized stress in spring leaves. Multi - leaf springs. Surge in springs, Nipping and shot peening.

Employability Employability Employability

Text Books:

1. Design of Machine Elements by V.B.Bhandari, TMH Publishing Co. Ltd., New Delhi

References:

1. Machine Design by Jain, Khanna Publications.
2. Machine Design by Pandya and Shaw, Charotar publications
3. Machine design , an integrated approach by R.L.Norton, 2nd edition, Pearson Education

MEC 323 - MANUFACTURING TECHNOLOGY – III

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5 Th Sess. : 30 Exam : 70

Examination (Theory): 3hrs. Credits: 4

Course Objective:

To demonstrate basic principles of NC, CNC, DNC and FMS. Able to learn how data is transformed from digital to analytical format. To learn G and N codes to write programming for CNC machining. To understand representation of tolerances and limits of machined components and learn about various metrology instruments. To know various acceptance tests used for various machines.

Course Outcomes:

CO-1	Students will able to understand the basic principles of CNC.
CO-2	Students will able to write part programming for CNC.
CO-3	Students will able to acquire knowledge about limits and fits and their applications.
CO-4	Students will learn about tool room metrology and how to use various measuring instruments.
CO-5	Students will able to understand about various acceptance tests carried out on machine tools.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		2	2			1	2		1	
CO2	1	3		3	3	1		1	2		1	
CO3	3	2	1	3	2			1	2		1	
CO4	2		3	3	3	3		1	2		1	
CO5		3	2	3	3	1		1	2			

Automatic screw lathes, Multi spindle automatic lathes, Turret lathes, Numerical control, NC operation, Coordinate system, Data input devices, Data storage, Programme editing, Machining centres, Turning centres, Vertical turning centres, Milling centres, Advantages of NC, Computers & NC, CNC, DNC, CAD/CAM, Computer graphics, Computer aided manufacturing, Robots, Flexibility in manufacture, Automatic sensing for FMS, Areas affected by FMS, Steps toward automatic factory.
CNC part programming: Designation of co-ordinate axes for CNC machines, Functions of machine control units, Tape format, Manual part programming and computer assisted part programming (using APT language). Exercises involving simple contours and positioning.
ISO system of limits, Fits and Tolerances, Interchangeability, Plain limit gauges, Measurement of screw threads, major diameters, Minor diameters and effective diameter, Pitch, Limit gauges for

Employability

Employability

internal and external threads, Measurement of spur gears, pitch, profile, lead, backlash, tooth thickness.

Tool maker's microscope, Straightness measurement, Slip gauges, Twisted strip mechanical comparator, Optical lever comparator, Optical projector, Electric comparator, Pneumatic comparator, Squareness testing, Optical bevel protractor, Sine bar, Angle gauges, Precision level, Autocollimeter, Angle dekkor, Optical dividing heads and rotary tables, Flatness measurement, Roundness measurement. Co-ordinate measuring machines.

Surface texture: Parameters, sampling length, Specification, Stylus instruments for surface roughness measurement. Acceptance tests on machine tools: Lathe, Milling machine, Radial drill, Laser equipment.

Employability

Employability

Text Books:

1. Process & Materials of Manufacture, R.A.Lindberg, 4th edition, Prentice-Hall of India, New Delhi.
2. A Text Book of Engineering Metrology, I.C.Gupta, Dhanpat Rai & Sons, Delhi.
3. CNC and Computer Aided Manufacturing, T.K.Kundra, P.N.Rao & N.K.Tewari, Tata McGraw-Hill Publishing Company Ltd, Delhi.

References:

1. A.S.T.M.E., Hand book of Industrial Metrology, Prentice-Hall of India, New Delhi.

1. A.S.T.M.E., Hand book of Manufacturing Engineering.
2. Manufacturing Processes & Materials for Engineers, L.E.Doyle & others, Prentice-Hall of India, New Delhi.
3. Manufacturing Technology by Adithan, New age international.

MEC 324 - INDUSTRIAL ENGINEERING AND MANAGEMENT

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5 Th   Ses. : 30   Exam : 70

Examination (Theory): 3hrs.   Credits: 4

Course objectives:

- To acquaint the student with fundamental concepts of industrial management, to discuss the functions of personal management; industrial relations; production systems; production planning and control;
- To introduce principles of plant layout; material handling; plant maintenance; concept of productivity; materials management; concept of method study and work study measurement; concepts of Quality control.

Course outcomes:

CO-1	Students will be able to understand the principles of Industrial Engineering.
CO-2	The student will be able to learn the concepts of time study, work study which are commonly used in any Industry
C0-3	The student will be able to learn the concepts of material management
CO-4	The student will be able to learn the concepts of production planning and control
CO-5	The student will be able to learn the concepts of quality control

ENTREPRENEURSHIP SKILLS/EMPLOYABILTY

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	1		3		2			3	3		3	
CO-2	1		3		2			3	3		3	
CO-3	2		3		2			3	3		3	
CO-4	1		2		1			3	3		3	
CO-5	1		3		1			3	3		3	

Concepts of Industrial Management: Principles of management- Growth of management thought, Functions of management, Principles of organization, Types of organization and committees.
Introduction to personnel management- Functions, Motivation, Theories of motivation, Hawthrone studies, Discipline in industry, Promotion, Transfer, lay off and discharge, Labour turnover.
Industrial relations- Trade unions, Industrial disputes, Strikes, Lock-out, Picketing, Gherao, Settlement of industrial disputes, Collective bargaining, Industrial dispute act 1947 and factories act 1948.
Production Planning and Control: Types of productions, Production cycle, Product design and development, Process planning, Forecasting, Loading, Scheduling, Dispatching, Routing, Progress, Control, Simple problems.
Plant Layout: Economics of plant location, Rural Vs Suburban sites, Types of layouts, Types of building, Travel chart technique, Assembly line balancing simple problems.
Materials Handling- Principles, Concept of unit load, Containerization, Pelletization, Selection of material handling equipment, Applications of belt conveyors, Cranes, Forklift trucks in industry.
Plant Maintenance: Objectives and types.
Work Study: Concept of productivity, Method Study - Basic steps in method study, Process charts, Diagrams, Models and Templates, Principles of motion economy, Micro motion study, Therbligs.

ENTREPRENEURSHIP SKILLS/EMPLOYABILTY

ENTREPRENEURSHIP SKILLS/EMPLOYABILTY

ENTREPRENUERSHIP SKILLS/EMPLOYABILTY

SIMO chart. Work Measurement - Stop watch procedure of time study, Performance rating, allowances, Work sampling, Simple problems.

Materials Management: Introduction, Purchasing, Objectives of purchasing department, Buying techniques, Purchase procedure, Stores and material control, Receipt and issue of materials, Store records. Inventory Control, EOQ model(Simple problems).

Quality Control - Control charts of variables and attributes (Use of formulae only). Single and Double sampling plans.

ENTREPRENUERSHIP SKILLS/EMPLOYABILTY

Text Book:

1. Industrial Engineering Management, by Dr. O. P .Khanna.

References:

1. Principles of Management by Koontz & Donnel.
2. Production and Operations Management by Everette Adam & Ronald Ebert.
3. Operations Management by John McClain & Joseph Thames.
4. Industrial Engineering and Production Management by Telsay, S. Chand & Co.

MEC 325 - ENGINEERING THERMODYNAMICS-III

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th Ses. : 30 Exam : 70
Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To impart the student the fundamentals of I.C Engines
- To generate an interest and understanding in evaluating the performance of thermodynamic machinery like engines, compressors, gas turbines and propulsion systems.
- To focus the attention of students on an intricate phenomena like combustion in engines and to create an keen interest in the student for further research.

Course Outcomes:

The student will able to

CO-1	Have a complete grasp on the construction and working principles of I.C Engines.
CO-2	To have a clear understanding on the differences between air standard cycle, Fuel air cycles and actual cycles.
CO-3	Have a thorough grip on the performance analysis of I.C engines.
CO-4	Understand the factors that differentiate between normal and abnormal combustion phenomena in both S.I and C.I engines.
CO-5	Rate the fuels and also understand the distinction in the properties of S.I C.I engines fuels.
CO-6	Distinguish between positive displacement and roto-dynamic compressors.
CO-7	Understand the construction and working of displacement and steady flow compressors.
CO-8	Understand the effect of regeneration, inter-cooling and reheating on the performance of gas turbine plant.
CO-9	Analyze the distinctive features of Turbo jet, Turbo prop, Turbo-fan, Ram jet and pulse jet engines and their performance.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	2	1			1			1	1	1
CO-2	2	2	2	3	1		1			1	1	1
CO-3	3	3	3	2	2	1	1	1		1	1	1
CO-4	3	3	3	2	3	1	1		1	1	1	1

CO-5	2	2	3	2	2	1	1			1	1	
CO-6	3	3	3	2	2	1	1				1	
CO-7	2	2	3	2	2					1		
CO-8	3	3	3	3	2	1	1				1	1
CO-9	3	3	3	2	2	2	1	1		1	1	1

Employability

I.C. engines: classification-comparison of two stroke and four stroke engines- comparison of S.I. and C.I. engines-Air cycles-Otto, Diesel, Dual, Stirling, Ericson and Atkinson cycles and their analysis-Valve timing and port timing diagrams- Efficiencies- air standard efficiency,indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, volumetric efficiency and relative efficiency-Testing and performances of I.C. engines-Basic principles of carburetion and fuel injection.
Combustion in I.C. Engines: S.I. engines- Normal combustion and abnormal combustion- Importance of flame speed and effect of engine variables-types of abnormal combustion pre-ignition and knock, Fuel requirements and fuel rating, anti-knock additions- Combustion chamber requirements and Types of combustion chamber- Design principles of combustion chambers-C.I. engines- Stages of combustion- Delay period and its importance- effect of engine variables, diesel knock, suction compression and combustion induced turbulence, open and divided combustion chambers.

Employability

Reciprocating and Rotary Compressors: Reciprocating compressors-effect of clearance in compressors, volumetric efficiency-single stage and multi stage compressors-effect of inter cooling in multi stage compressors-Vane type blower-centrifugal compressor- Adiabatic efficiency- Diffuser-Axial flow compressors- Velocity diagrams, degree of reaction, performance characteristics.

Employability

Gas Turbines: Simple gas turbine plant- Ideal cycle, closed cycle and open cycle for gas turbines-Efficiency, work ratio and optimum pressure ratio for simple gas turbine cycle- Parameters of performance- Actual cycle, regeneration, Inter-cooling and reheating, closed and semi-closed cycle-Jet propulsion and Rockets.
Nuclear power plants: Classification of reactors-Thermal utilization-Fuels, Fuel moderator and coolant, Control and safety rods, Special properties of structural materials required, Induced radio-activity-Gas cooled reactors, Radiation hazards and shielding-Radio active waste disposal.
Direct Energy Conversions and non conventional energy sources: Solar Energy- Introduction, Solar radiation, Solar collectors, Energy storage-Wind Energy- Wind mills-Thermo Electric- MHD.

Employability

Text Books:
1. A Treatise on Heat Engineering by Vasandhani and Kumar.
2. Applied Thermodynamics-II by R. Yadav.

References:

1. Thermal Engineering, by R.K.Rajput.
2. I.C. Engines, by Mathur and Nehata.
3. Gas Turbines, by Cohen and Rogers.
4. Fluid Flow Machines, by M.S. Govinda Rao, Tata McGraw Hill publishing company Ltd.
5. I.C. Engines by V. Ganesan.
6. Power Plant Engineering, P.K.Nag
7. Non Conventional Energy Sources, G.D.Rai
8. Internal Combustion Engines by R.K. Mohanty, Standard Book House.

MEC 326 - ELECTIVE – II
(A) GAS TURBINES AND JET PROPULSIONS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th Ses. : 30Exam : 70

Examination (Theory): 3hrs. Credits: 4

Course Objectives:

- To provide the student with the principles of compressible fluid flow.
- To create an understanding of the working principles of steady flow compressor and the factors effecting their performance.
- The course intends to provide an insight into the combustion mechanism, types of combustion chambers and their requirements.
- A thorough understanding of propulsion system and their working is provided in this course. Further the effects of the working parameters on the efficiency system is also studied.

Course Outcomes:

The student will be able to

CO-1	Select the type of compressor for any application and evaluate its performance.
CO-2	Have a thorough knowledge on combustion phenomena of a steady flow combustion chambers.
CO-3	Understand the working principles of both impulse & reaction gas turbines.
CO-4	Choose & design a regenerator for any application.
CO-5	Apply the principles of mechanics and thermodynamics in determination of thrust, propulsive efficiency, thermal efficiency and overall efficiency of a propulsive system.
CO-6	Distinguish between the different types of jet engines and their relative merits and demerits and their applications.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	1	2	2	1			1					
CO-2	1	3	3	2	1	1	3	1	1	1		1
CO-3	2	1	1	1	2	1	1	1		1		
CO-4	3	2	3	3	3	1	1				2	1
CO-5	3	3	2	2	1	1						1
CO-6	3	3	3	3							2	1

Employability

Employability

Introduction: Development- Competition- Competition Rules- Present and Future Status- Gas Turbine Problems.

The Fundamentals of Gas Turbines: Introduction- Conservation of Mass Continuity Equation- Conservation of Energy (First Law of Thermodynamics)- Momentum Equation- Sonic Velocity, Mach Number and Mach Waves-Stagnation Temperature, Pressure and Enthalpy- Isentropic Flow Through a Passage of varying cross sectional Area- Normal Shock- Equations for Normal Shock – Governing Equations- Impossibility of a Refraction shock- Strength of Shock wave- Shocks in a converging, Diverging Nozzle.

Ideal Power Plant Cycles: Introduction- Carnot Cycle- Stirling Cycle with Regenerator-Ericsson Cycle- The Joule Air Cycle- Brayton Cycle- Brayton Cycle with Regeneration- Complex Cycle- The Close Cycle- Operating Media other than Air.

Performance of a Actual Gas Turbine Cycles: Efficiency of the compressor and Turbine- Pressure or Flow Losses- Heat Exchanger Effectiveness- Effect of varying mass Flow-Loss due to incomplete combustion- Mechanical Losses- Effect of Variable Specific Heat- Calculation of Fuel consumption and cycle Efficiency- Polytrophic Efficiency- Performance of Actual Cycles.

Employability

Centrifugal Compressors: Introduction-Components- Method of Operation- Theory of Operation-Ideal Energy Transfer- Actual Energy Transfer-Slip- Analytical Methods of Determining σ- Power Input Factor- Pressure Coefficient- Compressors Efficiency- Inlet or Inducer Section, When Entrance is Axial, Sizing of Inducer Section, Prewhirl- Impeller Passage, The Effect of Impeller Blade Shape on Performance, The Impeller Channel- The Compressor Diffuser- Losses in Centrifugal Compressors- Compressor Characteristics- Surging and Choking.

Axial Flow Compressors: Introduction- Description- Principles of Operation- Performance Analysis- Momentum or Filament Analysis, Special Velocity Diagrams, Symmetric Stage, Non-Symmetric Axial -in flow, Non-Symmetric Axial- outflow- Actual Energy Transfer- Air Foil Analysis, One Dimensional Ideal Incompressible Flow, Two Dimensional flow With Friction-Blading Efficiency, Losses in terms of Air Angles and Drag Co efficient- Coefficient of Performance, Flow Coefficient (Φ), Pressure Coefficient (ψ_p),Work Coefficient(Ω)- Blade Loading- Cascade Characteristics-Blade angles- Reynolds and Mach Number Effects- Three Dimensional flow Analysis, Radial Equilibrium Theory, Free Vertex Blades, Constant Reaction Blades, Forced Vortex of Solid Rotation Blades, The General Design -Three Dimensional Blades Losses- Compressor Stall and Surge - Overall Performance- Compressor Characteristics.

Combustion Systems: Introduction- Combustion Mechanism- Pressure Losses- Combustion Intensity- Combustion Efficiency- Requirements of the Combustion chamber- Shape of the Combustion chamber- Stabilizing or Primary Zone- Dilution and Mixing- Combustion- Chamber Arrangements- Fuel Injection System.

Employability

Axial Flow Gas Turbines: Introduction- Description- Turbine and Nozzle efficiencies- Degree of Reaction, Ideal Impulse Turbine, Impulse Turbine with Loss, Blades Speed Ratio, Velocity Ratio and Torque, Velocity Compound Turbine (Curtits Stage)- The Reaction Turbine- Three Dimensional Flow Analysis, The Free Vortex Blades

Regenerator- Introduction--Types of Regenerators- Heat Transfer in Direct type Exchanger, Exchanger Heat Transfer Effectiveness, Number of Exchanger Heat Transfer Units- Effect of Flow Arrangement, Effect of Cmin/Cmax<1for a Regenerator- Rotary heat Exchangers.

Jet Propulsions: Introduction-The Ramjet Engine-The Pulse-jet Engine- The Turbo-jet Engine-Thrust Equation—Specific Thrust of the Turbo Jet Engine- Efficiencies- Inlet Diffuser or Ram Efficiency- thermal Efficiency of the TurboJet Engine- Propulsive Efficiency- Overall Efficiency of a Propulsive system- Effect of Forward Speed- Effect of Attitude- Overall Turbojet Process- Thrust augmentation- The After burn-Injection of Water, Alcohol Mixtures- Bleed- Burn Cycles.

Employability

Employability

Text Books:

1. Gas Turbines and Propulsive Systems by P.R. Khajuria and S.P. Dubey, Dhanpat Rai & Sons

Reference Books:

1. Gas Dynamics and Jet Propulsion By Murugaperumal, SCITECH Publications.

(B) AUTOMOBILE ENGINEERING
(C)

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th Ses. : 30Exam : 70
Examination (Theory): 3hrs. Credits: 4

Course Objectives:

- To provide an introduction to the basic principles of an automobile and functioning of its components.
- To strengthen the student's knowledge of various automobile systems like transmission, suspension, control, etc.
- To make students understand operational features of different types of engines used in automobiles.
- To expose students to the pollution norms and to make them aware of environment friendly vehicles.
- To impart basic concepts related to electrical and electronic systems used in automobiles.

Course Outcomes:

The student will be able to:

CO-1	Students will have clear idea about the principles of automobile and its functioning.
CO-2	Students can explainthe significance of various systems in automobile.
CO-3	Students will have the ability to explain the operational features of different engine types.
CO-4	Students will be able to reach latest advancements by building upon the fundamentals learnt in this course.
CO-5	Students will learn the principles related to electrical and electronic systems of automobile.
CO-6	Students will comprehend the importance of eco-friendly engineering.

Mapping of Course Outcomes with Programme Outcomes.
Strong -3, Medium -2, Low -1

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	3	3	2	1	2	1	2	2		2
CO-2	2	3	2	1	2		1	1	3	2	1	2
CO-3	2	3	3	3	2	1	2	1	2	2	1	3
CO-4	2	2	2	2	2	2	3	2	1	3	2	3
CO-5	2		2	1	1	1	2	1	2	1	2	2
CO-6	1	1	3	2	1	3	2	3	2	1		3

Introduction: Definition of automobile, Automobile Layout, Chassis and Transmission: Introduction to Drive Train: Clutch, Gearbox, Hook's Joint, Propeller /Drive Shaft, Slip Joint, Final Drive and

Employability

Differential, Front and Rear Axles, Wheels and Tires, Control systems: Introduction to Steering, and Brakes. Electrical system: Introduction to Starting System, Ignition, dynamo/alternator, cut-out and wiring. Automobile Body: Parts and Stream lining, Automobile types: Front, Rear and Four wheel drive and Automotive materials.

Engine (Power Plant): Multi cylinder engine parts, Classification: 'In-line' and 'V' type, Multi-Valve Engines, VCR Engines, Super Charging/Turbo charging, Air filters, Fuel Systems: Petrol Engines: Carbureted and MPFI, Ignition Systems: Conventional and Electronic, Diesel Engines: Conventional, CRDI, and Duel Fuel engines., Performance, Combustion and Exhaust Emissions, Air pollution and their control: EGR and Catalytic Converters, EURO/Bharat Stage Norms: I, II, III, IV and V., Manifolds and Mufflers, Engine Cooling and Lubrication.

Employability

Clutch: Necessity, Clutch Assembly: Construction and Working Principle, Types: Single and Multiple Plates, Free-Play, Fluid coupling/Torque converter, Clutch Troubles and Remedies.

Gearbox: Necessity of Transmission and Transaxle, Construction and Working Principle, Selector Mechanism, Types: Sliding mesh, Constant mesh, Synchromesh, and Epicyclical. Three, Four and Five- Speed Gearbox, Overdrive, Automatic Gearbox, Gearbox Troubles and Remedies.

Drive shaft and Final Drive: Drive Shaft: Constructional Features: Universal/Hooks Joints, Slip Joint, and Working Principle., Types of Propeller shafts, Final drive and Differential: Necessity, Constructional Features and Working Principle., Front/Rear Axles: Constructional Features and Types of Rear Axle Floating, Wheels: Disc and Drum type, Tires: Tire Construction, Tube and Tubeless Tires, Radial Tires, Tire specification, Tire rotation and Tire Maintenance.

Employability

Suspension System and Vehicle Control: Coil and Leaf Springs, Shock absorbers, Wheel alignment: Kingpin angle, Caster, Camber, Toe-in, and Toe-out., Necessity of vehicle control, Steering Mechanism and its Elements: Steering gear box and its types, Steering gear ratio, Constant Velocity Joints and linkages. Power Steering, Brake system: Necessity, Parking and Power Brakes, Parts and Working Principle of Mechanical, Air and. Hydraulic Brakes: Mater and Wheel cylinder, Properties of Brake Fluids, Brake Diagnostics and Service: Brake Bleeding, Anti-lock Braking System, Automobile Accessories and Tips for Safe Driving.

Employability

Electrical and Electronic Systems: Basics of Electrical/Electronic Systems: Battery, Starting system, Charging System, Lighting and Signaling System, A/C Electrical System, Electronic Engine Management system, Automotive Embedded Systems: Vehicle Security System and Working Principle of Computer Sensors: Temperature, Flow, Cam, knock, and Oxygen, and ECU/ ECM.

Trouble Shooting and Maintenance: Engine and Vehicle Troubles: Diagnostic Information: Symptom descriptions and their Causes and Remedies, Periodic, Preventive and Break down Maintenance: Engine tuning, Fuel and Air filters, Lubricants, Maintenance of Battery and Electrical/Electronic System, and Tires. The Motor Vehicle Act (India).

Employability

Employability

Text Books:

1. Automotive Mechanics (10/e) - William H. Crouse and Donald L. Anglin, Tata McGraw-Hill Publishing Company Limited, ISBN: 0-07-059054-0
2. Automobile Engineering – KK Jain/ RB Asthana, Tata McGraw-Hill Publishing Company Limited, ISBN: 0-07-044529-X
3. Internal Combustion Engines and Air Pollution- E.F. Obert, Harper & Row International Publishers Inc., ISBN: 0-06-350561-4

Reference Books:

1. Automotive Mechanics – S. Srinivasan, Tata McGraw-Hill Publishing company Limited, ISBN: 0-07-044941-6
2. Internal Combustion Engines – Heywood, John, B. McGraw-Hill Publications Limited.
3. Automotive Engines- S Srinivasan, Tata McGraw-Hill Publishing Company Limited, ISBN: 0-07-040265-5

(C) TOOL DESIGN

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5Th Ses. : 30Exam: 70

Examination (Theory): 3hrs. Credits: 4

Course Objective:

To demonstrate the basic knowledge of machine tools and understand designing concepts of Locating and Clamping Devices, Jigs & Fixtures, Press Tools. To give students the knowledge of designing forming dies and gauges.

Course Outcomes:

CO-1	Students will able to understand the basic principles of tool holding and guiding devices.
CO-2	Students will learn how to design a jig and fixture.
CO-3	Students will be able to learn about various tools used for NC and CNC.
CO-4	Students will be able to design forming dies and gauges.

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	2			1	2		2	
CO2	2	3	3	3	2			1	2		2	
CO3	2	3	3	3	3			1	2		2	
CO4	2	3	3	3	3			1	2		2	

Employability

Locating and Clamping Devices: Principles of Jigs and Fixtures design-Locating principles-Locating elements-Standard parts-Clamping devices-Mechanical actuation-Pneumatic & hydraulic actuation-Analysis of clamping forces-Tolerance and error analysis.

Jigs & Fixtures: Drill bushes-Different types of Jigs-Plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs- Automatic drill jigs-Rack & Pinion Operated, Air operated Jigs Components.

General principles of lathe, milling and broaching fixtures-Grinding, Drilling and shaping fixtures, Assembly, Inspection and Welding fixtures-Modular fixtures. Design and development of Jigs and fixtures for simple components.

Press Tools: Press working terminology-Presses and Press accessories-Computation of capacities and tonnage requirements-Design and development of various types of cutting, forming and drawing dies.

Tool Design for Numerically Controlled Machine Tools: Fixture Design for Numerically Controlled Machine Tools, Cutting Tools for Numerical Control, Tool-holding Methods for Numerical Control

Employability

Design of Limit Gauges: Elements, types and application of limit gauges, Gauge materials, their selection, Taylor's principles of gauge design, Types and methods to provide gauge tolerances. Design steps and design of plug & ring / snap gauge for given dimension and application.

Employability

Employability

Text Books:

1. Donaldson. C, Tool Design, Tata McGraw-Hill, 1986
2. “ASTME Handbook of Fixture Design ". Prentice Hall of India Pvt. Ltd.
3. Basu, Mukherjee, Mishra, Fundamentals of Tool Engg. Design, Oxford & IBH Publishing, N. Delhi

References:

1. A. K. Goroshkin, " Jigs and Fixtures Handbook ", Mir Publishers, Moscow, 1983.
2. “Die Design Handbook ", Ivana Suchy, McGraw Hill Book Co., 2005.
3. Production technology, HMT, Tata McGraw Hill.
4. P. Eugene Ostergaard, “Basic Die Making” - Mc Graw Hill Book, 1963.
5. Principle of Machine Tool. Sen & Bhattacharya, New Central Book Agencies, 1975.
6. Production tooling equipments S. N. Parsons, Macmillan, 1966. |

(D) PRODUCTION PLANNING AND CONTROL

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th — Ses. : 30Exam : 70

Examination (Theory): 3hrs. — Credits: 4

Course objectives:

To make the student Understand

- The production planning and inventory control systems through a managerial perspective.
- How operations managers allocate the resources using long term capacity planning, aggregate production planning, and inventory analysis.
- To recognizing the relationships among the strategic, tactical and operational levels of planning in production systems.
- Material Requirements Planning (MRP) and Enterprise Resource Planning (ERP) by teaching the logic and mathematical foundation behind these tools.

Course Outcomes:

Upon successful completion of this course, the students will be able to

CO-1	Learn the basics about managerial aspects of operations & Production, this will help them in understanding the actual business process.
CO-2	Formulate the problem of production planning and inventory control and discuss the difficulties in real life cases.
CO-3	Do production planning system structure, inputs of the system, forecasts and cost data, the solution methods and techniques and the interpretation of the outcomes.
CO-4	Solve inventory management system structure, inputs of the system, the solution models and techniques and the interpretation of the inventory policies under deterministic and stochastic environments.
CO-5	Learn the recent developments in the areas of Materials Requirement Planning (MRP), Materials Requirement Planning II (MRP-II).

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1
CO-1	1		2		1			1	3		3	
CO-2	1		2		2			1	3		3	
CO-3	2		3		1			1	2		3	
CO-4	1		3		1			1	3		2	
CO-5	2		3		1			1	3		1	

Production Planning and Control: Introduction-Definition-Functions of PPC- Objectives-Terminology- Types of Production-Production Control Department in Relation to Types of Production.

Forecasting: Introduction- Statistical forecasting techniques- Moving average-Exponential smoothing technique-Errors in forecasting and evaluation of fore casting techniques.

Employability

Process Planning, Computer aided Process Planning: production Control Procedures-Order, Flow , Load and Block types of Control-Production control Organization-Place and Significance of Production control Department in an Industry.
Inventory Management: Introduction-Definition - Types of Inventory - EOQ and EBQ Models with and without shortages - Buffer stock, Re-order Level- Inventory control techniques - Make or buy decision - Material requirement planning- MRP-II- JIT
Planning: Engineering aspects-Aggregate Planning- Master Processing instructions- Identification Systems- Production inventory programs- work design and job des
Routing-Steps in routing- Rout sheet.
Scheduling: Forward and Backward Scheduling- Master Scheduling- Evaluation of Job Shop Schedules with reference to Priority Scheduling rules, Sequencing, Assignment techniques in Production Scheduling.
Dispatching and Expediting: Centralized and Decentralized Dispatching- Functions in Dispatching-Dispatching policies- Progress reports- Gantt Load Charts and Schedule Charts- Use of components for production control other information processing systems- Computers in PPC

Employability

Employability

Text Books:
1. Joseph and Mork - Operations Management.
2. Donald Denmar - Management of Industrial Organization.
3. Moor and Deblonke - Production Control
4. Temokhna. J. A and White - Facilities Planning.
5. Everette.Adam, Jr. and Ronald J. Ebert- Production and Operation Management

References:
1. Production Planning and Inventory Control, Narasimhan, Mc Leavy, Billington, PHI(1999)
2. Operation Management- Strategy and Analysis, Lee Krajewski and Larry P. Ritzman, Addison-Wesley (2000).
3. Operations Management : Theory and Problems by Monk, J.G., McGraw Hill, NY, 1985.
4. Computer Aided Production Management, P. B. Mohapatra, PHI (2001)
5. Manufacturing Planning and Control Systems by Vollmann, Thomas, E. and Others, Richard D. Irwin, Illinois, 1984.
6. Service Operations Management by Fitzsimmons, J.A. and Sullivan, R.S., McGraw Hill, NY, 1982.
7. Materials Management by Ammer, Dean, S., Richard D. Irwin, Illinois, 1962.

(E) ROBOTICS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th Ses. : 30 Exam : 70

Examination (Theory): 3hrs. Credits: 4

Course objectives:

- ➢ To familiarize the students with the automation and brief history of robot and applications.
- ➢ To give the students the knowledge of kinematics of robots, robot end effectors and their design, various Sensors and their applications in robots.
- ➢ To make them learn about Robot Programming methods & Languages of robot.

Course outcomes:

The students will be able to

CO-1	Define a robot and analyze various components of it.
CO-2	Do kinematics analysis of robot manipulators
CO-3	Understand the importance of robot dynamics, Robot end effectors and their design concepts
CO-4	Describe different mechanical configurations of robot manipulators.
CO-5	Apply the principles of various Sensors and their applications in robots.
CO-6	Understand the Programming methods & various Languages of robots.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	3	1	3	2		1		1	2		2
CO-2	3	3	3	2	2				1	1	1	
CO-3	1	2	3	2	2	1	1		2	2	1	1
CO-4	2	1	3	2				1	2	1	2	2
CO-5	3	2	3	3	2	2	3	2	2	2	1	2
CO-6		2		1	3			1	1			2

Introduction: Background- Historical Development-Robot Arm kinematics and Dynamics-Manipulator Trajectory Planning and Motion Control-Robot Sensing- Robot Programming Language- Machine Intelligence.

Employability

Robot Arm kinematics: Introduction – The Direct Kinematics Problem- The Inverse Kinematics Solution.

Robot Arm Dynamics: Introduction – Lagrange-Euler Formulation- Newton-Euler Formation - Generalized D'Alemberts Equations of Motion.

Employability

Planning of Manipulator Trajectories: Introduction General Considerations on Trajectory Planning- Joint Interpolated Trajectories- Planning of Manipulator Cartesian Path Trajectories.

Control of Robot Manipulators: Introduction – Control of the Puma Robot arm- Computed Torque Technique- Near Minimum Time Control- Variable Structure Control- Nonlinear Decoupled Feedback Control- Resolved Motion Control- Adaptive Control.

Sensing: Introduction-Range Sensing-Proximity Sensing- Touch Sensors- Force and Torque Sensing.

Employability

Low-Level Vision: Introduction –Image acquisition- Illumination Techniques- Imaging Geometry- Some Basic Relationship Between Pixels – Preprocessing.
Robot Programming Languages: Introduction- Characteristics of Robot Level Languages- Characteristics of Task Level Languages.

Employability

Text Book:
1. Robotics By K.S. Fu, R.C. Gonzalez and C.S.G Le, McGraw- Hill International Editions1987.

Reference Books:

1. Industrial Robotics By M.P.Groover,Mitchell Weiss, Roger N. Nagel and N.G.Odrey, McGraw-Hill International Editions1986.
2. Robot Analysis- The Mechanics of Serial and Parallel Manipulators By Lung-Wen Tsai, Jhon Wiley and Sons,Inc

(E) MECHATRONICS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 5Th Ses. : 30Exam : 70
Examination (Theory): 3hrs. Credits: 4

Course Objectives:

To impart the knowledge of integrated design issues in Mechatronics and Mechatronics design process and the basic knowledge of modelling and simulation of block diagrams and also about sensors, transducers, signals and system controls. The objective is also to make them aware of advanced applications in mechatronics.

Course Outcomes:

The students will be able to:

CO-1	Design the mechatronics systems.
CO-2	Model and simulate the block diagrams of systems.
CO-3	Gain knowledge of operation of different sensors and transducers for various applications.
CO-4	Gain knowledge in application of Artificial intelligence and micro sensors in mechatronics

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1			2	1	2		1	1
CO2	3	3		3				1	2		1	
CO3	1	1	1							2	2	1
CO4	1	1	1		1		2		3		3	2

.

Employability

Mechatronics system design: Introduction to Mechatronics: What is mechatronics, Integrated design issues in mechatronics, Mechatronics key elements, The mechatronics design process, Advanced approaches in mechatronics.

Modelling and simulation of physical systems: Simulation and block diagrams, Analogies and impedance diagrams, Electrical systems, Mechanical translational systems, Mechanical rotational systems, Electromechanical coupling, Fluid systems.

Employability

Sensors and transducers: An introduction to sensors and transducers, Sensors for motion and position measurement, Force, torque and tactile sensors, Flow sensors, Temperature-sensing devices. Actuating devices: Direct current motor, Permanent magnet stepper motor, Fluid power actuation.

Signals, systems and controls: Introduction to signals, systems and controls, System representation, Linearization of nonlinear systems, Time delays.

Real time interfacing: Introduction, Elements of a data acquisition and control system, Overview of the I/O process, Installation of the I/O card and software.

Advanced applications in mechatronics: Sensors for condition monitoring, Mechatronic control in automated manufacturing, Artificial intelligence in mechatronics, Microsensors in mechatronics.

Employability

Employability

Text Book:

1. Mechatronics System Design by Devdas Shetty and Richard A. Kolk, P.W.S. Publishing Company, 2001.

References:

1. Mechatronics by W. Bolton, Pearson Education, Asia, II-Edition, 2001
2. Introduction to Mechatronics and Measurement Systems by David G. Alciatore and Michael B. Histand, Tata McGraw Hill Company Ltd.

MEC 327 - METROLOGY LAB./MECHATRONICS LAB.

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Sess. : 50 Exam : 50

Examination (Practical): 3hrs. Credits: 2

Course Objectives:

- To teach students the process of calibrating the instruments using higher standard
- To teach students the method of measuring taper angle, flatness of surface using different instruments and also to measure gear tooth parameters.
- To make students to learn to do alignment tests on spindle.
- To expose them to the use of Tool-makers microscope for measuring smaller dimensions.
- To expose students to programmable logic controllers.
- To provide students the knowledge of sensors and transducers.

Course Outcomes:

Student will be able to

CO-1	Calibrate the given instruments
CO-2	Measure taper angle, flatness of surface and gear tooth parameters
CO-3	Conduct concentricity and roundness test on spindle.
CO-4	Use Tool maker's microscope for measuring smaller dimensions.
CO-5	Select suitable sensors and transducers while designing a system to meet specified requirements.
CO-6	Interface the programmable logic controller with input/output components for various practical applications.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				2				3	1	1		
CO2	1	1		2				2	1	1		
CO3	1			2				2	1	1		
CO4				3				2	1	1		
CO5	1	1	1					1	1	1	2	1
CO6	3	3	3		3	1			2		3	2

METROLOGY LAB. EXPERIMENTS - (Any Five)

1. Calibration of the following instruments: (using slip gauges)
   i. Calibration of Micrometer. ii. Calibration of Mechanical Comparator.
   ii. Calibration of Vernier Caliper. iv. Calibration of Dial Gauge.

2. Measurement of taper angle using
   i. Bevel Protractor ii. Dial Gauge iii. Sine-Bar iv. Auto-Collimator.

3. Alignment tests:
   ii. Parallelism of the spindle ii. Circularity & Concentricity of the spindle
   iii. Trueness of running of the spindle.

4. Gear parameters Measurement
   i. diameter, pitch/module ii. Pitch circle diameter iii. Pressure angle
   ii. Tooth thickness.

5. Check the flatness of a surface plate.
   i. Using spirit level ii. Using Auto-collimator

6. Using light wave interference:
   i. Study of flatness of slip gauges ii. To find the height of a slip gauge.

7. Tool Maker's Microscope:
   i. Establish the thread details ii. To find the cutting tool angles.

8. Miscellaneous:
   i. To find the diameter of a cylindrical piece ii. Taper angle of a V-block
   ii. Central distance of two holes of a specimen.

Employability

MECHATRONICS LAB. EXPERIMENTS - (Any Five)

I. Training on Programmable Logic Controller (any ONE of the Following)
   i) Lift Control Using Ladder Logic Programme
   ii) Traffic Signal Control using Ladder Logic Programme

II. Training on Programmable Logic Controller - Sensor Training Kit
   a) Proximity Switch
   b) Photo Electric Switch
   c) Limit Switch

III. Training on Sensor and Transducer (any ONE of the Following)
   i). Linear position or Force applications
      a. LVDT (Linear variable differential transformer)
      b. The strain gauge Transducer
   ii). Rotational Speed or Position Measurement (The inductive Transducer)
   iii). Linear or Rotational Motion
      a. D.C. Solenoid
      b. D.C. Relay

IV. Training on Automation Studios
   i). Punch Machine operation
   ii). Hydraulic Cylinder operation

V. Training on Material Handling

VI. Training on any Controller Package

VII. Training on Servo Fundamental Trainer.

EMPLOYABILITY

MEC 328 - INDUSTRIAL ENGINEERING LAB

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50

Examination (Practical): 3hrs. Credits: 2

Course objectives:

- To acquaint the student with concepts of industrial engineering related to work study experiments
- To acquaint the student with concepts of industrial engineering related to time study experiments
- To acquaint the student with concepts of industrial engineering related to quality control experiments

Course outcomes:

CO-1	Students will be able to understand the principles of work study.
CO-2	The student will be able to learn the concepts of work study which are commonly used in any Industry
CO-3	The student will be able to learn the concepts of quality control

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	1		3						3		3	
CO-2	1		3						3		3	
CO-3	2		3						3		3	

List of Experiments:

1. To measure the skill and dexterity in the movement of Wrist and Fingers using pin board.
2. To measure the Heart beat using Stethoscope.
3. To show that the sample means from a normal universe follow a normal distribution.
4. To draw the control chart for fraction defective for a given lot of marble balls.
5. To determine the cycle time using PMTS. Employability
6. To draw two handed process charts for
   i. Bolt, Washer and nut assembly
   ii. Assembly of electric tester. Employability
7. To study the changes in heart rate for different subjects using Tread mill.
8. To draw Multiple Activity chart using an electric toaster.
9. To determine the percentage utilization using work sampling. Employability
10. To study the process capability of a given process.
11. To measure the Heart rate during working and recovery periods of the subjects under different loads, using Bicycle ergometer.
12. To draw flow process charts on activities in Workshop/ Laboratory/Office.
13. To determine the time required to perform motion sequence using work factor system.
14. To draw SIMO charts for
    i. Ball point pen assembly
    ii. Electric plug assembly.
15. To conduct time study of the bulb holder assembly operation of the existing method.
16. To collect the anthropometrics data using `Anthropolometer'.

MEC 411 – DESIGN OF MACHINE ELEMENTS - II

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To develop an ability to design a component, or a system, or a process to meet desired needs within realistic constraints.
- To develop an ability to select and design gears for efficient power transmission in different applications.
- To impart the fundamental knowledge involved in analyzing the forces acting on any component of an I.C. Engine and design them for their strength.
- To provide the basic design concepts for design of such components like Clutches, bearings, gears, chain drives and wire ropes used in power transmission.

Course Outcomes:

The Student will be able to:

CO-1	Design the various types of gears based on static and dynamic Loading.
CO-2	Design the various IC engine components like connecting rod, crankshaft etc subjected to combined Stresses.
CO-3	Design various types of Frictional Clutches and brakes used in Automobiles.
CO-4	Design and Analyze the Life of the bearings subjected to static and Dynamic Loads.
CO-5	Design Crane hook, wire ropes and chain drives subjected to various types of loads.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2						1	1
CO2	3	1	3	1	2						1	1
CO3	3	1	3	1	2						1	1
CO4	3	1	3	1	2						1	1
CO5	3	1	3	1	2						1	1

Classification of gears. Standard tooth systems. Spur, Helical, Bevel and Worm gears. Terminology of each. Tooth failure. Face width an beam strength. Lewis equation. Design for dynamic and wear loads. Force analysis of Bevel and Worm gears. Thermal design considerations of worm gears.

Employability

Employability

Employability

Employability

Engine parts: I.C. engine design. Design of cylinders and heads. Design of pistons. Design of cross-head, connecting rods and crank shafts.

