OPEN ELECTIVE - I

INDUSTRIAL SAFETY AND HAZARD MANAGEMENT

CHE 311(A)  Credits:4
Instruction :3 Lectures & 1 Tut/Week  Sessional Marks : 40
End Exam : 3 Hours  End Exam Marks: 60
Prerequisites: Engineering chemistry

Course Objectives:
1. To know about Industrial safety programs and toxicology, Industrial laws, regulations and source models
2. To understand about fire and explosion, preventive methods, relief and its sizing methods
3. To analyse industrial hazards and its risk assessment.

Course Outcomes:
By the end of the course the students will be able to
1. Analyze the effect of release of toxic substances
2. Understand the industrial laws, regulations and source models.
3. Apply the methods of prevention of fire and explosions.
4. Understand the relief and its sizing methods.
5. Understand the methods of hazard identification and preventive measures.

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SYLLABUS

UNIT I  9 L+ 3 T
Toxicology: Effect of Toxicants on Biological Organisms, Toxicological Studies, Dose versus Response, Models for Dose and Response Curves, Relative Toxicity, Threshold Limit Values, National Fire Protection Association (NFPA) Diamond.

UNIT II  9 L+ 3 T
Source Models: Introduction to Source Models, Flow of Liquid through Holes, and Pipes, Flow of Gases or Vapors through Holes and Pipes, Flashing Liquids, Liquid Pool Evaporation or Boiling, Conservative Analysis

UNIT III 9 L+ 3 T

UNIT IV 9 L+ 3 T
Introduction to Reliefs: Relief Concepts, Definitions, Location of Reliefs, Relief Types and Characteristics, Relief Scenarios, Data for Sizing Reliefs, Relief Systems.
Relief Sizing: Conventional Spring-Operated Reliefs in Liquid and in Vapor or Gas Services, Rupture Disc Reliefs in Liquid in Vapor or Gas Services, Two-Phase Flow during Runaway Reaction Relief, Pilot-Operated and Bucking-Pin Reliefs, Deflagration Venting for Dust and Vapor Explosions, Venting for Fires External to Process Vessels, Reliefs for Thermal Expansion of Process Fluids.

UNIT V 9 L+ 3 T
Hazards Identification: Process Hazards Checklists, Hazards Surveys, Hazards and Operability Studies, Safety Reviews, Other Methods,

Text Book:

Reference Books:
OPEN ELECTIVE - I

ENGINEERING BIOLOGY

CHE 311(B) Credits: 4
Instruction: 3 Periods & 1 Tut/Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Prerequisites:
Differential Equations

Course Objectives:
1. To inculcate the fundamentals of life sciences with engineering application
2. To write mathematical models for antigen-antibody interactions
3. To predict infection by mathematical modelling

Course Outcomes:
By the end of the course, the student will be able to:
1. Know the fundamentals of microbiology and application of mathematics to the growth of microorganisms
2. Know the structure and properties of biomolecules
3. Understand the importance of immune cells and mathematical modelling of antigen-antibody interactions
4. Able to formulate the mechanism of enzyme-substrate kinetics
5. Able to write kinetic models by understanding the mechanism of the disease

CO – PO – PSO Matrix:

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UNIT I 9 L + 3 T

Introduction to Microbiology:
Phylogeny of the three dimensions of life, ultra structure of bacteria, cell wall, cell membrane, flagella, pili, capsule, endospore, and cell inclusions, differences between prokaryotic and eukaryotic cell, counting of microorganisms, sterilization, microbial growth kinetics,
UNIT II  
**Introduction to Biochemistry:**  
**Carbohydrates biological functions:** General structure, monosaccharides, disaccharides and polysaccharides  
**Proteins biological functions:** Amino acids, peptide bond, primary, secondary, tertiary and quaternary structure of proteins  
**Nucleic acids biological functions:** Nucleotides, DNA structure and its properties, RNA structure and its properties,  
**Lipids biological functions:** General structure, saturated and unsaturated fatty acids

UNIT III  
**Introduction to Immunology:**  
Antigen-Antibody interactions, T-Cells (CD4 and CD8 cells), innate and adaptive immune response, autoimmunity

UNIT IV  
**Enzyme engineering:**  
Definition of enzyme, classification of enzymes, enzyme-substrate kinetics, immobilization of enzymes, applications of enzymes in various industries and medicine

UNIT V  
**Viral Dynamics:**  
Simple growth model, exponential growth and decay, predator-prey model, mathematical modeling of HIV dynamics in a human body

**Text books:**  
3. Rob J. de Boer & Kirsten ten Tusscher, *Theoretical Biology and Bioinformatics*, Utrech University (e-material) URL link: http://theory.bio.uu.nl/rdb/books/tb.pdf (Unit 5)

**Reference book:**  
Target group: Open Elective for Lateral Entry Students of all branches

Course Objectives
- To gain knowledge on the importance of environment and ecosystems.
- To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.
- To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.
- To understand the treatment of wastewater and solid waste management.
- To be aware of the national and international concern for environment for protecting the environment.