Friction clutches. Torque capacity multi-plate clutches. Design considerations. Energy considerations and Temperature rise friction materials. Centrifugal clutches. Brakes. Energy equations. Band and block brakes. Internal expanding shoe brakes, self locking, brake design. Sliding contact bearings. Lubrication modes. Temperature effect on viscosity. Journal bearing design. Bearing modulus. McKee equations. Heating of bearings. Collar and thrust bearings. Roller and ball bearings. Static and dynamic load capacity. Equivalent bearing load. Load-life relationships. Load factor. Selection of bearings from manufacturers catalogue.

Design of crane hooks, Wire rope construction and classification. Stresses in wire ropes. Design for service like lifts and winches. Chain drives, Nomenclature: Brief outline and simple applications of composite materials.

Employability

Employability

Text books:

1. Design of Machine Elements by V.B. Bhandari, TMH publishing Co. Ltd., New Delhi.

References:

1. Machine Design by R.K. Jain, Khanna publications.
2. Mechanical Engineering Design by Joseph E. Shingley.

MEC 412 – HEAT AND MASS TRANSFER

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs Credits : 4

Course Objective:

To demonstrate basic knowledge of heat transfer by understanding different modes of heat transfer, thermal conductivity of materials, composite walls, cylinders and spheres, heat transfer in fins, steady and unsteady heat conduction, applications of non dimensional numbers in free and forced convection, thermal boundary layer, radiation heat transfer, concept of shape factor, parallel & counter flow heat exchangers, basic principles of mass transfer.

Course Outcomes:

CO-1	Students will able to understand the basics of steady and unsteady state heat conduction and its applications.
CO-2	Students will able to understand the basics of free and forced convection and its applications.
CO-3	Students will able to understand the basics of radiation and its applications.
CO-4	Students will able to understand the basics of steady mass transfer and its applications.
CO-5	Students will able to design thermal equipment such as Fins, Heat Exchangers etc.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	3			2	1	1		1	
CO2	1	3	3	3			2	1	1		1	
CO3	1	3	3	3			2	1	1		1	
CO4	1	3	3	3			2	1	1		1	
CO5	1	3	3	3	1		2	1	2		3	

Introduction: Basic modes of heat transfer- Rate equations- Generalized heat conduction equation in Cartesian, Cylindrical and Spherical coordinate systems.
Steady state heat conduction solution for plain and composite slabs, cylinders and spheres- Critical thickness of insulation- Heat conduction through fins of uniform and variable cross section- Fin effectiveness and efficiency.

Employability

Employability

Unsteady steady state heat conduction- Transient heat conduction- Lumped system analysis, and use of Heisler charts.
Convection: Continuity, momentum and energy equations- Dimensional analysis- Boundary layer theory concepts- Free, and Forced convection- Approximate solution of the boundary layer equations- Laminar and turbulent heat transfer correlation- Momentum equation and velocity profiles in turbulent boundary layers- Application of dimensional analysis to free and forced convection problems- Empirical correlation.
Radiation: Black body radiation- radiation field, Kirchoff's laws- shape factor- Stefan Boltzman equation- Heat radiation through absorbing media- Radiant heat exchange, parallel and perpendicular surfaces- Radiation shields. Employability
Heat Exchangers: Types of heat exchangers- Parallel flow- Counter flow- Cross flow heat exchangers- Overall heat transfer coefficient- LMTD and NTU methods- Fouling in heat exchangers- Heat exchangers with phase change. Employability
Boiling: Different regimes of boiling- Nucleate, Transition and Film boiling. Condensation: Laminar film condensation- Nusselt's theory- Condensation on vertical flat plate and horizontal tubes- Dropwise condensation. Employability
Mass Transfer: Conservation laws and constitutive equations- Isothermal equimass, Equimolal diffusion- Fick's law of diffusion- diffusion of gases, Liquids- Mass transfer coefficient.

Text Books:

1. Heat Transfer, by J.P.Holman, Int. Student edition, McGraw Hill book company.
2. Analysis of Heat transfer, by Eckert and Drake, Int.Student edition, McGraw Hill Kogakusha Ltd.

References:

1. Heat and Mass Transfer by R.K. Rajput, S. Chand & Co.
2. Heat and mass transfer by Sachjdeva.
3. Heat and mass transfer by Kothandaramanna, New Age International.

MEC 413 – FLUID MACHINERY AND SYSTEMS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

To make the students to apply the knowledge of mathematics, science, and engineering to Fluid machinery and measure the forces exerted by the jet of water on various vanes. Also to make them understand the principles of hydraulic turbines, pumps and other equipments.

Course Outcomes:

Students will be able

CO-1	To Analyze the forces exerted by the jet on various stationary and moving vanes.
CO-2	To Determine the performance of different propulsion systems.
CO-3	To study and analyze the performance characteristic curves of hydraulic turbines and pumps at different working conditions.
CO-4	To Understand and analyze the performance of various hydraulic systems such as Hydraulic lift, ram etc.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3					1		1	1
CO2	3	2	3	3					1	2	1	
CO3	3	3	3	3		2	2	2	1	2	1	
CO4	3	3	3	3		2	2	2	1	2	1	

Employability

Impact of jet and jet propulsion: Impact of jet on stationary surfaces- Impact of jet on hinged surfaces- A moving curved vane high tangential entry of water- Radial flow over the vanes- Jet propulsion.

Hydraulic Turbines: Classification- Pelton wheel- Reaction turbines- Inward and outward radial flow reaction turbines- Fancis turbine- Axial flow reaction turbine- Kaplan turbine- Draft tube- Types- Theory- and efficiency of draft tube.

Specific Speed: Determination- Significance- Unit quantities- Unit speed- Unit discharge and unit power- Characteristic curves of hydraulic turbines- Constant heat curves- Constant speed curves and Iso-efficiency curves- Governing of turbines.

Employability

Employability

Centrifugal Pumps: Main parts- Efficiency- Minimum speed for starting- Multi-stage centrifugal pumps- Specific speed of a centrifugal pump- Priming of a centrifugal pump- Characteristic curves- Main, Operational and constant efficiency curves- Cavitation- Effects- Cavitation in Hydraulic machines.

Reciprocating Pumps: Main parts- Classification- Velocity and acceleration variation in suction and delivery pipes due to piston acceleration- Effect of variation of velocity on friction in suction and delivery pipes- Effect of acceleration in suction and delivery pipes on indicator diagram- Effect of friction- Maximum speed of reciprocating pump- Air vessels.

Hydraulic Press- Hydraulic accumulator- Differential hydraulic accumulator- Hydraulic intensifier- Hydraulic ram- Hydraulic lift- Hydraulic crane- Fluid coupling- Hydraulic torque converter. Servo systems- Open and closed loop systems- Hydraulic and Pneumatic systems- Fluid power components- Fluidics- Efficiency of a fluidic device- Proportional or analog devices- Vortex diode, Vortex triode, Counting, Fluidic systems- Digital devices.

Employability

Text Book:

1. Fluid Mechanics and Hydraulic Machinery, by R.K.Bansal, Laxmi publications.

Reference:

1. Fluid Flow Machines, by N.S.Govinda Rao, Tata McGraw Hill publishing company Ltd.

MEC 414 – STATISTICAL QUALITY CONTROL

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

- To acquaint the student with the basic knowledge of statistical quality control by understanding quality definitions, Taguchi's loss function Demings philosophy
- To prepare control charts for variables, X,R and Sigma charts, theory of runs, ARL and ATS , Type-I and Type-II errors,
- To prepare control charts for attributes, P-Chart, np-chart,c-chart, u-chart,
- To Design single and sequential sampling plans

Course Outcomes:

CO-1	Students will able to understand Taguchi's, Deming's principles.
CO-2	Students will be able to understand how to use the control charts and their significance
CO-3	Students will be able to understand how to use the sampling plans and their significance

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	1		3	1	2				3		3	
CO-2	1		3	1	2				3		3	
CO-3	1		3	1	2				3		3	

Employability

Introduction to quality, definitions, Taguchi's loss function, examples of off-line and on-line quality control techniques, quality costs, Deming's philosophy, introduction to six sigma concept.

Shewart's normal bowl, control charts for variables, $\bar{X}$, R and sigma control charts, theory of runs, ARL and ATS, Type-I and Type-II errors

Control charts for attributes, p-chart, standardized p –chart, np-chart, c-chart, u-chart, demerit control chart.

Employability

Process capability analysis: using frequency distribution and control charts. Process capability ratios, C_p and C_{pk} Process capability ratios for nominal the batter type, smaller the better type and larger the better type product specifications.

Sampling palns: single, double, multiple and sequential sampling plans, rectifying inspection, AOQ, AOQL, and ATI. Use of Dodge Romig Tables, Design of single and sequential sampling plans.

Employability

Text Books:

1. Introduction to statistical quality control by E.L. Grant
2. Introduction to statistical quality control by D.C. Montgomery

I YEAR – II SEMESTER

ELECTIVE-III C
COMPUTATIONAL FLUID DYNAMICS

Course Code: MECMD125

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To introduce students to the governing equations of Fluid dynamics and the application of finite difference method for solving partial differential equations.
- The objective is also to equip them to solve incompressible viscous flows, compressible flows, steady state, transient, two dimensional and three dimensional problems.

COURSE OUTCOMES:

The students will be able to:

CO1	Understand the basic concept of fluid dynamics, solution methods & apply it to real time problems to develop mathematical model.
CO2	Solve problems related to Incompressible viscous flows, compressible flows, steady state and transient analysis.
CO3	Apply finite volume method to solve two and three-dimensional problems.

. **SYLLABUS**

UNIT-I:

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions. Derivation of finite difference equations.

Employability

Solution methods: Solution methods of elliptical equations - finite difference formulations, interactive solution methods, direct method with Gaussian elimination.Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

UNIT-II:

Employability

Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations.Burgers equations: Explicit and implicit schemes, Runge-Kutta method.

UNIT-III:

Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Employability

Treatment of compressible flows: potential equation, Eluer equations, Navier-stokes system of equations, flowfield-dependent variation methods, boundary conditions, example problems.

UNIT-IV:

Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

Employability

UNIT-V:

Employability

Standard variational methods - 1: Linear fluid flow problems, steady state problems,

Standard variational methods - 2: Transient problems.

Employability

REFERENCE BOOKS:

1. Computational fluid dynamics, T. J.Chung, Cambridge University press, 2002.
2. Text book of fluid dynamics, Frank Chorlton, CBS Publishers & distributors, 1985.
3. D.A. Hoffmann & S.T. Chiang, “Computational Fluid Dynamics”, Volume-I, II&III, A publication of Engineering Education SystemTM, Wichita, Kansas, USA.

ELECTIVE II
EEE 423 Non- Conventional Energy sources

Instruction	:	4 periods per week
University Examination	:	3 hours
University Examination Marks	:	70
Sessional Marks	:	30

Introduction to energy sources: Conventional, non –Conventional renewable energy sources advantages prospects

Solar energy: Basic principles components of wind energy conversion system (wecs) classification of wecs, applications.

Employability & Enterpreneurship

Bio-energy: Introduction, biomass-energy conversion wet & dry processes, classification of biogas plants, constructional details of few main digesters, biogas form wastes, applications.

Employability & Enterpreneurship

Geo-thermal energy: Introduction, sources, prime movers, for Geo-thermal energy, applications.

Employability & Enterpreneurship

Energy from the oceans: Introduction, ocean –thermal electrical conversion (otec) open and closed cycles. Tidal energy principles, single and double basin arrangements, wave energy conversion devices.

Fuel Cells: Introduction, classification, types, conversion efficiency, applications.

Employability & Enterpreneurship

Text Books:

1. Non-Conventional Energy sources, by G.D. Rai, Khanna pub.

References Books:

Energy technology Non- Conventional, Renewable & Convectional By S. Rao Khanna pub.

Future sources of electrical power by M.P. Agarwal First ed. S. Chand & Co, 1999.

MEC 415 - ELECTIVE - III

MEC 415(C) – Computer Numerical Control and Computer Aided Manufacturing

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

1. To provide an introduction to the basic principles of computer integrated manufacturing and functioning of its components.
2. To strengthen the student's knowledge in the application of computerized numerically controlled machines in the areas of automobile components manufacturing, dies and moulds and other precision component manufacturing.
3. To make students understand features of different computer aided quality inspection methodologies and flexible manufacturing systems.
4. To impart basic concepts related to manual part programming through the use of loop statements in "C"-Language programming.
5. To expose students to execute simulations in cam software prior to machining in computerized numerically controlled machines.

Course Outcomes:

CO-1	Students will have clear idea about the principles of computer aided manufacturing and its functioning.
CO-2	Students can explain the significance of various methodologies that can be adopted in process planning and quality control.
CO-3	Students will have the ability to explain the operational features of group technology and components of flexible manufacturing and tool management systems.
CO-4	Students will be able to reach latest advancements in precision manufacturing by building upon the fundamentals learnt in this course.
CO-5	Students will learn the principles related to manual part programming and computer aided part programming for controlling various computerized numerically controlled machines.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	-	2	1	3	-	1	1	1	3	2	3
CO-2	2	3	3	3	1	-	-	2	2	3	3	3
CO-3	3	2	1	1	2	-	-	1	2	3	2	2
CO-4	3	-	1	2	3	-	-	2	3	2	3	3
CO-5	-	-	1	3	3	-	-	1	3	3	3	3

Introduction to CNC and CAM, CNC retrofitting, Adoptive control machining, NC part program preparation through computer languages. Group technology: Merits & demerits, Organisation, Classification and Coding systems, Facilities layout.

Employability

Computer aided process planning: Introduction to process planning, Methods of process planning, Computer aided process planning, CAPP systems, case studies.

Computer aided material handling and production planning: Robots: Structure and operation of Robots, robot sensors and applications. Automatic conveyor systems. Automated guided vehicles. Aid of computer in production planning and control, Inventory control and material requirement planning.

Computer aided inspection and quality control: Developments and practice, Quality assurance and quality control. Coordinate measuring machine. Non-contact inspection.

FMS & CIMS: Building blocks of Flexible Manufacturing Systems (FMS), Machining systems of FMS, Tool management systems, Advantages of FMS, Computer integrated manufacturing systems (CIMS).

Employability

Text Books:

1. Computer Aided Manufacturing, by P.N.Rao, N.K.Tewari & T.K.Kundra, Tata McGraw-Hill publishing company Ltd, NewtDelhi.
2. Automation, Production Systems and Computer Integrated Manufacturing, by Mikell P.Groover, Prentice-Hall of India Pvt. Ltd.

Reference:

1. Computer Integrated Design and Manufacturing, by David D.Bedworth, Mark R.Henderson & Philip M.Wolfe, McGraw-Hill Book Company, Singapore.

MEC 415 - ELECTIVE - III
MEC 415(D) – TOTAL QUALITY MANAGEMENT

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs. Credits : 4

Course objectives:

To give a brief theoretical knowledge related to concepts of Quality , concepts of TQM, Quality philosophies, to illustrate TQM process, quality control tools, Quality policy deployment, Designing for Quality.

To demonstrate the steps for Implementation of TQM, focusing on KAIZEN,5S,JIT,Taguchi methods, by giving case studies from the Industry.

Course outcomes:

CO-1	Students will be able to understand the various Quality concepts, the role of the Top Management, for the successful implementation of TQM
CO-2	Students will be able to understand the various TQM concepts
CO-3	Students will be able to understand the various Quality systems like ISO 9000 systems
CO-4	Students will be able to understand the various Quality concepts like KAIZEN
CO-5	Students will be able to understand the various Quality concepts like Taguchi methods

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	1		3	1	1				3		3	
CO-2	1		3	1	2				3		3	
CO-3	1		3	2	2				3		3	
CO-4	1		3	1	1				3		3	
CO-5	1		3	1	1				3		3	

Concepts of TQM: Philosophy of TQM, Customer focus, Organization, Top management commitment, Team work, Quality philosophies of Deming, Crossby and Muller.
TQM process: QC tools, Problem solving methodologies, New management tools, Work habits, Quality circles, Bench marking, Strategic quality planning.
TQM systems: Quality policy deployment, Quality function deployment, Standardization, Designing for quality, Manufacturing for quality.
Quality system: Need for ISO 9000 system, Advantages, Clauses of ISO 9000, Implementation of ISO 9000, Quality costs, Quality auditing, Case studies.

Enterprenuership skills

Enterprenuership skills

Implementation of TQM: Steps, KAIZEN, 5S, JIT, POKAYOKE, Taguchi methods, Case studies.

Enterprenuership skills

References:

1. Total Quality Management by Rose, J.E., Kogan Page Ltd., 1993.
2. The Essence of Total Quality Management by John Bank, PHI, 1993.
3. Beyond Total Quality Management by Greg Bounds, Lyle Yorks et al, McGraw Hill, 1994.
4. The Asian Productivity Organization by Takashi Osada, 1991.
5. KAIZEN by Masaki Imami, McGraw Hill, 1986.

MEC 415 - ELECTIVE - III
MEC 415(E) – OPTIMIZATION OF DESIGN

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs. Credits : 4

Course Objective:

To objective of the course is to familiarizing the students with optimization in design principles such as classical optimization techniques, nonlinear programming, dynamic programming, integer programming, and geometric programming to solve engineering problems.

Course Outcome:

CO-1	The Students will be able to model, solve and analyze problems using the concepts of non linear programming
CO-2	The Students will be able to model, solve and analyze problems using the concepts of dynamic programming
C0-3	The Students will be able to model, solve and analyze problems using the concepts of geometric programming
CO-4	The Students will be able to model, solve and analyze problems using the concepts of integer programming

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	1		3		3			3	3		3	
CO-2	2		3		2			3	3		3	
CO-3	1		2		3			2	1		3	
CO-4	1		1		3			1	2		1	

Employability

Introduction to Optimization: Engineering applications of optimization- Statement of an optimization problem- Classification of optimization problem- Optimization techniques.
Classical Optimization Techniques: Single variable optimization- Multivariable optimization with equality constraints- Multivariable optimization with inequality constraints.
Nonlinear Programming: One-Dimensional Minimization: Unimodal function- Elimination methods- Unrestricted search- Exhaustive search- Dichotomous search- Fibonacci method- Golden section method- Interpolation
methods- Quadratic interpolation method- Cubic interpolation method- direct root method.
Nonlinear Programming: Unconstrained Optimization Techniques: Direct search methods- Random search methods- Univariate method- Pattern search method- Rosenbrock's method of rotating coordinates- The simplex method- Descent methods- Gradient of function- Steepest

Employability

descent method- Conjugate gradient method (Fletcher-Reeves method)- Quasi-Newton methods- Variable metric method (Davidon- Fletcher-Powell method).

Nonlinear Programming: Constrained Optimization Techniques: Characteristics of a constrained problem- Direct method- The complex method- Cutting plane method- Methods of feasible directions- Indirect methods- Transformation techniques- Basic approach in the penalty function method- Interior penalty function method- Convex programming problem- Exterior penalty function method.

Geometric programming (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. Primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P). Complimentary geometric programming(C.G.P)

Employability

Dynamic programming(D.P): Multistage decision processes. Concepts of sub optimisation, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P., Continuous D.P.

Employability

Integer programming(I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Integer non linear programming.

Employability

Text Book:

1. Optimization Theory and Applications, by S.S.Rao, Wiley Eastern Limited, New Delhi.

References:

1. Optimization of Design of Machine Elements, by R.C.Johnson.
2. Computer Aided Analysis and Design of Machine Elements, by Rao V.Dukkipati, M.Ananda Rao and R.B.Bhat.
3. Engineering optimization methods and applications, by G.V.Reklaits, A.Ravindarn and K.M.Ragsdell, by Publications John Wiley and Sons.

MEC 415 - ELECTIVE - III
MEC 415(F) – ENGINEERING TRIBOLOGY

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course objectives:

- To provide broad based understanding of the interdisciplinary subject 'Tribology' and its technological significance.
- To make students learn the principles for selecting compatible materials for minimizing friction and wear in machinery.
- To make students understand the fundamental principles of lubrication for reduction of friction and Wear.
- To give students understanding of the principles of bearing selection and bearing arrangement in machines.
- To teach students the computations required for selecting and designing bearings in machines.

Course outcomes:

The students will be able to:

CO-1	Apply the basic theories of friction, wear and lubrication to predictions about the frictional behaviour of commonly encountered sliding interfaces.
CO-2	Characterize features of rough surface and liquid lubricants as they pertain to interface sliding.
CO-3	Interpret the latest research on new topics in Tribology including its application to nano scale devices and biological systems.
CO-4	Relate the composition of lubricant film and its properties and operational conditions such as load, temperature and speed to make correct designs for the applications in the industry
CO-5	Calculate and measure properties of contacting surfaces such as roughness, friction coefficient and adhesive strength.
CO-6	Understand the tribological applications of metals, polymers, ceramics and bio materials.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	1	2	1	1		2		1	2		1
CO-2		1	2	3	3	2	1		2	1	1	1
CO-3	1	2	3	3	1	3	1	1		1	2	
CO-4	3	2	1	2	1	2		1		1	1	
CO-5	1	2		2	2	2	2		2	1	2	

Introduction: history, industrial significance, different types of bearings, Employability Employability

Properties and testing of lubricants: viscosity, viscometry, effect of temperature and pressure on viscosity, physical properties of mineral oils, generalized Reynolds's equation

Engineering surfaces – properties and measurements: different measuring methods, statistical description, fractal description

Surface contact: Non –confirming Surface contact geometry, stresses in Non –confirming Surface, contact of surface roughness, numerical surface contact models

Adhesion, Friction, Wear: adhesion models, factors influencing adhesion, stiction, various types of frictions, laws of wear, types of wear, minor forms of wear, methods for reduction of wear and friction and ferrography, surface engineering

Boundary lubrication: Liquid lubrication, fluid film lubrication, liquid and solid lubricants, properties of lubricants, typical lubricant tests, additives, Fluid film lubrication

Bearings: hydrodynamic thrust bearings, hydrodynamic journal bearings, hydrodynamic squeeze film bearings, hydrostatic bearings, gas lubricated bearings and rolling element bearings and antifriction bearing, Nano tribology

Employability Employability Employability

Text books:

1. Introduction to triobology of bearings, B.C. Majumdar, a.h. wheelers and co
2. Engineering triobology, Prasanta Sahu, Prentice - Hall of India, 2005
3. Fundamentals of Tribology, S.K.Basu, s.N. Sengupta and B.B.Ahuja, Prentice - Hall of India, 2005

2015-16/288, 2016-17/290,2017-18/285.

ELECTIVE-1

EEE411-2 OPERATIONS RESEARCH

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**

CREDITS : 4

INTRODUCTION TO OPTIMIZATION: ENGINEERING APPLICATIONS OF OPTIMIZATION, STATEMENT OF PROBLEM, CLASSIFICATION OF OPTIMIZATION PROBLEM TECHNIQUES.

LINEAR PROGRAMMING : INTRODUCTION, REQUIREMENTS FOR A LP PROBLEM, EXAMPLES ON THE APPLICATION OF LP, GRAPHICAL SOLUTION OF 2-VARIABLE LP PROBLEMS, SOME EXCEPTIONAL CASES, GENERAL MATHEMATICAL FORMULATION FOR LPP, CANONICAL AND STANDARD FORMS OF LP PROBLEM, SIMPLEX METHOD, EXAMPLES ON THE APPLICATION OF SIMPLEX TECHNIQUES.

Employability

ARTIFICIAL VARIABLE TECHNIQUE: BIG-M METHOD AND TWO PHASE TECHNIQUES.

TRANSPORTATION PROBLEM: MATRIX TERMINOLOGY, DEFINITION AND MATHEMATICAL REPRESENTATION OF TRANSPORTATION MODEL, FORMULATION AND SOLUTION OF TRANSPORTATION MODELS (BASIC FEASIBLE SOLUTION BY NORTH-WEST CORNER METHOD, INSPECTION METHOD. VOGELL'S APPROXIMATION METHOD)

Employability

ASSIGNMENT PROBLEM: MATRIX TERMINOLOGY, DEFINITION OF ASSIGNMENT MODEL, COMPARISON WITH TRASPORTATION MODEL, MATHEMATICAL REPRESENTATION OF ASSIGNMENT MODEL, FORMULATION AND SOLUTION OF ASSIGNMENT MODELS.

Employability

PERT NETWORK: INTRODUCTION, PHASES OF PROJECT SCHEDULING, NETWORK LOGIC, NUMBERING THE EVENTS (FULKERSON'S RULE), MEASURE OF ACTIVITY

Employability

PERT NETWORK COMPUTATIONS: FORWARD PASS AND BACKWARD PASS COMPUTATIONS, SLACK CRITICAL PATH, PROBABILITY OF MEETING THE SCHEDULED DATES.

Employability

INVENTORY MODELS: INTRODUCTION, NECESSITY FOR MAINTAINING INVENTORY, CLASSIFICATION OF INVENTORY MODELS, INVENTORY MODELS WITH DETERMINISTIC DEMAND, DEMAND RATE UNIFORM-PRODUCTION RATE INFINITE, DEMAND RATE NON-UNIFORM PRODUCTION RATE FINITE, DEMAND RATE UNIFORM-PRODUCTION RATE FINITE.

Employability

GAME THEORY: USEFUL TERMINOLOGY, RULES FOR GAME THEORY, SADDLE POINT, PURE STRATEGY, REDUCE GAME BY DOMINANCE, MIXED STRATEGIES, 2X2 GAMES WITHOUT SADDLE POINT.

Employability

TEXT BOOKS:

1. "OPERATIONS RESEARCH-AN INTRODUCTION' BY H.TAHA, PRENTICE HALL OF INDIA Pvt. Ltd.
2. "ENGINEERING OPTIMIZATION-THEORY & PRACTICE" BY S.S. RAO, NEW AGE INTERNATIONAL (P) Ltd.
3. "OPERATIONS RESEARCH – AN INTRODUCTION" BY P.K.GUPTA & D.S.HIRA, S.Chnd & Co. Ltd.

MEC 417 - HEAT AND MASS TRANSFER LAB

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50

Examination (Practical): 3hrs. Credits: 2

Course Objective:

To demonstrate basic knowledge of heat transfer by understanding different modes of heat transfer, thermal conductivity of materials, composite walls, cylinders and spheres, heat transfer in fins, steady and unsteady heat conduction, principles of radiation heat transfer.

Course Outcomes:

CO-1	Students will able to understand the basics of steady and unsteady state heat transfer and its applications.
CO-2	Students will able to understand how to calculate thermal conductivity for different materials for different heat input.
CO-3	Students will acquire knowledge about free and forced convection.
CO-4	Students will analyze the variation of temperature at different mediums.

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3		2		1	2		2	
CO2	2	2	3	3		2		1	2		2	
CO3	2	2	3	3		2		1	2		2	
CO4	2	2	3	3		2		1	2		2	
CO5												

List of Experiments:

1. Study of conduction phenomena in the composite slab system.
2. Determination of emmissivity, time constant, Fouries Biot module and study of variation of temperature with respect to time on a circular disc.
3. Study of heat transfer by forced convection through a horizontal test section.
4. Study of heat transfer by forced convection through a vertical test section.
5. Determination of free convective heat transfer coefficient from a horizontal cylinder in air.
6. Determination of thermal conductivity of brass employing it as a fin.
7. Tests on natural convection and pool boiling.
8. Study of forced convection with turbulence promoters.
9. Study of condensation on fin.
10. Tests on film condensation.
11. Determination of COP of a vapour compression refrigeration system.
12. Study of vapour compression air conditioning system.

Skill Development

MEC 418 – FLUID MECHANICS AND MACHINERY LAB

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50

Examination (Practical): 3hrs. Credits: 2

Course Objectives:

- To demonstrate the students to measure the flow rate by using various instruments like venturi meter, orifice meter and Notches etc.
- To make students to determine the performance characteristics curves of turbines and pumps.

Course Outcomes:

Students will be able to:

CO-1	Measure the flow rate and efficiencies of turbines and pumps at various working conditions.
CO-2	Understand the experiments and draw the various performance characteristic curves of hydraulic machines.
CO-3	Analyze and design fluid systems.
CO-4	Safely execute experiments, analyze and interpret results and errors, and formulate conclusions

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	3				2	2		2	1
CO2	3	3	3	2		1		1	1		1	
CO3	3	3	3	3		1	2	1	1	1	1	
CO4				3				3	2	3	1	

.

List of Experiments:

Skill Development

1. Calibration of flow meters,
   a. Venturi meter
   b. Orifice meter
   c. Nozzle meter
2. Determination of coefficient of discharge for
   a. small orifice
   b. cylindrical mouth piece
3. Finding coefficient of discharge for
   a. rectangular notch
   b. triangular notch

   c. trapezoidal notch
4. To draw the performance characteristics of C.F. pump.
5. To find the specific speed of
   a. Pelton turbine
   b. Francis turbine
6. To draw the characteristic curves for reciprocating pump.
7. To draw the pressure distribution and finding coefficient of drag for
   a. a bluff body
   b. an Aero foil
8. To draw the characteristic curves for the hydraulic ram.

Skill Development

MEC 421 – INSTRUMENTATION AND CONTROL SYSTEMS

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70
Examination (Theory): 3hrs. Credits : 4

Instrumentations: Concepts of measurements, static performance, characteristics accuracy of measurement and its analysis. Instrumentation, for measurement: Force, torque, strain. pressure, flow, temperature and vibration.

skill development

Optical Methods of Measurement: Introduction, Laser beam as a light pointer, length/displacement measurement, temperature sensors, seismographic measurement.

Introduction to fiber optics, fiber types, properties of optical fibres and a fibre optic sensor configuration.

skill development

Introduction: Control systems, Feedback and its effects. Transfer Function, Block Diagram and Signal Flow Graph: Impulse response and Transfer functions of linear systems, Block diagrams.

Mathematical Modeling of Physical Systems: Equations of electrical networks, Modeling of mechanical system elements, Equations of mechanical systems. State-variable Analysis of Linear Dynamic Systems: Matrix representation of state equations, State transition matrix, State transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions, Characteristic equation, eigen values and eigen vectors.

Time-Domain Analysis of Control Systems: Typical test signals for the time response of control systems, Time- domain performance of control systems- The steady- state error, Time-domain performance of control systems- Stability of control systems- stability, Characteristic equation and the state transition matrix, Methods of determining stability of linear control systems, Routh- Hurwitz criterion.

Frequency-domain Analysis of Control Systems: Introduction, Nyquist stability criterion, Application of the Nyquist criterion, Stability of multi loop systems, Stability of linear control systems with time delays.

skill development

Text Books:

1. Automatic Control Systems, by Benjamin C. Kuo.
2. Mechanical Measurements, by R.S.Sirohi, H.G. Radha Krishna, Wiley Eastern, New Delhi.

References:

1. Experimental Methods for Engineers, by J.P.Holman, McGraw-Hill.
2. Instrumentation for Engineering Measurements, by R.H. Cerni and L.E.Foster, J.Wiley & Sons, New York.
3. Mechanical and Industrial Measurement, by R.K.Jain, Khanna publishers, Delhi.
4. Control Systems Engineering by Nagrath/Gopal ,New age international.

MEC 422 – COMPUTER AIDED DESIGN

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week: 5 Th. Ses. : 30 Exam :70

Examination (Theory): 3hrs. Credits : 4

Course Objectives:

1. To enable students in using computers for design, analysis and optimization of machine elements.
2. To introduce synthesis and analysis phases of design using computers.
3. To educate students about various types of input-output devices of computers.
4. To introduce different modeling and analysis techniques to students.
5. To write algorithms for various design problems using CAD.

Course Outcomes:

Student will be able to

CO-1	Students can use 2D entities in drawing Machine Elements.
CO-2	Students can understand the difference between wireframe model, surface model and solid model.
CO-3	Students can implement FEM using CAD.
CO-4	Students can develop algorithms for Design Problems.
CO-5	Students can implement Artificial Intelligence to design problems using CAD.

Mapping of Course Outcomes with Programme Outcomes.

High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	1	-	3	-	-	-	-	2	-	-
CO-2	3	-	3	-	2	-	-	-	-	1	-	-
CO-3	3	2	3	3	3	-	2	-	2	1	-	1
CO-4	2	2	-	-	1	-	-	-	1	-	-	1
CO-5	-	-	-	-	3	-	1	-	-	-	-	-

Skill development/Employability

Skill development/Employability

Fundamentals of CAD - Introduction - The design process - Application of computers for design - Operating systems - Hardware in CAD: The design work station - I/O Devices - CAD system configuration - Creating database for manufacturing - Benefits of CAD.

Interactive Computer Graphics - Graphic display devices- Graphics system- Graphics standards - Graphical user interface- Transformation systems- windowing - clipping - 2D and 3D transformations - Linear transformation- Display files for 3D data - Geometric Modeling - Modeling Techniques - Wire frame Modeling - Surface Modeling - 3 D Solid Modeling.

Introduction to Finite Element Analysis - CAD techniques to finite element data preparation-Automatic mesh generation- presentation of results - 3-dimensional shape description and mesh generation- CAD applications of FEM.

CAD applications and exposure to CAD packages: Simple examples of computer aided drafting, design and analysis - Introduction to simple machine elements - Analysis of cross sectional area, centroid & moment of inertia- Kinematics of crank- slider mechanism and

Skill development/Employability

other simple design applications. Introduction to CAD packages like ANSYS, NASTRON, NISA-II.

Introduction to Artificial Intelligence Introduction to Artificial Intelligence - Applications of AI in design and CAD.

Skill development/Employability

Text Books:

1. CAD/CAM- Computer Aided Design & Manufacturing, by M.D.Groover & E.W.Zimmer.
2. Computer Aided Design and Manufacturing, by Dr.Sadhu Singh, Khanna Publishers.

References:

1. Computer Aided Design in Mechanical Engineering, by V.Rama Murthy.
2. Elements of Computer Aided Design & Manufacturing, by Y.C.Pao.
3. Computer Aided Kinetics for Machine Design, by D.L.Ryan.
4. Computer Aided Design and Manufacturing, by C.B.Besant & C.W.K.Lui.
5. Computer-Aided Analysis & Design by S. Ghosal, Prentice Hall of India.
6. CAD/CAM/CIM by Radhakrishna, New age international.

MEC 424 - PROJECT

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 6 Pr. | Ses. : 50 Exam : 50
Credits: 8

Project topic to be decided by the guide/department.

Course Objectives:

To impart students:

Creative/Innovative thinking considering societal issues.
An ability to apply their theoretical knowledge in practical situation.
An ability to work in a team.
An ability to communicate effectively.

Course Outcomes:

The students will be able to develop:

CO_1	An ability to apply knowledge of mathematics, science, and engineering to design and conduct experiments, as well as to analyze and interpret data.
CO-2	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
CO-3	An ability to function on multi-disciplinary teams and engage themselves in life-long learning to be abreast with technological changes.
CO-4	An ability to identify, formulate, and solve engineering problems using latest technological and software tools and also to communicate effectively with the engineering community and society at large.

Mapping of course outcomes with program outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			3								
CO2			3			3	3	3				
CO3									3		3	3
CO4		3			3					3		

MEC 425 - COMPUTER AIDED DESIGN LAB

(Effective from the batch admitted during 2006-2007- Credit System)

Periods/week : 3 Pr. Ses. : 50 Exam : 50
Examination (Practical): 3hrs. Credits: 2

Course Objectives:

- To train students in such way that they can prepare Part model, Assembly of parts and obtaining the final production drawing from the assembly.
- To explain basics concepts of 2D drafting using Auto CAD.
- 3D modeling techniques are explained using solid works.
- Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings,
- To explain the Finite Element Analysis using ANSYS.
- To explain FMS using CNC lathe and 6-Axis Robo, and to give them knowledge of CNC programming for various operations on CNC lathe. 6-Axis Robo is used for material handling.

Course Outcomes:

Student will be able to

CO-1	Experiments in the CAD lab will give better knowledge in 2D drafting.
CO-2	Students can prepare 3D Models, Assemblies and Drawings.
CO-3	Students can solve Analysis problems.
CO-4	Students can do the real time industrial projects in the lab using the available softwares.
CO-5	Students will become industry ready.

Mapping of Course Outcomes with Programme Outcomes.
High-3, Medium-2, Low-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	1	-	1	-	-	-	-	-	-	-
CO-2	3	-	3	-	3	-	-	-	-	1	-	-
CO-3	3	2	3	3	3	-	2	-	-	1	-	1
CO-4	2	2	2	1	3	-	1	-	1	-	-	1
CO-5	-	-	3	-	2	-	1	1	2	1	1	-

Skill development/ Emploayability

CAD experiments:

1. Initiating the graphics package; Setting the paper size, space; setting the limits, units; use of snap and grid commands.
2. Drawing of primitives (line, arc, circle, ellipse, triangle etc.)
3. Drawing a flange.
4. Drawing a Bushing assembly.

5. Dimensioning the drawing and adding text.
6. Setting the layers and application of the layers.
7. Isometric and orthographic projections.
8. Viewing in Three dimensions.
9. Removal of hidden lines - Shading and rendering.

Skill development/ Emploayability

CAM experiments:

1. Preparation of manual part programming for CNC turning/Milling.
2. Part programming preparation through AutoCAD.
3. APT part programming for 2D - contour.
4. Machining of one job on CNC machine tool.
5. Robot programming through Teaching Box method.
6. Robot programming through computer.

2015-16/425, 2016-17/429, 2017-18/418,2018-19/441,2019-20/439

SYLLABUS FOR M. TECH. (CONTROL SYSTEMS ENGINEERING)

SEMESTER – I

ECS 111: SYSTEMS & CONTROL

Credits : 4
Lectures per week : 4
Univ. Exam. Marks : 60
Sessional Marks : 40
Total Marks : 100

Skill development

UNIT-I:
Transfer functions of linear systems-impulse response of linear systems- -signal flow graphs-reduction techniques for complex block diagrams and signal flow graphs.

UNIT-II:
Mathematical modeling of physical systems-equations of electrical networks-modeling of mechanical systems- equations of mechanical systems.

Skill development

UNIT-III:
Time domain analysis of control systems- time response of first and second order systems with standard input signals-steady state performance of feedback control systems-steady state error constants-effect of derivative and integral control on transient and steady state performance of feedback control systems.

Skill development

UNIT-IV:
Concept of stability and necessary conditions for stability-Routh-Hurwitz criterion, relative stability analysis, the concept and construction of root loci, analysis of control systems with root locus.

Skill development

UNIT-V:
Correlation between time and frequency responses- Polar plots- Bode plots-Log magnitude versus phase plots-all pass and minimum phase systems-Nyquist stability criterion- assessment of relative stability-constant M&N circles.

Employability

Text books:

1. Control systems engineering by I.J. Nagrath & M.Gopal, wiley eastern limited.
2. Automatic control systems by Benjamin C. Kuo, prentice hall of India.

Reference book:

1. Modern control engineering by Ogata, prentice hall of India.

2015-16/426, 2016-17/430, 2017-18/419,2018-19/442,2019-20/440

ECS 112: ENGINEERING OPTIMIZATION

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

UNIT-I:

Introduction to Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Statement of Optimization Problem.

UNIT-II:

Classical Optimization Techniques: Introduction, Single variable optimization, Multivariable optimization with no constraints; Multivariable optimization with Equality constraints – Solution by Direct Substitution method, Method of constrained variation, Method of Lagrangian multipliers; Multivariable optimization with inequality constraints: Kuhn-Tucker conditions.

Employability

UNIT-III:

Linear Programming: Introduction, Applications of Linear Programming, Standard Form of a Linear Programming, Basic Terminology and Definitions, Exceptional cases, Simplex method, Big-M method, Two- phase method, Revised Simplex method, Duality, Decomposition Principle.

UNIT-IV:

Non-Linear Programming-I: Unconstrained optimization-Univariate method, Pattern Directions, Hook and Jeeves Method, Powell's method, Gradient of a function, Steepest descent method, Conjugate Gradient Method, Newton's method, Marquardt Method, Quai-Newton Methods, Davidon-Fletcher-Powell Method, Broyden-Fletcher-Goldfarb-Shanno Method.

Employability

UNIT-V:

Non-Linear Programming-II: Constrained optimization- Characteristics of a Constrained Problem, Sequential linear programming, Basic approach in the methods of feasible directions, Zoutendijk's method of feasible directions, Sequential Quadratic Programming.

Employability

TEXT BOOK:

1. Engineering Optimization: Theory and Applications' By S.S.Rao, New Age International Publishers, Revised Third Edition,2005.

2015-16/427, 2016-17/431, 2017-18/420,2018-19/443,2019-20/441

ECS 113: ADVANCED DRIVES & CONTROL

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

UNIT-I:
DC Drives: Introduction to four-quadrant operation, motor rating, motor mechanism dynamics, 1-ph fully controlled converter and chopper fed separately excited dc motor, effect of armature current waveform, torque pulsations. Dual converter fed separately excited dc motor.

UNIT-II:
Machine Modeling: Fundamentals of machine modelling. Modelling of separately excited dc motor. Park's transformation. Dynamic dq modelling of 3-ph induction motor and 3-ph synchronous motor.

Employability

UNIT-III:
Induction Motor Control: Scalar control techniques of 3–ph induction motor: Variable Voltage, Variable frequency, Variable voltage and variable frequency with constant v/f ratio, Rotor resistance control. Slip power recovery schemes. Comparison between VSI and CSI. (Using Power Electronic Converters).

Skill development

UNIT-IV:
Vector Control & DTC of Induction Motor: Direct and Indirect vector control, sensor less vector control, direct torque and flux control

Employability

UNIT-V:
Synchronous Motor Drives: Permanent magnet materials and their properties,
Synchronous reluctance, sinusoidal and trapezoidal back emf permanent magnet motors, wound field machine drives, switched reluctance motor drives.

Text Books:
1. B. K. Bose, "Modern Power Electronics and AC drives", Pearson Education, Asia, 2003.
2. G. K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing house.
3. Power Electronics: converters, applications and design Ned Mohan 2nd edition john wiley sons Inc Nov 2002.
4. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", PH, 1998.

Reference Books:
1. V. Subrahmanyam, "Electric Drives-Concepts and Applications", TMH.
2. G. K. Dubey, "Power Semiconductor controlled drives", PH 1989.
3. P. Vas, "Sensor less vector and direct torque control", Oxford Press, 1998.
4. W. Leonard, "Control of Electric Drives", Springer Verlag, 1985.
5. M. H. Rashid, "Power Electronics", Third Edition, PHI.
6. Generalized Theory of Electrical Machines By Dr.P.S. Bhimbra, Khanna Publications.

2015-16/428, 2016-17/432, 2017-18/422,2018-19/444,2019-20/442

ECS 114: CONTROL SYSTEM COMPONENTS:

Credits	**: 4**
Lectures per week	**: 4**
Theory, Univ. Exam. Marks	**: 60**
Sessional Marks	**: 40**
Total Marks	**: 100**

UNIT-I:
Gyroscopes and Potentiometers: Working of gyroscopes, types of gyroscopes and their generalized mathematical model, applications of horizontal and vertical gyroscopes . Types of potentiometers, applications of potentiometers and selection of potentiometers.

UNIT-II:
Tachometers and Synchros: Construction details, e.m.f equation of tachometers, types of tachometers, characteristics of tachometers, tachometer applications. Constructional details and working of Synchros, Principles of Resolvers and Decoders,

Skill development

UNIT-III:
Stepper Motors and Servomotors: Working principle of Stepper motor, types – permanent magnet stepper motor, reluctance type stepper motor, hybrid stepper motor, Applications of stepper motor. Servomotors types, DC servomotors, AC servomotors – transfer functions, speed control methods (armature controlled & field controlled).

Skill development

UNIT-IV:
Magnetic Amplifiers and Servo Amplifiers: construction, types of magnetic amplifiers – series, parallel and self saturated magnetic amplifiers, Characteristics of magnetic amplifiers, features of servo amplifiers, DC and AC servo amplifiers.

Skill development

UNIT-V:
MEMS and Accelerometers: Introduction to MEMS, definitions, classification and applications. Introduction to the Accelerometer and types of accelerometers.

Skill development

TEXT BOOK:

1. Gibson T.E. and Tetuer F.B, "Control System Components", McGraw Hill, New York 1993.

REFERENCE BOOKS:

1. Greenwood, "Mechanical details of product design", McGraw Hill, New York, 1990.
2. Nadim Maluf and Kirt Williams "An Introduction to Micro electro mechanical Systems Engineering" Second edition

2015-16/429, 2016-17/433, 2017-18/421,2018-19/445,2019-20/443

ECS 115: DIGITAL CONTROL SYSTEMS

Credits : 4
Lectures per week : 4
Univ. Exam. Marks : 60
Sessional Marks : 40
Total Marks : 100

UNIT-I:

Discrete –Time Systems: Why Digital Control?, The Structure of a Digital Control System, Analog Systems with Piecewise Constant Inputs, Difference Equations, the Z-Transform, Computer-Aided Design, Z-Transform Solution of Difference Equation, The Time Response of a Discrete-Time System, The Modified Z-Transform, Frequency Response of Discrete-Time Systems, The Sampling Theorem, Resources, Problems.

UNIT-II:

Modeling of Digital Control Systems: ADC Model, DAC Model, Transfer Function of the ZOH, Effect of Sampler on Transfer Function of a Cascade, Transfer Function for the DAC, Analog Subsystem, ADC Combination, Systems with Transport Lag, the Closed-Loop Transfer Function, Analog Disturbances in a Digital System, Steady-State Error and Error Constants.

Skill development

UNIT-III:

Stability of Digital Control Systems: Definitions of Stability, Stable Z-Domain Pole Locations, Stability Conditions, Stability Determination, Jury Test, Nyquist Criterion, Resources, Problems, Computer Exercises.

Skill development

UNIT-IV:

State Space Representation: Discrete-Time State Space Equations, Solution of Discrete-Time State Space Equations, Z-Transfer from State Space Equations, Similarity Transformation, Resources, Problems, Computer Exercises. Stability of State Space Realizations, Controllability and Stabilizability, Observability and Detectability.

UNIT-V:

State Feedback Control: On State and Output Feedback, Pole Placement, Servo Problem, Invariance of System Zeros, State Estimation, Observer State Feedback, Pole Assignment Using Transfer Functions, Resources, Problems, Computer Exercises.

Skill development

Text Books:

1. Digital Control Engineering: Analysis and Design, By M. Sami Fadali, Antonio Visioli, Academic Press; 1 edition (February 16, 2009)

2015-16/430, 2016-17/434, 2017-18/422,2018-19/446,2019-20/444

ECS 116 (a): LARGE SCALE SY STEMS (ELECTIVE-I)

Credits : 4
Lectures per week : 4
Univ. Exam. Marks : 60
Sessional Marks : 40
Total Marks : 100

UNIT-I:
L.S.S. Modelling: Time Domain: Introduction, Aggregation methods, exact and model aggregation by continued fraction, chained aggregation descriptive variables approach, descriptive variable systems, solvability and conditionality, time invariance, shuffle algorithm.

Skill development

UNIT-II:
L.S.S. Modelling - Frequency Domain: Introduction, Moment matching, Pade approximation, Routh approximation, continued fraction method, error minimization methods, mixed methods and unstable systems.

Skill development

UNIT-III:
L.S.S. Modelling - Frequency Domain: Pade model method, Pade-Routh method, multi input and multi output systems, reduction, matrix continued fraction method, Model continued fraction method, Pade model method, frequency comparison method.

Skill development

UNIT-IV:
Time Scales: Introduction, problem statement and preliminaries, numerical algorithm, basic properties, relation to model aggregation, feedback control design, singularly perturbed linear systems.

Skill development

UNIT-V:
Singular Perturbations: Fast and slow sub systems, eigen value distribution, approximation to time scale approach, system properties, design of optimal controllers, fast and slow controllers, lower order controls.

Skill development

TEXT BOOKS:

1. 'Large Scale Systems Modeling and Control', Mohammad Jamshidi,1989, North Hollard (Series in systems science and engineering, vol.9).
2. 'Large Scale Systems Modeling', Magdi S. Mohamoud and Madan G. Singh, Pergamon Press (International series on Systems and Control), 1981.

ECS 116 (b): DIGITAL SIGNAL PROCESSING (ELECTIVE-I)

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

DISCRETE FOURIER TRANSFORM : DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

Skill development

INFINITE IMPULSE RESPONSE DIGITAL FILTERS: Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform - pre warping - Realization using direct, cascade and parallel forms.

FINITE IMPULSE RESPONSE DIGITAL FILTERS: Symmetric and Antisymmetric FIR filters - Linear phase FIR filters - Design using Hamming, Hanning and Blackmann Windows - Frequency sampling method - Realization of FIR filters - Transversal, Linear phase and Polyphase structures.

Skill development

FINITE WORD LENGTH EFFECTS: Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error - Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors - signal scaling

Skill development

MULTIRATE SIGNAL PROCESSING: Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

Skill development

TEXT BOOKS:

1. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007.
3. E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practicalapproach",Second edition, Pearson, 2002.
4. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.
5. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
6. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

ECS 116 (c): Data Structures (ELECTIVE-I)

2015-16/432, 2016-17/436, 2017-18/424,2018-19/448,2019-20/446

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

Course Objectives:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability

Course Outcomes:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc.

UNIT-I: Introduction to Data Structure: Types of Data Structure, Arrays, Strings, Recursion, ADT (Abstract Data type), Concept of Files, Operations with files, types of files.

UNIT-II: Linear Data Structure:
Linked List: Linked List as an ADT, Linked List Vs. Arrays, Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List polynomial, sparse matrix.

Skill development

UNIT-III: STACK: The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation.

Employability

UNIT-IV: Queues: The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & Dequeue, Application of Queues – Johnsons Algorithm, Simulation.

Employability

UNIT-V: Non-linear Data Structure

Trees: Basic trees concept, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to multi way search tree and its creation(AVL, B-tree, B+ tree).

Skill development

Graphs: Basic concepts, Graph Representation, Graph traversal (DFS & BFS)

TEXT BOOKS:

1. Data Structures A Pseudo code Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
2. Data Structures using C, Reema Thareja, Oxford University press.
3. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson.

Reference Books:

1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill.
3. Data Structure Using C, Balagurusamy

2015-16/433, 2016-17/437, 2017-18/425,2018-19/449,2019-20/447- Control systems Lab

2015-16/433, 2016-17/437, 2017-18/425,2018-19/449,2019-20/447

ECS 118: CONTROL SYSTEMS SIMULATION LAB-I
Credits : 2
Duration per week : 3
Univ. Exam. Marks : 50
Sessional Marks : 50
Total Marks : 100

Skill development

List of experiments

1. Compensation network
2. DC motor speed control demonstration unit
3. DC position control system
4. DC servo motor speed torque characteristics
5. Linear System Simulator
6. Magnetic Amplifier
7. Temperature control using P,PI, PD and PID controller
8. PIC Microcontroller Based speed control of BLDC motor
9. Speed Torque characteristics of AC Servo Motor
10. Synchro transmitter and Receiver pair
11. Observe motor Characteristics using Feedback Unit.

SYLLABUS FOR M. TECH. (CONTROL SYSTEMS ENGINEERING)

SEMESTER – II

2015-16/434, 2016-17/438, 2017-18/426,2018-19/450,2019-20/448

ECS 121: ADVANCED CONTROL SYSTEMS

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

UNIT-I:

State variable representation: Introduction-Concept of State-State equation for Dynamic Systems-Time invariance and linearity-No uniqueness of state model-State Diagrams-Physical System and State Assignment.

Skill development

UNIT-II:

Solution of state equation: Existence and uniqueness of solutions to Continuous-time state equations-Solution of Nonlinear and Linear Time Varying State equations- Evaluation of matrix exponential-System modes-Role of Eigenvalues and Eigenvectors.

Skill development

UNIT-III:

Controllability and Observability: Controllability and Observability-Stabilizability and Detectability-Test for Continuous time Systems- Time varying and Time invariant case-Output Controllability-Reducibility- System Realizations.

Skill development

UNIT-IV:

Stability: Introduction-Equilibrium Points-Stability in the sense of Lyapunov-BIBO Stability-Stability of LTI Systems-Equilibrium Stability of Nonlinear Continuous Time Autonomous Systems-The Direct Method of Lyapunov and the Linear Continuous-Time Autonomous Systems-Finding Lyapunov Functions for Nonlinear Continuous Time Autonomous Systems-Krasovskii and Variable-Gradiant Method.

Skill development

UNIT-V:

Modal control: Introduction-Controllable and Observable Companion Forms-SISO and MIMO Systems-The Effect of State Feedback on Controllability and Observability-Pole Placement by State Feedback for both SISO and MIMO Systems-Full Order and Reduced Order Observers.

Skill development

TEXT BOOKS:

1. M. Gopal, “Modern Control System Theory”, New Age International, 2005.
2. K. Ogatta, “Modern Control Engineering”, PHI, 2002.

REFERENCES:

1. John S. Bay, “Fundamentals of Linear State Space Systems”, McGraw-Hill, 1999.
2. D. Roy Choudhury, “Modern Control Systems”, New Age International, 2005.
3. John J. D’Azzo, C. H. Houpis and S. N. Sheldon, “Linear Control System Analysis and Design with MATLAB”, Taylor Francis, 2003.
4. Z. Bubnicki, ”Modern Control Theory”, Springer, 2005.

2015-16/435, 2016-17/439, 2017-18/427,2018-19/451,2019-20/449

ECS 122: NON-LINEAR CONTROLSYSTEMS

Credits : 4
Lectures per week : 4
Univ. Exam. Marks : 60
Sessional Marks : 40
Total Marks : 100

UNIT-I:
Introduction to Non-Linear System: Classification of non-linearity, types of non-linearity in physical system, jump phenomena and critical jump resonance curve, methods of analysis of non-linear systems and comparison, isoclines, singular point, limit cycle.

UNIT-II:
Phase Plane Analysis: Concept of phase plane, phase trajectory, phase portraits, methods of plotting phase plane trajectories Vander Pol's equation, stability from phase portrait, time response from trajectories, isoclines method, Pell's method of phase trajectory, and Delta method of phase trajectory construction.

Skill development

UNIT-III:
Frequency Domain Analysis: Absolute stability, Describing function, DF of typical nonlinearities stability analysis using DF method, stability studies using DF method.

Skill development

UNIT-IV:
Liapunov Stability: Autonomous Systems: Stability of equilibrium point. Concepts of positive definite/semi definite, negative definite/ semi definite, indefinite functions, Lyapunov function, Liapunov Stability: asymptotic stability, global asymptotic stability, instability.

Skill development

UNIT-V:
Linearization: Linear systems, linearization of nonlinear systems about equilibrium point, **f**eedback linearization and input/output linearization.

TEXT BOOK:

1. M.Vidyasagar, 'Nonlinear systems Analysis', 2nd Edition, 1991, prentice-Hall Inc.

REFERENCE BOOK:

1. Control Systems Theory and Application: Samarjit Ghosh, Pearson Education
2. Control System Engineering: Nagrath and Gopal, Wiley Eastern
3. Automatic Control System: George J. Thaler Brown, Jaico Publications
4. Nonlinear Systems: Hasan A. Khalil, Printece Hall of India

ECS 123: ADVANCED CONTROL SYSTEM DESIGN

Credits	: 4
Lectures per week	: 4
Univ. Exam. Marks	: 60
Sessional Marks	: 40
Total Marks	: 100

UNIT-I:

Design of Linear Control Systems: Review of compensation technique and choice of optimum parameters to obtain desired performance, Reshaping of Polar, Bode, Root locus plots to obtain desired response, Initial condition and forced response, a simple lag – lead design.

Skill development

UNIT-II:

Integral-square error compensation: parameter optimization using Integral-square error criterion with and without constraints, State variable Feedback compensation of continuous - time and discrete-time systems.,

UNIT-III:

MIMO Control design: Matching Based on Linear Quadratic Optimal Regulators, Discrete Time Optimal Regulators, Connections to Pole Assignment, Observer Design, Linear Optimal Filters, State Estimate Feedback, Transfer Function Interpretation, Achieving Integral Action in LQR Synthesis, Industrial Applications.

Skill development

UNIT-IV:

PID Controller: Tunable PID controller, Ziegler – Nichol's method, Simulation of multi-loop control system using P, PI, PD, PID controller and finding the system response. Standard compensator structures (P, PD, PI and PID control).

Skill development

UNIT-V:

Design of digital control system: Digital controller design, Regulator and observer design, Digital servo for inverted pendulum. Classical Compensation of Discrete-time control systems: Forward path continuous, Forward-path Digital, Z-plane Synthesis approaches, Deadbeat performance.

Skill development

Text Books:

1. G. C. Goodwin, S. F. Graebe, M. E. Salgado, "Control System Design", Prentice Hall of India
2. Gupta and Hasdorf, 'Fundamentals of Automatic control Willey Eastern, 1970.
3. B.C.Kuo, Automatic control systems' (5th Edition), Prentice Hall of India, 1988.

Reference Books:

1. M. Gopal, "Digital Control and State Variable Method", Tata McGraw Hill
2. Hadi Saadat, "Computational Aids in Control System Using MATLAB", McGraw Hill International
3. Ogata K., "Modern Control Engineering", 4th Edition, Prentice Hall
4. Ogata K. "System Dynamics", 3rd Edition, Prentice Hall
5. M. Gopal, "Control Systems Principles and Design", 2nd Edition, Tata McGraw Hill
6. Norman S. Nise, "Control Systems Engineering", 3rd Edition, Wiley
7. George Ellis, "Control System Design Guide – A Practical Guide", 3rd Edition, Academic Press

2015-16/437, 2016-17/441, 2017-18/429,2018-19/453,2019-20/451

ECS 124: INTELLIGENT SYSTEMS AND CONTROL

Credits : 4
Lectures per week : 4
Univ. Exam. Marks : 70
Sessional Marks : 30
Total Marks : 100

UNIT-I:

Neural Networks: Artificial Neural Networks: Basic properties of Neurons, Neuron Models, Feedforward networks – Perceptrons, Multilayer networks – Exact and approximate representation, Back propagation algorithm, variants of Back propagation, representation of supervised, Unsupervised and Reinforcement learning; Competitive learning and self organizing networks. [Text: 1]

Skill development

UNIT-II:

ANN based control: Introduction, Representation and identification, modeling the plat, control structures – supervised control study-application to electrical engineering. [Text: 3 chaper 6]

Skill development

UNIT-III:

Fuzzy Logic: Overview of classical logic, Fuzzy sets vs Crisp set, Membership function, Methods of Membership function, Value Assignment, Defuzzification – Methods of defuzzification, fuzzy rule based and Approximation, Aggregation of Fuzzy rules, Fuzzy inference system –Mamadani and Sugeno methods. [Ref: 2 & 9]

Skill development

UNIT-IV:

Fuzzy Controllers: Preliminaries – Basic architecture and operation of Fuzzy controller – Analysis of static properties of fuzzy controller – Analysis of dynamic properties of fuzzy controller – application to electrical engineering (PID Controllers for Servo Mechanic Systems). [Ref: 2,8 & 11]

Employability

UNIT-V:

Neuro–Fuzzy Controllers: Hybrid systems, Fuzzy logic in learning algorithm, fuzzy neurons, NN as Pre-processors, Architecture based on Back propagation, Adaptive neuro-fuzzy Inference systems (ANFIS). [Ref: 7 Chapter:17]

Skill development

TEXT BOOKS:

1. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.
2. Kosco B, Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.
3. George William Irwin, K. Warwick, Kenneth J. Hunt: Neural Network Applications in Control Institution of Electrical Engineers, London, United Kingdom, 1995.

REFERENCES:

4. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, PHI, New Delhi 1994.
5. Simon Haykin, Neural Networks, ISA, Research Triangle Park, 1995.
6. Bose, Nirmal K.; Bose, N. K.; Liang, Ping, Neural Network Fundamentals with Graphs, Algorithms, and Applications (McGraw-Hill Series in Electrical & Computer Engineering)

7. R.Alavala Chennakesava, "Fuzzy logic and NN based concepts and applications", New age International publishers, 1998.
8. Fuzzy logic with Fuzzy Applications – T.J.Ross – Mc Graw Hill Inc, 1997.
9. S.N. Sivanandam, S. Sumathi and S.N. Deepa,; Introduction to Fuzzy Logic using MATLAB, Springer, 2007.
10. Ernest Czogala, Jacek Lesk , Fuzzy and Neuro-Fuzzy Intelligent Systems, Springer, 2000.
11. G. Chen, Introduction to Fuzzy sets, Fuzzy logic, fuzzy systems, CRC Press, Boca Raton Landon New York Washington, D.C. 2001.

2015-16/438, 2016-17/442, 2017-18/430,2018-19/454,2019-20/452

ECS 125: OPTIMAL & ADAPTIVE CONTROL

(COMMON FOR POWER SYSTEMS AND AUTOMATION & CONTROL SYSTEM ENGINEERING)

Credits	**: 4**
Lectures per week	**: 4**
Univ. Exam. Marks	**: 60**
Sessional Marks	**: 40**
Total Marks	**: 100**

Part I: Optimal Control

UNIT I

Introduction - Problem formulation- State variable representation of systems – Performance measures for optimal control problems–selecting a performance measure. Dynamic programming – optimal control law – principal of optimality – discrete linear regulator problems -Hamilton- Jacobi-Bellman equation- continuous linear regulator problem.

Skill development

UNIT II

The Calculus of variations: Fundamental concepts- the fundamental theorem of the calculus of variations - Functional of a single function- the simplest variational problem .

UNIT III

The variational approach to optimal control problems-Necessary conditions for optimal control - Linear regulator problem pontryacyn's minimum principle and state inequality constraints

Skill development

Part II: Adaptive Control

UNIT IV

Introduction what is Adaptive control? Effect of process variations–Adaptive Schemes–Adaptive control problem Model Reference Adaptive Control- Motivational Example, Introduction to Direct Model Reference Adaptive Control, Direct Model Reference Adaptive Control of Scalar Linear Systems with Parametric Uncertainties.

Skill development

UNIT V

State Feedback Direct Model Reference Adaptive Control: Introduction, Command Tracking, Direct MRAC Design for Scalar Systems, Dynamic Inversion MRAC Design for Scalar Systems.

Skill development

TEXT BOOK:

1. Optimal control theory-An Introduction by Donald E.Kirk - Prentice Hall Networks series.

2. Robust and Adaptive Control: With Aerospace Applications, Advanced textbooks in control and signal processing, by Eugene Lavretsky, Kevin A. Wise, publisher Springer 2012.

2015-16/439, 2016-17/443, 2017-18/431,2018-19/455,2019-20/453

ECS 126 (a): SLIDING MODE CONTROL (ELECTIVE - II)

Credits	**: 4**
Lectures per week	**: 4**
Univ. Exam. Marks	**: 60**
Sessional Marks	**: 40**
Total Marks	**: 100**

UNIT-I:

An Introduction to Sliding Mode Control: Introduction, properties of sliding motion, typical controller design, pseudo-sliding with a smooth control action, a state-space approach

Skill development

UNIT-II:

Sliding mode control: Introduction, problem statement, existence of solution and equivalent control properties of the sliding motion, The reachability problem, the unit vector approach, continuous approximations.

Skill development

UNIT-III:

Sliding mode Design approaches: Introduction, A regulator form based approach, a direct eigenstructure assignment approach, Incorporation of a tracking requirement, Design study of Pitch- pointing flight controller

Skill development

UNIT-IV:

Sliding mode controllers using output information: Introduction, problem formulation, a special case of square plants, a general frame work, dynamic compensation, observer based dynamic compensation, a model reference system using only outputs.

Skill development

UNIT-V:

Sliding mode observers: Introduction, sliding mode observers, synthesis of a discontinuous observer, the Walcott-Zak observer revisited, sliding mode observers for fault detection

Skill development

TEXT BOOK:

1. Sliding Mode Control: Theory And Applications (Series in Systems and Control) by C Edwards and S Spurgeon, Published by Taylor & Francis,

REFERENCE:

1. Sliding Mode Control In Engineering (Automation and Control Engineering) by Wilfrid Perruquetti , Jean-Pierre Barbot published by Marcel Dekker, Inc, New York

2015-16/440, 2016-17/444, 2017-18/432,2018-19/456,2019-20/454

ECS 126 (b): ROBOTICS (ELECTIVE- II)

Credits : **4**
Lectures per week : **4**
Univ. Exam. Marks : **60**
Sessional Marks : **40**
Total Marks : **100**

Employability

UNIT-I:

Fundamentals of Robot Technology: Basic structure, links and Joints, types of Joints, types of links, types of end effectors: Grippers: Mechanical, Vacuum cups, Magnetic, adhesive and miscellaneous. Tools as end effectors. Wrist configuration: concept of: yaw, pitch and roll.

Skill development

UNIT-II:

Robot classification: according to 1) Co-ordinate system: Cartesian, cylindrical, spherical, SCARA, Articulated 2) Control Method: Servo controlled and non-servo controlled, their comparative study 3) Form of motion: P-T-P (point to point), C-P (continuous path), pick and place etc. and their comparative study 4) Motion conversion: Rotary to rotary, rotary to linear and vice versa.

Skill development

UNIT-III:

Robot arm dynamics: Newton Euler Equations, Kinetic and potential energy, Lagrangian analysis for a single prismatic joint working against gravity and single revolute joint. Joint vector, homogeneous co- ordinates. Matrix operators for translation and rotation

Employability

UNIT-IV:

Robot Control: Open loop and closed loop control, Linear control Schemes, PD and PID control, Torque and Force control of robotic manipulators, Adaptive control, Hybrid control, Impedance control. Manipulator Jacobian, Jacobian for prismatic and revolute joint. Jacobian Inverse, Singularities, Control of Robot manipulator: joint position controls (JPC), resolved motion position controls (RMPC) and resolved motion rate control (RMRC)

Employability

UNIT-V:

Industrial Applications: Industrial Applications of Robots: Welding, Spray-painting, Grinding, Handling of rotary tools, Parts handling/transfer, Assembly operations, parts sorting, parts inspection, Potential applications in Nuclear and fossil fuel power plant etc.

TEXT BOOKS:

1. R. K. Mittal, I. J. Nagrath, "Robotics and Control", Tata McGraw Hill Publishing Company Ltd., New Delhi.

REFERENCE BOOKS:

1. Arthur J. Critchlow, "Introduction to Robotics"
2. Robert J. Schilling, "Fundamentals of Robotics: Analysis and Control", Prentice Hall of India, New Delhi
3. John J. Craig, "Introduction to Robotics: Mechanics and Control", Pearson Education
4. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, "Industrial Robotics: Technology, Programming and Applications", McGraw Hill Book Company
5. Richard D. Klafter, Thomas A. Chemielewski, Michael Neign "Robotic Engineering – An Integral Approach", Prentice Hall of India Pvt. Ltd., New Delhi. Eastern Economy Edition.
6. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, "Robotics: Control Sensing, Vision and Intelligence", International Edition, McGraw Hill Book Co.

2015-16/441, 2016-17/445, 2017-18/433,2018-19/457,2019-20/455

ECS 126 (c): PROCESS CONTROL & AUTOMATION (ELECTIVE- II)

Credits	**: 4**
Lectures per week	**: 4**
Univ. Exam. Marks	**: 60**
Sessional Marks	**: 40**
Total Marks	**: 100**

Employability

UNIT-I:

Process Modeling- Introduction to Process control and process instrumentation-Hierarchies in process control systems-Theoretical models-Transfer function-State space models-Time series models-Development of empirical models from process data-chemical reactor modeling-. Analysis using MATLAB & SIMULINK.

Employability

UNIT-II:

Feedback & Feed forward Control- Feedback controllers-PID design, tuning, trouble shooting-Control system design based on Frequency response Analysis-Direct digital design-Feed forward and ratio control-State feedback control- LQR problem- Pole placement -Simulation using MATLAB & SIMULINK-Control system instrumentation-Control valves- Codes and standards- Preparation of P& I Diagrams.

Employability

UNIT-III:

Advanced process control-Multi-loop and multivariable control-Process Interactions-Singular value analysis-tuning of multi loop PID control systems-decoupling control-strategies for reducing control loop interactions-Real-time optimization-Simulation using MATLAB & SIMULINK.

UNIT-IV:

Employability

Model predictive control-Batch Process control-Plant-wide control & monitoring- Plant wide control design

UNIT-V:

Employability

Instrumentation for process monitoring-Statistical process control-Introduction to Fuzzy Logic in Process Control-Introduction to OPC-Introduction to environmental issues and sustainable development relating to process industries. Comparison of performance different types of control with examples on MATLAB and SIMULINK.

Textbooks

1. Seborg, D.E., T.F. Edgar, and D.A. Mellichamp, Process Dynamics and Control, John Wiley , 2004
2. Johnson D Curtis, Instrumentation Technology, (7th Edition) Prentice Hall India, 2002.

References

1. Bob Connel, Process Instrumentation Applications Manual, McGrawHill, 1996.
2. Edgar, T.F. & D.M. Himmelblau, Optimization of Chemical Processes, McGrawHill Book Co, 1988.
3. Macari Emir Joe and Michael F Saunders, Environmental Quality Innovative Technologies 7 Sustainable Development, American Society of Civil Engineers, 1997.
4. Nisenfeld(Ed) batch Control, Instrument Society of America, 1996.
5. Sherman, R.E.(Ed), Analytical instrumentation, Instrument Society of America, 1996.
6. Shinskey, F.G., Process Conrol Systems: Applications, Design and Tuning(3rd Edition) McGrawHill Book Co, 1988.

2015-16/443, 2016-17/446, 2017-18/434,2018-19/458,2019-20/456- Control Systems Lab -II

2015-16/443, 2016-17/446, 2017-18/434,2018-19/458,2019-20/456

ECS 128: CONTROL SYSTEMS SIMULATION SIMULATION LAB-I
Credits : 2
Duration per week : 3
Univ. Exam. Marks : 50
Sessional Marks : 50
Total Marks : 100

Skill development

List of Experiments

1. Conversion of transfer function to signal flow graph
2. Transfer function from block diagram
3. Check for stability
4. Time domain specifications
5. Time & Frequency Response
6. Lag compensation
7. Lead compensation
8. Z-N PID Method
9. Continuous to discrete conversion
10. Discrete step form
11. Pole placement method
12. Routh Hurwitz criteria
13. Jury stability
14. Lyapunov Stability
15. Linear Quadratic Regulator (LQR)

I SEMESTER

MTBT-111 : ADVANCED MICROBIOLOGY

Course Objectives:

To enable the students

- To understand microbial diversity
- To learn about culture media, isolation methods and preservation methods of microorganisms.
- To understand about bacterial growth and methods of control of microorganisms
- To explain the antigen-antibody interactions that offers defense mechanism.

Course Outcomes : At the end of the course student will be able to:

1. Understand the Microbial Diversity and their Characteristics.
2. Isolate and culture microorganisms.
3. utilize gained knowledge in microbiology labs and bioprocess industries.
4. gain knowledge in defense mechanisms, immunity, vaccines, antibiotics.

SYLLABUS

UNIT I

Introduction to Microbiology: Origin and evolution of microorganisms, nature and scope of microbiology, major characteristics of prokaryotes and Eukaryotes, structure and functioning of bacterial cell.

Classification of microorganisms: Major characteristics of microorganisms, concepts of Classification, classification methods, principles of nomenclature and identification, Modem trends in classification.
General features and classification of some groups of microorganisms - Algae, Fungi, Chlamydiae, Rickettsiae, Mycoplasmas, Viruses and Protozoa, economic importance of Micro-organisms.

UNIT II

Methods in microbiology: Nutritional requirements, nutritional types of bacteria, Characteristics of culture medium, type of culture media and preparation of culture media, isolation of microorganisms - general and selective methods, isolation of bacteria in pure culture, enrichment - enrichment methods, staining techniques, culture characteristics, maintenance and preservation of cultures, culture collections.

UNIT III

Reproduction and growth: Reproduction in bacteria, genetic transfer in bacteria, Bacterial growth, bacterial growth curve, growth measurement techniques, factors affecting growth, control of microorganisms by physical and chemical methods.

UNIT IV

Epidemiology and infectious diseases: Epidemiological markers, role of host in infectious diseases - Air borne, water borne and food borne diseases.

UNIT V

Immunology: Natural resistance, internal defense mechanisms, non-specific defense mechanisms, immunity, types of immunity, immune systems, antibody and its diversity, Hypersensitivity, transplantation, autoimmunity, AIDS and other immune deficiencies, vaccines, types of vaccines, production of vaccines and synthetic vaccines, monoclonal anti bodies and their use, antibiotics, history of antibiotics, classification and production of antibiotics, microbial toxins, types of microbial toxins, effects of microbial toxins and their control.

TEXT BOOKS:

1. Microbiology by M. J. Pelczer, E. C. S. Chan, N. R. Kries. Tata McGrew Hill publications
2. Microbiology fundamentals and applications by S. S. Purohit. Agro botanical. Publications.

REFERNCE BOOKS:

1. Microbiology by Prescott, Harley, Klein. Mc Graw-Hill publications
2. General Microbiology by Roger Y. Stainer, Edward A. Adebery, John L. Ingraham. Published by Macmillan Press LTD.

MTBT-112: ADVANCED BIOCHEMISTRY

Course Objectives:

- To study about the biomolecules and importance of biochemistry in the advanced level.
- To study the detailed structure and function of biomolecules like carbohydrates, amino acids, proteins, lipids and nucleic acids.
- To study membrane assembling, bioenergetic principles and ATP cycle.
- To study the metabolism and biosynthesis of fatty acids, DNA, RNA, and proteins.

Course Outcomes : At the end of the course student will be able to:

1. Explain the structure and functions of biomolecules.
2. Understand the biosynthesis and degradation of biomolecules.
3. Obtain knowledge in the metabolism and bioenergetic principles.
4. Carry out independent research work to improve and to invent new biomolecules and can understand new metabolic processes.

SYLLABUS

UNIT I

Carbohydrates: classification of carbohydrates, structure and properties of monosaccharides (ribose, glucose, fructose), disaccharides (maltose, lactose, sucrose) and polysaccharides (Starch, glycogen and cellulose).
Amino acids and proteins: Classification and properties of amino acids and proteins, peptide bond, structural organization of proteins: primary, secondary, tertiary and quaternary structure of proteins. Biochemical function of proteins, denaturation of proteins.

UNIT II

Lipids: Classification, structure and physiological functions of triglycerides, fattyacids, phospholipids, cerebrosides, gangliosides and cholesterol.

Nucleic Acids: Structure and properties of purines and pyrimidine bases, nucleosides, nucleotides. Structure of nucleic acids-DNA and RNA.

UNIT III

Bioenergetics:
Energetics-ATP as energy currency, biologic oxidation, structural organization and electron flow of respiratory chain, chemiosmotic theory of oxidative phosphorylation. Mitochondrial membrane transporters- shuttle systems.

UNIT IV

Metabolism Of Carbohydrates And Proteins:
Carbohydrate metabolism - Glycolysis, Glucogenesis, Citric acid cycle and Glycogen metabolism. Protein metabolism - Urea cycle, degradation of amino acids.

Fatty Acid And Nucleic Acid Metabolism:
Overview of Fatty Acid Metabolism - synthesis and degradation of fatty acids. Nucleotides - De novo and salvage pathways.

UNIT V

Central Dogma:
Biosynthesis of DNA (replication).
Biosynthesis of RNA (transcription).
Biosynthesis of proteins (translation).

Text Books:

1. Textbook of Biochemistry by Albert-Lehninger, Kalyani Publishers,Ludhiana,New Delhi.
2. Principles of Biochemistry- Lehninger,Nelson and Cox-CBS Publishers and distributors,Delhi.
3. A text book of Biochemistry by A.V.S.S.RamaRao,UBS Publishers and Distributors Ltd,NewDelhi,Chennai.
4. Fundamentals of Biochemistry-J.L.Jain,S.Chand and company Ltd. New Delhi.

MTBT-113: ADVANCED BIOCHEMICAL ENGINEERING

Course Objectives:

- To introduce enzymes, enzymatic and microbial growth kinetics
- To introduce transport of materials in biological systems with respect to mass transfer and heat transfer
- To introduce different types of bio-reactors and special reactors like animal and plant cell reactors
- To introduce immobilization and sterilization techniques.

Course Outcome: At the end of the course student will be able to

1. Determine the enzyme activity, parameters affecting activity and enzyme immobilization
2. Gain knowledge in gas liquid mass transfer, determine the K_La and know inter particle and intra particle diffusion
3. Understand working and analysis of all types of rectors
4. Know thermal death kinetics and sterilization of air and medium.

SYLLABUS

UNIT I

Enzyme Kinetics: Effects on enzyme activity, deactivation, immobilized enzymes.

UNIT II

Microbial growth kinetics: Batch growth, unstructured models, growth in continuous culture, structured models, product formation kinetics, cell immobilization.

UNIT III

Transport Phenomena: Gas-liquid Mass transfer; Theoretical models for K_{La}, interfacial area and bubble oxygen transfer, gas-liquid mass transfer of components other than oxygen. Mass transfer into solid particles: External transfer, intraparticle diffusion. Heat transfer correlations.

UNIT IV

Bioreactors: Review of various types of bioreactors used in the fermentation industry.
Multiphase bioreactors: packed bed, bubble-column, fluidized bed and trickle-bedreactors.
Alternate fermenters: new bioreactor configurations used in the fermentationtechnology.
Animal and plant cell reactor technology.

UNIT V

Sterilization: Sterilization methods, thermal death kinetics, design criterion, batch and continuous sterilization, air sterilization.

TEXT BOOK:

Shuler, M. L and F. Kargi, Bioprocess Engineering: Basic concepts, 2nd ed., Prentice Hall India, New Delhi, 2003.

REFERNCES:

1. Lee, J. M., Biochemical Engineering (e Book), Prentice Hall, Englewood Cliffs, 2001.
2. Bailey, J. E., and D. F. Ollis, Biochemical Engineering Fundamentals, 2nd edition, Mcgraw-Hill, New York, 1986.
3. Blanch, H. W., and D. S. Clark, Biochemical Engineering, Marcel Dekker, New York, 1996.
4. Swamy,A.V.N.,' Fundamentals of Biochemical Engineering' , BS publications, 2007

MTBT-114: BIOSEPARATIONTECHNOLOGY

Course Objectives:

To enable the students to

- Understand the methods to obtain pure proteins, enzymes and in general about product development R &D
- Have depth knowledge and hands on experience on Downstream processes to produce commercial therapeutically important proteins.

Course Outcomes:

Upon success completion of this course, the students will be able to:

1. Define advanced downstream processing methods for product recovery.
2. Describe the components of downstream equipment and to understand the requirements for successful operations.
3. Enhance problem solving techniques required in multi-factorial manufacturing environment in a structured and logical fashion.

UNIT I

Downstream Processing In Biotechnology:

Role and importance of downstream processing in biotechnological processes – Problems and requirements of bio product purification – Economics of downstream processing in Biotechnology, cost-cutting strategies – Separation characteristics of proteins and enzymes – size, stability, properties – Flocculation and conditioning of broth – Process design criteria for various classes of bio products (high volume, low value products and low volume, high value products) – Upstream production methods affect downstream purification strategies.

UNIT II

Physico-Chemical Basis Of Bio-Separation Processes:

Cell disruption methods for intracellular products – Physical, chemical, mechanical – Removal of insoluble, biomass and particulate debris separation techniques – Filtration at constant pressure and at constant rate – Empirical equations for batch and continuous filtration – Types of filtration - Centrifugal and cross – flow filtration – Types of filtration equipments – Centrifugation – Basic principles, design characteristics – Types of centrifuges and applications – Sedimentation.

UNIT III

Membrane Separations And Enrichment Operations:
Theory, Design consideration and configuration of membrane separation processes – Reverse osmosis, microfiltration, ultra filtration, dialysis and pervaporation – Structure and characteristics of membranes – Membrane modules – Enrichment Operations – Extraction– equipment forextraction– Aqueous two-phase extraction process – Evaporators – Types of evaporators – Adsorption isotherms and techniques – Protein precipitation – Methods of precipitation.

UNIT IV

Mechanism And Modes Of Chromatographic Separation:
Chromatography – Classification of chromatographic techniques – General description of column chromatography – Chromatographic terms and parameters – Practice of chromatography – Partition, normal-phase, displacement, reversed-phase, size exclusion, ion exchange, hydrophobic, affinity chromatography – Scale-up of chromatography – Process considerations in Preparative liquid chromatography and HPLC.

UNIT V

Finishing Operations And Formulations:
Drying – Mechanism, methods and applications, Types of dryers – Tray, spray, rotary, belt, disc – Crystallization – Nucleation , growth – Types of crystallizers – Tank, scrapped surface, Oslo, Circulating-magma evaporator – Freeze drying – Principle, process, applications – Case studies- Citric acid, Penicillin , Cephalosporin, Recombinant Streptokinase, Interferon.

REFERENCES

1. Belter, P.A., Gussler, E.L. and Hu, W.S., “Bioseparation: Downstream Processing for Biotechnology”, John Wiley and Sons,2011.
2. Forciniti, D., “Industrial Bioseparation: Principles & Practice”, Blackwell,2008.
3. Ghosh, R., “Principles of Bioseparations Engineering”, World Scientific Publishers,2006.
4. Ladisch, M.R., “Bioseparations Engineering: Principles, Practice, and Economics”, John Wiley & Sons,2001.
5. Roger, H., “Bioseparations Science and Engineering”, Oxford University Press,2006.

MTBT-115 -ELECTIVE – I

MTBT -115-1: BIO-ANALYTICAL TECHNIQUES

Course Objectives :

The course is designed to impart the knowledge in analytical techniques in biotechnology. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics will be taught to enable the students to understand the principles involved in techniques. In addition to theoretical aspects, the basic practical knowledge relevant to the analysis will also be imparted.

- To have a fundamental knowledge about the Light spectrum, Absorption, NMR, Mass spectroscopy
- To acquire knowledge on the different chromatographic methods for separation of biological products.
- To Understand the methods to obtain pure proteins, enzymes and in general about product development R &D

Course Outcomes: On completion of the course, students will be able to

1. Understand spectroscopy and the separation techniques used for biological products.
2. Quantify Bio molecules using spectroscopy methods
3. Purify enzymes and metabolites using Chromatography techniques
4. Gain knowledge in various assay techniques for qualitative and quantitative estimation of biomolecules

SYLLUBUS

UNIT I

Chromatographic Techniques - Affinity - Adsorption - paper - Thin layer - Column - Ion Exchange - Gel Chromatography - Applications.

UNIT II

Gas liquid chromatography - High Pressure liquid chromatography - Equipment - Applications.

UNIT III

Spectrophotometric Techniques - IR - UV - Visible - NMR - ESR - Optical density - Circular dischroism.

UNIT IV

pH - pH titrations - Determination of pKa values - Buffers - Preparation - Buffer Action - Physiological buffers - potentiometric titration - centrifugal dialysis - lyophilization - Electrophoresis - Ultra filtration - Assay techniques for proteins, lipids, sugars, amino acids and nucleic acids.

Unit – V

Microscopic Techniques

Light Microscopy; Fluorescence microscopy,Atomic force microscope,Electron microscope,Scanning electron microscopy, Transmission Electron microsope.Application of microscope in analyzing biological samples.