Course Outcomes

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<th>Course Outcomes</th>
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<td>CO-1</td>
<td>Identify the characteristics of various natural resources and can implement the conservation practices.</td>
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<td>CO-2</td>
<td>Realize the importance of Ecosystem and Biodiversity for maintaining ecological balance.</td>
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<td>CO-3</td>
<td>Classify, analyze various pollutants and can develop methods for solving problems related to environment.</td>
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<td>CO-4</td>
<td>Design and evaluate strategies and methods for sustainable development of environmental systems and for the remediation or restoration of degraded environments.</td>
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<td>CO-5</td>
<td>Get awareness on various environmental laws and regulations applicable to global issues and play a role in solving social problems.</td>
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UNIT I
INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES 10 Periods
Introduction: Definition, Multidisciplinary nature, Scope and Importance of Environmental Sciences- R & D in environment, green advocacy, green marketing, green media and environment consultancy. Need for public awareness.

Natural Resources: Forest resources-use and overexploitation, deforestation, Big Dams effects on forests and tribal people. Water resources-sources, use and over utilization of surface and ground water, conflicts over water, dams-benefits and problems. Food resources-environmental impact of modern agriculture-fertilizer and pesticides. Land resources-land degradation- landslides, soil erosion and desertification. Energy resources- renewable and non-renewable energy resources and use of alternate-energy sources.
UNIT- II
ECOSYSTEM & BIO DIVERSITY 10 Periods
Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession. Types, characteristic features, structure and function of forest, grass land, desert and aquatic ecosystems.
Biodiversity-definition, types, India as a Mega diversity Nation, Values of biodiversity. Hot spots of biodiversity, Threats to biodiversity-habitat loss, poaching, human-wildlife conflicts, Endangered and endemic species, Conservation of biodiversity.

UNIT -III
ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT 10 Periods
Sources, effects and control measures of Air pollution, Noise Pollution, Soil Pollution, Marine pollution, Thermal pollution, Radio Active Pollution. Water Pollution (Sources, Effects, Control measures, DO, BOD, COD, sewage treatment), Green house effect, Ozone depletion, Acid rain –causes and adverse effects.

UNIT- IV
SOCIAL ISSUES AND ENVIRONMENT 8 Periods

UNIT- V
LEGISLATIONS, CONVENTIONS & CASE STUDIES 10 Periods
Case Studies: Chipko Moment, Kolleru Lake, Fluorosis, Silent valley project, Narmada Bacho Andolan, Ralegeon siddhi, Tehri dam, Madhura refinery and Tajmahal

Prescribed Book
Principles of Environmental Studies by Anubha Kaushik & C.P.Kaushik, New Age International Publications.

Reference Books
2. G. S. Sodhi, Fundamental concepts of environmental chemistry, Narosa publishing house, New Delhi
CHARACTERIZATION OF MATERIALS

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**Target group:** Chemical Engineering, Mechanical Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering.

**Prerequisites:** Basics of chemistry and physics.

**Course Objectives**

- To provide basic knowledge on synthesis and fabrication of materials.
- To understand the surface characteristics of materials.
- To create awareness on morphology of materials by electron microscopy.
- To understand the principles of X-ray diffraction.
- To acquire knowledge on thermal studies of materials.

**Course outcomes**

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

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<td>Select an appropriate method of synthesis based on the basic knowledge about synthesis of material.</td>
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<td>Apply the suitable adsorption isotherms to determine the surface area, pore size and pore volume of materials.</td>
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<td>Analyze the surface morphology of the samples from SEM and TEM images.</td>
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<td>Interpret the XRD patterns for phase identification, lattice parameter and crystallite size determination.</td>
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<td>Understand the principle of thermo gravimetric analysis, Differential scanning calorimetry and its applications.</td>
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**SYLLABUS**

**Unit-I Introduction to material synthesis and fabrication**

Synthesis of bulk phase materials-Solid state reaction route, introduction to precipitation & co-precipitation, sol-gel technique, hydrothermal; Semi Conducting materials – Stoichiometric GaAs, Non-Stoichiometric- ZnO and Hopping Semi Conductors-CdSe; Conducting polymers-polyacetylene.

Synthesis of nanoparticles-Bottom-Up approach- thin film growth by physical vapour deposition and chemical vapour deposition; Top-down approach- ball milling, Microfabrication- lithography- UV, electron beam and ion beam lithography; Energy applications of Nano metal oxides-cells

**Unit-II Surface characterization**


Surface area determination from BET equation, Adsorption on porous solids; Pore size distribution- adsorption and mercury porosimetry.
Unit-III Electron microscopy

Introduction to Electron Microscopy - electron beam specimen interaction; Scanning Electron Microscopy (SEM) – instrumentation, specimen preparation, image interpretation and applications.

Transmission Electron Microscopy (TEM) – instrumentation, specimen preparation, image modes- intensity contrast, diffraction contrast, phase contrast and applications; Scanning Transmission Electron Microscopy (STEM) - image interpretation and applications.

Unit-IV X-ray diffraction

X-rays generation; crystal lattice, diffraction-Brags equation; X-ray diffractometer – instrumentation; Small and Wide angle X-ray diffraction.

Applications of Powder X-Ray Diffraction (PXRD)-identification of phases, crystallite size determination, intercalation in compounds; Quantitative X-ray diffraction-quantification of clay minerals.

Unit-V Thermal analysis

Introduction to thermal methods of analysis, Thermogravimetry- instrumentation, factors influencing TG, applications of TG.

Differential thermal analysis (DTA), block diagram of DTA apparatus, applications of DTA; Differential scanning Calorimetry- instrumentation and applications.