Text Books:

1. "Instrumental methods of Chemical Analysis - Chatwal, G & Anand, S. Himalaya Publishing House, Bombay.
2. "Instrumental methods of Chemical Analysis - Sharma, B.K. Goel Publishing House, Meerut.
3. "Instrumental Methods Analysis - Willard, Merritt, Dean & Settle, CBS Publishers & Distributors, Delhi.

MTBT-115-2-BIOINFORMATICS

Course Objectives:

- To improve the programming skills of the student in the field of Biological research
- To let the students know the recent evolution in biological databank usage

Course Outcomes:

Upon completion of this course, students will be able to

1. Develop bioinformatics tools with programming skills.
2. Apply computational based solutions for biological perspectives.

SYLLABUS

UNIT I

Introduction, Molecular Biology and Bioinformatics, Biological database,
Primary, Secondary and Structural data bases, tools for web search, data retrieval tools

UNIT II

Genome analysis and gene mapping: sequence assembly problem, genetic mapping and linkage analysis, genome sequencing, sequence assembly tools, Human genome project. Alignment of pairs of sequences, scoring matrices, multiple sequences, phylogenetic analysis, Tree evaluation, automated tools for phylogenetic analysis, working with FASTA and BLAST.

UNIT III

Gene identification and prediction: Basis for gene prediction, pattern recognition, gene prediction methods, working with DNA, Micro arrays, Micro array analysis.

UNIT IV

Protein classification and structure visualization: structure – based protein classification, protein structure databases, visualization databases and tools, protein structure alignment, tools for plotting protein-ligand interaction.

Protein structure prediction: Analysis and prediction of primary structure and secondary structure, motifs, profiles, patterns and fingerprints search, Ab Initio approach, 2-D structure prediction, protein function prediction from DNA sequence.

UNIT V

Proteomics: Tools and techniques in proteomics, protein – protein interactions, gene family identification methods. Computational Methods for pathways and systems Biology: Analysis of pathways, metabolic network properties, metabolic control analysis, simulation of cellular activities.

Text-book:

S.C..Rastogi, N.Mendiratta and P.Rastogic, **Bioinformatics**, Prentice- Hall of India Pvt.Ltd, New Delhi, 2004

Reference books:

1. T.K.Attwood and D.J. Parry-Smith, Introduction to Bioinformatics, Pearson Education Asia, Delhi, 2002
2. A.M. Lesk, Introduction to Bioinformatics, Oxford University press, New Delhi, 2004.

MTBT-115-3: IPR AND BIOSAFETY

Course Objectives:

- To create awareness about IPR and engineering ethics
- To follow professional ethics and practices in their careers
- To create awareness and responsibilities about the environment and society

Course Outcomes:

Upon completion of this course, the student would be able

1. To understand the ethics and responsibility for safety
2. To create awareness for the professional responsibilities and rights

SYLLABUS

UNIT I

Agreements, Treaties And Concept Of PriorAct:

History of GATT Agreement – Madrid Agreement – Hague Agreement – WIPO Treaties – Budapest Treaty – PCT – Indian Patent Act 1970 & recent amendments Ordinary – PCT – Conventional – Divisional and Patent of Addition – Specifications – Provisional and complete – Forms and fees Invention in context of "prior art" – Patent databases – Searching International Databases – Country-wise patent searches (USPTO,esp@cenet(EPO) – PATENT Scope(WIPO), IPO,etc.

UNIT II

IPR:

Intellectual property rights – Origin of the patent regime – Early patents act & Indian pharmaceutical industry – Types of patents – Patent Requirements – Application preparation filing and prosecution – Patentable subject matter – Industrial design, Protection of GMO's IP as a factor in R&D,IP's of relevance to biotechnology and few casestudies.

UNIT III

Patent FilingProcedures:

National & PCT filing procedure – Time frame and cost – Status of the patent applications filed – Precautions while patenting – disclosure/non-disclosure – Financial assistance for patenting – Introduction to existing schemes Patent licensing and agreement Patent infringement – Meaning, scope, litigation, case studies.

UNIT IV

Biosafety:

Introduction – Historical Backround – Introduction to Biological Safety Cabinets – Primary Containment for Biohazards – Biosafety Levels – Biosafety Levels of Specific Microorganisms – Recommended Biosafety Levels for Infectious Agents and Infected Animals – Biosafety guidelines–Government of India.

UNIT V

Genetically Modified Organisms:

Definition of GMOs & LMOs – Roles of Institutional Biosafety Committee – RCGM – GEAC etc. for GMO applications in food and agriculture – Environmental release of GMOs – Risk Analysis – Risk Assessment – Risk management and communication – Overview of National Regulations and relevant International Agreements including Cartegana Protocol.

REFERENCES

1. Bouchoux, D.E., "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets for the Paralegal", 3rd Edition, Delmar Cengage Learning,2008.
2. Fleming, D.O. and Hunt, D.L., "Biological Safety: Principles and Practices", 4th Edition, American Society for Microbiology,2006.
3. Irish, V., "Intellectual Property Rights for Engineers", 2nd Edition, The Institution of Engineering and Technology,2005.
4. Mueller, M.J., "Patent Law", 3rd Edition, Wolters Kluwer Law & Business,2009.
5. Young, T., "Genetically Modified Organisms and Biosafety: A Background Paper for Decision-Makers and Others to Assist in Consideration of GMO Issues" 1st Edition, World Conservation Union,2004.

MTBT-116 -ELECTIVE – II

MTBT-116 -1: CANCER BIOLOGY

Course Objectives:

To enable the students to understand

- Basic biology of cancer
- Impact of antibodies against cancer in the human body leading to more effective treatments
- Enhanced immunology based detection methods and imaging techniques
- Development of cell based and cytokine based immunotherapy against cancer

Course Outcomes:

The course would facilitate the students

1. To appreciate the role of immune system in cancer
2. To understand the cancer microenvironment and its influence on immune cells
3. To medical applications of cytokines and immune cells against cancer.

SYLLABUS

UNIT I

Principles Of Cancer Biology:

Cancer: Definition, causes, properties, classification, clonal nature – Cell Cycle: Regulation of cell cycle, cell proliferation and apoptosis – Signal transduction pathways – Apoptosis: apoptotic pathways, signal molecules, effects on receptor, signal switches – Modulation of cell cycle in cancer – Mechanism of spread.

UNIT II

Principles Of Carcinogenesis:

Cancer risk factors – Theory of carcinogenesis – Chemical carcinogenesis – Physical carcinogenesis: x-ray radiation – mechanisms of radiation carcinogenesis – Stages of cancer: initiation, promotion, progression.

UNIT III

Molecular Biology Of Cancer:

Signal targets and cancer – Growth factors – Transformation – Activation of kinases – Oncogenes: c-Myc, Ras, Bcl-2 family – Mechanism of oncogene activation – Retroviruses and oncogenes – Detection of oncogenes – Oncogenes/proto oncogene activity – Tumor suppressor genes: Rb, p53, APC, BRCA paradigms –Telomerases.

UNIT IV

Cancer Metastasis:

Clinical significances of invasion – Heterogeneity of metastatic phenotype – Metastatic cascade: basement membrane disruption, invasion – Recent approach to identify key factors controlling metastasis – Angiogenesis.

UNIT V

Cancer Therapy:

Therapy forms – Surgery, chemotherapy, radiation therapy - Detection of cancers – Prediction of aggressiveness of cancer – Advances in cancer detection – Tumor markers; New approaches of cancer therapy – mAbs, vaccines, gene therapy, stem cell therapy.

REFERENCES

1. Fialho, A. and Chakrabarty, A., "Emerging Cancer Therapy: Microbial Approaches and Biotechnological Tools" 1st Edition, Wiley,2010.
2. Pelengaris, S. and Khan, M., "The Molecular Biology of Cancer", Blackwell Publishing, 2006.
3. Ruddon, R.W., "Cancer Biology", 2nd Edition, Oxford University Press,2007
4.Schulz, W.S., "Molecular Biology of Human Cancers – An Advanced Students Text Book", Springer,2005.
5. Weinberg, R.A., "The Biology of Cancer", Taylor & Francis, Garland Science,2007

MTBT-116-2:TISSUE ENGINEERING

Course Objectives:

To enable the students

- To learn the fundamentals of tissue engineering and tissue repairing
- To acquire knowledge on clinical applications of tissue engineering
- To understand the basic concept behind tissue engineering focusing on the stem cells, biomaterials and its applications

Course Outcomes:

Upon completion of this course, the students would get

1. Ability to understand the components of the tissue architecture
2. Opportunity to get familiarized with the stem cell characteristics and their relevance in medicine
3. Awareness about the properties and broad applications of biomaterials
4. Overall exposure to the role of tissue engineering and stem cell therapy in organogenesis

SYLLABUS

UNIT I

Fundamental of tissue engineering:

Cell cycle – Stem cells – Types, factors influencing stem cells – Mechanical properties of cells and tissues, cell adhesion – Extracellular matrix – Glycans, laminin, fibronectin, collagen, elastin, extracellular matrix functions – Signalling – Mechanics and receptors – Ligand diffusion and binding, trafficking and signal transduction – *In vitro* cell proliferation.

UNIT II

Biomaterials For Tissue Engineering:

Measurement of protein adsorption – Direct and indirect methods, fibrinogen adsorption – Displaceable and non-displaceable – Changes in protein conformation upon adsorption – Vroman effect principle to maximize the amount of fibrinogen adsorption – Devices for tissue engineering transplant cells.

UNIT III

Delivery of molecular agents and cell interactions with polymers:

Molecular agents in tissue engineering – Controlled released of agents – Methods, in time and space – Future applications of controlled delivery – Microfluidic systems – Microfluidics and microfluidic devices – Cell interactions – Factors influencing cell interactions – Cell interactions with polymer surfaces and suspension – Cell interactions with three-dimensional polymer.

UNIT IV

Polymers And Controlled Drug Delivery:

Natural and synthetic biodegradable Polymers – Engineered tissues – Skin regeneration – Nerve regeneration – Liver, cartilage, bone – Biodegradable polymers in drug delivery – Polymeric drug delivery systems – Applications of biodegradable polymers.

UNIT V

Biopolymer- based biomaterials as scaffolds and stem Cells:

Natural polymers – Structural and chemical properties, scaffold processing, mechanical properties and biodegradability – Biocompatibility and host response – Application of scaffolds in tissue engineering. Use of stem cells in tissue engineering – Embryonic stem cells, mesenchymal stem cells (MSC), adult stem cells, markers for detection of stem cells – Risks with the use of stem cells.

REFERENCES

1. Pallua, N. and Suscheck, C.V., “Tissue Engineering: From Lab to Clinic” Springer,2010
2. Palsson, B., Hubbell, J.A., Plonsey, R. and Bronzino, J.D., “Tissue Engineering”, CRC Press, 2003.
3. Palsson, B.O. and Bhatia, S., “Tissue Engineering”, Pearson Prentice Hall,2004.
4. Saltzman, W.M., “Tissue Engineering”, Oxford University Press,2004.
5. Scheper, T., Lee, K. and Kaplan, D., “Advances in Biochemical Engineering / Biotechnology – Tissue Engineering I”, Volume 102, Springer-Verlag Berlin Heidelberg,2006.

MTBT116-3: ANIMAL BIOTECHNOLOGY

Course Objectives:

- To provide the fundamentals of animal cell culture, diseases and therapy
- To offer the knowledge about the micromanipulation and transgenic animals

Course Outcomes:

Upon completion of this subject the student will be able to

1. Understand the animal cell culture, animal diseases and itsdiagnosis
2. Gain the knowledge for therapy of animal infections
3. Know the concepts of micromanipulation technology and transgenic animal technology
4. Use the knowledge gained in this section to apply in the field of clinical research

SYLLABUS

UNIT I

Cell Culture

Culturing of cells– Primary and secondary cell lines – Genetics of cultured cells – Scaling up in suspension –Monolayer culture – Bio-reactors used for animal cell culture –Roller bottle culture– Bioreactor process control –Stirred animal cell culture –Air-lift fermentor, Chemostat/Turbidostat– Cell lines and their applications.

UNIT II

Gene Cloning Vectors And Immunology:

Viral disease in animals–Animal viral vectors –Vector design–SV40, adeno virus, retrovirus, vaccinia virus, herpes virus, adeno associated virus and baculo virus– Immune response – Lymphocyts, immune system – Baculo virus expression vectors–Vaccines and their applications in animal infections –High technology vaccines – Hybridoma technology.and production of monoclonal antibodies.

UNIT III

Stem Cell And Cloning:

Characteristics of ES cells –Types of stem Cells – ES cell research–*In vitro* derivation of gametes

–Maintenance of stem cells in culture and applications – Somatic cell nuclear transfer – Gene expression of pluripotent cells –Cellular reprogramming –Induced pluripotency– Cloning techniques in animals and therapeutic cloning.

UNIT IV

Genetic Engineering:

Gene therapy –Prospects and problems – Single gene – Gene mapping – Hematopoietic cells for cellular gene therapy of animal disease –Knockout mice and mice model for human genetic disorder –Baculo virus in biocontrol– Enzymes technology – Somatic manipulation of DNA – Nucleic acid hybridization and probes in diagnosis– Preparation of probes, evaluation and applications.

UNIT V

Applications:

Rumen manipulation– Probiotics embryo transfer technology – *Invitro* fertilization, transgenesis– Methods of transferring genes into animal oocytes, eggs, embryos and specific tissues by physical, chemical and biological methods–Biopharming– Transgenic animal technology, application to production and therapeutics (mice, sheep, cattle) – Artificial insemination and embryo transfer – Transgenic growth hormonegenes.

REFERENCES

1. Freshney R.I. Cultures of Animal cells: A manual of Basic Techniques and specialized applications, 6th Edition, John Wiley and Sons,2010.
2. Glick, B.R. and Pasternack, J.J. and Pattern ,C. Molecular Biotechnology, 4th Edition ASM Press,2003
3. Lewin, B. Genes VIII , Pearson Prentice Hall,2004
4. Portner, R, Animal Cell Biotechnology, Methods and Protocol, 2nd Edition, Humana Press, 2007

MTBT-117 : Biotechnology Lab-1

Course Objectives:

- To Provide hands on experience on production and down streaming through simple experiments

Course Outcomes:

1. Gain ability to design and conduct experiments, analyse, interpret and apply laboratory skills to solve bioprocess engineering problems.
2. Skills and knowledge gained is useful for bio industry and research

List of Experiments:

1. Preparation of Acetate buffer system and validation of Hendersen-Hesselbalch Equation
2. Determination of Absorption spectrumof BSA using UV- Visible Spectrophotometer and validation of Beer-Lamberts Law
3. A. Separation of Aminoacids and Selection of solvents by Thin Layer Chromatography.

   B. Titration of Aliphatic and Aromatic aminoacids.
4. Determination of Growth curve for *Bacillus cereus* in Nutrient Broth
5. Screening of two substrates for *Bacillus cereus* for amylase production by submerged cultivation
6. Optimization of Amylase production medium for Bacillus cereus using Barley starch as substrate by Response surface Methodology
7. Partial purification of Proteins by Salt precipitation
8. Desalting of Protein sample by Dialysis
9. Enzyme purification by Ion-Exchange Chromatography
10. Adsorption of Methylene Blue on to activated carbon and Evaluation of Langmuir and Fruendlich Isotherms
11. Extraction of Ethanol obtained by submerged fermentation using distillation principle
12. Protein purification by Affinity chromatography
13. Effect of pH on the production of antibiotic (Streptomycin) using *Streptomyces griseus*

II SEMESTER

MTBT-121: GENETIC ENGINEERING

Course Objectives:

To make the student to understand

- the basic tools in genetic engineering
- Cloning and expression vectors
- Preparation of genomic and cDNA libraries
- Production and downstream processing of recombinant proteins

Course Outcomes:

1. The students after completing this course would be aware of clone methods of commercially important genes.
2. The students would be aware of producing the commercially important recombinant proteins.
3. The students would be aware of gene and genome sequencing techniques.
4. The students would be aware of applications of gene cloning in medicine, agriculture and environment.

SYLLABUS

UNIT I

Cloning vectors:
Ideal features of cloning vectors – plasmids and bacteriophages – cloning vectors for *E.coli* ; pBR322, pUC vectors, M13 and other plasmid vectors – Cosmids, Phagemids – vectors for Bacillus, Streptomyces Restriction mapping and analysis

UNIT II

Enzymes And Techniques for cloning:
DNA modifying enzymes – ligases – Nucleic acid probe preparation; Radioactive and nonradioactive labels – Hybridization techniques – PCR; different types and applications – DNA sequencing – DNA fingerprinting – RFLP, RAPD – chromosome walking.

UNIT III

Expression vectors:
Expression vectors in prokaryotes – Expression vectors in Eukaryotes-Yeast cloning

vectors – selectable markers for eukaryotes – SV40, Papilloma, Retrovirus, Baculoviral vectors – mammalian cell expression system – Gene transfer techniques – Agrobacterial plasmids – Ti plasmid and viral vectors – cloning in plants.

UNIT IV

Genomic And cDNA library:
Different strategies for in vitro and in vivo cloning – Preparation of rDNA, Preparation of cDNA and genomic DNA libraries – screening procedures – linkers, adapters, homopolymer tailing and TA cloning – gene transfer technologies – Mutagenesis – site directed mutagenesis – application.

UNIT V

Application Of gene cloning:

Fusion protein- down-stream processing of recombinant proteins- Applications in medicine – Gene therapy- Diagnostics, pathogenesis, recombinant vaccines –humanized antibodies and their applications genetically modified food – bioremediation with recombinant micro organisms– forensic science – genetic diversity – Agriculture, crop improvement – production of biosensors, enzymes – safety guidelines in rDNA research – containment and disposal.

Text Books:

1. Introductory Bio - Technology by R. P. Singh.
2. Principles of genetic Engineering by Old and Primarose.

REFERENCES:

1. Jeremy W. Dale, Malcolm von Schantz, Nicholas Plant. From Genes to Genomes: Concepts and Applications of DNA Technology-3rd Edition. 2011.Wiley-Blackwell.
2. Michael R. Green and Joseph Sambrook. Molecular Cloning: A Laboratory Manual (Fourth Edition). 2012. Cold Spring HarborPress.
3. Jocelyn E. Krebs, Elliott S. Goldstein and Stephen T. Kilpatrick. Lewin's GENES XI. 2012. Jones & BartlettLearning.
4. Sandy B. Primrose and Richard Twyman. Principles of Gene Manipulation and Genomics. 2009.Wiley.
5. T. A. Brown. Gene Cloning and DNA Analysis: An Introduction, 6th Edition. 2010.Blackwell.

MTBT -122: ENZYME ENGINEERING

Course Objectives:

1. To understand the importance of enzymes, their classification, sources, extraction and purification of enzymes.
2. To understand the mechanism of enzyme action, their kinetics and types of enzyme inhibitions.
3. To know about the advantages of immobilization of enzymes, methods of immobilization.
4. To acquaint with the applications of enzymes in solution as well as immobilized enzymes.

Course Outcome:

1. The student is able to appreciate the importance of enzymes and know about their sources and extraction.
2. The student can analyze the kinetics of enzyme reactions, and can identify the type of enzyme inhibition.
3. The student will know to use different immobilization techniques and enzyme purification.
4. The student will be aware of different enzymes and their applications used in various industries.

SYLLABUS

UNIT I

Introduction To Enzymes: Importance of enzymes in Biotechnology, Nomenclature and classification of enzymes, enzyme specificity, coenzymes, enzyme units and turnover number, factors affecting enzyme activity (pH, temperature, chemical agents and irradiation), mechanism of enzyme catalysis.

UNIT II

Enzyme Kinetics: Simple enzyme kinetics, Michaelis-Menten equation, Quasi-steady-state kinetics and Briggs –Haldane approach, Evaluation of parameters in Michaelis-Menten equation.

Enzyme Inhibition: Inhibition of enzyme reactions-Competitive, non-competitive, uncompetitive, substrate and product inhibition, deactivation kinetics, derivations of M-M form of equations for various inhibitions.

UNIT III

Sources Of Enzymes: Plant, animal and microbial sources and their advantages and disadvantages.

Enzyme Extraction And Purification: Methods of production of enzymes, cell disruption, extraction of enzymes, purification of enzymes.

UNIT IV

Enzyme Immobilization: Methods of immobilization- physical and chemical (covalent binding, cross-linking, adsorption, matrix entrapment and microencapsulation), advantages and disadvantages of different immobilization techniques, kinetics of immobilized enzymes, mass transfer effects in immobilized enzyme systems.

UNIT V

Enzyme Applications: Application of enzymes in various industries (brewing, detergent, starch, baking, dairy, food, leather, wool, animal feed, textile, paper and pulp, pharmaceutical).

Application Of Immobilised Enzymes: Immobilized enzyme processes, HFCS, production of amino acids, antibiotics.

Text books:

1. Enzyme Technology by Chaplin, M.F and Bucke, C Cambridge University Press,1990.
2. Enzyme Technology 2nd Ed S.Shanmugan, T.Sathish Kumar, M.Shanuga Prakash I.K.International Publishing House Pvt. Ltd.
3. Biochemical Engineering Fundamentals. J.E.Bailey and David F Ollis 2nd Edition 1986, McGraw Hill.

References books:

1. Enzyme Engineering. L.B.Wingard, J.Inter Science, New York 1972.
2. Enzymes Trevor Palmer East West Press Pvt. Ltd. New Delhi

MTBT-123: ENVIRONMENTALBIOTECHNOLOGY

Course Objectives:

The proposed course is designed

- To understand the scientific and engineering principles of microbiological treatment technologies to clean up contaminated environments
- To replace of conventional treatment methodologies by molecular biology and genetic engineering strategies
- To seek the way for the alternate sources of energy to avoid environmental issues

Course Outcomes:

Upon successful completion of the course

1. Environmental Pollution or problems can be solved
2. Scientific solutions and participation can be served for the environmental Protection
3. improvement for the alternate sources of energy to avoid environmental disasters

SYLLABUS

UNIT I

Biodegradation And Bioremediation:

Aerobic and Anaerobic degradation of aliphatic and aromatic compounds – Biodegradation of herbicides and pesticides. Bioremediation technologies – Biostimulation, Bioaugmentation, Bioventing, biosparging and Phytoremediation – Bioleaching, bioprecipitation, bioaccumulation and biosorption of heavy metals.

UNIT II

Microbial Metabolism In wastewater treatment:
Decomposition of organic compounds in natural ecosystems – Co-metabolic degradation of organo-pollutants - Hydrolysis of biopolymers by aerobic and anaerobic microorganisms – Anaerobic degradation of carbohydrates, proteins, lipids – Nitrogen removal – Ammonification, nitrification, denitrification

UNIT III

Biological Treatment of Wastewater:

Physico-chemical characteristics of wastewater – Overview of aerobic and anaerobic treatment processes – Process design of aerobic and anaerobic system – Activated sludge process – Trickling filter – Rotating biological contactors – Fluidized bed reactor – Up flow anaerobic sludge blanket reactor (UASB) – Membrane bioreactors – Algal photosynthesis in wastewater treatment.

UNIT IV

Biotechnology For Air Pollution And waste management:
Air pollution control and treatment strategies – Biotechnology for treating air pollutants – Biofilters and Bioscrubbers – Biotechnology for the management of agricultural, plastic, dairy, paper and pulp, textile, leather, hospital and pharmaceutical industrial wastes.

UNIT V

Bioproducts From renewable sources
Overview of renewable sources – Production of biocompost and vermicompost – Production of biofertilizers and biopesticides – Production of biomethane, bioethanol, biohydrogen, biodiesel – Production of bioplastics and biopolymers – Bioelectricity generation and value added products from renewable sources.

TEXT BOOKS:

1. Environmental Pollution Control Engineering by C. S. Rao. Wiley Eastern Limited
2. Waste Water Treatment: Rational Methods of design and industrial practices by M. Narayana Rao and Amal K. Datta. Oxford & IBH publishing Co. Pvt. Ltd.
3. Environmental Biotechnology: Basic concepts and applications by Indu Shekhar Thakur. 1. K. International Pvt. Ltd.

References:

1. Chakrabarty K.D., Omen G.S., Biotechnology And Biodegradation, Advances In Applied Biotechnology Series , Vol.1, Gulf Publications Co., London,1989.
2. Evans, G.G. and Furlong, J., Environmental Biotechnology: Theory and Application, 2nd Edition, John Wiley & Sons,2011.
3. Henze, M., Harremoes, P., Jansen, J.C. and Arvin, E., "Wastewater Treatment: Biological and Chemical Processes", 2nd Edition, Springer,2013.
4. Jordening, H.J. and Winter, J., "Environmental Biotechnology: Concepts and Application", Wiley-VCH Verlag GmbH & Co.,2005.
5. Wong J.W-C., Tyagi R.D., and Pandey. A., "Current Developments in Biotechnology and Bioengineering Solid waste" Elsevier,2016.
6. Zarook, S. and Ajay,S., Biotechnology for Odor and Air Pollution Control, Springer,2005.

MTBT-124: Bio Nanotechnology

Course Objectives:

To enable the students

- To learn about basis of nanomaterial science, preparation method, types and application

Course Outcomes:

Upon completing this course, the students

1. Will familiarize about the science of nanomaterials
2. Will demonstrate the preparation of nanomaterials
3. Awareness about the properties and broad applications of biomaterials

SYLLABUS

UNIT I

Nanoscale Processes and nanomaterials:

Overview of nanoscale processes and characterization of nanomaterials – Physicochemical properties of nanomaterials – Concepts in nanotechnology – Natural nanomaterials –Types of Nanomaterials (Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Polymeric nanoparticles, Buckyballs, Nanotubes) – Interaction between biomolecules and nanoparticle surface –Synthesis and assembly of nanoparticles and nanostructures using bio-derived templates.

UNIT II

Structural And Functional Principles Of Bionanotechnology:

Biomolecular structure and stability – Protein folding – Self-assembly – Self-organization – Molecular recognition – Flexibility – Information-Driven nanoassembly – Energetics – Chemical transformation – Regulation – Biomaterials – Biomolecular motors – Traffic across membranes – Biomolecular sensing – Self-replication – Machine-phase bionanotechnology.

UNIT III

Protein-Based Nanotechnology:

Overview of protein nanotechnology – Nanotechnology with S-Layer protein – Engineered nanopores – Bacteriorhodopsin and its potential – Protein assisted synthesis of metal nanoparticles – Synthesis of protein-based nanoparticles – Protein nanopaticle-hybrids – Covalent and non-covalent protein nanoparticle conjugates – Protein-carbon nanotubeconjugates.

UNIT IV

DNA-Based nanotechnology:

DNA-based nanostructures – Biomimetic fabrication of DNA based metallic nanowires and networks – Self assembling DNA structures – DNA-nanoparticle conjugates – DNA-carbon nanotube conjugates – DNA templated electronics – DNA nanostructures for mechanics and computing – DNA nanomachine.

UNIT V

Nanomedicine and nanosensing:

Promising nano biotechnologies for applications in medicine – Role of nanotechnology in methods of treatment – Liposomes in nanomedicine – Therapeutic applications of nanomedicine – Nano- Sized carriers for drug delivery and drug carrier systems – Protein and peptide nanoparticles, DNA based nanoparticles, Lipid matrix nanoparticles for drug delivery – Design and development of bio nanosensors using DNA, enzymes – Nano biosensors for imaging and diagnosis.

REFERENCES:

1. Gazit, E., and Mitraki, A., “Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology”, Imperial College Press, 2013.
2. Goodsell, D.S., “Bionanotechnology”, John Wiley and Sons,2004.
3. Jesus M. de la Fuente and Grazu, V., “Nanobiotechnology: Inorganic Nanoparticles Vs Organic Nanoparticles” Elsevier,2012.
4. Niemeyer, C.M. and Mirkin, C.A., “Nanobiotechnology: Concepts, Applications and Perspectives”, Wiley- VCH,2006.
5. Shoseyov, O. and Levy I., “Nanobiotechnology: Bioinspired Devices and Materials of the Future”, Humana Press,2008.

MTBT-125: ELECTIVE-III

MTBT- 125-1: Industrial Biotech Products

Course Objectives:

- To study the structure and functions of various fermentors and study indetail the production media preparation, inoculums preparation and sterilization methods.
- To study the production ethyl alcohol, vinegar, lactic acid , citric acid and amino acids using microbial fermentation processes.
- To study the production of alcoholic and non alcoholic beverages in detail and to study the production of antibiotics, vitamins and baker's yeast, microbial enzymes and co-enzymes in detail using modern fermentation techniques.

Course Outcome:

1. Students will obtain vast knowledge in the fermentation technology to produce various industrially important bio products.
2. Students will acquire knowledge in handling bioreactors and sterilization methods.
3. Students can start small scale industries to produce bio products using fermentation techniques.
4. As this subject gives advanced level knowledge in the production of industrial biotech products, the further improvement and advances can be achieved by research.

SYLLABUS

UNIT I

Fundamentals involved in the' production of industrial Microbial products such as details of the Fermentors, Synthetic and natural medium, processors, Sterilization methods, and innocuium preparation. A detailed study of 'Ethanol' production by fermentation, using black blinap molasses, aarchy substance and glus\cosic like waste sulphate liquid purification methods of the fermented broth and production, of absolute ethyl alcohol.

UNIT II

Materials for fermentative production of Vinegar, Lactic Acid, Citric Acid, and Amino acids. The method Involves selection of the particular strain of the micro-organism for Industrial Fermentation, process details and purification.

UNIT III

Production of Alcoholic beverages with Beer, Brandy, Whisky and Wine. Baked goods, cheese and other dairy products.

UNIT IV

Production *of* Antibiotics, Tetracyclines, Alkaloids Bakers yeast and Microbial Enzymes and Co-enzymes.

UNIT V

Fermentative materials for producing vitamins, Products from plant cell Cultures, Non -

alcoholic beverages (Coco, Coffee, Tea fermentation).

Textbook:

"Industrial Microbiology" by Samuel C. Presscott and Cecil, G. Dunn; A McGraw - Hill Publication.

References:

1. "Industrial Mic~obiology" by L.E. Casida. Jr. Wiley Eastern Limited. , .
2. "Microbial Technology Vol. 1 and Vol. 2 by H.J. Peppler and D. Pulman (Academic Press).

MTBT- 125-2: Pharmaceutical Biotechnology

Course Objectives:

- To understand the required parameters for lead molecule identification and optimization
- To introduce various analytical tools employed in industrial sector during preclinical trials.
- To highlight the various drug delivery systems and production of biologicals in pharmaceutical market.

Course outcomes: At the end of the course student is able to

1. Understand drug metabolism
2. Gain knowledge in Drug design and drug delivery systems
3. Summarize biologically derived therapeutic products .

UNIT I

Drug metabolism:
Biotransformation of drugs – Microsomal and non-microsomal mechanisms and the enzymes involved. Mode of excretion – Biliary/ fecal excretion, Factors affecting drug metabolism. Drug metabolism in fetus and new born. Models to study drug metabolism, Dose effect relationships, Adverse drug reactions – Toxic reactions, Allergic reactions, Idiosyncrasy, Acute poisoning and treatment.

UNIT II

QSAR AND drug design:
Drug Action – physicochemical properties and stereochemistry of compound. Isosterism and bioisosterism – metabolite, antagonist and structural variations. Methods for variation – Fibonacci search, Topliss tree, Craigsplot, Simplex methods, and Cluster analysis. Hansch's Liner method, Free and Wilson methods, mixed approached principal component analysis.

UNIT III

Computer assisted Combinatorial design:
Combinatorial chemistry – Introduction, Principles, methodology, purification and analytical tools in solid phase synthesis with case studies. Compound library, interactive graphics program – with examples.

UNIT IV

New Drug Regulation and DDs:

Rational drug design – phases of preclinical and clinical trials. Role of regulatory authorities., Drug delivery system – Basic concepts and Novel advances. Cell specific drug delivery, Brain specific drug targeting strategies and Pulmonary delivery systems.

UNIT V

Biological Products:
Properties of biotechnology derived therapeutic products. Production of Human insulin, Interferons, somatotropin, human growth hormone, somatostatin. Gene Therapy, vaccines, Monoclonal Antibody Based Pharmaceuticals, Recombinant Human Deoxyribonuclease

REFERENCES

1. K. D. Tripathi, "*Essentials of Medical Pharmacology*," 6th Edition, Jaypee publications,2008.
2. Gary Walsh, "*Pharmaceutical Biotechnology-Concepts and Applications*," Wiley,2007.
3. D. J. A. Crommelin, Robert D. Sindela, "*Pharmaceutical Biotechnology*," - 2nd Edition -2004.
4. Remington, "*The science and Practice of Pharmacy*," Vol. I and II, 20th Edition,2007.
5. Medicinal chemistry: A molecular and biochemical approach, 3rd Edition, OUP,2005.
6. Alfred Burger, "*Guide to Chemical Basis of Drug Design*," by (John Wiley & Sons)1983.
7. John Smith &Hywel Williams, "*Introduction to the Principles of Drug Design*,"Wright PSG,1983.

MTBT- 125-3: Agriculture Biotechnology

Course Objectives

:

- To give the details of conventional methods of breeding for crop improvement
- To understand about plant tissue culture and its applications
- To provide the basics of agro bacterium and methods of transformation in plants
- To familiarize commercial applications of genetic engineering in plants and also about biofertilizers

Course outcomes: At the end of the course student is able to

1. Understand methods of breeding of various crops for improvement
2. Learn about micropropagation, somatic hybridization , synthetic seed and can use gained knowledge for entrepreneurship
3. Summarize applications of genetic engineering in agriculture
4. Understand the ethics and responsibility for safety.

UNIT 1

Introduction to Agricultural biotechnology :

Conventional methods of crop improvement, Objectives of plant breeding, Types of breeding, Genetic variation and manipulation of variability, Breeding of selected crops- important cereals, pulses, oilseeds, fibre, sugar and cash crops, Classical deliberate interbreeding, Intraspecific hybridization, Methods of breeding of self-pollinated crops and cross- pollinated crops, Methods of breeding asexually propagated crops, self incompatibility and male sterility in crop breeding, mutation breeding, Ploidy breeding, Innovative breeding methods, Hybrid varieties

UNIT 2

Plant tissue culture and its application:

Principles of plant micropropagation, The totipotency concept, Role & composition of Plant tissue culture media, Micropropagation pathways, Callus induction & culture, organogenesis and embryogenesis, Meristem tip culture, Haploid production, Hardening of plants, Techniques of anther, embryo and ovule culture, Protoplast isolation, Somatic hybridization, Cybrids, Somaclones, Artificial seed Technology(synthetic seed), Embryo rescue, Production of secondary metabolites, Cryopreservation and germplasm storage

UNIT 3

Plant molecular biology:

Organelle DNA, Regulation of gene expression, Methods of gene transfer in plants, Achievements and recent developments of genetic engineering in agriculture, Development of transgenies for biotic & abiotic stress tolerance, Ribozfore Technology, Ti plasmid-based transformation, Agrobacterium biology, crown gall and hairy root disease, Ti and Ri plasmids, T-DNA genes, borders, overdrive, chromosomal and Ti plasmid virulence genes and their functions, vir gene induction, mechanism of T-DNA transfer, Ti pasmid vectors, vir helper plasmid, super virulence and monocot transformation, binary vector, Transgene silencing, Strategies to avoid transgene silencing, Direct transformation of protoplasts using PEG, electroporation, Transformation by particle bombardment, Assembly of particle gun, Microprojectile preparation and bombardment, Chloroplast transformation by particle bombardment.

UNIT 4

Advanced technology for crop improvement:

Genetic engineering of crops, Commercial status of transgenic plants, Herbicide resistance, glyphosate, sulfonyl urea, phosphinothricin, atrazine, Pest resistance, B.t. toxin, synthetic B.t. toxin, Bt brinjal, Bt cotton, Protease inhibitor, GNA and other lectins, α-amylase inhibitor, nematode resistance, Genetic engineering for male sterility-Barnase-Barstar, Delay of fruit ripening, polygalacturanase, ACC synthase, ACC oxidase, Improved seed storage proteins, Improving and altering the composition of starch and plant oils, Golden rice for β-carotene accumulation, Production of antibodies and pharmaceuticals in plants, Biofertilizers,

UNIT5

Ethics and Biosafety:

Ethical issues in biotechnology, Biosafety and Risk assessment of GMOs, Public perception. IPR and Trade related aspects, Methods for producing transgenic plants, Important genes of agronomic interest, Current trends in finding useful genes, GMO Act 2004. Traceability, Legislative aspects.Introduction, Historical Backround, Introduction to Biological Safety Cabinets, Primary Containment for Biohazards, Biosafety Levels, Biosafety Levels of Specific Microorganisms, Recommended Biosafety Levels for Infectious Agents and Infected Animals, Biosafety guidelines - Government of India, Definition of GMOs & LMOs, Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture, Environmental release of GMOs, Risk Analysis, Risk Assessment, Risk management and communication, Overview of National Regulations and relevant International Agreements including Cartegana Protocol

Text books

1.Keshavachandran.R and K V Peter. 2008 .Plant Biotechnology: Tissue culture and Genetransfer. Orient and Longman, (Universal Press) Chennai.

2.Gresshoff, Peter M. (Ed). Plant biotechnology and development. 1992.

3.Jones, MGK & Lindsey, K. "Plant Biotechnology" in Molecular biology and biotechnology, Walker, JM & Gingold, EB (Eds). 2000.

4.Kumar H D, Agricultural Biotechnology, India ,2005

Reference books:

1.Esau's Plant Anatomy, Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development, 3rd Edition, John Wiley & Sons, 2006.

2.R.H.Smith, Plant Tissue Culture: Techniques and Experiments, Academic Press, San Diego. 1992.

3.M. J. Chrispeels and D.F. Sadava (eds), Plants, Genes and Crop Biotechnology, 2nd Edition, Jones and Barlett Press, 2003

4.J.H. Hammond, P. Mcgarvey, and V. Yusibov (eds), Plant Biotechnology, Springer Verlag, Heidelberg. 2000

5.BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007

6.Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2007

7.Encyclopedia of ethics, legal and policy issues in biotechnology. 2000

MTBT-126 – ELECTIVE - IV

MTBT-126-1: BIOTECHNOLOGY IN FOOD PROCESSING

Course Objectives:

To enable the students

- To know about the constituents and additives present in the food.
- To gain knowledge about the microorganisms, food spoilage diseases.
- To know different techniques used for the preservation of foods.

Course outcomes:

Through this subject the student can understand about

1. Different constituents present in food and microorganism involved in processing of food.
2. Principles and different preservations techniques of food.
3. Unit operations in modern food processing and impact of the process on food quality

SYLLABUS

UNIT I

Food Processing:

Heat Processing using steam or water (Blanching, Pasteurization) – Heat sterilization (Evaporation and distillation) – Heat processing using hot air (Dehydration, baking and roasting) – Heat processing using hot oils – Processing by the removal of heat (chilling , Freezing) – High pressure processing of foods – Pulsed electric field processing of liquids and beverages – Non-thermal processing by radiofrequency electric fields.

UNIT II

Food Fermentation:

Fermentative production of foods – Single cell protein (yeast, mushroom) – Microorganisms responsible for production of fermented foods – Enzyme in bakery and cereal products – Enzymes in fat/oil industries – Protease in cheese making and beverage production – Production of Pectinases and Utilization in Food Processing – Food Flavour Production – Utilization of food waste for production of valuables.

UNIT III

Fermented Foods:

Overview of fermented foods – Bean-based – Grain-based – Vegetable-based – Fruit-based – Honey-based – Dairy-based – Fish-based – Meat-based – Tea-based – Advantages of fermented foods Health benefits of fermented foods – Nutritive value of fermented food – Biotechnological approaches to improve nutritional quality – Microbial changes in fermented food.

UNIT IV

Food Preservation techniques:

Spoilage of food - Microbiology of water, meat, milk, vegetables – Food poisoning – Cold preservation – Heat conservation – Ionizing radiation – High pressure – Electric field – Chemical food preservation – Combination of techniques for food preservation – Natural antioxidants – Antimicrobial enzymes – Edible coatings – Control of pH and water activity.

UNIT V

Food Quality and Control:

Analysis of food – Major ingredients present in different product – Food additives, vitamins – Analysis of heavy metal, fungal toxins, pesticide and herbicide contamination in food – Microbial safety of food products – Chemical safety of food products – Good manufacturing practice

REFERENCES

1. Adams M., Adams M. R. and Robert NoutM. J., "Fermentation and food safety", Springer, 2001.
2. Da-Wen S., "Emerging Technologies for Food Processing", Academic Press,2005.
3. Fellows, P.J., "Food Processing Technology: Principles and Practice", 3rd Edition, CRC Press,2009.
4. HutkinsR. W., "Microbiology and Technology of Fermented Foods", IFT Press series, Volume 32 of Institute of Food Technologists Series, Wiley-Blackwell,2006.
5. Pometto A, Shetty K, Paliyath G and Levin R. E., "Food Biotechnology", 2nd Edition , CRC press,2005.
6. Zeuthen P. and Bogh-Sorensen, L., "Food Preservation Techniques", 1st Edition, CRC Press,2003.