Prescribed Books

4. Engineering Chemistry by P.C.Jain and M.Jain, Dhanpat Rai publishing company (P) LTD. (for Unit V)

Reference Books

OPEN ELECTIVES
(For Students Other than Civil Engineering)

BASIC CIVIL ENGINEERING

CIV 311(A)  
Credits : 3
Instruction : 3 Lectures & 1 Tutorial / week  
Sessional Marks : 40
End Exam : 3 Hours  
End Exam Marks : 60

Prerequisite:
Nil

Course objectives:
The objective of this course is to
1. Know the various materials and components in building construction
2. Have knowledge on survey and highways engineering, irrigation and water supply engineering and soil mechanics.

Course outcomes:
At the end of this course the student will be able to
1. Student will able to identify various materials, components in building construction.
2. Student will be familiar in various disciplines in civil engineering.

Mapping of course outcomes with program outcomes:

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SYLLABUS

UNIT – I  
12 Periods
Construction materials
Stones -Characteristics of good building stones-common building stones and their uses-
Bricks-Characteristics of good bricks-classification of bricks and their uses-
Timber-Classification of Timber and their uses-
Cement-Types of cement and their uses-

UNIT – II  
12 Periods
Components of building
Components of sub structure and their functions-Components of super structure and their functions-
Types of forces – compression, tension, shear – Stress – Strain-
Concrete-
Ingredients of concrete and its importance in construction - Steel - Types of steel and its importance in construction

UNIT – III
12 Periods

Survey and Highway Engineering
Definition and classification of surveying – linear and angular measurements - levelling
Modes of transportation – Classification of highways - Classification of pavements - Super elevation.

UNIT – IV
12 Periods

Irrigation and Water supply
Definition and classification of irrigation – Irrigation structures – dams, weirs, cross drainage works, canal drops - Quality of water - Treatment methods

UNIT – V
12 Periods

Geotechnical Engineering
Origin of soil – types of soil – bearing capacity of soil – Types of foundation – shallow and deep

REFERENCES


Note: As the subject is an Open elective taken by non-civil engineering students, the student is expected to gain only elementary knowledge of the subject.
BUILDING PLANNING AND CONSTRUCTION

CIV 311(B)  Credits : 3
Instruction : 3 Lectures & 1 Tutorial / week  Sessional Marks : 40
End Exam : 3 Hours  End Exam Marks : 60

Prerequisite:
Nil

Course Objective:
1. Learn about building byelaws laid by planning authorities.
2. Learn about the principles and methods to be followed in constructing various components of a building.
3. Understand about masonry types in brick and stone construction

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
2. Learn about masonry types in brick and stone construction
3. Understand about various building components.
4. Know about damp prevention and fire protection methods.
5. Understand about various types of roofs.

Mapping of course outcomes with program outcomes:

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UNIT – I  12 Periods
Residential Buildings: Different types of Residential Buildings Selection of Site for Residential Building, Components of building, bye-laws and regulations, Orientation of Buildings

UNIT – II  12 Periods
Masonry: Definitions of terms used in masonry, Materials used, Stone masonry, Brick masonry, Different bonds used for brick masonry, Composite masonry.

UNIT – III  12 Periods
Floors and Roofs: Components of a floor, materials used for floor construction, Different types of flooring, Ground floor and upper floors, Types of roofs, Basic roofing elements and Roof coverings.

UNIT – IV 12 Periods

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

UNIT – V 12 Periods

Water proofing: Causes and effect of dampness on buildings, Materials and methods used for water proofing.

Fire hazards, Fire resisting properties of common building materials.

REFERENCES


Note: As the subject is an Open elective taken by non-civil engineering students, the student is expected to gain only elementary knowledge of the subject.
BASICS OF FOUNDATION ENGINEERING

CIV 311(C)  
Credits : 3
Instruction : 3 Lectures & 1 Tutorial / week  
End Exam : 3 Hours  
Sessional Marks : 40  
End Exam Marks : 60

Prerequisites:
Nil

Course Objective:
The course content enables students to
1. Learn Soil and its formation.
2. Learn the various methods of Sub-soil exploration.
3. Impart knowledge on types of shallow foundations, theories required for the
determination of their bearing capacity and imbibe the concepts of pile foundations.

Course Outcomes:
At the end of the course the student will be able to:
1. Explain Soil and its formation.
2. Identify the method of Soil Exploration.
3. Classify the types of shallow foundations and theories required for the
determination of their bearing capacity.
4. Explain the necessity of pile Foundation.

Mapping of course outcomes with program outcomes:

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SYLLABUS

UNIT – I  
8 Periods

Introduction: Definition of soil - Definition of soil Engineering and Geotechnical Engineering
- Origin of Soils-Formation of Soils-Transportation of Soils-Major soil deposits of India.

UNIT – II  
8 Periods

Subsoil Investigation for Foundations: Borings for Exploration-Auger boring, Wash Boring,
Rotary Drilling, Percussion Drilling-Split Spoon Samplers-Standard Penetration Test- Cone
Penetration Test- In-situ Vane Shear Test.

UNIT – III  
8 Periods

UNIT – IV


UNIT – V


REFERENCES


Note: As the subject is an Open elective taken by non-civil engineering students, the student is expected to gain only elementary knowledge of the subject.
**FILE SYSTEMS & DATABASES**

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**Prerequisites:**
1. Basic knowledge of Computer Fundamentals.
2. Contexts in which databases are used

**Course Objectives:**
1. Analyze the theory behind various database models and query languages
2. Apply querying languages, primarily SQL, and other database supporting software
3. Analyze Transaction management and Concurrency Control
4. Design and implement database projects

**Course Outcomes:**
1. CO-1: able to differentiate the architecture of file systems and Databases and interpret them.
2. CO-2: able to design E-R Diagrams and Relational Model.
3. CO-3: able to analyze and practice Query Processing
4. CO-4: able to analyze and apply Normalization techniques.
5. CO-5: able to observe Transaction Processing, Concurrency Control.