MTBT-126-2: BIOFUELS AND PLATFORM CHEMICALS

Course Objectives:

- To impart the knowledge Bioconversion of renewable lignocelluloses biomass to bio fuel and value added products
- To demonstrate a drive towards products benign to natural environment increasing the importance of renewable materials
- To emphasize the development of Biomass an inexpensive feedstock considered sustainable and renewable to replace a wide diversity of fossil based products

Course Outcomes:

On completion of the course, students will have gained knowledge on

1. The use of Biomass an inexpensive feedstock as sustainable and renewable energy
2. To replace fossil based products with Biodiesel
3. To source other alternate energy such as bio hydrogen and biorefinery

SYLLABUS

UNIT I

Introduction:

Cellulosic Biomass availability and its contents. Lignocellulose as a chemical resource. Physical and chemical pretreatment of lignocellulosic biomass. Cellulases and lignin degrading enzymes.

UNIT II

Ethanol:

Ethanol as transportation fuel and additive; bioethanol production from carbohydrates; engineering strains for ethanol production from variety of carbon sources to improved productivity.

UNIT III

Biodiesel:

Chemistry and Production Processes; Vegetable oils and chemically processed biofuels; Biodiesel composition and production processes; Biodiesel economics; Energetics of biodiesel production and effects on greenhouse gas emissions Issues of ecotoxicity and sustainability with ; expanding biodiesel production

UNIT IV

Other Biofuels

Biodiesel from microalgae and microbes; biohydrogen production; biorefinery concepts

UNIT V

Platform chemicals:

Case studies on production of C3 to C6 chemicals such as Hydroxy propionic acid, 1,3 propanediol, propionic acid, succinic acid, glucaric acid, cis-cis muconic acid.

Reference:

1. Lee, Sunggyu; Shah, Y.T. “Biofuels and Bioenergy”. CRC / Taylor & Francis, 2013 BY5020

MTBT-126-3: BIOPROCESS MODELING AND SIMULATION

Course Objectives:

- To make the students aware of the overall industrial bioprocess so as to help them to manipulate the process to the requirement of the industrial needs.
- To impart knowledge on design and operation of fermentation processes with all its prerequisites.
- Provide the students with the basics of bioreactor engineering.
- To develop bioengineering skills for the production of biochemical product using integrated biochemical processes.

Course Outcomes:

Upon completion of Bioprocess Engineering course graduates will be able to

1. Select appropriate bioreactor configurations and operation modes based upon the nature of bio products and cell lines and other process criteria.

2. Apply modelling and simulation of bioprocesses so as to reduce costs and to enhance the quality of products and systems.

3. Plan a research career or to work in the biotechnology industry with strong foundation about bioreactor design and scale-up.

4. Integrate research lab and Industry; identify problems and seek practical solutions for large scale implementation of Biotechnology.

SYALLBUS

UNIT I

Concepts and Principles:

Introduction to modelling–Systematic approach to model building–Material and energybalance –Classification of models – General form of dynamic models dimensionless models – General form of linear systems of equations nonlinear function – Conservation principles thermodynamic principles of process systems

UNIT II

Models:

Structured kinetic models – Compartmental models (two and three) – Product formation Unstructured models – Genetically structured models – Stochastic model for thermal sterilization of the medium – Modelling for activated sludge process – Model for anaerobic digestion – Models for lactic fermentation and antibiotic production

UNIT III

Modelling of Bioreactors:

Modelling of non-ideal behaviour in Bioreactors – Tanks-in-series and Dispersion models – Modelling of PFR and other first order processes – Analysis of packed bed and membrane bioreactors Recombinant Cell Culture Processes – Plasmid stability in recombinant Cell Culture limits to over-expression

UNIT IV

Monitoring of Bioprocesses:

On-line data analysis for measurement of important physico-chemical and biochemical parameters – State and parameter estimation techniques for biochemical processes – Biochemical reactors- model equations – Steady-state function – Dynamic behavior – Linearization – Phase plane analysis – Multiple steady state – Bifurcation behavior

UNIT V

Solution strategies:

Solution strategies for lumped parameter models – Stiff differential equations – Solution methods for initial value and boundary value problems – Euler's method – R-K method – shooting method – Finite difference methods – Solving the problems using MATLAB/SCILAB – ISIM-Simulation of bioprocesses using models from literature sources

References:

1. Bailey, J.A. and Ollis, D. F., Fundamentals of Biochemical Engineering", McGraw Hill – 1986.
2. Bequette, B.W., "Process Control: Modeling, Design & Stimulating", Prentice Hall,2003.
3. Boudreau, M.A. and McMillan, G.K.," New Directions in Bioprocess Modelling and Control", ISA,2006.
4. Hangos, K.M. and Cameron, I.T., "Process Modelling and Simulation",2001.
5.Heinzle, E., Biwer, A.P. and Cooney, C.A.L., "Development of Sustainable Bioprocess: Modeling", Wiley,2007.

MTBT-127: BIOTECHNOLOGY LAB –II

Course objectives:

- To let the students know the recent evolution biological databank usage
- To provide hands on experience in performing basic recombinant technique

Course Outcomes:

1. Develop Bioinformatics tools with programming skills
2. Apply computational based solutions for biological perspectives
3. Describe principle, methods for preparation & cloning of DNA
4. Able to use biotechnology techniques to manipulate genetic material and develop new and improved living organisms

Bioinformatics Lab:

1. Sequence formats
2. Structure formats
3. Sequence Retrieval from NCBI-GenBank using Entrez
4. Sequence Retrieval from EMBL-ENA using SRS
5. Sequence Retrieval from DDBJ using ARSA
6. Protein Sequence Retrieval from Swiss-Prot
7. Protein Sequence Retrieval from PIR-PSD
8. Protein Structure Retrieval from RCSB-PDB
9. Searching Bibliography Databases
10. DotPlot
11. DotPlot using BioEdit
12. NCBI BLAST
13. Global Alignment
14. Local Alignment
15. Multiple Sequence Alignment using MEGA
16. Phylogeny using MEGA
17. Structural Visualization of proteins using RasWin
18. Restriction Mapping using BioEdit
19. ORF Finding using NCBI ORF Finder

Molecular Biology Lab:

1. Isolation of Genomic DNA
2. Isolation of Plasmid
3. Restriction Digestion
4. Ligation
5. Transformation
6. Southern Hybridization

MECHANCIAL ENGINEERING DEPARTMENT

I YEAR – I SEMESTER

ADVANCED MECHANICS OF SOLIDS

Course Code: MECMD111

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To make students understand the advanced topics related to flat plates, torsion in rectangular and circular bars, stress concentration and experimental techniques, assumptions and analysis of contact stresses.

COURSE OUTCOMES:

The students will be able to:

CO1	Understand the crack propagations and their testing techniques for an out coming of various structures.
CO2	Design new components based on the concept of contact stresses
CO3	Design various mechanical systems subjected to torsional loads and different types of beams.

. **SYLLABUS**

UNIT – I

Flat plates: Introduction - Stress resultants in a flat plate - Kinematics: Strain - Displacement relations for plates - Equilibrium equations for small displacement theory of flat plates - Stress-strain-temperature relations for isotropic elastic plates - Strain energy of a plate - Boundary conditions for plates - Solutions of rectangular and circular plate problems.

Employability

UNIT – II

Torsion: Torsion of cylindrical bar of circular cross-section Saint-Venant's semi-inverse method - Linear elastic solution - The Prandtl elastic - Membrane (soap-film) analogy - Narrow rectangular cross-section - Hollow thin-wall torsion members: Multiply connected cross-section - Thin-wall torsion members with restrained ends - Fully plastic torsion.

Employability

UNIT – III

Beams on elastic foundation: General theory - Infinite beam subjected to concentrated load: Boundary conditions - Infinite beam subjected to a distributed load segment - Semi-infinite beam subjected to loads of its end - Semi-infinite beam with concentrated load near its end - Short beams - Thin-wall circular cylinders.

Employability

Employability

UNIT – IV

Stress concentrations: Basic concepts - Nature of a stress concentration problem. Stress concentration factor - Stress concentration factor. Theory of elasticity - Stress concentration factors. Experimental techniques - Stress gradients due to concentrated load - The stationary crack - Crack propagation. Stress intensity factor. Effective stress concentration factor: Applications - Stress concentration factor. Combined loads - Effective stress concentration factors - Effective stress concentration factors. Repeated loads - Effective stress concentration factors - Other influences - Effective stress concentration factors - In-elastic strains.

Employability

UNIT – V

Employability

Contact stresses: Introduction - The problem of determining contact stresses - Assumptions on which a solution for contact stresses is based - Notation and meaning of terms - Expressions for principal stresses - Method of computing contact stresses - Deflection of bodies in point contact - Stress for two bodies in contact over narrow rectangular area (line contact). Loads normal to area - Stresses for two bodies in line contact. Loads normal and tangent to contact area.

Employability

REFERENCE BOOKS:

1. Advanced Mechanics of Materials by Boresi, A.P. and Sidebottm, O.M.
2. Advanced Mechanics of Materials by Seely and Smith.
3. Advanced Strength of Materials by Den Hartog.
4. Advanced Strength of Materials by Timoshenko S.P.

MECHANCIAL ENGINEERING DEPARTMENT

I YEAR – I SEMESTER

MECHANICS OF MACHINERY

Course Code: MECMD112

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

- To make the students to understand synthesis and analysis of complex mechanisms and concepts of cam dynamics.

COURSE OUTCOMES

The student will be able to

CO 1	Determine velocity and acceleration of various components in complex mechanisms by applying graphical and analytical methods
CO 2	Understand the concepts of synthesis and use it for the design of mechanical systems
CO 3	Understand Cam dynamics and use it in designing of Cams

. **SYLLABUS**

UNIT-I:

Kinematics of complex mechanisms - Complex mechanisms, Low and high degree of complexity, Goodman's indirect acceleration analysis, Method of normal accelerations, Hall and Ault's auxiliary point method, Carter's method and comparison of methods.

Employability

UNIT-II:

Advanced kinematics of plane motion - The inflexion circle - Euler-Savary equation, Analytical and graphical determination of diameter of inflection circle - Bobbileier's construction, Collineation axis - Hartman's construction, Application of inflection circle to kinematic analysis - Polode curvature - General case and special case, Polode curvature in the four-bar mechanism - Coupler motion, Relative motion of the output and input links, Freudenstein'scollineation axis theorem - Carter Hall circle, Circling-point curve (general case).

Employability

UNIT-III:

Introduction to synthesis (graphical methods) guiding a point through two, three and four distinct positions - Burmaster's curve, Function generation - Overlay's method, Path generation - Robert's theorem.

Employability

UNIT-IV:

Introduction to synthesis (analytical methods) - Freudenstein's equation - Precision point approximation - Precision derivative approximation - Method of components - Block synthesis and Reven's method.

UNIT-V:

Cam dynamics - Forces in rigid systems, Mathematical models, Response of a uniform - Motion undamped cam mechanism - Analytical method, Follower response by phase - Plane method - Position error, Jump, Crossover shock - Johnson's numerical analysis.

Employability

REFERENCE BOOKS:

1. Kinematics and Dynamics of Plane Mechanisms by J. Hirschhorn, McGraw Hill Book Co., 1962.
2. Theory of Mechanics by J.E. Shigley, McGraw Hill Book Co., 1961 .
3. Theory of Mechanisms and Machines/ Amitabh Ghosh and Ashok Kumar Mallik/ E. W.P.Publishers
4. Kinematics and Linkage Design/ Allen S.Hall Jr./ PHI,1964.

5. Kinematics and Dynamics of Machinery/Charles E Wilson/Pearson/3rd Edition

I YEAR – I SEMESTER

ADVANCED OPTIMIZATION TECHNIQUES

Course Code: MECMD113

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

The objective of the course is to provide students

- Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively;
- Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry;
- Skills in the use of optimization approaches and computer tools in solving real problems in industry;
- Ability to develop mathematical models for analysis of real problems in optimization

COURSE OUTCOMES:

The students will be able to:

CO1	Recognize the importance and value of optimization and mathematical modeling in solving practical problems in industry.
CO2	Formulate a managerial decision problem into a mathematical model.
CO3	Understand optimization models and apply them to real-life problems.
CO4	Use computer tools to solve a mathematical model for a practical problem.

SYLLABUS

UNIT I

Geometric programming (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. Primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P), Complementary Geometric Programming (C.G.P)

Skill development/
Employability

UNIT II

Dynamic programming(D.P): Multistage decision processes. Concepts of sub optimization and Principal of optimality, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P. and continuous D.P.

Skill development/Employability

UNIT III

Integer programming(I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Branch-and-bound method, Sequential linear discrete Programming, Generalized penalty function method.

Skill development/Employability

UNIT IV

Stochastic Programming (S.P.): Basic Concepts of Probability Theory, Stochastic Linear programming.

Skill development/Employability

UNIT V

Non-traditional optimization techniques: Multi-objective optimization - Lexicographic method, Goal programming method, Genetic algorithms, Simulated annealing, Neural Networks based Optimization.

Skill development/Employability

REFERENCE BOOKS:

1. Operations Research- Principles and Practice by Ravindran, Phillips and Solberg, John Wiely
2. Introduction to Operations Research by Hiller and Lieberman, Mc Graw Hill
3. Engineering Optimization - Theory and Practice by Rao, S.S., New Age International (P) Ltd. Publishers.
4. Engineering Optimization By Kalyanmanai Deb, Prentice Hall of India, New Delhi.
5. Genetic Algorithms - In Search, Optimization and Machine Learning by David E. Goldberg, Addison-Wesley Longman (Singapore) Pvt. Ltd.

I YEAR – I SEMESTER

DESIGN ENGINEERING

Course Code: MECMD114

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

To develop the ability:

- To identify different design models, steps involved in it and he ability to apply the fundamentals of product design and manufacturing design techniques for metallic and non metallic parts along with material selection criteria in design.
- To gain knowledge of economic factors, human engineering, ergonomics, and value engineering and modern approaches in design.
- To find static failure theories, surface failures and fatigue strengths.

COURSE OUTCOMES:

The students will be able to:

CO1	Approach a design problem successfully, taking decisions when there is not a unique answer.
CO2	Devise a list of concepts for a design application using idea-generation techniques for product design, material selection and design for manufacturing along with their failures and fatigue strengths.
CO3	Use proficiently the economic factors, human engineering, ergonomics, and value engineering and modern approaches in design.

. **SYLLABUS**

Unit-I

Employability

Design philosophy: Design process, Problem formation, Introduction to product design, various design models-Shigley model, Asimov model and Norton model, Need analysis. Strength considerations -standardization. Creativity, Creative techniques, Material selections, Notches and stress concentration, design for safety and Reliability

Employability

Unit –II Employability Employability

Product Design: Product strategies, Product value, Product planning, product specifications, concept generation, concept selection, concept testing.

Design for manufacturing: Forging design, Casting design, Design process for non metallic parts, Plastics, Rubber, Ceramic, Wood, Glass parts. Material selection in machine design

Unit –III Employability

Failure theories: Static failure theories, Distortion energy theory, Maximum shear stress theory, Coulomb-Mohr's theory, Modified Mohr's theory, Fracture mechanics theory., Fatigue mechanisms, Fatigue failure models, Design for fatigue strength and life, creep; Types of stress variation, design for fluctuating stresses, design for limited cycles, multiple stress cycles, Fatigue failure theories ,cumulative fatigue damage, thermal fatigue and shock, harmful and beneficial residual stresses, Yielding and transformation

Employability

Unit -IV

Surface failures: Surface geometry, mating surfaces, oil film and their effects, design values and procedures, adhesive wear, abrasive wear, corrosion wear, surface fatigue, different contacts, dynamic contact stresses, surface fatigue failures, surface fatigue strength,

Unit -V

Economic factors influencing design: Economic analysis, Break-even analysis, Human engineering considerations, Ergonomics, Design of controls, Design of displays. Value engineering, Material and process selection in value engineering, Modern approaches in design.

Employability

REFERENCE BOOKS:

1. Machine Design An Integrated Approach by Robert L. Norton, Prentice-Hall New Jersey, USA.
2. Mechanical Engineering Design by J.E. Shigley and L.D. Mitchell published by McGraw-Hill International Book Company, New Delhi.
3. Fundamentals of machine elements by Hamrock, Schmid and Jacobian, 2nd edition, McGraw- Hill International edition.
4. Product design and development by Karl T. Ulrich and Steven D. Eppinger. 3rd edition, Tata McGraw Hill.
5. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall

I YEAR – I SEMESTER

ELECTIVE-I A

INTEGRATED COMPUTER AIDED DESIGN

Course Code: MECMD115

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

To make students

- Learn advanced concepts of feature based modeling
- Understand the methods of representation of wireframe, surface, and solid modeling systems.
- Learn role of CAD in MDO (Multidisciplinary Design Optimization).
- Gain extensive hands-on experience with two commercial CAD systems to gain proficiency in using the systems at advanced levels, migrating and sharing data between systems, and applying the theory covered in this course.
- Understand the tools and techniques used to come up with a proper design
- Better communicate their design to an audience

COURSE OUTCOMES:

The students will be able to:

CO1	Develop capacity for creativity and innovation.
CO2	Apply knowledge of basic science and engineering fundamentals
CO3	Utilize systems approach to design and operational performance
CO4	Use appropriate techniques and resources
CO5	Conduct an engineering project

. **SYLLABUS**

UNIT-I

Employability

Fundamentals of CAD: Introduction, Design process, Application of computer for design, Creating the manufacturing database, Benefits of CAD, Design work station, CAD hardware.

UNIT-II

Employability

Geometric modeling: Geometric modeling techniques - Multiple view 2D input, Wire frame geometry, Surface models, Geometric entities - Curves and Surfaces, Solid modelers, Feature recognition.

Employability

Computer aided drafting: AutoCAD tools, 3D model building using solid primitives and boolean operations, 3D model building using extrusion, Editing tools, Multiple views: Orthogonal, Isometric.

UNIT-III

Visual realism: Shading solids, Coloring, Color models, Using interface for shading and coloring.

Employability

Graphic aids: Geometric modifiers, Naming scheme, Layers, Grids, Groups, Dragging and rubber banding.

UNIT-IV

Computer animation: Conventional animation, Computer animation - Entertainment animation, Engineering animation, Animation types, Animation techniques.

Employability

Mechanical assembly: Assembly modeling, Part modeling, Mating conditions, Generation of assembling sequences, Precedence diagram, Liaison-sequence analysis.

UNIT-V

Mechanical tolerancing: Tolerance concepts, Geometric tolerancing, Types of geometric tolerances, Location tolerances, Drafting practices in dimensioning and tolerancing, Tolerance analysis.

Employability

Mass property calculations: Geometrical property formulation - Curve length, Cross-sectional area, Surface area, Mass property formulation - Mass, Centroid, Moments of inertia, Property mapping. Properties of composite objects.

REFERENCE BOOKS:

1. CAD/CAM Theory and Practice by Ibrahim Zeid.
2. CAD/CAM Principles and Applications by P.N. Rao, Tata McGraw Hill Publishing Company Ltd.
3. CAD/CAM Computer Aided Design and Manufacturing by Mikell P. Groover and Emory W. Zimmer, Jr.
4. Computer Integrated Design and Manufacturing by David D. Bedworth, Mark R. Henderson, Philip M. Wolfe.

I YEAR – I SEMESTER

ELECTIVE-I B

PRESSURE VESSEL DESIGN

Course Code: MECMD115

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

To make students:

- Develop an ability to apply knowledge of mathematics, science, and engineering.
- Develop an ability to design a pressure vessel system, component, or process to meet desired needs within realistic constraints.
- Develop an ability to identify, formulate, and solve engineering problems.
- Develop an ability to identify discontinuity stresses in pressure vessels.

COURSE OUTCOMES:

The students will be able to:

CO1	Analyze the stress and strain on cylindrical, spherical and arbitrary shaped shells subjected to internal pressure, wind load bending etc.
CO2	Understand the theory of Rectangular and circular plates subjected to pure bending and different edge conditions.
CO3	Understand the effect of stress concentration influencing various factors such as surface, thermal stress ,fatigue, creep ,hydrogen embrittlement of pressure vessels.

SYLLABUS

Employability

Unit-I

Introduction, Materials- shapes of Vessels –stresses in cylindrical spherical and arbitrary, shaped shells. Cylindrical Vessels subjected to internal pressure, wind load bending and torque-ilation of pressure vessels –conical and tetrahedral vessels.

Theory of thick cylinders; Shrink fit stresses in built up cylinders – auto frettage of thick Cylinders Thermal stresses in Pressure Vessels.

Employability

Unit-II

THEORY OF RECTANGULAR PLATES: Pure bending – different edge conditions.

Theory circular plates: Simple support and clamped ends subjected to concentrated and Uniformly distributed loads-stresses from local loads. Design of dome bends, shell connections, flat heads and cone openings.

DISCONTINUITY STRESSES IN PRESSURE VESSELS: Introduction beam on an elastic

Foundation, infinitely long beam semi infinite beam, cylindrical vessel under axially symmetrical Loading, extent and significance of load deformations on pressure vessels, discontinuity stresses in vessels, stresses in a bimetallic joints, deformation and stresses in flanges.

Unit-III

Pressure vessel materials and their environment: Introduction ductile material tensile tests, Structure and strength of steel Leuder's lines determination of stress patterns from plastic flow Observations, behavior of steel beyond the yield point, effect of cold work or strain hardening on The physical properties of pressure vessel steels fracture types in tension. Toughness of Materials, effect of neutron irradiation of steels, fatigue of metals, fatigue crack growth fatigue life.
Prediction cumulative fatigue damage stress theory of failure of vessels subject to steady state And fatigue conditions.

Employability

Unit-IV

STRESS CONCENTRATIONS: Influence of surface effects on fatigue, effect of the environment
And other factors on fatigue life thermal stress fatigue creep and rupture of metals at elevated Temperatures, hydrogen embitterment of pressure vessel steels brittle fracture effect of Environment on fracture toughness, fracture toughness relationships criteria for design with Defects, significance of fracture mechanics evaluations, effect of warm prestressing on the Ambient temperature toughness of pressure vessel steels.

Employability

Unit-V

DESIGN FEATURES: Localized stresses and their significance, stress concentration at a Variable thickness transition section in a cylindrical vessel, stress concentration about a circular Hole in a plate subject to tension, elliptical openings, stress concentration, stress concentration Factors for position, dynamic and thermal transient conditions, theory of reinforced openings and Reinforcement, placement and shape fatigue and stress concentration.

Employability

REFERENCE BOOKS:

1. Theory and design of modern Pressure Vessels / John F. Harvey 'Van/ Nostrand Reihold Company / New York.
2. Pressure Vessel Design and Analysis / Bickell M. B. Ruizes / Macmillan Publishers
3. Process Equipment design / Beowll & Yound Ett.
4. Indian standard code for unfired Pressure vessels IS 2825.
5. Pressure Vessels Design Hand Book Henry H. Bednar PE / CB S Publishers / New Delhi.
6. Theory of plates and shells / Timoshenko& Noinosky / Dover Publications.
7. Stress in Beams, Plates and Shells / Ansel C. Ugural / CRC Press / 3rd Edition**SIGNAL**

I YEAR – I SEMESTER

ELECTIVE-I C

FATIGUE, CREEP AND FRACTURE MECHANICS

Course Code: MECMD115	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

COURSE OBJECTIVES:

To make students:

- Develop an ability to apply knowledge of mathematics, science, and engineering.
- Develop an ability to design a system, component, or process to meet desired needs within realistic constraints
- Develop an ability to identify the Crack growth in fracture mechanics.
- Develop an object or component subjected to creep and fluctuating loads.

COURSE OUTCOMES:

The students will be able to:

CO1	Analyze the stress and strain on mechanical components; and understand, identify and quantify failure modes for mechanical parts.
CO2	Understand the Crack growth and Energy release rate and establishing a relationship between Crack tip stress and Displacement fields.
CO3	Design the welded structures subjected to fatigue with the use of fracture mechanics to supplement design rules with practical Examples.

. **SYLLABUS**

Employability

UNIT-I

INTRODUCTION: Fracture behaviour of metals and alloys. The ductile/brittle transition temperatures for notched and un-notched components, Ductile rupture as a failure mechanism Fracture at elevated temperature.

Definitions of types of fracture and failure, Introduction to stress intensity factor and strain energy release rate, Equivalence of energy approach and stress intensity approach.

Basic stress analysis and mechanical properties: Elasticity, General 3-D relations, Plane stress and plane strain, Mohr's circle-principal stresses. Yield in materials, Tresca and Von Mises criteria, Ideal and actual strength of materials. Typical stress/strain curves for different classes of materials.

Employability

Employability

UNIT-II:

STRESS INTENSITY FACTOR AND ITS USE IN FRACTURE MECHANICS: Early concepts of stress concentrators and flaws, Ingles solution to stress round an elliptical hole-implications of results. Stress intensity factor for a crack. Westergaard's solution for crack tip stresses. Stresses and displacement in Cartesian and polar coordinates, Linear Elastic Fracture Mechanics. Typical values of fracture toughness, Different modes of crack opening. Superposition of crack tip stress fields, Direction of crack growth under mixed mode loadings, Crack tip plasticity, Early estimates of plastics zone, Irwin plastic zone correction and Dugdale approach, Plastic zone shape in three dimensions and shape under plane stress and plane strain conditions, Allowable plasticity for LEFM to apply, the thickness criterion Experimental methods for measuring Kic.

Employability

UNIT-III:

Employability

ELASTIC/PLASTIC FRACTURE MECHANICS: Elastic/plastic fracture mechanics: The crack opening displacement and J-integral approaches, R-curve analysis Testing procedures, Measurement of these parameters, RAD, Fail sage and safe life design approaches, Practical applications. Advanced topics in EOFM.

UNIT-IV:

Employability

Employability

FATIGUE: Importance of fatigue in engineering, Low cycle fatigue, Coffin-Manson law, Cyclic work hardening and softening. Micro structural models of crack initiation. Stage I, II and III crack growth.

Analysis of Fatigue: The empirical laws of fatigue failure. High cycle-low strain fatigue, Basquin's law, Goodman, Soderberg and Gerber mean stress corrections, Miner's law of damage summation. Low cycle fatigue, Crack growth and application of fracture mechanics to fatigue, Paris-Ergodan law, Threshold stress intensity range. Crack closure and its theories Cycle counting methods, Developments in using rain-flow counting methods to recreate fatigue standard spectra. Standard spectra suitable for different applications.

UNIT-V:

Employability

FATIGUE OF WELDED STRUCTURES: Factors affecting the fatigue lives of welded joints, the codes and standards available to the designer, the use of fracture mechanics to supplement design rules. Practical examples.

Creep: Phenomenology, Creep curves, Creep properties, Multi-axial creep, Creep-fatigue interaction, Creep integrals.

Employability

REFERENCE BOOKS:

1. Mechanical Metallurgy / Dieter / McGraw Hill
2. Fracture Mechanics: Fundamental and Applications /Anderson T.L & Boca Raton/ CRC Press, Florida, 1998.
3. Deformation and Fracture mechanics of Engineering Materials / Richard W Hertz /Wiley
4. Plasticity for structural Engineers / W.F. Chen and D.J,. Ha,
5. Engineering Fracture Mechanics/ D.R.J. Owen and A.J. Fawkes /Pincridge press, Swansea, U.K.
6. Fracture and fatigue control in structures/ S.T. Rolfe and J.M. Barsom/ Printice Hall, Eglewood cliffs, N.J..
7. Fracture of brittle solids/ B.R. Lawn and T.R. Wilshaw/ Cambridge university press.
8. Plastic deformation of Metals/ R.W.K. Honeycombe/ 2nd edition, Edward

I YEAR – I SEMESTER

ELECTIVE-I D

DATA BASE MANAGEMENT SYSTEMS

Course Code: MECMD115

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To make students understand the concepts of Data Base Management Systems.

COURSE OUTCOMES:

The students will be able to:

CO 1	Understand the basic concepts and the applications of database systems.
CO 2	Master the basics of SQL and construct queries using SOL.
CO 3	Understand the relational database design principles.
CO 4	Familiar with the basic issues of transaction processing and concurrency control.
CO 5	Familiar with database storage structures and access techniques.

. **SYLLABUS**

UNIT- I

Introduction-Database System Applications, Purpose. of Database Systems, View of Data — Data Abstraction, lnstan.ces and Schemés, Data Models, Database Languages — DDL, DML, Database.Access from Application Programs, Transaction Management, Data"htoragé bnd Querying, Database Architecture, Database Users and Administrators, History of Data base Systems.

Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprise9.. Relational Model: Introduction to the Relational Model — Integrity Constraints over Relations, Enforcing Integrity consti aints, Querying relational data, Logical data base Design, Introduction to Views — Destroying /altering Tables and Views.

UNIT- II

Relational Algebra and Calculus: Relational Algebra — Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus — Tuple relational Calculus - Domain relational calculus — Expressive Power of Algebra and calculus.

Form of Basic SQL Oue•y — Examples of Basic SQL Queites, Introduction to Nested Queries, Correlated Nested Queries, Set — Comparison Operators, Aggregate Operators. NULL values — Comparison using Null values — Logical connectives — AND, OR and NOT — Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT- III

Introduction to Schema Refinement — Problems Caused by redundancy, Decompositions — Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms — FIRST, SECOND, THIRD Normal forms — BCNF —Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design — Multi valued Dependencies — FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT- IV

Transaction Management-Transaction Concept- Transaction State- Implementation of Atomicity and Durability — Concurrent — Executions Serializabil'ity- Recoverability — Implementation of Isolation — Testing for serializability.
Concurrency Control- Lock —Based Protocols — Timestamp Based Protocols- Validation-Based Protocols — Multiple Granularity.
Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity — Log -Based Recovery — Recovery with Concurrent Transactions— Buffer Management — Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT- V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing — Clustered Indexes, Primary and Secondary Indexes, Index data Structures — Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.
Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.
Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Exlendible vs. Linear Hashing.

REFERENCE BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Data base System Concepts, A.SiIberschatz, H.F. Korth, S.Sudarshan, McGraw hill, Vl edition, 2006.
3. Database Systems, 6th edition, Ramez Elmasri, Shamkant B.Navathe, Pearson Education, 2013.
4. Database Principles, Programming, and Performance, P.O'Neil, E.O’NeiI, 2nd ed., ELSEVIER.

I YEAR – I SEMESTER

ELECTIVE-II A

THEORY OF ELASTICITY AND PLASTICITY

Course Code: MECMD116

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To study the classical theory of linear elasticity for two and three dimensional state of stress and obtain solutions for selected problems in rectangular and polar coordinates as well as torsion of prismatic bars.
- To understand the plastic stress strain relations, criteria of yielding and elasto- plastic Problems.

COURSE OUTCOMES:

The students will be able to:

CO 1	Form various equations to study the effect of forces on two dimensional and three dimensional type problems.
CO2	identify the stresses induced in curved bars, rings by considering the stresses induced in the polar coordinate system
CO3	Write down stress-strain and displacement components equations in rectangular and polar coordinate system for various types of problems.
CO4	Understand the concepts of plastic deformation of metals ,Creep.

. **SYLLABUS**

UNIT-I:

Employability

Elasticity: Two dimensional stress analysis - Plane stress - Plane strain - Equations of compatibility - Stress function - Boundary conditions.

Problem in rectangular coordinates - Solution by polynomials - Saint Venent's principles - Determination of displacement - Simple beam problems.

UNIT-II:

Employability

Problems in polar coordinates - General equations in polar coordinates - Stress distribution symmetrical about axis - Strain components in polar coordinates - Simple and symmetric problems.

Analysis of stress and strain in three dimensions - Principle stresses - Homogeneous deformations - Strain spherical and deviatoric stress - Hydrostatic strain.

Employability

UNIT-III:

General theorems: Differential equations of equilibrium and compatibility - Displacement - Uniqueness of solution - Reciprocal theorem.

Bending of prismatic bars - Stress function - Bending of cantilever beam - Beam of rectangular cross-section - Beams of circular cross-section.

Employability

UNIT-IV:

Plasticity: Plastic deformation of metals - Structure of metals - Deformation - Creep stress relaxation of deformation - Strain rate condition of constant maximum shear stress - Condition of constant strain energy - Approximate equation of plasticity.

Employability

UNIT-V:

Methods of solving practical problems - The characteristic method - Engineering method - Compression of metal under press - Theoretical and experimental data drawing.

REFERENCE BOOKS:

1. Theory of Elasticity by Timoshenko, S.P. and Goodier, J.N.
2. An Engineering Theory of Plasticity by E.P. Unksov.
3. Applied Elasticity by W.T. Wang.
4. Theory of Plasticity by Hoffman and Sacks.

I YEAR – I SEMESTER

ELECTIVE-II B

COMPUTATIONAL METHODS IN ENGINEERING

Course Code: MECMD116

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To make students familiar with the numerical methods for scientific and engineering computation.

COURSE OUTCOMES:

The students will be able to:

CO1	Discuss several important methods with widespread application for solving large system of equations.
CO2	Appraise the importance of eigen value problems in engineering sciences.
CO3	Analyze experimental data by fitting a polynomial or estimating the derivative or finding the integrals or performing Fourier analysis.
CO4	Prepare mathematical model for physical situations and numerically analyze the corresponding ordinary linear/nonlinear, initial/boundary value differential equations.
CO5	Prepare mathematical model for physical situations and numerically analyze the corresponding partial linear/nonlinear, initial value/ initial boundary value differential equations.

. **SYLLABUS**

Employability

UNIT-I

Linear System of Equations: Gauss elimination method, Triangularization method, Cholesky method, Partition method, Error Analysis for Direct Methods. Iteration Methods: Jacobi Iteration Method, Gauss Seidel Iteration Method, SOR Method

Employability

UNIT-II

Eigenvalue and Eigen Vectors, Bounds on Eigen values, Jacobi Method for symmetric Matrices, Givens Method for Symmetric Matrices, Householders Method, Power Method

Employability

UNIT-III

Numerical differentiation: Introduction, Methods based on undetermined coefficients, Optimum choice of step length, Extrapolation Methods, Partial Differentiation Numerical Integration: Introduction, Open type integration rules, Methods based on undetermined coefficients: Gauss-

Employability

Legendre, Gauss- Chebyshev, Romberg Integration. Double integration: Trapezoidal method, Simpson s method.

UNIT-IV

Employability

Numerical Solutions of Ordinary Differential Equations (Boundary Value Problem): Introduction, Shooting Method: Linear and Non Linear Second order Differential Equations.

UNIT-V

Numerical Solutions of Partial Differential Equations: Introduction, Finite difference Approximation to Derivatives. Laplace equation- Jacobi method, Gauss Seidel Iteration Method, SOR Method. Parabolic Equations, Iterative methods for Parabolic Equations, Hyperbolic equations.

Employability

REFERENCE BOOKS:

1. M.K. Jain, S.R.K. Iyengar and R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International (P) Limited, Publishers, 4th edition, 2003.

2. S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall India Pvt., Limited, 4th edition, 2009.

3. Samuel Daniel Conte, Carl W. De Boor, "Elementary Numerical Analysis: An Algorithm Approach", 3rd edition, McGraw-Hill, 2005.

I YEAR – I SEMESTER

ELECTIVE-II C
THEORY OF PLATES AND SHELLS

Course Code: MECMD116	L	T	P	C
	4	0	0	4

COURSE OBJECTIVES:

To make students:

- Familiar with the concepts allied to Bending of long rectangular plates to a cylindrical surface, Pure bending of plates which consists of small deflections of laterally loaded plates with various edge conditions.
- Familiar with the various views of deformation of shells in the form of a surface of revolution.

COURSE OUTCOMES:

The students will be able to:

CO1	Understand the concepts of bending of plates.
CO2	Design plates and shell for different engineering applications.

. **SYLLABUS**

Unit I:

Bending of long rectangular plates to a cylindrical surface: Differential equation for cylindrical bending of plates - Cylindrical bending of uniformly loaded rectangular plates with simply supported edges - Cylindrical bending of uniformly loaded rectangular plates with built-in edges

Pure bending of plates: Slope and curvature of slightly bent plates - Relations between bending moments and curvature in pure bending of plates - Particular cases of pure bending - Strain energy in pure bending of plates.

Employability

Unit II:

Symmetrical bending of circular plates: Differential equation for symmetrical bending of laterally loaded circular plates - Uniformly loaded circular plates - Circular plate with a circular hole at the center - Circular plate concentrically loaded - Circular plate loaded at the center.

Employability

Unit III:

Small deflections of laterally loaded plates: The differential equation of the deflection surface - Boundary conditions - Alternate method of derivation of the boundary condition - Reduction of the problem of bending of a plate to that of deflection of a membrane

Employability

Unit IV:

Simply supported rectangular plates: Simply supported rectangular plates under sinusoidal load - Navier solution for simply supported rectangular plates.

Employability

Rectangular plates with various edge conditions: Bending of rectangular plates by moments distributed along the edges - Rectangular plates with two opposite edges simply supported and the other two edges clamped.

Continuous rectangular plates: Simply supported continuous plates - Approximate design of continuous plates with equal spans - Bending symmetrical with respect to a center.

Unit V:

Deformation of shells without bending: Definition and notation - Shells in the form of a surface of revolution and loaded symmetrically with respect to their axis - Particular cases of shells in the form of surfaces of revolution - Shells of constant strength.

General theory of cylindrical shells: A circular cylindrical shell loaded symmetrically with respect to its axis - Particular cases of symmetrical deformation of circular cylindrical shells - Pressure vessels.

Employability

REFERENCE BOOKS:

1. Theory of Plates and Shells / Timoshenko, S. and Woinowsky-Krieger, S/McGraw Hill

2. Stress in Beams, Plates and Shells / Ansel C. Ugural / CRC Press / 3rd Edition.

I YEAR – I SEMESTER

ELECTIVE-II D
VEHICLE DYNAMICS

Course Code: MECMD116

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

- To make the students understand the intricacies of vehicle dynamics and apply them for road safety and ride comfort.

COURSE OUTCOMES

The student will be able to

CO 1	Understand the mechanisms of pneumatic tyres
CO 2	Understand performance, handling, stability and ride characteristics of road vehicles.

. **SYLLABUS**

UNIT-I:

Introduction to Vehicle Dynamics: Various kinds of vehicles, Motions, Mathematical modelling methods, Multibody system approach, Lagrangian formulations, Methods of investigations, Stability concepts.

Employability

UNIT-II:

Mechanics of pneumatic tyres: Tyre construction, SAE recommended practice, Tyre forces and moments, Rolling resistance of tyres, Tractive effort and longitudinal slip, Cornering properties of tyres, Performance of tyre traction on dry and wet surfaces, Ride properties of tyres.

Employability

UNIT-III:

Performance characteristics of road vehicle: Equation of motion and maximum tractive effort, Aerodynamic forces and moments, Vehicle power plant and transmission characteristics, Prediction of vehicle performance, Operating fuel economy, Braking performance.

Employability

UNIT-IV:

Handling and stability characteristics of road vehicles: Steering geometry, Steady state handling characteristics, Steady state response to steering input, Testing of handling characteristics, Transient response characteristics, Directional stability, Effects of tyre factors, Mass distribution and engine location on stability of handling.

Employability

UNIT-V:

Vehicle ride characteristics: Human response to vibration, Vehicle ride models, Introduction to random vibration - 1) Road suirface profile as a random function, 2) Frequency response function, 3) Evaluation of vehicle vertical vibration in relation to ride comfort criteria, 4) Active and semi active systems, 5) Optimum design for ride comfort and road holding.

Employability

REFERENCE BOOKS:

1. Theory of Ground Vehicles by Wong, J.Y., John Wiley and Sons, NY, 1993.
2. Fundamentals of Vehicle Dynamics by Gillespie, T.D., SAE Publication, Warrendal, USA, 1992.
3. Tyres, Suspension and Handling by Dixon, J.C., SAE Publication, Warrendal, USA and Arnold Publication, London, 1997.

I YEAR – I SEMESTER

CAD LAB

Course Code: MECMD117

L	T	P	C
0	**0**	**3**	**2**

COURSE OBJECTIVES:

- To train students in such way that they can prepare Part model, Assembly of parts and obtaining the final production drawing from the assembly.
- To explain basics concepts of 2D drafting using Auto CAD.
- 3D modelling techniques are explained using Autodesk Inventor.
- Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings.
- To enhance the students knowledge in presentation and simulation of the assemblies.
- To impart the analysis skills in student by performing various Finite Element Analysis in ANSYS.

COURSE OUTCOMES:

Student will be able to

CO-1	Experiments in the CAD lab will give better knowledge in 2D drafting
CO 2	Students can prepare 3D Models, Assemblies and Drawings
CO 3	Students can solve Analysis problems.
CO 4	Students can do the real time industrial projects in the lab using the available softwares.
CO 5	Students will become industry ready.

. **SYLLABUS**

2D and 3D modeling and assembly modeling using modeling packages like AutoCAD, Auto Desk Mechanical desktop, ProEngineer, IDEAS.

Linear and non-linear static and dynamic analysis using any FEA package ANSYS / CAEFEM / NASTRAN.

Skill Development & Employability

I YEAR – II SEMESTER

MECHANICAL VIBRATIONS

Course Code: MECMD121

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To make students familiar with the concepts of various types of Mechanical vibrations and apply them in various engineering applications

COURSE OUTCOMES:

The student will be able to

CO 1	Measure various vibration parameters of vibrating systems subjected to longitudinal vibrations with different degrees of freedom
CO 2	Understand the concepts of torsional vibrations
CO 3	Apply the principals of vibration to continuous systems

. **SYLLABUS**

UNIT I

Single degree freedom systems -Introduction - Single degree freedom systems - free and forced vibrations - Damping classification and damped systems.

Employability

UNIT II

Two degree freedom systems - Free, forced damped and undamped motions - Use of influence coefficients, Matrix methods and Lagrange's equations - Phenomenon of beat - Dynamic absorbers – Applications.