**CO-PO MAPPING:**

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**Course Content:**

**UNIT-I**

**Overview of File Structures:**

**File System:**
File Concept, Access methods, Protection.

**Storing Data Disks and Files:**
The Memory Hierarchy - Magnetic Disks - performance implications of disk architecture - Redundant arrays of independent disks - data sharing - redundancy - levels of redundancy - disk space management - buffer management - files of records - page formats - record formats.
UNIT-II 10-12 hours

Overview of Database Management:
File Systems vs DBMS, Introduction & Advantages of DBMS - What is database system - What is database - Why is database - Data Dependency

Database System Architecture:

UNIT –III 10-14 hours

Introduction to Database Design
Database design and ER Diagram – Entities, Attribute, and Entity Set – Relationships and Relationship Set – Additional Features of ER Model

An Introduction to Relational Model:
Introduction – An Informal Look at the Relational Model – The Catalog – Base Tables and Views – Transaction

Relations:
Introduction – Tuples – Relation Types – Relational Values - Relation Variables

UNIT-IV 10-14 hours

SQL: Overview –
UNION, INTERSECTION and EXCEPT – Nested Queries – Aggregation Operators – Null Values – Triggers and Active Databases – PL-SQL – Embedded SQL

UNIT-V 8-10 hours

Schema refinement and normal forms:
Schema refinement, functional dependencies, reasoning normal forms, normalization up to 3rd & BC normal forms, lossless join & dependency preserving decomposition

Transaction management:
Transaction concept, transactions and schedules, concurrent execution of transactions, lock-based concurrency control

TEXT BOOKS:
2. C.J. Date "An Introduction to Database Systems", Eighth Edition – (Only for Unit – II)
OPEN ELECTIVE – I (for Non-CSE Students)

COMPUTER OPERATING SYSTEMS

CSE 311 (B)  Credits : 3
Instruction : 3 Periods & 1 Tut/Week  Sessional Marks : 40
End Exam : 3 Hours  End Exam Marks : 60

Prerequisites:
To undertake this course student must have good foundation of Computer Basics.
Student must be familiar with concepts of microprocessor and computer organization.
Prior programming experience with C (or any other programming language) is recommended.

Course Objectives:
- Students should able to understand the importance and need of operating systems.
- Students should learn the inter process communication, resource allocation and deadlock management.
- To understand the concept of memory management.
- To make the students aware of the File systems and input/output management.
- Student must know the different operating systems available and how do they function.

Course Outcomes:
By the end of the course, the student will be able to:
1. Be familiar with basics like need, functions, Challenges of Operating System and
2. Analyze the theory and logic behind inter process communication, Synchronization and deadlock handling.
3. Describe and differentiate various memory management techniques.
4. Recognize and use file system interface, protection and security mechanism disk management and disk scheduling algorithms for better utilization of memory.
5. Compare various features like scheduling, memory management etc of different Operating systems.

Mapping of Course Outcomes with Program Outcomes:

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SYLLABUS

UNIT-I: 15 periods

Introduction to OS:

Process Management:
Introduction to Processes, process control block, process state diagram. Scheduling algorithm, Threads and multithreading.
UNIT-II:  15 periods
Process coordination:
Deadlocks:
Resources, Deadlocks, the Optical Algorithm, Deadlock Detection and Recovery, Deadlock Avoidance, Deadlock Prevention.

UNIT-III  15 periods
Memory Management:
Memory Management without Swapping or Paging, Swapping, Memory allocation and free space memory management algorithms.
Virtual Memory Management:

UNIT-IV:  15 periods
File Systems and Input/output:
Files, Directories, Security, Protection mechanism, Principles of I/O Software & Hardware, Disk Structure, Disk Scheduling algorithm.

UNIT-V:  15 periods

Text Books:

Reference Books :

Web Resources:
1.http://nptel.ac.in/courses/106108101/
2.https://onlinecourses.nptel.ac.in/noc16_cs10/preview
3.https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems
OPEN ELECTIVE – I (for Non-CSE Students)

FUNDAMENTALS OF COMPUTER NETWORKS

CSE 311 (C)  

Credits : 3

Instruction : 3 Periods & 1 Tut/Week

End Exam : 3 Hours

Sessional Marks : 40

End Exam Marks : 60

Prerequisites:
Basic knowledge of data structure and operating system.

Course Objectives:
- To understand the fundamental concepts of computer network and data communication.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

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

1. Analyzing the basics fundamental of Data Communications and Computer Networks protocols.

2. Enumerate the layers of the OSI model and TCP/IP

3. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.

4. Should have the ability to administrate a network and analyze the flow of information in computer network.

5. Identify the different types of network devices and their functions within a network.

Mapping of Course Outcomes with Program Outcomes:

<table>
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<th>Mapping</th>
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</table>

SYLLABUS

UNIT-I:  

Understanding of network and Internet:  
Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

Physical Layer: 
Guided transmission media, wireless transmission media.

Data Link Layer 
Design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol.
UNIT-II:  
**Multi Access Protocols:**  
ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT-III:  
**Network Layer:**  
Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms.

UNIT-IV:  
**Internetworking:**  
Tunneling, Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.  
**Transport Layer:**  
Introduction and transport layer services, Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP).

UNIT-V:  
**Application Layer:**  
Principles of computer applications, Introduction, providing services, Applications layer paradigms, Client server model, standard client-server application, FTP, electronic mail, TELNET, DNS, Web and HTTP.

**Text Books:**  
1. Behrouz A. Forouzan, “Data Communications and Networking”  

**Reference Books :**  

**Web Resources:**  
http://nptel.ac.in/courses/106105082/
OPEN ELECTIVE – I (for Non-CSE Students)

CONCEPTS OF OBJECT ORIENTED PROGRAMMING

<table>
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<tr>
<th>CSE 311 (D)</th>
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<td>Instruction : 3 Periods &amp; 1 Tut/Week</td>
<td>Sessional Marks : 40</td>
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<td>End Exam : 3 Hours</td>
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Prerequisites:
Basic Knowledge of Programming Fundamentals
Knowledge of Programming Languages (such as C, C++)

Course Objectives:
- Understand Object Oriented Programming Concepts
- Learn Basics of Java Programming Language
- Apply Object Oriented Programming Concepts in Problem Solving Using Java

Course Outcomes:
By the end of the course, the student will be able to:
1. Identify the Classes for Real Time Applications
2. Establish the Connectivity Among The Classes Using Inheritances and Interfaces
3. Modularize the Application Using Packages
4. Add the Test Cases By Including The Runtime Errors Using Exceptions Handling Mechanism.
5. Develop the GUI Using Applet and AWT Frameworks

Mapping of Course Outcomes with Program Outcomes:

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SYLLABUS

UNIT-I: 12 periods
OOP Concepts:
Data Abstraction, Encapsulation, Inheritance, Benefits of Inheritance, Polymorphism, Classes and Objects, Procedural and Object Oriented Programming Paradigms

Java Programming:
History of Java, Java Buzzwords, Data Types, Variables, Operators, Control Structures, Arrays, Simple Programs in Java

Introduction To Classes And Methods: 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.

UNIT-II: 12 periods
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 Class Path, Importing Packages

**UNIT-III:** 10 periods

**Input / Output:**
I/O Basics, Streams, Byte Streams and Character Streams, the Predefined Streams, Reading Console Input, Reading Characters, Reading Strings, Writing Console Output, the PrintWriter Class, Reading and Writing Files, Automatically Closing a File

**String Handling:**
String Class, String Constructors, String Operations, String Conversion and toString(), StringBuffer.

**UNIT-IV:** 12 periods

**Exception Handling:**
Fundamentals, Exception Types, Use of Try and Catch, Throw, Throws, Finally, Multiple Catches, Built-In Exceptions, User Defined Exceptions

**Multithread Programming:**
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

**UNIT-V:** 12 periods

**Applets:**
Basics, Applet Class, Applet Architecture, Applet Skeleton, the HTML Applet Tag, a Simple Banner Applet, Difference between Application Program and Applet Program

**Event Handling:**
The Delegation Event Model, Event Classes, Event Listener Interfaces, Handling Mouse and Keyboard Events

**Using AWT Controls:**
AWT Classes, Labels, Buttons, Check Boxes, Choice, Lists, Scroll Bars, Text Field, Text Area, Layout managers.

**Text Books:**

**Reference Books :**
1. P.J. Deitel and H.M. Deitel, "Java for Programmers”, Pearson Education

**Web Resources:**
INTRODUCTION TO EMBEDDED SYSTEMS

ECE 311(A)                      Credits: 3
Instruction: 3 Periods & 1 Tut/week Sessional Marks: 40
End Exam: 3 Hours               End Exam Marks: 60

Prerequisites: Nil

Course Objectives:
➢ To introduce the student to the basics of embedded systems
➢ To learn about the components of embedded systems
➢ To familiarize the student with embedded systems by providing examples from various fields

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

1. learn about the general principles of computer architecture
2. learn about the working of a simple embedded system and embedded system applications
3. learn the hardware aspects of embedded systems
4. understand the sensors, ADCs and actuators used in embedded systems
5. understand the real world examples of embedded systems

Mapping of Course Outcomes with Program Outcomes:

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SYLLABUS

UNIT I:                            8 Periods
Basics of computer architecture and the binary number system
Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity

UNIT II:                           8 Periods
Introduction to embedded systems
Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple embedded system, figure of merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems, current trends
UNIT III: 10 Periods
Embedded systems-The hardware point of view
Microcontroller unit (MCU), a popular 8-bit MCU, memory for embedded systems, low power design, pull up and pull down resistors

UNIT IV: 12 Periods
Sensors, ADCs and Actuators
Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Opto couplers/Opto isolators, relays.

UNIT V: 12 Periods
Examples of embedded systems
Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks (WISENET), robotics, biomedical applications, brain machine interface

Text Books:

Reference Books:
ELECTROMAGNETIC INTERFERENCE AND COMPATABILITY

ECE 311(B)  Credits : 3
Instruction : 3 periods & 1 Tutorial/Week
End Exam : 3 Hours

Prerequisites: Nil

Course Objectives:
➢ To introduce the concepts of electromagnetic interference and electromagnetic compatibility
➢ It presents different kinds of electromagnetic interference coupling principles.
➢ To study the electromagnetic interference control techniques
➢ To discuss electromagnetic interference measurements and standards

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

1. Gain enough knowledge to understand the concept of EMI / EMC related to product design & development.
2. Analyze the different EM coupling principles and its impact on performance of electronic system.
3. Know how to bring down the electromagnetic interference highlighting the concepts of both susceptibility and immunity
4. Acquire broad knowledge of various EM radiation measurement techniques
5. Gain enough knowledge to understand the present leading edge industry standards in different countries

Mapping of Course Outcomes with Program Outcomes:

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SYLLABUS

Unit I: EMI / EMC Concepts  12periods
EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.