Employability

UNIT III

Transient (Shock) vibrations as applied to single and two degree freedom systems - Use of mathematics and graphical techniques in the analysis (superposition integral, Laplace transformations, phase plane techniques).

Employability

UNIT IV

Multi degree freedom systems - Free and forced motions in longitudinal, torsional and lateral modes - damped and undamped, critical speeds of rotors.

Employability

UNIT V

Continuous systems:

Free and forced vibrations of string, bars and beams - Principle of orthogonality Classical and energy methods by Rayleigh, Ritz and Gelerkin.

Employability

REFERENCE BOOKS:

1. Mechanical Vibrations by A.H. Church.
2. Vibration Problems in Engineering by Timoshenko and Young.
3. Mechanical Vibrations by Den Hartog.
4. Mechanical vibrations by S S Rao
5. Mechanical vibrations by Grover

I YEAR – II SEMESTER

INSTRUMRNTATION & EXPERIMENTAL STRESS ANALYSIS

Course Code: MECMD122

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

1. To give a brief theoretical knowledge related to Instrumentation.
2. The central purpose of this subject is to help students to develop their understanding and ability to apply, both theoretical and experimental stress analysis techniques to real world engineering design tasks.

COURSE OUTCOMES:

The student will be able to:

CO 1	Use the fundamental knowledge in Instrumentation systems.
CO 2	Understand the concepts of Stress Analysis.
CO 3	Use the experimental techniques on the practical problems

. **SYLLABUS**

PART - A (Instrumentation)

Skill development

UNIT-I

Basic concepts: Calibration - Standards - Basic concepts in dynamic measurements – System response - Distortion.

Sensing devices: Bridge circuits - Amplifiers - Filter circuits - Oscilloscope - Oscillograph - Transducers - variable resistance transducers - LVDT - Capacitive and piezoelectric transducers.

Pressure measurement: Mechanical pressure measurement devices - Bourdon tube pressure gauge - Diaphragm and bellow gauges - Low pressure measurement - McLeod gauge – Pirani gauge - Ionization gauge.

Skill development

UNIT-II

Flow measurement: Positive displacement methods - Flow obstruction methods – Flow measurement by drag effect - Hot wire anemometer.

Temperature measurement: Temperature measurements by mechanical effects, Electrical effects and by Radiation - Thermocouples;

Force and Torque measurement; Motion and Vibration measurement.

Skill development

PART - B (Stress Analysis)

Employability

UNIT-III

Brittle lacquer method of stress analysis: Application of lacquer - Stress determination - Dynamic stresses; **Grid methods.**

UNIT-IV

Strain Measurement Methods: Mechanical resistance wire gauges - Types of resistance gauges – Cements and cementing of gauges - Wheatstone bridge - Balanced and unbalanced gauge factor - Calibration of gauges - Strain gauge rosette - Evaluation and principal stresses static and dynamic instrumentation.

Employability

UNIT-V

Photo elasticity: Polariscope - Plane and circularly polarized light, Bright and dark field setups, Photo elastic materials - Isochromatic fringes - Isoclinics - Calibration - Isoclines stress determination.

Employability

REFERENCE BOOKS:

1. Experimental Stress Analysis and Motion Measurement by Dove and Adams.
2. Experimental Methods for Engineers by Holman, J.P., McGraw Hill Book Company.
3. Experimental stress analysis by Dally and Riley, Mc Graw-Hill.
4. Photo Elasticity by Frocht.

I YEAR – II SEMESTER

ADVANCED FINITE ELEMENT ANALYSIS

Course Code: MECMD123

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To introduce students to the basics of theory of elasticity.
- To enable the students understand the mathematical and physical principles underlying the Finite Element Method (FEM) as applied to solid mechanics and Heat transfer
- To teach students the characteristics of various elements in structural and thermal analysis and selection of suitable elements for the problems being solved.
- To make the students derive finite element equations for different elements.
- To teach students the application of finite element in dynamic analysis and analysis of plates.

COURSE OUTCOMES

The students will be able to:

CO1	Apply the knowledge of Mathematics and Engineering to solve problems in structural mechanics by approximate and numerical methods.
CO2	Solve the problems in solid mechanics and heat transfer using FEM.
CO3	Use commercial FEA packages like ANSYS for solving real life problems.

. **SYLLABUS**

UNIT-I:

Introduction to FEM, basic concepts, historical back ground, applications of FEM, general description, comparison of FEM with other methods, variational approach, Glerkin's Methods. Coordinates, basic element shapes, interpolation function, Virtual energy principle, Rayleigh – Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain-displacement relations.

Employability

Employability

UNIT-II:

1-D STRUCTURAL PROBLEMS: Axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape functions and problems.

ANALYSIS OF TRUSSES, BEAMS & FRAMES: : Plane Trusses and Space Truss elements and problems, Hermite shape functions – stiffness matrix – Load vector – Problems, Plane Frames, Three-Dimensional frames.

Employability

UNIT-III:

2-D PROBLEMS: CST, LST, force terms, Stiffness matrix and load vectors, boundary conditions, Isoparametric elements – quadrilateral element, shape functions – Numerical Integration. Finite element modelling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements.

3-D PROBLEMS: Tetrahedran element, Hexahedral elements – Jacobian matrix – Stiffness matrix.

UNIT-IV:

SCALAR FIELD PROBLEMS: 1-D Heat conduction-Slabs – Fins - 2-D heat conduction problems – Introduction to Torsional problems.

Employability

DYNAMIC CONSIDERATIONS: Dynamic equations – consistent mass matrix – Eigen Values, Eigen vector, natural frequencies – mode shapes – modal analysis.

UNIT-V

Employability

Analysis of Plates:

Introduction, Triangular Membrane element, Quadratic Triangle element, Rectangular plate element(in-plane forces), Bending behavior of plates, finite element analysis of plates in bending, triangular plate bending element.

Introduction to FEA packages: ANSYS, SOLID WORKS

Skill & Employability

REFERENCE BOOKS:

1. Introduction to Finite Elements in Engineering, by Tirupathi R. Chandrupatla, Ashok D.Belegundu. Third edition, Pearson education.
2. Finite element method in engineering by S.S.Rao.
3. Introduction to Finite Element Method, by Abel & Desai.
4. Finite Element Method, by O.C. Zienkiewicz.
5. Concepts and Applications of Finite Element Analysis, by Robert D. Cook.
6. Finite element method by JN Reddy.
7. Finite element method by P.Seshu.

I YEAR – II SEMESTER

ROBOTICS

Course Code: MECMD124

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- ➢ To be familiar with the automation and brief history of robot and applications.
- ➢ To give the student familiarities with the kinematics of robots.
- ➢ To give knowledge about robot end effectors and their design.
- ➢ To give knowledge about various Sensors and their applications in robots.
- ➢ To learn about Robot Programming methods & Languages of robot.

COURSE OUTCOMES:

The students will be able to

CO 1	Define a robot and identify different robotics components.
CO 2	Describe different mechanical configurations of robot manipulators and undertake kinematics analysis of robot manipulators.
CO 3	Understand the importance of robot dynamics
CO 4	Equip with the automation and brief history of robot and applications.
CO 5	Familiar with robot end effectors and their design concepts.
CO 6	Equip with the principles of various Sensors and their applications in robots.
CO 7	Equip with the Programming methods & various Languages of robots.

Employability

. **SYLLABUS**

UNIT-I

Introduction: Transformations and kinematics: Historical development, A sense of mechanisms, Robotic systems, Classification of robots, Position, orientation and location of a rigid body, Mechanics of robot manipulators. Objectives, Homogeneous coordinates, Homogeneous transformations, Coordinate reference frames, some properties of transformation matrices, Homogeneous transformations and the manipulator: The position of the manipulator in space, moving the base of the manipulator via transformations, Moving the tool position and orientation.

Employability

UNIT-II

Position analysis of serial manipulators: Link parameters and link coordinate systems, Denavit-Hartenberg homogeneous transformation matrices, Loop-closure equations, Other coordinate systems, Denavit-Hartenberg method: Position analysis of a planar 3-DOF manipulator: Direct kinematics, Inverse kinematics, Method of successive screw displacements, Wrist centre position.

UNIT-III

Employability

Position analysis of parallel manipulators: Structure classification of parallel manipulators, Denavit-Hartenberg method versus geometric method, Position analysis of a planar 3RRR parallel manipulator, Geometry, Inverse kinematics and Direct kinematics, Position analysis of a spatial orientation mechanism.

Employability

UNIT-IV

Jacobian analysis of serial manipulators: Differential kinematics of a rigid body, Differential kinematics of serial manipulators, Screw coordinates and screw systems, Manipulator Jacobian matrix.

UNIT-V

Trajectory generation: General considerations in path description and generation, Joint space schemes, Cartesian space schemes, Geometric problems with Cartesian paths, Path generation at run time, Description of paths, planning paths using the dynamic model, Collision-free path planning. Robot Programming: Robot languages: AL, AML, RAIL, RPL, VAL, Demonstration of points in space: Continuous path (CP), Via points (VP), Programmed points (PP).

Employability

REFERENCE BOOKS:

1. Robot Analysis - The Mechanics of Serial and Parallel Manipulators by Lung-Wen Tsai, John Wiley & Sons, Inc.

2. Introduction to Robotics - Mechanics and Control by John J. Craig, Addison-Wesley Longman Inc., 1999.

3. Robotic Engineering - An Integrated Approach by Richard D. Klafter, Thomas A. Chmielewski and Michael Negin, Prentice-Hall of India Private Limited, 1994.

I YEAR – II SEMESTER

ELECTIVE-III A
CONCURRENT ENGINEERING

Course Code: MECMD125

L	T	P	C
4	**0**	**0**	**4**

COURSE OBJECTIVES:

- To make the students familiar with the concepts of concurrent engineering and apply them in the industry.

COURSE OUTCOMES:

The students will be able to

CO 1	Understand design principles such as systematic approach to the integrated, concurrent design of products
CO 2	Understand the related processes to concurrent engineering which includes manufacturing and support.
CO 3	Design of automated fabrication systems , Assembly workstation.
CO 4	Enhance their knowledge through various case studies..

. **SYLLABUS**

Unit-I

Introduction: Concurrent design of products and systems - Product design - Fabrication and assembly system design - designing production systems for robustness and structure.

Employability

Unit-II

Strategic approach and technical aspects of product design: Steps in the strategic approach to product design - Comparison to other product design methods - Assembly sequence generation - Choosing a good assembly sequence - Tolerances and their relation to assembly - Design for material handling and part mating - Creation and evaluation of testing strategies.

Employability

Unit –III

Basic issues in manufacturing system design: System design procedure - Design factors - Intangibles - Assembly resource alternatives - Task assignment - Tools and tool changing - Part feeding alternatives - Material handling alternatives - Floor layout and system architecture alternatives.

Assembly workstation design: Strategic issues - Technical issues analysis.

Employability

Employability

Unit –IV

Design of automated fabrication systems: Objectives of modern fabrication system design - System design methodology - Preliminary system feasibility study - Perform detailed work content analysis - Define alternative fabrication configurations - Configuration design and layout - Human resource considerations - Evaluate technical performance of solution.

Employability

Unit –V

Case studies: Automobile air conditioning module - Robot assembly of automobile rear axles.

Employability

REFERENCE BOOK:

1. Concurrent Design of Product and Processes by James L. Nevins and Daniel E. Whitney, McGraw-Hill Publishing Company, 1989.

I YEAR – II SEMESTER

ELECTIVE-III B
MECHATRONICS

Course Code: MECMD125

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To impart the knowledge of integrated design issues in Mechatronics and Mechatronics design process and the basic knowledge of modelling and simulation of block diagrams and also about sensors, transducers, signals and system controls.
- To make students aware of advanced applications in mechatronics.

COURSE OUTCOMES:

The students will be able to:

CO1	Design the mechatronics systems.
CO2	Model and simulate the block diagrams of systems
CO3	Gain knowledge of operation of different sensors and transducers for various applications.
CO4	Gain knowledge in application of Artificial intelligence and micro sensors in mechatronics.

. **SYLLABUS**

UNIT-I

Mechatronics system design: Introduction to Mechatronics: What is mechatronics, Integrated design issues in mechatronics, Mechatronics key elements, The mechatronics design process, Advanced approaches in mechatronics.

Employability

UNIT-II

Modelling and simulation of physical systems: Simulation and block diagrams, Analogies and impedance diagrams, Electrical systems, Mechanical translational systems, Mechanical rotational systems, Electromechanical coupling, Fluid systems.

UNIT-III

Sensors and transducers: An introduction to sensors and transducers, Sensors for motion and position measurement, Force, torque and tactile sensors, Flow sensors, Temperature sensing devices. Actuating devices: Direct current motor, Permanent magnet stepper motor, Fluid power actuation.

Employability

UNIT-IV

Signals, systems and controls: Introduction to signals, systems and controls, System representation, Linearization of nonlinear systems, Time delays.
Real time interfacing: Introduction, Elements of a data acquisition and control system, Overview of the I/O process, Installation of the I/O card and software.

Employability

UNIT-V

Advanced applications in mechatronics: Sensors for condition monitoring, Mechatronic control in automated manufacturing, Artificial intelligence in mechatronics, Microsensors in mechatronics.

Employability

Employability

REFERENCE BOOKS:

1. Mechatronics System Design by Devdas Shetty and Richard A. Kolk, P.W.S. Publishing Company, 2001.
2. Mechatronics by W. Bolton, Pearson Education, Asia, II-Edition, 2001.

I YEAR – II SEMESTER

ELECTIVE-III C
COMPUTATIONAL FLUID DYNAMICS

Course Code: MECMD125 | **L** 4 | **T** 0 | **P** 0 | **C** 4

COURSE OBJECTIVES:

- To introduce students to the governing equations of Fluid dynamics and the application of finite difference method for solving partial differential equations.
- The objective is also to equip them to solve incompressible viscous flows, compressible flows, steady state, transient, two dimensional and three dimensional problems.

COURSE OUTCOMES:

The students will be able to:

CO1	Understand the basic concept of fluid dynamics, solution methods & apply it to real time problems to develop mathematical model.
CO2	Solve problems related to Incompressible viscous flows, compressible flows, steady state and transient analysis.
CO3	Apply finite volume method to solve two and three-dimensional problems.

. **SYLLABUS**

Employability

UNIT-I:

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions. Derivation of finite difference equations.

Solution methods: Solution methods of elliptical equations - finite difference formulations, interactive solution methods, direct method with Gaussian elimination.Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

Employability

UNIT-II:

Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations.Burgers equations: Explicit and implicit schemes, Runge-Kutta method.

UNIT-III:

Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Treatment of compressible flows: potential equation, Eluer equations, Navier-stokes system of equations, flowfield-dependent variation methods, boundary conditions, example problems.

Employability

UNIT-IV:

Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

Employability

UNIT-V:

Standard variational methods - 1: Linear fluid flow problems, steady state problems,

Standard variational methods - 2: Transient problems.

Employability

REFERENCE BOOKS:

1. Computational fluid dynamics, T. J.Chung, Cambridge University press, 2002.
2. Text book of fluid dynamics, Frank Chorlton, CBS Publishers & distributors, 1985.
3. D.A. Hoffmann & S.T. Chiang, “Computational Fluid Dynamics”, Volume-I, II&III, A publication of Engineering Education SystemTM, Wichita, Kansas, USA.

I YEAR – II SEMESTER

ELECTIVE-IV B

QUALITY CONCEPTS IN DESIGN

Course Code: MECMD126

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

To impart knowledge on various concepts in engineering design and principles of implementing quality in a product or service through tools such as quality houses, control charts, statistical process control method, failure mode effect analysis and various strategies of designing experiments, methods to uphold the status of six sigma and improve the reliability of a product.

COURSE OUTCOME:

The students will be able to:

CO 1	Get familiarize with various concepts in design, quality and reliability principles in the design of an engineering product or a service.

. **SYLLABUS**

UNIT I

DESIGN FUNDAMENTALS, METHODS AND MATERIAL SELECTION

Morphology of Design – The Design Process – Computer Aided Engineering – Concurrent Engineering – Competition Bench Marking – Creativity – Theory of Problem solving (TRIZ) – Value Analysis - Design for Manufacture, Design for Assembly – Design for casting, Forging, Metal Forming, Machining and Welding

Employability

Employability

UNIT II

DESIGN FOR QUALITY

Quality Function Deployment -House of Quality-Objectives and functions-Targets-Stakeholders-Measures and Matrices-Design of Experiments –design process-Identification of control factors, noise factors, and performance metrics - developing the experimental plan- experimental design – testing noise factors- Running the experiments –Conducting the analysis-Selecting and conforming factor-Set points-reflecting and repeating.

UNIT III

FAILURE MODE EFFECT ANALYSIS AND DESIGN FOR SIX SIGMA

Basic methods: Refining geometry and layout, general process of product embodiment - Embodiment checklist- Advanced methods: systems modeling, mechanical embodiment principles-FMEA method- linking fault states to systems modeling - Basis of SIX SIGMA – Project selection for SIX SIGMA- SIX SIGMA problem solving- SIX SIGMA in service and small organizations - SIX SIGMA and lean production –Lean SIX SIGMA and services

Employability

UNIT IV

DESIGN OF EXPERIMENTS

Importance of Experiments, Experimental Strategies, Basic principles of Design, Terminology, ANOVA, Steps in Experimentation, Sample size, Single Factor experiments - Completely Randomized design, Randomized Block design, Statistical Analysis, Multifactor experiments - Two and three factor full Factorial experiments, 2 K factorial Experiments, Confounding and Blocking designs, Fractional factorial design, Taguchi's approach - Steps in experimentation, Design using Orthogonal Arrays, Data Analysis, Robust Design- Control and Noise factors, S/N ratios

UNIT V

STATISTICAL CONSIDERATION AND RELIABILITY

Frequency distributions and Histograms- Run charts –stem and leaf plots- Pareto diagrams-Cause and Effect diagrams-Box plots- Probability distribution-Statistical Process control–Scatter diagrams –Multivariable charts –Matrix plots and 3-D plots.-Reliability-Survival and Failure-Series and parallel systems-Mean time between failure-Weibull distribution

REFERENCE BOOKS:

1. Dieter, George E., "Engineering Design - A Materials and Processing Approach", McGraw Hill, International Editions, Singapore, 2000.
2. Product Design Techniques in Reverse Engineering and New Product Development, KEVIN OTTO & KRISTIN WOOD, Pearson Education (LPE), 2001.
3. Product Design And Development, KARL T. ULRICH, STEVEN D. EPPINGER, TATA McGRAW-HILL- 3 rd Edition, 2003.
4. The Management and control of Quality-6 th edition-James R. Evens, William M Lindsay Pub:son south-western(www.swlearning.com)
5. Fundamentals of Quality control and improvement 2nd edition, AMITAVA MITRA, Pearson Education Asia, 2002.
6. Montgomery, D.C., Design and Analysis of experiments, John Wiley and Sons, 2003.
7. Phillip J.Rose, Taguchi techniques for quality engineering, McGraw Hill, 1996.

I YEAR – II SEMESTER

ELECTIVE-IV C

SIGNAL ANALYSIS AND CONDITION MONITORING

Course Code: MECMD126

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

To make the student Understand

- The use of advanced instrumentation and sensing methods.
- System integration.
- Apply signal processing methods and system design methods.
- Introduce condition monitoring procedures.

COURSE OUTCOMES:

The students will be able to:

CO1	Apply signal-processing methods, the principles of instrumentation and measurement systems.
CO2	Perform practical analysis on actual machines and systems, Develop a maintenance strategy based on system response.
CO3	Understand the advantages and limitations of a variety of techniques for condition monitoring.
CO4	Understand the environmental benefits of condition monitoring techniques, Condition monitoring approaches, sensor types, sensor placement, data analysis.

. **SYLLABUS**

UNIT-I

INTRODUCTION: Basic concepts, Fourier analysis, Bandwidth, Signal types, Convolution.

SIGNAL ANALYSIS: Filter response time, Detectors, Recorders, Analog analyzer types.

Employability

UNIT-II

PRACTICAL ANALYSIS OF STATIONARY SIGNALS:
Stepped filter analysis. Swept filter analysis. High speed analysis, Real-time analysis.

Employability

UNIT-III

PRACTICAL ANALYSIS OF CONTINUOUS NON-STATIONARY SIGNALS: Choice of window type, Choice of window length, Choice of incremental step, Practical details, Scaling of the results.

Employability

UNIT-IV

PRACTICAL ANALYSIS OF TRANSIENTS: Analysis as a periodic signal, Analysis by repeated playback (constant bandwidth), Analysis by repeated playback (variable bandwidth)

UNIT-V

CONDITION MONITORING IN REAL SYSTEMS: Diagnostic tools, Condition monitoring of two stage compressor, Cement mill foundation, I.D. fan, Sugar centrifugal, Cooling tower fan, Air separator. Preheater fan, Field balancing of rotors. ISO standards on vibrations.

Employability

REFERENCE BOOKS:

1. Condition Monitoring of Mechanical Systems by Kolacat.
2. Frequency Analysis by R.B.Randall.
3. Mechanical Vibrations Practice with Basic Theory by V. Ramamurti, Narosa Publishing House.

I YEAR – II SEMESTER

ELECTIVE-IV D
COMPOSITE MATERIALS

Course Code: MECMD126

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

COURSE OUTCOMES:

The students will be able to:

CO 1	Understand the mechanics and design related to layered components such as fiber reinforced polymer composites, isotropic layered structures (example electronic chips) etc and its manufacturing methodologies.

. **SYLLABUS**

UNIT I

INTRODUCTION TO COMPOSITE MATERIALS

Definition-Matrix materials-polymers-metals-ceramics - Reinforcements: Particles, whiskers, inorganic fibers, metal filaments- ceramic fibers- fiber fabrication- natural composite wood, Jute - Advantages and drawbacks of composites over monolithic materials. Mechanical properties and applications of composites, Particulate-Reinforced composite Materials, Dispersion-Strengthened composite, Fiber-reinforced composites Rule of mixtures-Characteristics of fiber-Reinforced composites, Manufacturing fiber and composites.

Employability

Employability

UNIT II

MANUFACTURING OF COMPOSITES

Manufacturing of Polymer Matrix Composites (PMCs)-handlay-up, spray technique, filament winding, Pultrusion, Resin Transfer Moulding (RTM)-, bag moulding, injection moulding,

Employability

Sandwich 15 Mould Composites (SMC) - Manufacturing of Metal Matrix Composites (MMCs) - Solid state, liquid state,vapour state processing, Manufacturing of Ceramic Matrix Composites (CMCs) –hot pressing-reaction bonding process-infiltration technique, direct oxidation- interfaces.

UNIT III

Employability

INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS

Lamina Constitutive Equations: Lamina Assumptions – Macroscopic Viewpoint. Generalized Hooke's Law. Reduction to Homogeneous Orthotropic Lamina – Isotropic limit case, Orthotropic Stiffness matrix (Qij), Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of Laminated anisotropic plates. Laminate Constitutive Equations – Coupling Interactions, Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural Moduli. Evaluation of Lamina Properties from Laminate Tests. Quasi-Isotropic Laminates. Determination of Lamina stresses within Laminates.

UNIT IV

LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED FLAT PLATES

Introduction - Maximum Stress and Strain Criteria. Von-Misses Yield criterion for Isotropic Materials. Generalized Hill's Criterion for Anisotropic materials. Tsai-Hill's Failure Criterion for Composites. Tensor Polynomial (Tsai-Wu) Failure criterion. Prediction of laminate Failure Equilibrium Equations of Motion. Energy Formulations. Static Bending Analysis. Buckling Analysis. Free Vibrations – Natural Frequencies

Employability

UNIT V

THERMAL ANALYSIS

Assumption of Constant Co-efficient of Thermal Expansion (C.T.E.) - Modification of Hooke's Law. Modification of Laminate Constitutive Equations. Orthotropic Lamina C.T.E's. C.T.E's for special Laminate Configurations – Unidirectional, Off-axis, Symmetric Balanced Laminates, Zero C.T.E laminates, Thermally Quasi-Isotropic Laminates.

REFERENCE BOOKS:

Employability

1. Gibson, R.F., Principles of Composite Material Mechanics, McGraw-Hill, 1994, Second Edition - CRC press in progress.
2. Hyer, M.W., "Stress Analysis of Fiber – Reinforced Composite Materials", McGraw-Hill, 1998

3. Issac M. Daniel and Ori Ishai, “Engineering Mechanics of Composite Materials”, Oxford University Press-2006, First Indian Edition - 2007
4. Mallick, P.K., Fiber –”Reinforced Composites: Materials, Manufacturing and Design”, Maneel Dekker Inc, 1993.
5. Halpin, J.C., “Primer on Composite Materials, Analysis”, Techomic Publishing Co., 1984.
6. Agarwal, B.D., and Broutman L.J., “Analysis and Performance of Fiber Composites”, John Wiley and Sons, New York, 1990.
7. Mallick, P.K. and Newman, S., (edition), “Composite Materials Technology: Processes and Properties”, Hansen Publisher, Munish, 1990.
8. Madhujit Mukhopadhyay, “Mechanics of Composite Materials and Structures”, University Press (India) Pvt. Ltd., Hyderabad, 2004 (Reprinted 2008)
9. Chung, Deborah D.L., “Composite Materials: Science and Applications”, Ane Books Pvt. Ltd./Springer, New Delhi, 1st Indian Reprint, 2009

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
M.Tech. (Communication Systems), Two year (Four Semester) Syllabus Scheme

SEMESTER – I

CODE	*SUBJECT NAME*	*Instruction periods per Week*				*MAX MARKS*		CREDITS
		LECTURE	*TUTORIAL*	*PRACTICAL*	*TOTAL*	*SESSIONAL MARKS*	*SEMESTER END MARKS*	
MTCS-1	Advanced Digital signal processing	4	1	-	5	40	60	4
MTCS-2	Digital Communication Techniques	4	1	-	5	40	60	4
MTCS-3	Satellite Communication and Phased arrays	4	1	-	5	40	60	4
MTCS-4	Optical Fiber Communications	4	1	-	5	40	60	4
MTCS-5	Core Elective –I	4	1	-	5	40	60	4
MTCS-6	Core Elective-II	4	1	-	5	40	60	4
MTCS-7	Communication Engineering Lab	-	-	3	3	50	50	2
MTCS-8	Seminar - I	-	-	2	2	100	-	2
	Total	24	6	5	35	390	410	28

Core Elective – I
a) Global Positioning System
b) Micro Controllers and Embedded Systems
c) Smart Antennas

Core Elective-II
a) Telecommunication Switching and Networks
b) Spread Spectrum Techniques & Multiple Access
c) Speech Signal Processing

SEMESTER – II

CODE	**SUBJECT NAME**	*Instruction periods per Week*				*MAX MARKS*		CREDITS
		LECTURE	*TUTORIAL*	*PRACTICAL*	*TOTAL*	*SESSIONAL MARKS*	*SEMESTER END MARKS*	
MTCS-9	Communication Networks	4	1	-	5	40	60	4
MTCS-10	Wireless Communications	4	1	-	5	40	60	4
MTCS-11	Multimedia and Communication Systems	4	1	-	5	40	60	4
MTCS-12	Elective - III	4	1	-	5	40	60	4
MTCS-13	Elective – IV	4	1	-	5	40	60	4
MTCS-	Elective – V	4	1	-	5	40	60	4

14								
MTCS-15	Signal Processing Lab	-	-	3	3	50	50	2
MTCS-16	Seminar - II	-	-	2	2	100	-	2
	Total	24	6	5	35	390	410	28

Core Elective-III
a) Software Defined Radio
b) Modern Radar Systems
c) Digital Image Processing

Core Elective- IV
a) RF and Microwave Engineering
b) Wavelet transforms and Its Applications
c) Modeling and Simulation of Communication Systems

Core Elective -V
a) Statistical Signal Processing
b) CPLD and FPGA Architecture and Applications
c) AD-HOC Networks

SEMESTER – III

CODE	**SUBJECT NAME**	*MAX MARKS*		CREDITS
		SESSIONAL MARKS	*SEMESTER END MARKS*	
MTCS – 17	MOOC	100	-	4
MTCS – 18	Thesis (Part I)	50	50	6
Total		150	50	10

Project work to be submitted before the end of 3rd Semester and it will be evaluated by a committee consisting of Chairman, Board of Studies, Head of the Department and thesis guide.

SEMESTER – IV

CODE	**SUBJECT NAME**	*MAX MARKS*		CREDITS
		SESSIONAL MARKS	*SEMESTER END MARKS*	
MTCS – 19	Thesis (Part II)	50	50	14

Semester –IV project work will begin after completion of semester-III examination.
Thesis work is for a period of SIX months in Industry/Department. The students are required to submit their thesis two/three phases. Thesis will be evaluated by a committee consisting of an external member from reputed institution, HOD, Chairman BOS and thesis Guide.

MTCS-1 ADVANCED DIGITAL SIGNAL PROCESSING

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Pre-requisites: Prior to this, an apt knowledge of signal & systems and digital signal processsing subjects should be known.

Course Objectives:

At the end of this course, the students will be able to understand the:

a) Various optimization techniques used in designing the digital filters.
b) Sampling rate requirement in the digital signal applications
c) Need for prediction, filtering & smoothening of the signals to minimize the mean-square error(MSE).
d) Different DSP algorithms used for DFT computation procedures.
e) Applications of DSP in real time.

Unit– I: Advanced digital filter design techniques: Design of optimum equi-ripple FIR filters, Remez Algorithm, Parks-McClellan Algorithm, Differentiators, BPF, Hilbert transformer filters multiple band optimal FIR filters, Design of filters with simultaneous constraints in time and frequency response, Optimization methods for designing IIR filters, Comparison of optimum FIR filters and delay equalized elliptic filters. **(12hrs)**

Unit – II: Multirate DSP: The basic sample rate alteration – time – domain characterization, frequency – domain characterization: Cascade equivalences, filters in sampling rate alteration systems, digital filter banks and their analysis and applications, Multi-level filter banks.**(10hrs)**

Employability

Unit – III: Linear prediction and optimum linear filters: forward and backward linear prediction, AR Lattice and ARMA lattice – ladder filters, Wieners filters for filtering on prediction. **(7hrs)**

Unit – IV: DSP Algorithms: Levinson – Durbin algorithm, the Schur algorithm, The Goertzel algorithm, the chirp – z transform algorithm, Bluestein algorithm, computations of the DFT, concept of tunable digital filters**.** Employability **(8hrs)**

Unit – V: Applications of DSP: Speech Model of speech production, speech analysis – synthesis system vocoder analyzers and synthesizers, convolvers,Linear Prediction of speech, DTMF System, DTTR, MUSIC, TDM to FDM translator. **(8hrs)**

Employability

Course Outcomes:

a) Using filter optimization techniques students will be able to design a filter with Least Mean Square error.(UNIT-I)
b) Students will be able to solve research papers related to multirate signal processing— Data Acquisition, Bandwidth reduction in a system etc. (UNIT-II)
c) Apply methods for prediction of real world signals, based on signal modeling and advanced filtering techniques, such as Linear Predictive Filters and Optimal Linear Filters.(UNIT-I,III,V)
d) Apply fundamental principles, methodologies and techniques of the course to analyze and design various problems encountered in both academic research ,industry and R&D practice. (UNIT-IV)
e) This course is basis for understanding Adaptive signal processing, statistical signal processing and wavelet transform subjects.

employability

Prescribed Text Books:

1. Lawrence R. Rabiner and Bernard Gold ,"Theory and applications of digital signal processing" PHI,4th edition.**(UNIT 1,5)**
2. J. G. Proakis and D. G. Manolakis, Introduction to Digital Signal Processing, 4td Edition. Prentice Hall, 1996, ISBN No. 0-13-373762-4. **(UNIT 2,3 4)**

References:

1. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Prentice Hall,1st edition
2. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2nd Ed., Prentice Hall.
3. Sanjit K. Mitra,"Digital Signal Processing, A Computer – Based approach,Tata Mc Graw-Hill, 1998,$th edition **(UNIT 2)**

MTCS2- DIGITAL COMMUNICATION TECHNIQUES

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives

1. To enable student to Design a channel coder for different channels for obtaining optimum error probablitiy.

2. To enable student to analyze the synchronizing circuits for different modulation schemes.

3. To familiarize Student with the concepts of spread spectrum and jammer considerations

UNIT – I

DIGITAL MODULATION SCHEMES: Detection using matched filter – Optimum receivers for arbitrary binary signals and M'ary orthogonal signals – Analysis of coherent detection schemes for ASK, PSK and DPSK – M'ary signaling schemes – QPSK and QAM – MSK – Performance of the data transmission schemes under AWGN. Trellis coded Modulation.

UNIT – II

CHANNEL CODING: Waveform coding and structured sequences-Types of error control, structured sequences, Linear block codes –soft/hard decision decoding of linear block codes – Non binary block codes and concatenated block codes – Polynomial representation of codes – Cyclic codes

UNIT – III

CHANNEL CODING-II: Convolution codes Lattice type Trellis codes. Geometrically uniform trellis codes,– viterbi decoding algorithm. Decoding of modulation codes – Reed Solomon codes – Turbo codes(elementary treatment).

BASEBAND SIGNALLING CONCEPTS:

Signaling formats – RZ/NRZ, Duobinarysplitphase (Manchester) and high density bipolar coding – scrambling & unscrambling – channel equalization – tapped delay line and transversal filters.

UNIT – IV

SYNCHRONISATION: Receiver synchronization, costas loop, symbol synchronization, synchronization with CPM – Data aided and Non aided synchronization- synchronization methods based on properties of wide sense

cyclo-stationary random process – Carrier recovery circuits – Symbol clock estimation schemes.

UNIT – V
SPREAD SPECTRUM SYSTEMS: PN sequences, DS spread spectrum systems; FH spread spectrum systems and performance of FHSS in AWGN – Synchronization – Jamming considerations – Commercial Applications – Cellular subsystems.

Course Outcomes
After completion of this Course Student will be able to:
1. Simulate a digital communication System.
2. Design Linear Block coder with different Error correction capabilities.
3. Design a Convolution coder to obtain specific error probabilities.
4. Simulate different channel encoders.
5. Design a Synchronizing circuit for any digital modulation scheme under specified error rate.
6. Analyze the jamming to signal noise ratio for a jammer.

PRESCRIBED :
1. Bernard sklar, " Digital communications", Pearson Education Asia,2001.
2.Fundamentals of Communication Systems, Proakis and Salehi, Prentice Hall

REFERENCES:
1.Das,J Etal, " Principles of Digital Communications and Spread spectrum Systems", Willey Eastern Limited,1985.
2.Ziemer R E & Peterson R L, "Digital Communication and Spread spectrum Systems", McMillan publishing co.,1985.

MTCS 3- SATELLITE COMMUNICATION AND PHASED ARRAYS

Course code	Credits	Periods			Exam Hours	Sessional Marks	Exam Marks	Total Marks
		Lectures	Tutorials	Practicals				
MTCS-3	4	3	1	-	3	40	60	100

Course Objectives:
1. To learn about the science behind the orbiting satellites, various multiplexing schemes and earth station parameters used for satellite communication.
2. In-depth understanding of specialist bodies of knowledge within the engineering discipline.
3. Application of established engineering methods to complex engineering problem solving.

Unit 1: **Orbits, Propagation impairments and space link:**
Introduction, Satellite orbits, Kepler's three laws, Orbital Elements, Eclipse effect, Orbit determination, Look angle determination. Satellite sub systems: Attitude and Orbital Control System (AOCS), Telemetry Tracking and Command (TT&C), Power System, Communications System, Satellite transponder, Space Craft Antennas, Frequency Reuse Antennas. Communication link design: Basic transmission theory, EIRP, Completion Link design with and without frequency reuse, System noise temperature G/T ratio, Noise figure and Noise temperature.
Unit 2: **Satellite Multiple Accesses: Satellite mobile and specialized services**
Frequency Division Multiple Access (FDMA),Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA),Satellite Switched TDMA, Demand Assignment Multiple Access (DAMA), CDMA Spread Spectrum Transmission and Reception.

Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA, Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm, VSAT Technologies, Network Configurations, Polling VSAT Networks, Mobile Satellite Networks, CDMA MSAT Network.

Unit 3: **Earth Station Technology**:

Transmitters, Receivers, Antennas, Tracking Systems, Transponders, Small earth station Antennas, Equipment for earth station, Lower Orbit Considerations, Coverage and frequency considerations, Direct broadcasting satellite Television and Radio, Satellite Navigation.

Employability

Unit 4: **Introduction of Phased Arrays**

System Requirements for Radar and Communication Antennas : Directive Properties of Arrays, Array Noise Characterization, The Receiving Antenna in a Polarized Plane Wave Field, System Considerations, Monopulse Beam Splitting.

Unit 5: **Phased Arrays in Radar and Communication Systems**:

Array Characterization for Radar and Communication Systems and Fundamental Results from Array Theory: Phase Scanning in One Dimension $(ø_o=0)$, Two-Dimensional Scanning of Planar Arrays, Beam width and Directivity of Scanning Arrays, Array Size Determination: EIRP and G/T for Large, Two-Dimensional Passive or Active Arrays.

Employability

Course Outcomes:

On successful completion of this course, the student will be able to:

CO1: Architect appropriate technologies for implementation of specified satellite communication systems based on specify systems design for satellite communications

CO2: Analyze and evaluate a satellite link and suggest enhancements to improve the link performance

CO3: Exercise the following skills: project management, teamwork and leadership, technical communication, and self-directed and group learning.

CO4: Conduct further research on satellite communication systems engineering & on phased array antennas as per given specifications.

TEXT BOOKS:

1. Satellite Communications –Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition, 2003, John Wiley & Sons.
2. Digital Satellite Communications-Tri.T.Ha, 2nd Edition, 1990, Mc.Graw Hill.
3. Phased Array Antenna Hand Book – Robert J. Mailloux, Artech House, Boston, London, 1994.

REFERENCE BOOKS:

1. Satellite Communications - by Dr.D.C.Agarwal
2. Satellite Communications: Design Principles – M. Richcharia, 2nd Ed., BSP, 2003.
3. Fundamentals of Satellite Communications – K. N. Raja Rao, PHI, 2004.

MTCS-4 OPTICAL FIBER COMMUNICATIONS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives:
1. To expose the students to the modulation formats used in fiber optic communications
2. To impart the understanding and modeling of optical amplifiers
3. To understand the various multiplexing schemes
4. To understand the working of optical networks
5. To understand the nonlinear effects of optical communication systems

UNIT-I
Advanced Modulation Formats for Fiber Optic Communication Systems: Fiber Optic Coupler,
Coherent Optical Communication, BER performance, Differential Phase Modulation Schemes with Direct Detection

EMPLOYABILITY

UNIT-II
Semiconductor optical amplifiers. EDFA and Raman amplifiers , Wideband Optical amplifiers, Amplifier Noise, Optical SNR, modeling and analysis. Analysis and digital transmission with high power fiber amplifiers

EMPLOYABILITY

UNIT-III
Multichannel systems: WDM lightwave systems. TDM and code division multiplexing.
Advances in wavelength division multiplexing / demultiplexing technologies

EMPLOYABILITY

UNIT-IV
SONET/SDH, ATM, IP, storage area networks, Wavelength routed networks, Next generation optical Internets

EMPLOYABILITY

UNIT-V
Soliton systems: Nonlinear effects. Soliton – based communication. High speed and WDM soliton systems

EMPLOYABILITY

Course Outcomes:
Upon successful completion of the course, students will be able to:

1. Compare the performances of modulation formats used in optical communications
2. Model and use optical amplifiers
3. Understand and apply the multiplexing technologies
4. Understand the operation of, and trends in, optical networks.
5. Exploit the nonlinear effects of fibers in Soliton based communications.

Text Books:
1.G.P.Agrawal, Fiber Optic Communication Systems (3/e), Wiley, 2002
2.M.Satish Kumar, Fundamentals of Optical Fiber Communication(2/e), PHI, 2014
3.C.S.Murthy & M.Gurusamy, WDM Optical Networks, PHI, 2002

References:

1.Gerd Keiser, Optical Fiber Communications(4/e), TMH, 2008
2.B.P.Pal , Guided Wave Optical Components and Devices, Elsevier , 2006
3.Keang P. Ho Phase-modulated Optical Communication Systems, Springer, 2005

MTCS-5 GLOBAL POSITIONING SYSTEM AND APPLICATIONS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

COURSE OBJECTIVES:

1. To enable student to understand the basic principle of GPS
2. To enable student to understand the difference between GPS, GALILEO and GLONASS
3. To familiarize the student with the concepts of different co-ordinates system used in GPS
4. To enable student to know about the effect of ionosphere and troposphere on GPS position determination

UNIT I

Introduction to GPS: Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture.

UNIT II

GPS Signals: Signal structure, anti spoofing (AS), selective availability, Difference between GPS, GALILEO and GLONASS satellite construction, GPS Receiver Concepts and main receiver components.

UNIT III

GPS coordinate frames & Time references: Geoid and Ellipsoid of rotation, Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS & GALILEO time.

UNIT IV

GPS orbits and position determination: GPS orbital parameters, GPS position determination, Positioning methods- point positioning, relative positioning, and description of receiver independent exchange format (RINEX).

UNIT V

GPS Errors & Future of GPS: GPS error sources- clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver, DGPS concepts, Future of GPS- Modernization plans of navigational satellites, Hardware and software improvements.