Unit II: EMI Coupling Principles  12periods
Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling, cross talk ; Field to cable coupling ; Power mains and Power supply coupling.

Unit III: EMI Control Techniques  12periods
Shielding- Shielding Material-Shielding integrity at discontinuities, Filtering- Characteristics of Filters-Impedance and Lumped element filters-Telephone line filter, Power line filter design, Filter installation and Evaluation, Grounding- Measurement of Ground resistance-system
grounding for EMI/EMC-Cable shielded grounding, Bonding, Isolation transformer, Transient suppressors, Cable routing, Signal control. EMI gaskets

**Unit IV: EMI /EMC Measurements**

*12periods*

Open area test site; TEM cell; Anechoic chamber; Tx /Rx Antennas, Sensors, Injectors /Couplers, and coupling factors; EMI Rx and spectrum analyzer.

**Unit V: EMI /EMC and Standards**

*12periods*


**REFERENCES:**

OPEN ELECTIVE-I
RENEWABLE ENERGY TECHNOLOGIES

EEE 311 Credits : 3
Instruction : 4 Periods & 1 Tut/Week Sessional Marks : 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

- Analysis to Non-Conventional Energy Sources.
- Analysis working of Solar Energy, Wind Energy and Energy from Oceans etc.
- Animated working videos of Solar, Wave Energy, Geo-Thermal, Wind Energy Power Plants etc. are shown to Students in the class.

Course Outcomes:

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<tr>
<th>At the end of the course student should be able to:</th>
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<tr>
<td>1.</td>
<td>acquire knowledge on the Non-Conventional Energy Sources related to electrical and electronics engineering.</td>
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<tr>
<td>2.</td>
<td>acquire knowledge about the fundamental principles of Solar Energy, Wind Energy, Energy from Oceans etc.</td>
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<tr>
<td>3.</td>
<td>acquire knowledge on the Non-Conventional Energy Sources.</td>
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<tr>
<td>5.</td>
<td>apply the acquired knowledge in Non-Conventional Energy Sources for the benefit of the society</td>
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</table>

SYLLABUS

UNIT I: [15 Periods]

UNIT II: [10 Periods]
Wind energy: Wind energy, Characteristics, Aerodynamics, Power extraction, Types of wind machines, Performance of Wind Machines, Wind Mills, Applications, Economics of wind power.

UNIT III: [10 Periods]

UNIT IV: [10 Periods]

**UNIT V:**  
**[15 Periods]**  

**Textbooks:**


**References:**

2. Fuel Cell Systems, James Larminie, Andrew Dicks, John Wiley & Sons Ltd.
COURSE OBJECTIVE:

The objectives of the course are:

- Understand intellectual property rights and law of copy rights.
- Procedure to apply various patents for innovative ideas and products.
- Aware various trade laws in the field of business.

COURSE OUTCOMES:

At the end of the course students are able to:

- **CO1**: Understand the importance of Intellectual property rights and its usage.
- **CO2**: Know various International laws in trade policies.
- **CO3**: Identify the international trade secrets trade secrets litigation
- **CO4**: Analyze international trade and copy right laws

SYLLABUS

UNIT I: (7 Periods)

**Introduction to Intellectual Property**: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT II: (10 Periods)

**Trade Marks**: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT III: (15 Periods)

**Law of copy rights**: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**Law of patents**: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT IV: (10 Periods)

**Trade Secrets**: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, protection for submission, trade secretes litigation.

**Unfair Competition**: Misappropriation right of publicity, False advertising
UNIT V: \hspace{1cm} (18 Periods)

**New development of intellectual property:** New developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international-trade mark law, copy right law, international patent law and international development in trade secrets law.

**TEXT BOOKS:**

1. Intellectual property right, Deborah, E. Bouchoux, Cengage learning
COURSE OBJECTIVE:
Following this course students will be able to:

- Assess how the choice of data structures impacts the performance of programs.
- 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, binary search trees, and graphs and writing programs for these solutions.

COURSE OUTCOMES:

CO1 Analyze, evaluate and choose appropriate abstract data types and algorithms to solve particular problems
CO2 Compare and contrast the benefits of dynamic and static data structures implementations
CO3 Design and implement abstract data types such as linked list, stack, queue and tree by Using C programming language using static or dynamic implementations
CO4 Describe applications for arrays, records, linked structures, stacks, queues, trees and graphs.

SYLLABUS

Unit-1: Introduction (12 Periods)
Introduction to data structures, arrays and structures. Dynamic Memory Management, Abstract Data Type (ADT).
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.

Unit-2: Stacks and Queues (12 Periods)
Unit - 3: Sorting and Searching (12 Periods)
Sorting: General background, selection sort, bubble sort, insertion sort, merge sort.
Searching: General background, linear search, binary search.
Introduction to Hashing, Hash Function, Hashing techniques, Collision Resolution Methods: Open Addressing, Chaining.

Unit-4: Trees (12 Periods)

Unit-5: Graphs (16 periods)

TEXT BOOK:
1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structure, computer science Press.

REFERENCE BOOKS:
Course Objectives:

- To understand software process models such as waterfall and evolutionary models.
- To understand software requirements and SRS document.
- To understanding of different software architectural styles.
- To understanding of software testing approaches such as unit testing and integration testing.
- To understanding on quality control and how to ensure good quality software.

Course Outcomes:

At the end of the course the student will be able

1. To understand basics of software engineering
2. Apply suitable process model for a software project
3. Gather requirements to Analyze and design a software project
4. Understand testing concepts

UNIT - I: (10 Periods)

UNIT - II: (10 Periods)
Software life cycle models: Use of Life cycle model, classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models

UNIT – III: (10 Periods)
Requirements analysis and specifications: Requirement gathering and analysis, Software requirements Specification, Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL

UNIT - IV: (10 Periods)
Software Design: Outcome of design process, Characteristics of a good software design, Cohesion and coupling, Layered arrangement of module, Approaches to software design, Object oriented versus function oriented design approaches

UNIT - V: (8 Periods)

Coding and testing: Coding, Code review, Software documentation, Testing, Testing in the large versus testing in the small Unit testing, Black box testing, White box testing, Debugging, Program analysis tools, Integration testing Testing Object oriented Programming, System testing, General issues associate with testing

TEXT BOOKS:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, third edition

REFERENCE BOOKS:

2. Introduction to Software Engineering, R. J. Leach, CRC Press.
Course Objective: Purpose to develop a thorough understanding of the methods of probability and statistics which are used to model engineering problems.

Course Outcomes:

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

1. Demonstrate the understanding of basic probability axioms and rules and Baye’s theorem.
2. Explain various concepts of discrete and continuous random variables and calculate moments about origin and mean, conditional expected values.
3. Examine, analyze, and compare Probability distributions.
4. Discuss basic ideas of linear regression and correlation, create and interpret a line of best fit, calculate and interpret the correlation coefficient.
5. Prepare null and alternative hypothesis and test its validity based on random samples.

UNIT-I: PROBABILITY [12 Periods]

Probability: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Baye’s theorem and independence.

UNIT II: RANDOM VARIABLES [12 Periods]

Random variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, Chebyshev’s inequality.

UNIT III: PROBABILITY DISTRIBUTIONS [10 Periods]

Binomial Distribution, Mean, Variance and Standard Deviations of Binomial Distribution, Poisson distribution, Mean, Variance and Standard Deviations of Poisson Distribution, Normal Distribution and their properties, Gamma Distribution (All without Proofs).

UNIT IV: CORRELATION & REGRESSION [12 Periods]

Correlation, Linear Correlation, Correlation Coefficient, Properties of correlation coefficients, Rank correlation coefficients. Regression, Equation of the Regression line of Y on X, Equation of Regression line of X on Y, Standard error of estimate of Y

UNIT V: SAMPLING THEORY [14 Periods]

Formulation of Null Hypothesis, Critical Region, Level of Significance. Large samples Test of Significance of Large Samples – Single Proportion, Difference between two Proportions, Single mean and Difference of means. Small Samples Students t-distribution (Significance test of a sample mean, Significance test of difference between sample means), F-distribution, χ²-test, Goodness of fit.

TEXT BOOK:


REFERENCE BOOKS:
Course Objective: This course provides an advanced introduction to various numerical methods for

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

| CO - 1 | Apply the numerical methods to find a root of algebraic and transcendental equations |
| CO - 2 | Solve linear equations using Jacobi method and Gauss-Seidal method |
| CO - 3 | Explain the concepts of Numerical Differentiation and Integration. |
| CO - 4 | Be familiar with numerical solution of ordinary differential equations |
| CO - 5 | Be familiar with numerical solution of partial differential equations |

UNIT – I: NUMERICAL SOLUTIONS TO ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction, Solutions of Algebraic and Transcendental equations, Bi-Section method, Method of False-Position, Newton-Raphson method, Useful deduction from the Newton Raphson formula

UNIT – II: ITERATIVE METHODS OF SOLUTION OF SYSTEM OF EQUATIONS

Solution of Linear simultaneous equations: Jacobi’s iteration method, Gauss-Seidel iteration method, Relaxation method.

UNIT – III: NUMERICAL DIFFERENTIATION AND INTEGRATION


UNIT – IV: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS


UNIT – V: NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Introduction, Classification of Second order equations, Finite Difference approximation to derivatives, Solutions of Laplace equation, Poisson’s equations, Heat equation and Wave equation.
Text Books:


Reference books:


**Reference books:**
OPEN ELECTIVE-I (A)
ROBOTICS

MEC 311  
Credits: 3

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

End Exam: 3hrs  
End Exam Marks: 60

Prerequisites:

Engineering mathematics, Engineering mechanics.

Course objective:

To familiarize the students with the automation and brief history of robot development, impart knowledge on kinematics of robots, robot end effectors and their design, various sensors and their applications in robots and further acquaint them with robot programming methods & languages of robot.

Course outcomes:

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

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<th>CO</th>
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<td>Understand the definition of a robot &amp; its historical development and various components of it.</td>
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<td>CO-2</td>
<td>Apply the concepts of kinematic and dynamic analysis for the design of robot manipulators.</td>
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<td>CO-3</td>
<td>Determine the trajectory planning of robotic system.</td>
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<td>CO-4</td>
<td>Describe different mechanical configurations of robot manipulators.</td>
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<td>CO-5</td>
<td>Apply the principles of various Sensors and their applications in robots and understand the programming methods &amp; various languages of robots.</td>
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Mapping of course outcomes with program outcomes:

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SYLLABUS

UNIT-I (8+0)
Introduction
Background - historical development - robot arm kinematics and dynamics - manipulator trajectory planning and motion control - robot sensing - robot programming language - machine intelligence.