COURSE OUT COMES:

After learning this subject student can be able to

1. Understand basic concepts of GPS and its architecture (unit-1)
2. Describe the signal structure and can differentiate GPS &GALILEO time (unit-2)
3. Convert one co-ordinate frame into another (unit-3)
4. Determine the GPS user position (unit-4)
5. Calculate different error's in GPS and can design the system in GPS and can design the system with improved accuracy (unit-5)

PRESCRIBED :

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001).
2. G S RAO, Global Navigation Satellite Systems, McGraw-Hill publications, New Delhi, 2010

REFERENCES:

1. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).
2. Gunter Seeber., Satellite Geodesy Foundations-Methods and Applications,2003.

MTCS-5b MICROCONTROLLERS & EMBEDDED SYSTEMS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives

a. To provide a theoretical & practical introduction to microcontrollers

b. To assembly language programming techniques,

c. To design interfacing circuits for microcontroller 8051.

d. To develop an understanding of the technologies behind the embedded computing systems

e. To understand the technology capabilities and limitations of the hardware, software components

f. To evaluate design tradeoffs between different technology choices.

UNIT I: **8051 Microcontroller**

Introduction to Microcontrollers, comparing Microprocessors and Microcontrollers, Architecture of 8051 Micro controller, Register organization of 8051, SFRs, Addressing modes of 8051,.

Pin configuration of 8051, Input/Output Ports and Circuits, External Memory, Counters/Timers and modes of Timers, Serial data Input/Output, Interrupts.

UNIT II: **Assembly Language Programming of 8051**

Programming the 8051. Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions.

UNIT III: **Interfacing 8051**

Interfacing with Keyboards, Displays, D/A and A/D conversions, Multiple Interrupts, Serial Data Communication.

Employability/Skill Development

UNIT IV: **Introduction To Embedded Systems**
Embedded systems overview, design challenge, Processor technology, IC technology, Design Technology, Trade-offs.

UNIT V: **Introduction to advanced architectures**
ARM and SHARC, Processor and memory organization and Instruction level parallelism;
Networked embedded systems: Bus protocols, I2C bus and CAN bus;
Internet-Enabled Systems, Design Example-Elevator Controller.

Employability/Skill Development

COURSE OUTCOMES

Upon successful completion of the course, students will be able to:

1. Explain the architecture and operation of microcontrollers - 8051, ARM and SHARC.

2. Interface 8051 with various peripherals

3. Understand the hardware/software tradeoffs involved in the design of microcontrollers based systems.

4. Understand the hardware/software tradeoffs involved in the design of embedded systems.

5. Use an Integrated Development Environment (IDE) as a modern software tool for embedded system development.

TEXT BOOKS:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D Mc Kinlay , The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2nd Edition, Pearson Education, 2008.
2. Frank Vahid, Tony Givargis, Embedded System Design, 2nd Edition, John Wiley.
3. Wayne Wolf, Computers as Components-principles of Embedded computer system design, Elsevier

REFERENCE BOOKS:

1. Kenneth. J. Ayala, Dhananjay V. Gadre, The8051 Microcontroller & Embedded Systems Using Assembly and C, 1st edition, Cengage learning, 2010
2. David E. Simon, An Embedded Software Primer, Pearson Education
3. Satish Shah, 8051 Microcontrollers: MCS 51 Family and Its Variants, 1/e, Oxford University Press, 2010
4. B. Kanta Rao, Embedded Systems, 1st Ed., PHI, 2011

MTCS-5C SMART ANTENNAS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course objectives:

The course helps the students

1. To understand basic concepts of cellular mobile systems.
2. To understand the concept of smart antennas and adaptive algorithms to adjust the required weighting on antennas.
3. To learn Modeling, spatial processing, techniques for CDMA system and RF positioning for the smart antennas.

Module I

Introduction To Smart Antennas Need for Smart Antennas, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Mutual Coupling Effects.

Skill Development

Module II

DOA Estimation Fundamentals Introduction The Array Response Vector, Received Signal Model, The Subspace Based Data Model, Signal Auto covariance Matrices ,Conventional DOA Estimation Methods, Conventional Beam forming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation ,The MUSIC Algorithm, The ESPRIT Algorithm, Uniqueness of DOA Estimates.

Module III

Beam forming Fundamentals The Classical Beam former-Statistically Optimum Beam forming Weight Vectors, The Maximum SNR Beam former, The Multiple Side lobe Canceller and the Maximum, SINR Beam former- Minimum Mean Square Error (MMSE),Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV) , Adaptive Algorithms for Beam forming ,The Least Mean-Square (LMS) Algorithm, The Recursive Least Squares (RLS) Algorithm.

Module IV

Space–Time Processing Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beam forming, Inter symbol and Co-Channel Suppression, ISI Suppression, CCI Suppression, Joint ISI and CCI Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Single-User Data Rate

Skill Development

Limits, Multiple Users Data Rate Limits, Data Rate Limits Within a Cellular System, MIMO in Wireless Local Area Networks.

Module V

Mobile Stations' Smart Antennas Introduction -Multiple-Antenna MS Design, Combining Techniques, Selection (Switched) Diversity, Maximal Ratio Combining, Adaptive Beam forming or Optimum Combining ,RAKE Receiver Size, Mutual Coupling Effects, Dual-Antenna Performance Improvements ,Downlink Capacity Gains

Skill Development

Course outcomes:

After learning the course the students should be able to:

1. Understand the basic architecture, features and benefits of smart antennas.
2. Able to integrate smart antenna technology with overall communication system design, principle and its performance.
3. Understand fundamental characteristics, problem, architectures and consequences of all wireless communication system.
4. Understand the beam forming techniques and adaptive array techniques.

Text Books:

1. Constantine A. Balanis, Panayiotis I. Ioannides, Introduction to Smart Antennas Morgan & Claypool Publishers.
2. Ahmed El Zooghby, Smart Antenna Engineering, Artech House.

Reference Book:

1. M.J. Bronzel, Smart Antennas, John Wiley, 2004.
2. T.S. Rappaport & J.C.Liberti, Smart Antennas for Wireless Communication, Prentice Hall (PTR) , 1999.
3. R. Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Kluwer, 2001 CWT3205 Global Positioning Systems.

MTCS-6 TELECOMMUNICATION SWITCHING AND NETWORKS

Credits	Instruction periods per Week			Exam hrs	Sessional Marks	Exam Marks	Total Marks
	Lectures	Tutorials	Practicals				
4	3	1	-----	3	40	60	100

Course Objectives

1. To understand the working principles of switching systems from manual and electromechanical systems to stored program control systems.
2. The students will be able to apply the knowledge and principles leant to analyze, design, install and manage typical wired and wireless communication systems and networks.

UNIT-I

Resource sharing and need for switching; Circuit switching, Store and forward switching, Packet switching, electronic space division switching, Need for networks, Two stage networks, Three stage networks and n-stage networks.

UNIT-II

Time division switching: Time switching, space switching, Three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling.

Employability

UNIT-III

High speed digital access: DSL technology, Cable Modem, SONET.

Employability

UNIT-IV

Local area networks: Traditional ETHERNET, fast ETHERNET, Gigabit ETHERNET, Wireless LAN, Bluetooth, Connecting LAN's, Backbone networks.

Employabilitty

UNIT-V

Integrated Services Digital Network: Network & protocol architecture, user network interfaces, signaling, inter-networking, ISDN standards, expert systems in ISDN, Broadband ISDN.

Employability

Course Outcomes:

Students are able to

1: Explain the working principle of switching systems involved in telecommunication switching

2: Assess the need for voice digitization and T Carrier systems

3: Compare and analyze Line coding techniques and examine its error performance

4: Design multi stage switching structures involving time and space switching stages

5: Analyze basic telecommunication traffic theory

PRESCRIBED Text Books:

1. **Telecommunication Switching Systems and Networks- ThiagarajanViswanathan, Prentice Hall, New Delhi, 2001.**
2. **Data Communications and Networking- B.A. Forouzan, TataMcGrawhill, Third Edn., 2004.**

Reference:

1. **Telecommunication Switching,Traffic and Networks-Flood, Pearson Education India,2001**
2. **Telecommunication Switching and Networks-P.Gnanasivam, New Age International,2005.**

MTCS 6b Spread Spectrum Techniques and Multiple Access

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

UNIT- I

Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping system, pulse FM (chirp) system, hybrid systems.

UNIT II

Coding for communication and ranging- Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composites codes, code selection and signal spectra, error detection and correlation codes.

UNIT –III

Modulation and demodulation- Balance modulator, quadriphase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, costas loop, FM.

UNIT-IV

Need for synchronization, types of synchronizers, RF link- Noise figure, co channel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.

UNIT V

Test and evaluation of spread spectrum system- selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.

Reference Books :

1. R. C. Dixen, “Spread Spectrum Systems with commercial application”, John Wiley, 3rdEd.
2. H. Taube. And D. L. Schilling, “Principle of Communication Systems”. Tata Mc graw Hill, 2nd Ed. Reprint 2007.

MTCS-6C SPEECH SIGNAL PROCESSING

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives:
The objectives of this course are to make the student

1. Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.
2. To understand the articulatory and acoustic interpretation of various phonemes and their allophones.
3. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,
4. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a bye product of Homomorphic processing of Speech.
5. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.
6. To study various Audio coding techniques based on perceptual modeling of the human ear.

Unit – I :
Fundamentals of Digital Speech Processing:
Anatomy & Physiology of Speech Organs, The Process of Speech Production, The Acoustic theory of speech production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

Perception : Anatomical pathways from the Ear to the Perception of Sound, The Peripheral Auditory system, Hair Cell and Auditory Nerve Functions, Properties of the Auditory Nerve. Block schematics of the Peripheral Auditory system.

Unit – II :
Time Domain models for Speech Processing:
Introduction – Window considerations, Short time energy, average magnitude, average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, pitch period estimation using a parallel processing approach, the short time autocorrelation function, average magnitude difference function, pitch period estimation using the autocorrelation function.

Linear Predictive Coding (LPC) Analysis :
Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance method, Solution of LPC Equations : Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, comparison between the methods of solution of the LPC Analysis Equations, Applications of LPC Parameters : Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit – III :
Homomorphic Speech Processing:
Introduction , Homomorphic Systems for Convolution : Properties of the Complex Cepstrum, Computational Considerations , The Complex Cepstrum of Speech, Pitch Detection , Formant Estimation, The Homomorphic Vocoder.

Speech Enhancement:
Speech enhancement techniques : Single Microphone Approach, Spectral Subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi Microphone Approach.

Unit – IV:
Automatic Speech Recognition:
Basic pattern recognition approaches, parametric representation of Speech, Evaluating the similarity of Speech patterns, Isolated digit Recognition System, Continuous word Recognition system. Elements of HMM, Training & Testing of Speech using HMM.

Automatic Speaker Recognition:
Recognition techniques, Features that distinguish speakers, MFCC, delta MFCC, Speaker Recognition Systems: Speaker Verification System , Speaker Identification System, Performance Metrics.

Unit – V:
Audio Coding :
Lossless Audio Coding, Lossy Audio coding, Psychoacoustics , ISO-MPEG-1 Audio coding , MPEG - 2 Audio coding, MPEG - 2 Advanced Audio Coding, MPEG - 4 Audio Coding.

Course Outcomes:
On completion of this course student will be able to
1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Can extract the features for Automatic speaker recognition system which can used for classification.
6. Can design basic audio coding methods for coding the audio signal.

TEXT BOOKS:
1. Digital Processing of Speech Signals - L.R. Rabiner and S. W. Schafer. Pearson Education.
2. Digital Audio Signal Processing – Udo Zolzer, 2nd Edition, Wiley.
3. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley

REFENCE BOOKS:
1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, PHI.

Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., EEE Press.

MTCS-7 COMMUNICATION SYSTEMS LABORATORY

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
2	-	-	3	3	50	50	100

LIST OF EXPERIMENTS

1. Measurement of VSWR using Microwave bench.
2. S-parameter estimation of Microwave devices.
3. Study of antenna trainer system.
4. Characteristics of Horn antenna.
5. Generation & detection of binary digital modulation techniques.
6. Spread Spectrum communication system-Pseudo random binary sequence generation-Baseband DSSS.
7. Digital Filter Design
8. Channel equalizer design(LMS,RLS)
9. Antenna Radiation Pattern measurement
10. Study of Manchester code on optical fiber kit.
11. Measurement of optical losses in fiber optic communication.
12. Study of spectrum analysis using Spectrum analyzer.

MTCS-9 COMMUNICATION NETWORKS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives:
1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Employability

Syllabus

Unit I: Virtual-Circuit Networks: Frame Relay and ATM **(10hrs)**

FRAME RELAY , Architecture , Frame Relay Layers , Extended Address , ATM , Design Goals , Problems, Architecture , Switching , ATM Layers , ATM Adaptation layers, ATM LANs ,ATM LAN Architecture. (Text Book 1&2)

Employability

Unit II: Peer – to – Peer Protocols **(10hrs)**

Peer – to- Peer Protocol & service models, ARQ protocols & reliable data transfer service, other Peer – to- Peer Protocols, process – to process delivery, user datagram protocol. (Text Book 1&2)

Employability

Unit III: Transmission control protocol/ Internet Protocol Networks **(12hrs)**

TCP/IP Architecture, internet protocol, IPv6, Transmission control protocol, Stream Control Transmission Protocol, forwarding, unicast routing protocols, multicast routing protocols. (Text Book 1)

Employability

Unit IV: Advanced Network Architectures **(12hrs)**

Architecture, web documents, HTTP, Integrated services in the internet, RSVP, differentiated services, network interconnection models, real-time transport protocols. (Text Book 1&2)

Unit V: Security Protocols **(10hrs)**

Symmetric-key & asymmetric –key cryptography, IP Security, Secure Socket Layer /Transport Layer Security, Pretty Good Privacy, Firewalls (Text Book 2)

Text Books:

1. Alberto Leon Gracia and Indra Widjaja, "Communication networks," Second Edition, Tata McGraw Hill, 2008.
2. Behrouza A. Forouzan," Data Communications and Networking", Fourth Edition, Tata McGraw Hill,

Reference Books:

1. Introduction to Data communications and Networking, W.Tomasi, Pearson education

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the TCP/IP. Explain the function(s) of each Layer.
5. Familiarity with the basic protocols of computer networks, and how they can be secure in network design and implementation.

MTCS 10 WIRELESS COMMUNICATION SYSTEMS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
04	03	01	00	03	40	60	100

Course Objectives:

1. Understand the basic Propagation models
2. Able to analyze the capacity of wireless channels
3. Aable to understand the different Diversity and equalization techniques
4. Able to understand the basic concepts of MIMo Channel

Unit 1: Radio Wave Propagation

Free space propagation model- basic propagation mechanisms –reflection- ground reflection model-diffraction-scattering-practical link budget design-outdoor and indoor propagation models

Small scale fading and multipath: Small scale multipath propagation-Impulse response model of a mulitpath channel –small scale multipath measurements-parameters of mobile multipath channels - –types of small scale fading.

Unit 2: Capacity of Wireless Channels and Performance of digital modulation over wireless channels

Capacity of Flat Fading Channel- Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels.

Error probability of M-ary PSK, M-ary QAM and M-ary FSK , MSK, GMSK, on AWGN channels- Fading– Outage Probability– Average Probability of Error –– Combined Outage and Average Error Probability.

Unit 3: Diversity

Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combining – Maximal-Ratio Combining – Equal - Gain Combining – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme-basic concepts of RAKE receivers.

Unit 3: Equilization

Fundamentals of equalization ,Training A Generic Adaptive Equalizer,Equilizers in a Communications Receivers, Survey of Equilization Techniques, Linear Equilizers, NonLinear Equilization,Alogorithms for Adaptive Equilization , Fractionslly Spaced Equalizers

Unit 5: Multiple Access Techniques and MIMO and multicarrier modulation:

Frequency division multiple access-time division multiple access-spread spectrum multiples access-space division multiple access- packet radio.

Narrowband MIMO model-parallel decomposition of MIMO channel-MIMO channel capacity-MIMO diversity gain –data transmission using multiple carriers-multicarrier modulation with overlapping subchannels-mitigation of subcarrier fading-basic concepts of OFDM.

Text Books:

1. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005
2. T.S. Rappaport, "Wireless Communications," Pearson Education, 2003

Reference Books:

1. Raj Pandya, "Mobile and Personal Communication Systems and Services," Prentice Hall of India, 2002
2. William C.Y. Lee, "Wireless and Cellular Telecommunications," Third edition, Mc. Graw Hill, 2006.

COURSE OUTCOMES

After completing the Course , Students is able to

1. Analyze the propagation models of free space.
2. leads to current and upcoming wireless communications technologies for broadband wireless access network design and research.
3. Do research in system evaluation methods used in the design of communications network.

MTCS-11 Multimedia and communications systems

Course Objectives:

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	--	3hrs	40	60	100

1. To understand the Multimedia Communication Models and to study the Multimedia Transport in Wireless Networks.
2. To solve the Security issues in multimedia networks and to explore real-time multimedia network applications.
3. To explore different network layer based application.
3. To understand the process of compressing and sending text, image, audio and video signals over networks.
4. To gain knowledge of various entertainment networks.

UNIT I: Multimedia communications **(6hrs)**

Introduction, multimedia networks, multimedia applications, Digitization principles, Text, Images, Video, Audio.

UNIT II: Text and Image Compression **(15hrs)**

Compression Principles, Text compression, Image compression.

UNIT III: Audio and Video Compression **(15hrs)**

DPCM, ADPCM, Adaptive predictive coding, Linear predictive coding, code-excited LPC, perceptual coding, MPEG audio coders, Dolby audio coders, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, MPEG-4.

UNIT IV: Standards for multimedia communications **(15hrs)**

Reference Models, Standards related to interpersonal communications, Standards relating to interactive applications over the internet, standards for entertainment applications.

UNIT-V: Entertainment networks and internet applications **(8hrs)**

Cable TV networks, Satellite television networks, high-speed PSTN access technology, DNS, Email, FTP, TFTP, Internet telephony, SNMP.

Text Books:

1. Fred Halsall – Multimedia Communications, Pearson publication 2001.
2. Ze-Nian Li, Marks. Drew- Fundamentals of Multimedia, PHI publications 2004.

Course outcomes:

1. Deploy the right multimedia communication models.
2. Apply multimedia network applications with efficient routing techniques.
3. Solve the security threats in the multimedia networks.
4. Develop the real-time multimedia network applications.
5. Explore different entertainment networks.

MTCS 12 a Software Defined Radio

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

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UNIT-I

A Basic Software Defined Radio Architecture –Introduction – 2G Radio Architectures- Hybrid Radio Architecture- Basic Software Defined Radio Block Diagram- System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

Employability

UNIT-II

RF System Design – Introduction- Noise and Channel Capacity- Link Budget- Receiver Requirements- Multicarrier Power Amplifiers- Signal Processing Capacity Tradeoff.

Analog-to-Digital and Digital-to-Analog Conversion- Introduction – Digital Conversion Fundamentals- Sample Rate- Bandpass Sampling- Oversampling- Antialias Filtering – Quantization – ADC Techniques-Successive Approximation- Figure of Merit-DACs- DAC Noise Budget- ADC Noise Budget.

UNIT-III

Digital Frequency Up- and Down Converters- Introduction- Frequency Converter Fundamentals- Digital NCO- Digital Mixers- Digital Filters- Halfband Filters- CIC Filters- Decimation, Interpolation, and Multirate Processing-DUCs - Cascading Digital Converters and Digital Frequency Converters.

Employability

UNIT-IV

Signal Processing Hardware Components- Introduction- SDR Requirements for Processing Power- DSPs- DSP Devices- DSP Compilers- Reconfigurable Processors- Adaptive Computing Machine- FPGAs

Employability

Software Architecture and Components – Introduction- Major Software Architecture Choices – Hardware – Specific Software Architecture- Software Standards for Software Radio-Software Design Patterns- Component Choices- Real Time Operating Systems- High Level Software Languages- Hardware Languages.

Employability

UNIT V

Smart Antennas Using Software Radio- Introduction- 3G smart Antenna Requirements- Phased Antenna Array Theory- Applying Software Radio Principles to Antenna Systems- Smart Antenna Architectures- Optimum Combining/ Adaptive Arrays- DOA Arrays- Beam Forming for CDMA- Downlink Beam Forming.

Employability

Course Outcomes: At the end of the course the student will be able to:

CO1 Conceptualize the SDR and implementation details
CO2 Design SDR for a specific application
CO3 Identify the challenges in the maintenance of SDR
CO4 Analyse the transmitter and receiver architectures

References:

1. Paul Burns, Software Defined Radio for 3G, Artech House, 2002.
2. Tony J Rouphael, RF and DSP for SDR, Elsevier Newnes Press, 2008
3. Jouko Vanakka, Digital Synthesizers and Transmitter for Software Radio, Springer, 2005.
4. P Kenington, RF and Baseband Techniques for Software Defined Radio, Artech House, 2005.

MTCS 12 b MODERN RADAR SYSTEMS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

UN IT-I

Fundamentals of Surveillance Radar and Design :

Bandwidth considerations, prf, Unambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter.

Employability

UN IT-II

Tracking Radar :

Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Monopulse Radar.

Employability

UN IT-III

Radar waveform design :

Bandwidth and pulse duration requirements, Range and Doppler accuracy uncertainty relation, pulse compression and phase coding.

Employability

UN IT-IV

Principles of Secondary Surveillance Radar,

Radar studies of the atmosphere, OHR and Radar jamming, EC, ECC measures and stealth applications.

Employability

Course Outcomes

At the end of the Course,student will be able to:

1.Interpret the various bandwidth considerations related to survellience radar and design

2.Illustrate the various tracking methods and significance of monopulse radar

3.Design a Radar waveform,given bandwidth and pulse duration.

4.Understand the principles of secondary surveillance for various stealth applications.

Text Books :

1. "Understanding of Radar Systems", Simon Kingsley and Shaun Quegan, McGraw Hill, 1993.

2. Radar Handbook by Skolnik.

MTCS-12 DIGITAL IMAGE PROCESSING

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	Lecture	Tutorial	Practical				
4	4	1	-	3	40	60	100

Course Objectives:

1. To learn Image Fundamentals and Processing Techniques
2. To be familiar with Image Transformations in Spatial Domain and Frequency Domain
3. To learn various Filters for Image Restoration
4. To study various Image Compression and Segmentation Techniques
5. To gain experience in applying image processing algorithms to real problems

UNIT I – DIGITAL IMAGE FUNDAMENTALS (8 hours)

Introduction – Origin –Steps in Digital Image Processing – Components; Elements of Visual Perception – Light and Electromagnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels.

UNIT II – IMAGE ENHANCEMENT (9 hours)

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

Employability

Employability

UNIT III –IMAGE RESTORATION (9 hours)

Noise models – Mean filters – Order Statistics – Adaptive filters – Band reject – Band pass – Notch – Optimum notch filtering – Inverse Filtering – Constrained Least Square Filtering – Wiener filtering.

Employability

UNIT IV –IMAGE COMPRESSION (9 hours)

Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding –Bit – Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding –Wavelet Coding – Compression Standards – JPEG 2000.

Employability

UNIT V –IMAGE SEGMENTATION AND REPRESENTATION (10 hours)

Segmentation – Detection of Discontinuities – Edge Linking and Boundary detection – Region based segmentation; Representation – Boundary descriptors – Simple Descriptors – Shape numbers –Regional descriptors – Simple and Topological Descriptors – Introduction to Image Processing Toolbox – Practice of Image Processing Toolbox – Case studies–Various Image Processing Techniques.

Employability

Text books:

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Pearson Education, Third Edition, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill Pvt. Ltd., Third Edition, 2011.

Reference books:

1. Rosefeld & Kak AC, Digital Picture Processing Academic Press Inc.
2. Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning
3. William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Apply 2D Fourier transform concepts for image enhancement.
3. Remove various noises present in an image using different filters.
4. Understand various coding techniques for image compression.
5. To use the techniques, skills, and modern engineering tools necessary for image processing applications.

MTCS-13 RF AND MICROWAVE ENGINEERING

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Course Objectives:
This course is intended to introduce to students:

(i) The concepts of scattering parameters signal flow graphs, and their applications in microwave circuit analysis and design .

(ii) Concepts of planar transmission lines, lumped/distributed circuit elements, impedance matching circuits, resonators, dividers, couplers, filters and duplexers.

Chapter 1 : Introduction to RF and Microwave concepts and applications (8hrs)

Introduction, Reasons for using RF/Microwaves, RF/Microwave applications, Radio frequency waves, RF and Microwave circuit design, The unchanging fundamentals versus the ever-evolving structure, General active circuit block diagrams.

Chapter 2 : RF Electronics Concepts (10hrs)

Introduction, RF/Microwaves versus DC or low AC signals, EM spectrum, Wave length and frequency,
Circuit representation of two port RF/microwave networks. Basics of RF component, Resonant circuits, Analysis of a simple circuit in phasor domain, Impedance transformers, RF impedance matching, Three element matching.

Chapter 3 : Smith Chart and its Applications (12hrs)

Introduction, A valuable graphical aid the smith chart, Derivation of smith chart, Description of two types of smith charts, Smith charts circular scales, Smith charts radial scales, The normalized impedance-admittance (ZY) smith chart introduction, Applications of the smith chart - Distributed circuit applications, Lumped element circuit applications.

Chapter 4 : RF and Microwave Amplifiers Small and Large Signal Design (18hrs)

Employability

Introduction, Types of amplifiers, Small signal amplifiers, Design of different types of amplifiers, Multistage small signal amplifier design.

Introduction, High-power amplifiers, Large signal amplifier design, Microwave power combining/dividing techniques, Signal distortion due to inter modulation products, Multistage amplifiers, Large signal design

Chapter 5 : Radio Frequency and Microwave Oscillator Design (10hrs)

Employability

Introduction, Oscillator versus amplifier design, Oscillation conditions, Design of transistor oscillators, Generator-tuning networks.

Text Book :

"Radio Frequency and Microwave Electronics", by Mathew M. Radmanesh, Person Education Inc., New Delhi

References

"Microwave Engineering, Active and Non-reciprocal Circuits", by Joseph Helszain, McGraw Hill International Edition, 1992

MTCS 13 b WAVELET TRANSFORMS AND ITS APPLICATIONS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

Unit – I:

Continuous And Discrete Wavelet Transform: Continuous time ;wavelets transform (CWT): Definition, CWT as a correlation, Constant Q factor filtering interpretation and time frequency resolution, CWT as an operator, Inverse CWT, Discrete Wavelet Transform: Approximations of vectors in Nested Linear Vector Subspaces – Multiresolution analysis (MRA) with examples.

Skill Development

Unit – II:

Orthonormal Wavelets And Filter Banks: Definition of an MRA- construction of a General Orthonormal MRA – Wavelet Basis for the MRA-Digital filtering Interpretation- Examples of orthonormal Basis – Generating Wavelets- Interpreting Orthonormal MRAs for Discrete – time Signals Miscellaneous Issues Related to PRQMF Filter Banks-Generating Scaling Functions and Wavelets from Filter Banks – Generating Scaling functions and Wavelets from Filter coefficients – Problems.

Skill Development

Unit – III:

Alternative Wavelet Transforms: Biorthogonal Wavelet Bases – Filtering Relations for Orthogonal Filters-Examples of Biorthogonal Scaling Functions and Wavelets-Two Dimensional Wavelets- Nonseperable Multidimensional Wavelets- Wavelet Packets – Transform Coding – DTWT for Image Compression – Audio Compression – Video Coding Using Multiresolution Techniques.

Skill Development

Unit – IV:

Applications of Wavelet Transforms: Wavelet Denoising – Speckle Removing – Edge Detection and Object Isolation - Image Fusion-Object Detection by Wavelet Transforms of Projections – Communication Applications – Scaling Functions as signaling pulses, Discrete Wavelet Multitone Modulation.

Skill Development

Unit – V:

Advanced Topics: Parseval's Identity for CWT Wavelet inner product as a projection operation CWT with an orthonormal basis for generating wavelet – A Trous algorithm-Regularity and Convergence – Daubechies Construction of Orthonormal Scaling Functions – Bandlimited Bi-orthogonal Decomposition – Design and Selection of Wavelets – Perfect Reconstruction Circular Convolution Filter Banks-Interpolators Matches to the Input Process – The Scaling Operation and Self-Similar Signals

Skill Development

Text Book:

1. Raghuveer M. Rao and Ajit S. Bopardikar, "Wavelet Transforms – Introduction to Theory and Applications" Addison Wesley Pearson Education Asia, 2000.

Reference Book:

1. C.Sidney Burrus, Ramesh A Gopinath, and Haitao Guo, "Introduction to Wavelets and Wavelet Transforms, A Primer " PH International Editions, 1998.

MTCS 13 c MODELLING AND SIMULATION OF COMMUNICATION SYSTEMS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

UNIT I
Simulation of Random Variables and Random Process:
Univariate and multi-variate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND ARMA sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

UNIT II
Modeling of Communication Systems:
Information Sources, Formatting/Source Coding, Digital Waveforms, Line Coding, Channel Coding, Radio frequency and Optical Modulation, Demodulation and Detection, Filtering, Multiplexing/Multiple Access, Synchronization, Calibration of Simulations.

Employability

UNIT III
Communication Channels & Models:
Fading & Multipath Channels, Almost Free-Space Channels, Finite State Channel Models, Methodology for Simulating Communication Systems Operating over Fading Channels, Reference Models for Mobile Channels: GSM, UMTS-IMT-2000.

Employability

UNIT IV
Estimation of Parameters in Simulation:
Quality of an estimator, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Estimating the Power Spectral Density of a process, Estimating the Delay and Phase.

Employability

UNIT V
Estimation of Performance Measures from Simulation:
Estimation of SNR, Performance Measures for Digital Systems, Importance sampling method, Efficient Simulation using Importance Sampling, Quasianalytical Estimation. Case Studies: 16-QAM Equalized Line of Sight Digital Radio Link, CDMA Cellular Radio System.

Employability

Text Book:

1. William H. Tranter, K. Sam Shanmugan, Theodore S. Rappaport, Kurt L. Kosbar, “Principles of Communication Systems Simulation with Wireless Applications”, Prentice Hall PTR, 2002.
2. John G. Proakis, Masoud Salehi, Gerhard Bauch, Bill Stenquist, Tom Ziolkowski, “Contemporary Communication Systems Using MATLAB” Thomson-Engineering, 2 edition, 2002.

Reference books:

1. M.C. Jeruchim, Philip Balaban and K.Sam Shanmugam, “Simulation of Communication Systems, Modeling, Methodology and Techniques”, Kluwer Academic/Plenum Publishers, New York, 2000.
2. C. Britton Rorabaugh, “Simulating Wireless Communication Systems: Practical Models In C++”Prentice Hall, 2004.

MTCS-14 STATISTICAL SIGNAL PROCESSING

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
04	3	1	0	3	40	60	100

Course Objectives:

1. To understand the fundamentals of Estimation Theory
2. To understand Deterministic Parameter Estimation
3. To understand Random Parameter Estimation:
4. To understand State Estimation
5. To understand the Fundamentals of Detection Theory

Syllabus

Unit-I. : Fundamentals of Estimation Theory (8 hrs)

Estimation in Signal Processing, Unbiased Estimators, Existence of the Minimum variance unbiased estimator. Finding Minimum variance unbiased Estimators, Cramer-Rao Lower Bound, Linear Model Examples, Sufficient Statistics, Using Sufficiency to find the MVU Estimator.

Unit-II. Deterministic Parameter Estimation (11 hrs)

The Least Squares Approach, Order- Recursive Least Squares, Definition of the BLUE, Finding the BLUE. Maximum Likelihood Estimation: Finding the MLE, Properties of the MLE , MLE for Transformed parameters, Numerical Determination of the MLE.

Unit-III. Random Parameter Estimation: (10 hrs)

The Bayesian Philosophy: Prior Knowledge and Estimation, Choosing a Prior PDF, Bayesian linear model, Nuisance parameters,Bayesian Estimation for Deterministic parameters,Derivation of Conditional Gaussian PDF,Minimum Mean Square Error Estimator, Maximum a Posteriori Estimators.

Unit-IV. State Estimation: (9 hrs)

Linear Minimum Mean Squared Error Estimation, Signal processing examples- Wiener Filtering,
Kalman Filters: Scalar Kalman Filter, Kalman versus Wiener Filters, Extended Kalman Filter.

Unit-V. Fundamentals of Detection Theory: (14 hrs)

Statistical Decision Theory: Neyman - Pearson Theorem, Receiver Operating Characteristics, Irrelevant Data, Minimum Probability of Error, Bayes Risk, Multiple Hypothesis Testing -Composite Hypothesis Testing, Composite Hypothesis Testing Approaches, Performance of GLRT, Multiple Hypothesis Testing

Text books:

1. Steven M. Kay, "Fundamentals of Statistical Signal Processing Volume I Estimation Theory", Prentice Hall PTR, 1993. (UNIT- I, II, III & IV)
2. Steven M. Kay, "Fundamentals of Statistical Signal Processing Volume II Detection Theory", Prentice Hall PTR, 1998 (UNIT- V)

Reference books:

1. M D Srinath, P K Rajasekaran, R Viswanathan, Introduction to Statistical Signal Processing with Applications, "Pearson"
2. Harry L. Van Trees, "Detection, Estimation and Modulation Theory, Part 1 and 2," John Wiley & Sons Inc. 1968.
3. Monson H. Hayes, "Statistical Digital Signal Processing and Modelling," John Wiley & Sons Inc., 1996.
4. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
5. *An Introduction to Signal Detection and Estimation*, Second Edition, by H. Vincent Poor. Springer Verlag, 1994
6. Decision and estimation theory. James L. Melsa, Davíd L. Cohn. McGraw-Hill, 1978

Course Outcomes:
At the end of the course, the student will be able to:

1. Learn about basic Estimation Methods: Maximum Likelihood Estimation, Maximum Aposteriori Estimation, Minimum Variance Unbiased Estimation, Minimum Mean Square Error Estimation, Linear Minimum Mean Square Error Estimation and Kalman Filtering
2. Learn about basic estimator properties such as Bias, Efficiency, Linearity
3. Learn Classical and Bayesian Estimation Approaches
4. Learn Basic Estimation Performance Bounds such as Cramer-Rao Bound
5. Gain ability to apply estimation methods to real engineering problems.
6. Able to analyze and design decision devices using Bayes' risk formulation
7. Able to analyze and design decision devices using the Neyman-Pearson criterion

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MTCS -14 b CPLD AND FPGA ARCHITECTURE AND APPLICATIONS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

UNIT I

PROGRAMMABLE LOGIC DEVICES:

COMPLEX PROGRAMMABLE LOGIC DEVICES (CPLD):

Employability

ROM, PLA, PAL, PLD, PGA – Features, programming and applications using complex programmable logic devices Altera series – Max 5000/7000 series and Altera FLEX logic – 10000 series CPLD, AMD's – CPLD (Mach 1 to 5); Cyprus FLASH 370 Device Technology, Lattice LSI's Architectures – 3000 Series – Speed Performance and in system programmability.

Field Programmable Gate Arrays (FPGA)

Field Programmable Gate Arrays – Logic blocks, routing architecture, Design flow, Technology Mapping for FPGAs.

UNIT-II

Employability

FPGA/CPLD ARCHITECTURES:

Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T –

ORCA's (Optimized Reconfigurable Cell Array): ACTEL's – ACT-1, 2, 3 and their speed performance.

UNIT III

FINITE STATE MACHINES (FSM):

Top Down Design – State Transition Table, state assignments for FPGAs. Problem of initial state assignment for one hot encoding. Derivations of state machine charges. Realization of state machine charts with a PAL.

Alternative realization for state machine chart using microprogramming. Linked state machines. One – Hot state machine, Petrinets for state machines – basic concepts, properties, extended petrinets for parallel controllers. Finite State Machine – Case Study, Meta Stability, Synchronization.

UNIT IV

Employability

FSM ARCHITECTURES:

Architectures centered around non-registered PLDs. State machine designs centered around shift registers. One – Hot design method. Use of ASMs in One – Hot design. Application of One – Hot method.

UNIT V

SYSTEM LEVEL DESIGN:

Controller, data path and functional partitions, Parallel adder cell, parallel adder sequential circuits, counters, multiplexers, parallel controllers.

TEXT BOOKS:

1. P.K.Chan & S. Mourad, "*Digital Design Using Field Programmable Gate Array*", prentice Hall (Pte), 1994.
2. S.Brown, R.Francis, J.Rose, Z.Vransic, "*Field Programmable Gate Array*", Kluwer Publications, 1992.

REFERENCE BOOKS:

1. J. Old Field, R.Dorf, "*Field Programmable Gate Arrays*", John Wiley & Sons, New York, 1995.
2. S.Trimberger, Edr. "*Field Programmable Gate Array Technology*", Kluwer Academic Publications, 1994.
3. Bob Zeidman, "*Designing with FPGAs & CPLDs*", CMP Books, 2002.

MTCS 14 c ADHOC NETWORKS

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	1	-	3	40	60	100

UNIT I ROUTING

Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive, Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Meshbased protocols – Multicast with Quality of Service Provision

UNIT II QUALITY OF SERVICE

Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based QoS Routing Protocols

UNIT III ENERGY MANAGEMENT AD HOC NETWORKS

Need for Energy Management – Classification of Energy Management Schemes – Battery Management and Transmission Power Management Schemes – Network Layerand Data Link Layer Solutions – System power Management schemes

UNIT IV MESH NETWORKS

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic Routing – Self Configuration and Auto Configuration - Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks

UNIT V SENSOR NETWORKS

Introduction – Sensor Network architecture – Data Dissemination – Data Gathering – MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks – Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks

Text Books:

1. C. Siva Ram Murthy and B.S. Manoj, “Ad hoc Wireless Networks – Architectures and Protocols’, Pearson Education, 2004

Reference:

1. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, MorganKaufmanPublishers, 2004
2. C.K. Toh, “Adhoc Mobile Wireless Networks”, Pearson Education, 2002.
3. Thomas Krag and SebastinBuettrich, ‘Wireless Mesh Networking’, O’ReillyPublishers.

MTCS 15 Signal Processing Lab

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
2	-	-	3	3	50	50	100

List of Experiments

Cycle-I: Digital Signal Processing based Experiments:

1. Write a MATLAB program to find (i) Circular convolution of the given two sequences (ii) Linear convolution using circular convolution.
2. Write a MATLAB program to find the spectrum of the given sequence using FFT.
3. Write a MATLAB program to design Butterworth (i) low pass filter for the given specifications.
4. Write a MATLAB program to design Chebyshev type-I (i) low pass filter for the given specifications.
5. Write a MATLAB program to convert given analog filter into digital filter using Bilinear transformation
6. Write a MATLAB program to plot the frequency response of low pass filter using Kaiser window for different values of β

EMPLOYABILITY

Cycle-II:Digital Image Processing based Experiments:

1. Write a program forfollowing geometric transformation on image
   (a) Translation(b) Scaling(c) Rotation (d) Shrinking (e) Zooming
2. Write a Program in MATLAB to
   a. Obtain Negative image b. Thresholding c. Contrast stretching (Linear & Non-linear)
3. Write a program to
   (a) compute the histogram of an input image
   (b) To improve the appearance using histogram equalization technique.
5. Write a program to performsmoothing and sharpening operation of an image using spatial filtering

6. Write programs for image
   (a) Apply FFT and IFFT on given image(b) Perform low pass and high pass filtering in frequency domain
7. Write a program in MATLAB for edge detection using different edge detection mask
8. Write programsto implement following morphological operations on images
   (a)Erosion (b) Dilation(c)Closing(d)Opening

EMPLOYABILITY

MTCST111 Theory of Computation

Periods/week 3 Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100

Marks --

UNIT-I

Finite Automata, Deterministic finite automata, Non deterministic finite automata, finite automata with epsilon transitions. Application of finite automata.

UNIT-II

Regular Expressions, finite automata and regular expressions, algebraic laws of regular expressions, Application of regular expression.

UNIT-III

Context free grammars, The language of a grammar, sentential form, parse trees, ambiguity in grammars and languages, Applications of context free grammar.

UNIT-IV

Normal forms for context free grammer, Chomsky normal form, The pumping lemma for context free languages. Decision properties of context free language.

UNIT-V

Push down automata, Languages of a PDA,. parsing and pushdown automation. Turing machine, Programming techniques for turing machine, restricted turing machines, turing machine and computers.

Text Books

1. Introduction to automata theory, language & computations- Hopcroft & O.D. Ullman, R. Mothwani. AW, 2001
2. Theory of Computer Science(automata, languages, and computation): K.L.P Mishra and N. Chandrasekaran, PHI,2000
3. Introduction to formal languages & automata- Peter Linz, Narosa Pub. 2001.
4. Fundamentals of the theory of computation- principles and practice by Ramond Greenlaw and H . James Hoover, Harcourt India Pvt. Ltd.1998.
5. Elements of theory of computation by H.R. Lewis & C.H. Papaditriou, PHI,1998.

MTCST112 SOFTWARE PROJECT MANAGEMENT

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

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UNIT I Software Process Maturity Software maturity Framework**,** Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM)**,** CMMI, PCMM, PSP, TSP.

UNIT II Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

UNIT III Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

UNIT V CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, *Watts S. Humphrey*, Pearson Education.
2. Software Project Management, *Walker Royce,* Pearson Education.
3. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
4. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000 5. Process Improvement essentials, James R. Persse, O'Reilly, 2006

MTCST113 ADVANCED DATABASE MANAGEMENT SYSTEM

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

Unit I Introduction, Parallel database architecture, speedup, scale-up I/O parallelism, Inter-query and Intra-query parallelism, Inter-operational and Intra-operational parallelism, parallel query evaluation, Design of parallel systems, Implementation issues of Parallel query evaluation, Design of parallel systems, Comparison of Inter-query and Intra-query parallelism.

EMPLOYABILITY

Unit II Distributed Databases, Study of DDBMS architectures, Comparison of Homogeneous and Heterogeneous Databases, Analysis of Concurrency control in distributed databases, Implementation of Distributed query processing. Distributed data storage, Distributed transactions, Commit protocols, Availability, Distributed query processing, Directory systems-ldap, Distributed data storage and transactions.

EMPLOYABILIT

Unit III Overview of client server architecture, Databases and web architecture, N-tier architecture, XML, Introduction, Structure of XML Data, XML Document Schema, DTD, Querying and Transformation: XQuery, FLOWR, XPath, XML validation, Web server, API to XML, Storage of XML Data, XML Applications: web services, Web based system, Implementation of XML validations, Use of web servers. XML and DTD implementation, Use of Web service like Amazon web service or Microsoft Azure.

EMPLOYABILITY

Unit IV Introduction to Decision Support, Data Warehousing, Creating and maintaining a warehouse. Introduction to Data warehouse and OLAP, Multidimensional data model, Data Warehouse architecture, OLAP and data cubes, Operations on cubes, Data preprocessing need for preprocessing, Multidimensional data model, OLAP and data cubes, Data warehousing Concepts, Study of Data preprocessing need for preprocessing, Simulating and maintaining a Warehouse, Analysis of Data preprocessing.Introduction to data mining , Data mining functionalities, clustering - k means algorithm, classification - decision tree, Baysian classifiers, Outlier analysis, association rules - apriori algorithm, Introduction to text mining, Implementing Clustering - k means algorithm, Analysis of Decision tree.

EMPLO

Unit V Information retrieval - overview, Relevance ranking using terms and hyperlinks, synonyms, homonyms, ontologies, Indexing of documents, measuring retrieval effectiveness, web search engines, Information retrieval and structured data. Information Retrieval, Study and Comparison of Synonyms, Homonyms, Ontologies. Implementation issues of Relevance ranking Algorithm.

EMPLOYABILITY

Text Books:

1. Database System Concepts, Avi Silberschatz , Henry F. Korth , S. Sudarshan McGraw-Hill, Sixth Edition, ISBN 0-07-352332-1.

2. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke,McGraw-Hill.

MTCST114 Elective-I IMAGE PROCESSING

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT-I

DIGITAL IMAGE FUNDAMENTALS : What Is Digital Image Processing?, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Image Sensing and Acquisition, Some Basic Relationships between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing.

Employability

UNIT-II

Intensity Transformations and Spatial Filtering: Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Employability

UNIT-III

Filtering in the Frequency Domain: Background, Preliminary Concepts, DFT, Some Properties of the 2-D Discrete Fourier Transform, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters, Selective Filtering.

Employability

UNIT-IV

Morphological Image Processing & Image Compression: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms, JPEG Compression model, Huffman coding.

Employability

UNIT-V

Image Segmentation: Fundamentals, Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation.

Employability

Text Books:

Title: “Digital Image Processing”. Author(s)/Editor(s): R. C. Gonzalez and R. E. Woods. Publisher: Pearson Prentice-Hall, 2008 ISBN: 0-13-168728-x, 978-0-13-168728-8 Edition: third.

Title: “Digital Image Processing using Matlab”. Author(s)/Editor(s): R. C. Gonzalez, R. E. Woods, S. L. Eddins. Publisher: Pearson-Prentice-Hall, 2004 ISBN: 0-13-008519-7 Edition: 2nd .

MTCST114 Elective-I Semantic Web

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

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Introduction to Semantic Web and Ontologies: Today’s Web, From Today’s Web to the Semantic Web, Semantic Web Technologies, A Layered Approach, Differences Among Taxonomies, Thesauri and Ontologies, Classifying Ontologies, Knowledge Representation in Description Logic.

UNIT-II

Describing Web Resources in RDF: XML Essentials like elements/attributes and URIs and Namespaces, RDF (statements and vocabularies, RDF Triples and Graphs) and RDF Schema (Classes, Properties, Individuals).

UNIT-III

Querying the Semantic Web: SPARQL Infrastructure, Basics Matching Patterns, Filters, Organizing result sets, Other forms of SQL Queries, Querying Schemes, Adding Information with SPARQL Update.

EMPLOYABILITY

UNIT-IV

Web Ontology Language (OWL): Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Properties, Classes and Individuals.

UNIT-V

Logic and Inference Rules: Introduction, Example of Monotonic Rules: Family Relationships, Monotonic Rules: Syntax, Monotonic Rules: Semantics, Semantic Web Rule language (SWRL), Rules in SPARQL: SPIN, Non-monotonic Rules: Motivation and Syntax.

Case Studies: Applications: Software Agents, Semantic Desktop, Ontology Applications in Art.

EMPLOYABILITY

Text Books:

1. Grigoris Antoniou, Frank Van Harmelen, A Semantic Web Primer, MIT Press, 2008 (Second Edition)
   ISBN: 9780262012423
2. Grigoris Antoniou, Frank Van Harmelen, A Semantic Web Primer, MIT Press, 2012 (Third Edition)
   ISBN: 9780262018289

Reference Books:

1. Karin K. Breitman and Marco Antonio Casanova, Semantic Web: Concepts, Technologies and Applications, Springer, 2010, ISBN:9788184893977

MTCST114 Elective-I EMBEDDED SYSTEMS

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 MarksTotal: 100 Marks

Unit -I

A First look at Embedded systems- Examples of Embedded Systems - Telegraph development challenges, **Hardware fundamentals for software engineers**- Logic gates, Advanced Hardware Fundamentals- microprocessor, D-flip flop, memories, Buses, Watch Dog Timer, DMA, UART and PLD's, ASIC, FPGA.

Interrupts basics, ISR; Context saving, shared data problem. Atomic and critical section, Interrupt latency.

Unit -II

Survey ofsoftware architectures- Round Robin, Round Robin with Interrupt, Function queue scheduling architecture, Use of real time operating system and their comparison.

Unit-III

RTOS- concept, Tasks and Task structures , Scheduler, Shared data, Reentrancy, Priority Inversion, Mutex binary semaphore and counting semaphore. **Inter task communication methods** and their comparison- message queue, mailboxes and pipes, timer functions, events.

Unit- IV

Interrupt routines in an RTOS environment-Rule1 and Rule2, No Blocking, Solutions to Break the Rules,

Basic Design of Embedded Software using an RTOS- Hard real time and soft real time system principles, Task division, need of interrupt routines, shared data.

Employability

Unit -V

Embedded Software Development Tools- Host and target systems, Cross Compilers/Cross Assembler, linkers/locators for embedded systems. Getting embedded software into the target system.

Employability

Debugging techniques- Testing on host machine, Instruction set Simulators, logic analyzers. In circuit Emulators and Software-Only Monitors.

Employability

Text Books:

1. David A. Simon, An Embedded Software Primer, Pearson Education, Inc., 1999
2. Sriram V Iyer and Pankaj Gupta, Embedded Real Time Systems programming, TMH,2004
3. Frank Vahid/ Tony Givargis, Embedded Systems Design – A Unified Hardware/Software Introduction, John Wiley & Sons, Inc., 2002
4. Raj Kamal, Embedded Systems, Architecture, Programming and Design, TMH, 2003

MTCST114 Elective-I WIRELESS SENSOR & ACTUATOR NETWORKS

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT-I

Overview of Wireless sensor and actuator networks, comparison of adhoc network, infrastructure network and sensor networks. Introduction to wireless sensor Networks and wireless sensor actuator networks, Terminology WSN architecture, requirements and standards, Topologies uses in Wireless sensor and actuator network.

Employability

Employability

UNIT-II

Applications of wireless sensor networks and wireless sensor actuator networks, , what the challenges ,issues in wireless sensor actuator networks ? requirement for wireless sensor network deployment various standards for WSAN Development of sensor network. Overview of broadcasting techniques, backbone and broadcasting in sensor actuator networks, coverage and connectivity criteria.

UNIT-III

Placement and deployment of sensors in wireless sensor networks. Static sensors and mobile sensors placements.

Placement by Actuators: - **Least Recently Visited Approach, Snake like Deployment Approach, Back Tracking-Deployment Approach**

Different methods used for sensor placement and deployment, Issues with the Wireless sensor network deployment

Sensor Self Depolyment Methods :- Virtual Force/Vector Based Approach, Voronoi Based Approach, Mobile Sensor Migration

UNIT-IV

Multicasting,multirating casting,geo casting and anycasting in sensor network,
Routing in Wireless Sensor and Actuator Networks : flooding,gossiping,classification of routing protocols, Study of types of routing protocols used in wireless sensor network.

Routing protocols based on network structures :- Flat networks routing – directed diffusion,SPIN,Rumor,GBR hierarchicial networks routing :- LEACH,PEGASIS,TEEN routing,location based routing :- Greedy,Face,Geographic adaptive fidelity, Geographic and energy aware routing.

Employability

UNIT-V

Sink Mobility :- Data gathering in deplay tolerant Wireless Sensor Networks : - Sink tour and RP based data collection methods : Direct contact data collection,Rendezvous based data collection,Introduction to sink mobility, energy problems, **Topology Control in Sensor, Actuator : - use of MST and LMST** , Introduction and detection of critical nodes and links : how to identify the critical nodes and links,how to solve the problem of critical nodes and critical links.

Text Books:

1.Wireless Sensor and Actuator Networks Algorithms and Protocols for Scalable Coordination and Data Communication, Edited by Amiya Nayak and Ivan Stojmenovic A JOHN WILEY & SONS, INC., PUBLICATION,2010.

2. Wireless Communications & Networks, 2nd Edition, William Stallings ,Pearson Education India,2009 3. Wireless Sensor Networks: An Information Processing Approach,Feng Zhao and Leonidas Guibas ,Morgan Kauffman Publication,2004

MTCST115 Advance Operating System

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

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UNIT-I Process Synchronization: Functions of an operating system, Design approaches, why advanced operating system, Types of advanced operating systems, synchronization mechanisms- concept of a process, concurrent processes, the critical-section problem, other synchronization problems, language mechanisms for synchronization. **Process Deadlocks:** Preliminaries, models of deadlock, models of resources, graph-theoretical model of a system state, necessity conditions for a deadlock, system with single-unit resources and reusable resources.

Skill Development Employability Skill Development

UNIT-II Distributed Operating Systems: Architecture of a Distributed Systems, system architecture types, issues in distributed operating systems, communication networks, and communication primitives. Limitations of distributed systems, Lamport's logical clocks, vector clocks, casual ordering of messages, global state. **Distributed Mutual Exclusion:** Introduction, preliminaries, Lamport's Algorithm, Ricart Agrawala Algorithm, generalized non-token based algorithm, token-based algorithm, Suzuki-kasami broadcast algorithm.

Employability Skill Development

UNIT-III Distributed Deadlock Detection: Introduction, preliminaries, deadlock handling strategies, distributed deadlock detection, centralized-deadlock detection algorithms, distributed deadlock detection algorithms, hierarchical deadlock detection algorithms, Agreement protocols-classification solutions-Applications.

Skill Development

UNIT-IV Distributed Resource Management: Distributed file systems, mechanisms, design issues, distributed shared memory architecture-algorithms-memory coherence, coherence protocols, design issues. Distributed scheduling-issues, components, load distribution, performance comparision.

Employability Skill Develop

UNIT-V Failure Recovery and Fault Tolerance: Recovery-concepts, classifications, error recovery, basic approaches, recovery in concurrent systems, Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and

Skill Development

Nonblocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.

Employability

Text Book:

Advanced Concepts in Operating Systems by Mukesh Singhal and N.G. shivaratri, McGraw Hill, 2000.
Operating System concepts by Abraham Silberschatz, Peter B. Galvin, G. Gagne, sixth edition, Addision Wesley Publishing co., 2003.
Modern Operating Systems by Andrew S. Tanenbaum, Second Edition, Addision Wesley, 2001.

MTCST116 Computer Networks

Instruction: 3 Periods/week Time: 3 Hours Credits: 4

Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT- I:

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, TCP / IP protocol suite, Guided and Unguided Transmission media, Understanding of Delay, Loss and Throughput in the packet switching network.

UNIT- II:

Introduction and link layer services, error-detection and correction techniques, Multiple access protocols, Sliding Window Protocols, Multiplexing, Switching, Broad Band ISDN , ATM Networks.

UNIT- III:

Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

UNIT -IV:

TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

UNIT-V:

Domain Name System (DNS) , E-mail, FTP,TFTP,WWW ,HTTP,– Multimedia Network Security: Cryptography – Symmetric key and Public Key algorithms - Digital signature –Management of Public keysAdvanced Concepts in Networks: Over View of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks .Delay Tolerant Networks DTN, .

Text Book:

1. Computer Networks, Andrews S Tanenbaum,, Edition 5, PHI, ISBN:-81-203-1165-5
2.Computer Networking Top Down approach 3rd edition By Jim kurose and keith ross
3.Computer networks, Mayank Dave, CENGAGE.
4. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier. 5.Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

MTCST117 Network Programming and Web Programming Lab Instruction: 3

Periods/week Time: 3 Hours Credits: 2

Internal: 50 Marks External: 50 Marks Total: 100 Marks

- Part I:

Network programming

1.Identifying well known ports on a Remote System :By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.

2. Writing a Chat application :

i). One-One: By opening socket connection and displaying what is written by one party to the other.

ii). Many-Many (Broad cast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.

3. SMTP Client : Gives the server name, send e-mail to the recipient using SMTP

commands. 4.TFTP- Client:To develop a TFTP client for file transfer.

5. HTTP-Server: Develop a HTTP server to implement the following commands. GET, POST, HEAD, DELETE. The server must handle multiple clients.

Part II:

Web Programming

1.Design of the Web pages using various features of HTML and DHTML

2. Design of the Web pages using client side scripting (javascript) for page validation. 3. Client server

programming using servlets and JSP on the server side and java script on the client side. 4. Multimedia

effects on web pages design using Flash

References

1. Java Network Programming, Harol, Orielly Publications

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Subject code: MTCST119 SEMINAR Practical Time: 3 Hours

Credits:2 Total: 100 Marks

Purpose: To enable a student to be familiar with Communication skills and to make them learn about technical writing skills. Student is expected to Learn

a. How to Make a Presentation

I. Verbal

II.Non Verbal

III. LCD based Power Point

b. How to write a report

I. Abstract

II. Body

III. Conclusions

IV. Executive Summary

c. Communication

Students will be Given a Topic of Importance and are expected to Present the Topic Verbally in 45minutes + Question Answering

To Present the Topic as a Report

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER -II

Syllabus

Subject code: MTCST121 Machine Learning

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks

Total: 100 Marks

_ UNIT I:

Introduction: Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning**Concept learning and the general to specific ordering** – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Decision Tree learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis Space search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in decision tree learning

UNIT III: Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

UNIT IV: Computational learning theory : Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces.**Instance-Based Learning**- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

UNIT V: Learning set of Rules: Introduction, Sequential Covering Algorithms, Learning and Learning Set of First Order Rules.Machine Learning and its Application, case studies such as classification, clustering, prediction .

TEXT BOOK:

1. Machine Learning ,Tom M. Mitchell, MGH,1997

REFERENCE BOOK:

1. Machine Learning, An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC) 2.

Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER -II

Syllabus

Subject code: MTCST122 Data Ware Housing & Data Mining

Instruction: 3 Periods/week Time: 3 Hours Credits: 4
Internal: 40 Marks External: 60 Marks Total: 100 Marks

_ UNIT – I

Introduction to Data Mining: Evolution of I T into DBMS, Motivation and importance of Data Warehousing and Data Mining,Kinds of Patterns, Technologies, Basic Data Analytics: Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Major Issues in Data Mining., Data Mining Applications

Skill and employablity

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

UNIT – II

Data Mining Primitives & Data Cubes: DataMining Primitives, Data Mining Tasks, Data Mining Query Language, DesigningGraphical user Interfaces based on aData Mining Query language, Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC Computing for Iceberg Cubes, Star-Cubing Using Dynamic Star-Tree Structure, Pre
computing Shell Fragments for Fast High-Dimensional OLAPs.

Data Mining Concept Description:: Data Preprocessing: Pre-processing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation; **Data** Architectures of Data Mining Systems; Characterization and Comparison, Concept Description, Data Generalization and Summarization; Analytical Characterization: Analysisof AttributeRelevance, Mining Class Comparisons, Discriminating between Different Classes, Mining Descriptive & Statistical Measures in Large Databases.

Employability

UNIT – III

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP Growth Approach, Mining Frequent Patterns using Vertical Data Formats, Mining Closed and Max Patterns, Pattern Evaluation Methods

Skill and Employability

UNIT – IV

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Advanced Methods: Classification by Back Propagation, SVM, Associative Classification, Lazy Learning, Fuzzy Sets, Rough Sets, Genetic Algorithms, Multiclass Classification, Semi-Supervised Classification

Employability

UNIT – V

Cluster Analysis: Basic Concepts, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions.

Text Book:

1. Data Mining- Concepts and Techniques by Jiawei Han, MichelineKamber and Jian Pei –Morgan Kaufmann publishers –--3rd edition
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers
4. Data Mining –Introductory and Advanced by Margarett Dunham -- Pearson Education publishers
5. Data Warehousing for Real –world by Sam Annahory-- Pearson Education publishers **6.** Web Data Mining and Applications in Business Intelligence and Counter Terrorism, BavaniThuraisingham, CRC Press, June 2003

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
M. Tech I/II CST SEMESTER

Syllabus

MTCST123 HIGH PERFORMANCE COMPUTING WITH CUDA

Instruction: 3 Periods/week Time: 3 Hours Credits: 4
Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT 1 INTRODUCTION: GPUs as Parallel Computers, Architecture of a Modern GPU, Why More Speed or Parallelism? Parallel Programming Languages and Models .

(Text Book 1)

UNIT 2 HISTORY OF GPU COMPUTING : Evolution of Graphics Pipelines ,The Era of Fixed-Function Graphics Pipelines, Evolution of Programmable Real-Time Graphics, Unified Graphics and Computing Processors , GPGPU: An Intermediate Step, GPU Computing , Scalable GPUs, Recent Developments, Future Trends.

(Text Book 1)

UNIT 3 INTRODUCTION TO CUDA: Data Parallelism, CUDA Program Structure A Matrix–Matrix Multiplication Example, Device Memories and Data Transfer, Kernel Functions and Threading. CUDA Thread Organization Using blockIdx and threadIdx, Synchronization and Transparent Scalability , Thread Assignment, Thread Scheduling and Latency Tolerance

(Text Book 1)

UNIT 4 CUDA MEMORIES & PERFORMANCE CONSIDERATIONS:
Importance of Memory Access Efficiency, CUDA Device Memory Types , A Strategy for Reducing Global Memory Traffic, Memory as a Limiting Factor to Parallelism, More on Thread Execution ,Global Memory Bandwidth ,Dynamic Partitioning of SM Resources , Data Pre fetching Instruction Mix , Thread Granularity , Measured Performance

(Text Book 1)

UNIT 5 PARALLEL PROGRAMMING & COMPUTATIONAL THINKING :
Goals of Parallel Programming , Problem Decomposition, Algorithm Selection ,Computational Thinking, **CASE STUDIES**: High Performance Linear ,Algebra**, Design of parallel algorithms :**Odd-Even Transposition sort, quick sort ,bitonic sort ,Graph Analytics, N-body problems, **GPU-Super Computer Acceleration of Pattern Matching.**

(Text Books 1,2,3)

TEXT BOOKS:

1) Programming Massively Parallel Processors A hands-on Approach By David B. Kirk and Wen-mei W. Hwu, Morgan Kaufmann, 2010.

2) Introduction to High Performance Scientific Computing, Victor Eijkhout, Edmond Chow, Robert van de Geijn ,2nd edition 2014.

3)GPU Computing Gems, **Wen-mei W. Hwu,** Emerald Edition , Morgan Kaufmann Publishers 2011,

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Syllabus

Subject code: MTCST124

Information Security and Management Systems

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100 Marks

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UNIT I Threat analysis: Basic security terminologies, Understanding the threat environment, security goals, compromises, countermeasures, Need for security, Threats, Attacks, Types of Attacks, Employee and ex-employee threats- why employees are dangerous, employee sabotage, employee hacking, employee financial theft and theft of intellectual property, employee computer and internet abuse, data lose, other internal attacks; Malware and malware writers; virus; Trojan horses and rootkits.
(Text Book-1)

EMPLOYABILITY

UNIT II Risk management: Risk, Types of Risks ,Risk analysis- reasonable risk, Classic risk calculations, problem with classic risk analysis, responding to risk; Risk Management: Overview of Risk Management, Risk Identification- Business Risks, Risk Management Models, Risk Assessment, Risk Control Strategies, Quantitative and Qualitative Risk Management Approaches
(Text Book-5)

EMPLOYABILITY

EMPLOYABILITY

EMPLOYABILITY

UNIT III Security Technologies: Firewalls– Processing modes, Categorization, Architectures, Selection and management of the firewalls. Intrusion Detection and Prevention Systems (IDS & IPS), Protecting Remote Connections – Virtual Private Networks for security, Physical Security

(Text Book-3)

EMPLOYABILITY

UNIT IV Information Security Standards: Information Security Policy, Standards, and Practices, Policy Management, Information Security Blue print, ISO/IEC 27001:2005, Design of Security Architecture, Security Education, Training, and Awareness Program,

EMPLOYABILITY

(Reference -5)

UNIT V **Implementation of Information Security**: Information Systems Security Certification and Accreditation. Cryptography techniques –asymmetric and symmetric key cryptosystems introduction. Information Security Maintenance: Maintenance models, Digital Forensics. Overview of ISO 17799/ISO 27001 Standards.

EMPLOYABILITY

(Reference -6)

TEXT BOOKS:

1. Corporate Computer Security, 4th Edition, by Randall J. Boyle (Author), Raymond R. Panko (Author)
2. Principles of Information Security. Michael E. Whitman, Herbert J. Mattord, Cengage Learning, 4th edition.

3. **The Essentials of Risk Management** by Michel Crouhy and Dan Galai Robert Mark(Professional Finance and Investment) Second Edition

4. Information Systems Security, Nina Godbole, Wiley Publishers, India, 2009

5. Corey Schou and Dan Shoemaker, Information assurance for the enterprise: a roadmap to information security, TMH, 2007

REFERENCES:

1. Slay, J. and Koronios, A. (2006) IT Security and Risk Management, Wiley
2. Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management (Paperback) AUERBACH; 1 edition
3. Microsoft Security Risk Management Guide
4. Risk Management Guide for Information Technology Systems http://csrc.nist.gov/publications/nistpubs/800-30/sp800-30.pdf
5. Guide lines for Patch and Vulnerability Management Programme http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf
6. Incident Response and Computer Forensics. Chris Prosise and Kevin Mandia. McGraw- Hill (2003).

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)
M. Tech I/II CST SEMESTER

Syllabus

Elective-II

Subject code: MTCST125 Cloud Computing

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks

Total: 100 Marks

UNIT-I

Introduction to cloud computing - distributed computing, centralized computing, grid computing, cluster computing, what is intranet and internet.
What's cloud computing, History of cloud computing, , Benefits of cloud computing, Service models, Deployment models. Current issues and challenges of cloud computing
Cloud Computing Basics - Cloud Computing Overview, Six Phases of Computing Paradigms, cloud

Computing architecture, Applications

UNIT-II

Hardware and Infrastructure– Clients:-Mobile,Thick,Thin, **Security**:- Data Leakage, Offloading work,Logging,Forensics, Compliance VPNs,Key management **,Network**- four different levels : Basic Public Internet, The Accelerated Internet, Optimized Internet Overlay Site-to-Site VPN, **Services** : - identify,integration,mapping,payment,search. **Accessing the Cloud** - Platforms, Web Applications, Web APIs,Web Browsers.

EMPLOYABILITY

UNIT-III

Cloud Services : - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS),Software plus services - Overview, Cloud computing applications and business case for going to the cloud, **Infrastructure as a Service**--Amazon EC2, **Platform as a Service**—RightScale, Salesforce.com ,**Software as a Service**--Google App Engine and Salesforce , --Microsoft's take on SaaS is slightly different with their Software plus Services (sometimes they shorten it to S+S) Software plus Services **,** how applications help business –operational benefits and economical benefits.

EMPLOYABILITY

UNIT-IV

Cloud Storage and data storage security: - what is cloud storage? uses of cloud storage, Types of cloud storage, things looked for cloud storage, infrastructure, data types used in cloud computing, Data security challenges, VPN- Virtual Private Network ,FADE – File assured deletion ,TPA – Third Party Auditing. Cloud Security – need for security and privacy in cloud computing, Security and privacy issues,

EMPLOYABILITY

UNIT-V

Local Clouds,Thin Clients,Thick clients – Types of Virtualizations,Virtualization in Your Organization, Server Solutions, Thin Clients,
Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

EMPLOYABILITY

Text Books:

Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.
The Basics of Cloud Computing , Derrick Rountree and Ileana Castrillo

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)
M. Tech I/II CST SEMESTER

Syllabus

Elective-II

Subject code: MTCST125 Mobile Computing

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT-I

Introduction: Wireless transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread Spectrum, MAC SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

Employability

UNIT-II

Telecommunication Systems: GSM, GPRS, Capacity Allocation: FAMA and DAMA, Broadcast Systems: Digital audio broadcasting (DAB), Digital video broadcasting (DVB), CDMA and 3G.

UNIT-III

Wireless LAN: IEEE 802.11, Architecture, Services, MAC-Physical Layer, IEEE 802.11a- 802.11b Standards, Bluetooth.

UNIT-IV

Routing Adhoc Network Routing Protocols: Adhoc Network Routing Protocols, Destination Sequenced Distance Vector Algorithm, Cluster Based Gateway Switch Routing, fish-eye state routing, Dynamic Source Routing, Adhoc on-demand Routing, Location Aided Routing, Zonal Routing Algorithm. Mobile IP, Dynamic Host Configuration Protocol, Traditional TCP-Classical TCP Improvements-WAP, WAP 2.0

Employability

UNIT-V

Publishing & Accessing Data in Air: Pull and Push Based Data Delivery models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air, Energy Efficient Indexing Scheme for Push Based Data Delivery.

Mobile Transaction and Commerce: Models for Mobile transaction, Kangaroo and Joey Transactions, Team Transaction. Recovery Model for Mobile Transactions. Electronic Payment and Protocols for Mobile Commerce.

Employability

Text Books:

1. Jochen, M Schiller, "Mobile Communications, 2nd Edition Pearson Education, India, 2009.
2. Kurnkum Garg "Mobile Computing",Pearson 2010
3. Asoke K Talukder,Roopa R Yavagal, "Mobile Computing", TMH 2008
4. Raj Kamal,"Mobile Computing", Oxford, 2009.

Reference Books:

1. William Stallings, Wireless Communications & Networks, 2nd Edition, Pearson 2. Mike Gallegher, Randy Snyder, "Mobile Telecommunications Networking with IS-41", McGraw Hill 1997.
3. Yi-Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architecture, Wiley
4. Vijay Kumar, Mobile Database Systems, Wiley

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Elective – II

Syllabus

Subject code: MTCST125 Soft Computing

Instruction: 3 Periods/week Time: 3 Hours Credits: 4
Internal: 40 Marks External: 60 Marks Total: 100 Marks: 100

UNIT-I

FUNDAMENTALS OF NEURAL NETWORKS: Basic concepts of Neural Network, Human Brain, Model of an Artificial Neuron, Neural Network Architectures, Characteristics of Neural Networks, Learning Methods, Taxonomy of Neural Networks Architectures, History Of Neural Networks, Early Neural Network Architectures and Applications

Employability

UNIT-II

BACKPROPAGATION NETWORKS: Architecture of a Back Propagation Network, Back Propagation Learning, Effective of Tuning Parameters of the Back Propagation Neural Network, selection of Various Parameters of BPN, Research Directions, Applications.

Employability

UNIT-III

ADAPTIVE RESONANCE THEORY: Introduction, ART1: Architecture, Special Features, Algorithm, Illustration, ART2: Architecture, Algorithm, Illustration, Applications

UNIT IV

FUZZY SET THEORY: Fuzzy Versus Crisp, Crisp Sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations

Employability

FUZZY SYSTEMS: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule based System, Defuzzification Methods, and Applications

UNIT V

FUNDAMENTALS OF GENETIC ALGORITHMS: History, Basic Concepts, Creation of Offspring, Working Principle, Encoding, Fitness Function, Reproduction

GENETIC MODELLING: Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit

Wise Operators and used in GA, Generational Cycle, Convergence of Genetic Algorithm. Applications, Multi-Level Optimization, Difference and Similarities between GA and Other T[illegible]ods, Advances in GA.

Employability

TEXT BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.**(Refer PART-I AND PART-II in this Book)**

REFERENCE BOOKS:

1. Neural Networks: A Comprehensive Foundation by Simon Haykin- PHI Publication.
2. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
5. Fuzzy Logic¨Intelligence, Control and Information by John Yen and Reza Langari- Pearson Publication.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Syllabus

Elective-II

Subject code: MTCST125 Big Data Analysis

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks

Total: 100 Marks

Employability

UNIT I - Introduction to Big Data: Big Data and its Importance - Four V's of Big Data - Drivers for Big Data - Introduction to Big Data Analytics - Big Data Analytics applications.

UNIT II - R and Hadoop: Features of R language, Hadoop features, HDFS and MapReduce Architecture. **Hadoop MapReduce Programs:** Basics of MapReduce, Hadoop MapReduce Scenario, limitations of MapReduce, MapReduce objects, Hadoop MapReduce example.

Employability

Employability

UNIT III - Integrating R and Hadoop: Introducing RHIPE, architecture of RHIPE, RHIPE samples, Understanding the RHIPE function reference, RHadoop.

UNIT IV - Hadoop Streaming with R: run Hadoop streaming with R, Exploring the Hadoop Streaming R package. **Data Analytics with R and Hadoop:** the data analytics project life cycle, data analytics problems, computing the frequency of stock market change, case study.

Employability

UNIT V - Big Data Analysis with Machine Learning: Introduction to machine learning, Supervised and unsupervised machine learning Algorithms. **Importing and Exporting Data from Various DBs:** data files as database, MySQL, Excel, MongoDB, SQLite, PostgreSQL, Hive, Hbase.

Employability

REFERENCES:

1. Vignesh Prajapati ,"Big Data Analytics with R and Hadoop", 2013 Packt Publishing. 2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", IBM Corporation, 2012.
3. Michael Minelli, Michehe Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", Wiley CIO Series, 2013.
4. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'Reilly, 2012.
5. Kevin Roebuck, "Storing and Managing Big Data - NoSql, Hadoop and more: High-Impact Strategies - What You Need to Know", Tebbo, 2011.
6. Bill Franks, "Taming The Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)
M. Tech I/II CST SEMESTER

Syllabus

Elective-III

Subject code: MTCST126 Approximation Algorithms

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100 Marks

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Syllabus

Employability

Unit 1: The Greedy Algorithm, Layering, Application to shortest superstring, Metric Steiner Tree, MST Based algorithm, Metric TSP, A simple factor 2 algorithm, Improving the factor to 3/2. Example problems. (Chapters 2 and 3)

Employability

Unit 2: The mutliway cut problem, Minimum K-cut problem. Parametric pruning applied to metric K center, the weighted version, Cyclomatic weighed graphs, layering applied to feedback vertex set. Example problems.
(Chapters 4, 5 and 6)

Employability

Unit 3: An FPTAS for Knapsack, Strong NP-hardness and existence of FPTASs. Bin Packing, An asymptotic PTAS. Application: Constrained Shortest Paths, Directed Steiner Trees or Geometric PTASs (polynomial time approximation schemes). Example problems.
(Chapters 8 and 9)

Employability

Unit 4: Factor 2 algorithm, A PTAS for minimum makespan, Bin packing with fixed number of object sizes, Reducing makespan to restricted bin packing. Euclidean TSP The algorithm, Proof of correctness, LP duality theorem, Min-Max relations and LP duality. Two fundamental algorithm design techniques, A comparison of the technique and the notion of integrality gap. Example problems.
(Chapters 10, 11 and 12)

Employability

Unit 5: Set Cover via dual fitting: Dual fitting based analysis for the greedy set cover algorithm, generalization of set cover, dual fitting applied to constrained set multicover. Rounding applied to set cover: A simple rounding algorithm, Randomized rounding, half integrality of vertex cover. Example problems.
(Chapters 13 and 14)

Employability

Text Book: "Approximation Algorithms" by Vijay V Vazirani.
Online version at: http://www.cc.gatech.edu/fac/Vijay.Vazirani/book.pdf
Refereed Chapters from this book is an indicative only.

References:

1. The Design of Approximation Algorithms by David Williamson and David Shmoys 2. Geometric Approximation Algorithms by Sariel Har-Peled, First Edition, 2011.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
I/II M. Tech(CST) SEMESTER-II

MTCST126 INTERNET OF THINGS
(Elective-III)

Instruction: 3 Periods/week Time: 3 Hours Credits: 4
Internal: 40 Marks External: 60 Marks Total: 100 Marks

UNIT- I : Introduction to the Internet of Things

Introduction, WWW, Internet, Network Protocols, History of IoT , About objects/things in the IoT , The identifier in the IoT , Enabling technologies of IoT , About the Internet in IoT

UNIT-II : Radio Frequency Identification Technology , Applications and Related Research Issues

Introduction , Principle of RFID , Components of an RFID system , Issues , Introduction , Concepts and terminology , RFID applications , Ongoing research projects ,

UNIT – III : Wireless Sensor Networks: Technology

History and context , The node, Connecting nodes , Networking nodes , Securing communication , Standards and Fora ,

UNIT – IV Power Line Communication Technology

Introduction , Overview of existing PLC technologies and standards , Architectures for home network applications , Internet of things using PLC technology.

UNIT – V : RFID Deployment for Location and Mobility Management on the Internet

Introduction , Background and related work , Localization and handover management relying on RFID , Technology considerations , Performance evaluation

IOT – Setting the standards Introduction Standardizing the IoT , Exploiting the potential of RFID, Identification in the IoT , Promoting ubiquitous networking: any where, any when, any what , Safeguarding data and consumer privacy

REFERENCES: The Internet of Things: Connecting Objects ,Hakima Chaouchi (Editor), ISBN: 978-1-84821- 140-7 , 288 pages, June 2010, Wiley-ISTE

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Syllabus

Elective-III

Subject code: MTCST126 Visual Computing &Applications

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100 Marks

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UNIT-I

Review of graphics systems – Video display devices, Graphics Software; **Output primitives** – Point and line drawing algorithms, Loading the frame buffer, Circle and ellipse generating algorithms; Pixel addressing and object geometry, Filled area primitives, **2D and 3D geometric transformations**-Matrix representations and homogeneous coordinates, Scaling, Translation, Rotation, special type, **Clipping operations** – Line and polygon clipping algorithms.

Employal

UNIT-II

Representation of Geometry - Parametric Curves, Bezier Curves, B-Splines (degree zero and higher degrees), NURBS, **Tensor Product Surfaces, Triangle Meshes, Subdivision Methods-** Discrete convolution, Lane-Riesenfeld algorithm, Linear (Gaussian) Diffusion.

UNIT-III

Digital Image Processing- Digital Image Filtering, Image Enhancement and Restoration, Wiener Filters, Nonlinear Image processing (Median filtering), Image Segmentation, **Image Transforms and applications**- DFT, DCT, KLT, applications, Orthogonal filter bank (Haar basis), DWT, Scale Space, Vector quantization, Gray level and color quantization, **Template matching-**Template matching and case study,

Employability

Optical Flow.

UNIT-IV

Learning Methods in Vision- Features, Feature extraction and feature selection (SIFT-a case study), **Classifier Learning-** SVM, RBF network, **Dimensionality Reduction**-PCA, LDA

Employability

Modeling- Markov Random Fields, HMM, Maximum Entropy Inference and Bayesian Image Analysis.

Employability

UNIT-V

Emploability

Case studies- Basic approaches for Face recognition, Optical character recognition, and Object detection in videos.

Employability

Employability

Text Books:

1. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education.
2. Digital Image Processing, 3/e by Gonzalez, Pearson (2009).

Web Resources:

1. https://graphics.stanford.edu/courses/cs348a-01-winter/Papers/warren-subdivision.pdf
2. http://www.cs.utexas.edu/~grauman/courses/spring2011/

Reference Books:

1. Computer Graphics: a Programming Approach by Steven Harrington, McGraw-Hill. 2. FUNDAMENTALS OF DIGITAL IMAGE PROCESSING (English) 2nd Edition, Anil K. Jain, Phi Learning 3. Computer Vision: Algorithms and Applications, by R. Szeliski, Springer

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M. Tech I/II CST SEMESTER

Syllabus

Elective - III

Subject code: MTCST126 Software Metrics & Quality Assurance

Instruction: 3 Periods/week Time: 3 Hours Credits: 4 Internal: 40 Marks External: 60 Marks Total: 100 Marks

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UNIT-I

What Is Software Quality: Quality: Popular Views, Quality Professional Views, Software Quality, Total Quality Management and Summary. **Fundamentals Of Measurement Theory:** Definition, Operational Definition, And Measurement, Level Of Measurement, Some Basic Measures, Reliability And Validity, Measurement Errors, Be Careful With Correlation, Criteria For Causality, Summary. **Software Quality Metrics Overview:** Product Quality Metrics, In Process Quality Metrics, Metrics for Software Maintenance, Examples For Metrics Programs, Collecting Software Engineering Data. **10 hours**

UNIT-II

Applying The Seven Basic Quality Tools In Software Development : Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts , Scatter Diagram, Control Chart, Cause And Effect Diagram. **The Rayleigh Model:**Reliability Models, The Rayleigh Model Basic Assumptions, Implementation, Reliability And Predictive Validity.
10 hours

UNIT-III

Complexity Metrics And Models: Lines Of Code, Halstead's Software Science , Cyclomatic Complexity Syntactic Metrics, An Example Of UNIT Design Metrics In Practice .**Metric And Lessons Learned For Object Oriented Projects:** Object Oriented Concepts And Constructs, Design And Complexity Metrics, Productivity Metrics, Quality And Quality Management Metrics, Lessons Learned For object oriented Projects.
10 hours

UNIT-IV

Availability Metrics: Definition And Measurement Of System Availability, Reliability Availability And Defect Rate, Collecting Customer Outage Data For Quality Improvement, In Process Metrics For Outage And Availability
Conducting Software Project Assessment : Audit Ad Assessment , Software Process Maturity Assessment And Software Project Assessment , Software Process Assessment A Proponed Software Project Assessment Method.
10 hours
UNIT-V
Dos And Don'ts Of Software Process Improvement : Measuring Process Maturity, Measuring Process Capability, Staged Versus Continuous Debating Religion, Measuring Levels Is Not Enough, Establishing The Alignment Principle , Take Time Getting Faster, Keep it Simple Or Face Decomplexification, Measuring The Value Of Process Improvement , Measuring Process Compliance , Celebrate The Journey Not Just The Destination. **Using Function Point Metrics to Measure Software Process Improvement: Software** Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels.**10 hours**

Text Book

1.Stephen H Khan: Metrics and Models in Software Quality Engineering, Pearson 2nd edition 2013.

REFERENCES:
1.Norman E-Fentor and Share Lawrence Pflieger." So ftware Metrics". International Thomson Computer Pre ss, 1997.
2.S.A.Kelkar,"Software quality and Testing, PHI Le aring, Pvt, Ltd., New Delhi 2012. 3.Watts S Humphrey,

“Managing the Software Process ”, Pearson Education Inc, 2008. 4.Mary Beth Chrissis, Mike Konrad and Sandy Shrum, “CMMI”, Pearson Education(Singapore) Pte Ltd, 2003
5.Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
M. Tech I/II CST SEMESTER

Subject code: MTCST127 Knowledge Engineering lab Practical Time: 3 Hours Credits: 2

Internal: 50 Marks External: 50 Marks Total: 100 Marks

Introduction:

The rapid growth of the Web has generated a wealth of information for individuals and organizations, to the extreme of overloading its users with information. This phenomenon has created the pressing need for turning this information into actionable knowledge according to the requirements of each individual. This need represents the major motivation behind the R&D activities of Knowledge Engineering Laboratory (KEL). KEL researchers can combine their efforts to develop knowledge technologies that will enable the efficient, cost-effective and user-adaptive management and presentation of information.The objectives are as follows

Course Objective:

1. Practical exposure on implementation of well known data mining tasks.
2. Exposure to real life data sets for analysis and prediction.
3. Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.
4. Handling a small data mining project for a given practical domain.
5. To introduce students to the basic concepts and techniques of Machine Learning. 6. To develop skills of using recent machine learning software for solving practical problems. 7. To gain experience of doing independent study and research

Learning Outcomes:

1. The data mining process and important issues around data cleaning, pre-processing and integration.
2. The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.
3. basic knowledge about the key algorithms and theory that form the foundation of machine learning and computational intelligence
4. a practical knowledge of machine learning algorithms and methods

List of Programs [All the programs have to implemented in JAVA or R language] 1. Develop an application to implement defining subject area, design of fact dimension table, data mart. 2. Develop an application to implement OLAP roll up, drill down, slice and dice operation

3. Develop an application to construct a multidimensional data.

4. Develop an application to implement data generalization and summarization technique. 5. Develop an application to extract association rule of data mining.

6. Develop an application for classification of data using Decision Tree

7. Develop an application for implementing clustering using any one technique

8. Develop an application for implementing Naïve Bayes classifier

9. Develop an application for implementing KNN

10. Study on various tools used in Data mining and Machine Learning. (ex : WEKA, SCIKIT LEARN)