UNIT-II (12+4)

UNIT-III (8+2)
Planning of Manipulator Trajectories
Introduction - general considerations on trajectory planning - joint interpolated trajectories - planning of manipulator Cartesian path trajectories.

UNIT-IV (10+2)
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.

UNIT-V (10+4)
Sensing: Introduction - range sensing - proximity sensing - touch sensors - force and torque sensing.
Low-Level Vision: Introduction – image acquisition - illumination techniques - imaging geometry - some basic relationship between pixels - preprocessing.
Robot Programming Languages: Introduction - AL, AML, RAIL, RPL, VAL, Demonstration of points in space: Continuous path (CP), Via points (VP), Programmed points (PP).

Text Books:
Reference Books:


Web resources:

1. http://nptel.ac.in/courses/112101098
2. nptel.ac.in/courses/112101099/
3. www.nptelvideos.in/2012/12/robotics.html
4. https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/
OPEN ELECTIVE-I (B) 
COMPUTER AIDED DESIGN

MEC 311
Credits : 3
Instruction : 3 Periods & 1 Tut/Week
Sessional Marks : 40
End Exam : 3 Hours
End Exam Marks : 60

Course objectives

To enable students in using computers for design, analysis and optimization of machine elements and synthesis. Further educate them on different modeling techniques and writing algorithms for various design problems using CAD.

Course outcomes

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

1. Understanding the usage of computer peripherals and 2D entities in drawing Machine Elements.
2. Evaluate the difference between wireframe model, surface model and solid model.
3. Analyze the behavior of a CAD system using FEM.
4. Design the algorithms and implement them in solving mechanical design problems.
5. Apply the technique of Artificial Intelligence to design problems using CAD.

Mapping of course outcomes with program outcomes:

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SYLLABUS

Unit-I
Fundamentals of CAD

Periods (L+T) (12+0)
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.

Unit-II

Computer Graphics


Unit-III

CAD approach to Finite Element Analysis

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.

Unit-IV

CAD approach to design problems and exposure to CAD packages

Introduction to simple machine elements - Analysis of cross sectional area, centroid & moment of inertia- Kinematics of crank- slider mechanism and other simple design applications using flow charts and algorithms, Introduction to CAD packages like ANSYS, NASTRON, NISA-II.

Unit-V

Artificial Intelligence:

Introduction to Artificial Intelligence - Applications of AI in design and CAD.

Text Books:

Reference Books:
OPEN ELECTIVE – 3RD YEAR 1ST SEM

NANO TECHNOLOGY AND ENGINEERING APPLICATIONS

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<td>End Exam Marks: 60</td>
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Prerequisites:

Engineering Physics, Applied Physics

Course Objective:

1. To introduce the concept of nanotechnology and understand the importance of nanotechnology.
2. To give deep insight to fabrication and characterization techniques for nanostructures.
3. To provide an overview about the wide applications of nanotechnology in various technological fields.

Course Outcomes:

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

1. Apply the basic concepts of nanotechnology and gain basic knowledge on various synthesis and characterization techniques involved in Nanotechnology
2. Understand the general types and different classes of Nanomaterials
3. Apply the knowledge on different properties of Nanomaterials and selection of material for the specific purpose of application
4. Understand and apply the knowledge of different characterization tools and characterization of Nanomaterials
5. Apply the basic knowledge about the wide applications of nanotechnology in various technological fields.

Mapping of course outcomes with program outcomes:

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Syllabus

Unit – I: 11 Periods

Introduction and synthesis of Nanomaterials:
Introduction to nanotechnology – definition, invention, building blocks of nanotechnology, chemical bonds - Van der Waals Interactions, Dipole-Dipole interactions, Microstructure and Defects in Nanocrystalline Materials – dislocations, twins, stacking points and voids; grain boundaries.


Unit – II: 15 Periods

Different types of Nanomaterials:

Carbon Nanotubes (CNT): Introduction, classification of CNT'S, synthesis and physical properties of CNT (Electrical, Transport, Mechanical), applications.

Semiconductor Quantum dots: Introduction, synthesis of Quantum dots, physical and chemical properties, applications.

Nanocomposites: Introduction, synthesis and processing of Inorganic nanotubes and polymeric nanocomposites, applications.

Nanowires: Introduction, physical properties of nanowires – (structural, Optical, Chemical), Applications.

Unit – III: 13 Periods

Properties of Nanomaterials:


Electrical and optical properties: Electrical conduction and tunnelling conduction in nano particles, electronic conduction with nano particles (AC Conductivity & DC Conductivity).

Optical properties: Transmission, Absorption, Reflection in nano particles, optical constants (Absorption coefficient, extinction coefficient and Refractive index).

Unit – IV: 10 Periods

Characterization Tools:


Unit – V: 15 Periods

Applications of Nanotechnology:

Electrical and electronic applications: MEMS (Micro Electro Mechanical Systems), NEMS (Nano Electro Mechanical Systems), Nanosensors.
Nanotechnology for information technology and Data Storage applications.

Text books:


Reference Books:

1. Nanotechnology - An Introduction to Nanostructuring Techniques by Michael Kohfer and Wolkang Fritzsch

Web Resources: