

With effect from the A.Y 2018-19

VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)

Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

**Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad**



**SYLLABI FOR
B.E III and IV SEMESTER (CSE) UNDER CBCS FOR
WITH EFFECT FROM 2018-19
(For the students admitted in 2017-18)**



DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

+91-40-23146020, 23146021

Fax: +91-40-23146090

Website: www.vce.ac.in

VISION OF THE DEPARTMENT

To be a center for academic excellence in the field of Computer Science and Engineering education to enable graduates to be ethical and competent professionals.

MISSION OF THE DEPARTMENT

To enable students to develop logic and problem solving approach that will help build their careers in the innovative field of computing and provide creative solutions for the benefit of society.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR B.E. III-SEMESTER w.e.f. 2018-19 (2017-18 Joined Batch)

III SEMESTER											
S. No	Course Code	Course Name	Scheme of Instruction				Scheme of Examination			Credits	
			Hours / Week				Duration in Hrs	Max Marks			
			L	T	D	P		SEE	CIE		
THEORY											
1	BS310MA	Engineering Mathematics-III	3	1	0	0	3	60	40	3	
2	PC310CS	Data Structures	3	1	0	0	3	60	40	3	
3	PC320CS	Object Oriented Programming	3	1	0	0	3	60	40	3	
4	PC330CS	Discrete Structures	3	1	0	0	3	60	40	3	
5	PC340CS	Logic and Switching Theory	3	1	0	0	3	60	40	3	
6	MC300EH	Human Values and Professional Ethics-I	1	0	0	0	2	40	30	1	
7	HS310EH	FS-I: Communication Skills in English-I	2	2	0	0	3	60	40	2	
8	MC310ME	Introduction to Entrepreneurship	1	0	0	0	2	40	30	1	
9	OE3XXXX	Open Elective-I	2	0	0	0	3	60	40	2	
PRACTICALS											
1	PC311CS	Data Structures Lab	0	0	0	2	3	50	30	1	
2	PC321CS	JAVA Lab	0	0	0	2	3	50	30	1	
		Total	21	7	0	4	-	600	400	23	
		Grand Total	32				-	1000			

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
 SYLLABUS FOR B.E III SEMESTER
 ENGINEERING MATHEMATICS – III
 (Common to all Branches except IT)

Subject Code : BS310MA	Instruction : 3+1 Hrs/week	CIE – Marks : 40
SEE – Marks : 60	SEE - Duration : 3 Hours	Credits: 03

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> 1. <i>Study</i> the Fourier series, conditions for expansion of function and half range series 2. <i>Formulate</i> and solve linear and nonlinear partial differential equations and apply partial differential equations to engineering problems viz., wave, heat and Laplace's equations. 3. <i>Study</i> the methods to solve equations, apply numerical methods to interpolate, differentiate and integrate functions and to solve differential equations using numerical methods and solve systems of equations. 4. <i>Understand</i> Random variables Probability Distributions, Statistics and their applications. 5. <i>Understand</i> how to fit a curve to a given data, how correlation between variables can be measured. 	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. <i>Expand</i> any function which is continuous, discontinuous, even or odd in terms of its Fourier series. 2. <i>Find</i> the partial differential equations by eliminating arbitrary constants and functions and solve linear, nonlinear Partial differential equations and also will be able solve wave, heat and Laplace's equations in engineering problems. 3. <i>Solve</i> algebraic and transcendental equations using Bisection method Regula-Falsi, Newton-Raphson, apply numerical methods to interpolate, differentiate functions, solve systems of equations and solve differential equations using numerical methods. 4. <i>Apply</i> various probability distributions to solve practical problems, to estimate unknown parameters of populations and apply the tests of hypotheses. 5. <i>Solve</i> problems on how fitting of a curve to given data using curve fitting, and also to find co-efficient of correlation and to determine regression lines and their applications.

UNIT- I :

Fourier Series: Introduction to Fourier series – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions - Fourier Expansion of Half- range Sine and Cosine series.

UNIT –II :

Partial Differential Equations and its Applications: Formation of first and second order Partial Differential Equations - Solution of First Order Equations – Linear Equation - **Lagrange’s Equation, Non-linear first order equations - Charpit’s method**

Applications of Partial Differential Equations: Classification of second order Partial Differential Equations- Method of Separation of Variables - Solution of One Dimensional Heat Equation - One Dimensional Wave Equation –Two Dimensional Heat Equation - **Laplace’s Equation.**

UNIT-III :

Numerical Methods: Solution of Algebraic and Transcendental equations-Bisection method - Regula Falsi method- Newton-Raphson Method - Interpolation- **Newton’s Forward and Backward Interpolation Formulae - Lagrange’s Interpolation Formula - Newton’s Divided Difference Formula - Numerical Differentiation -Interpolation approach- Numerical Solutions of Ordinary Differential Equations - Taylor’s Series Method - Euler’s Method - Runge-Kutta Method of 4th order(without proofs).**

UNIT–IV:

Probability and Statistics: Random variables – Probability Distribution function for Discrete and Continuous Random variables - Expectation – Variance – Moments -Moment Generating Function- Poisson and Normal Distributions – Testing of Hypothesis - Tests of Significance - t-test - F-test - χ^2 - test for small samples.

UNIT-V:

Curve Fitting: Curve fitting by the Method of Least Squares -Fitting of Straight line –Regression - Lines of Regression – Correlation – Karl **Pearson’s Co-efficient of Correlation.**

Suggested Readings:

1. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Dr.B.S Grewal Higher Engineering Mathematics, 40th Edition, Khanna Publishers.
3. Dr.B.S Grewal Numerical Methods, Khanna Publishers.
4. Gupta & Kapoor, Fundamentals of Mathematical Statistics, Sultan chand& sons, New Delhi.
5. Kreyszig E Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons Ltd, 2006.
6. N.P.Bali& Manish Goyal A text book of Engineering Mathematics by, Laxmi Publication.
7. S.S.Sastry Numerical Analysis–PHI Learning Ltd.,

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
DATA STRUCTURES

Instruction: 3+1Hrs /week	SEE Marks :60	Course Code : PC310CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">Identify and use appropriate data structure for a given problem with effective utilization of space and time.Describe the linear and nonlinear data structuresAnalyze the complexities of different sorting techniques	<ol style="list-style-type: none">Analyze the time and space complexities of Algorithms. Design a solution to a given problem using arrays.Develop applications using stacks, queues and linked listsChoose the appropriate nonlinear data structure and perform operations on them.Choose suitable sorting techniques to maximize the performance. Select the hashing techniques to perform dictionary operations.Illustrate operations on Efficient Binary Search Trees and Multiway Search Trees

UNIT-I

Basic concepts: Algorithm Specification- Introduction, Recursive algorithms, Data Abstraction, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations. Arrays: Arrays - ADT, Polynomials, Sparse matrices, Strings-ADT, Pattern Matching.

UNIT – II

Stacks and Queues: Stacks, Stacks using dynamic arrays, Queues, Circular Queues using dynamic arrays, A Mazing Problem, Evaluation of Expressions – Evaluating Postfix Expression, Infix to Postfix.
Linked Lists: Singly Linked Lists and Chains, Linked Stacks and Queues, Polynomials, Operations for Circularly linked lists, Equivalence Classes, Sparse matrices, Doubly Linked Lists.

UNIT – III

Trees: Introduction, Binary Trees, Binary Tree Traversals, Heaps, Binary Search trees (BST) : Definition, Searching a BST, Insertion into a BST, Deletion from a BST

Graphs: The Graph ADT, Elementary graph operations, Minimum Cost Spanning Trees- Kruskal's Algorithm, Prim's Algorithm.

UNIT – IV

Sorting: Insertion Sort, Quick sort, Merge sort, Heap sort, Sorting on Several Keys, List and Table Sorts

Hashing : Introduction, Static Hashing – Hash tables, Hash functions, Overflow handling

UNIT – V

Efficient Binary Search Trees: AVL Trees, Red-Black Trees, Splay Trees
Multiway Search Trees: m-way search trees-Definition and Properties, Searching an m-way search tree, B-Trees-Definition and properties, Number of Elements in a B-Tree, Insertion into a B-Tree and Deletion from a B-Tree

Suggested Books:

1. Horowitz E, Sahni S and Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd Edition (2008), Universities Press

Reference Books:

1. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition (2002), Pearson
2. Kushwaha D. S and Misra A.K, Data structures A Programming Approach with C, Second Edition (2014), PHI.,
3. Gilberg R. F and Forouzan B. A, Data structures: A Pseudocode Approach with C, Second Edition (2007), Cengage Learning
4. Tanenbaum A. M , Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Third Edition (2009), MIT Press
6. Yedidyah Langsam , Moshe J. Augenstein ,Aaron M. Tenenbaum, Data Structures Using C and C++ , Second Edition (2009), PHI

Online Resources :

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos>
2. <http://nptel.ac.in/courses/106106127/>
3. <http://www.nptel.ac.in/courses/106102064>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
OBJECT ORIENTED PROGRAMMING

Instruction: 3+1Hrs /week	SEE Marks :60	Course Code : PC320CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">● Apply object oriented principles for developing an application using Java constructs.● Design model view and controller enabled Java application.	<ol style="list-style-type: none">1. Apply the OOP concepts to design a Java application2. Employ runtime error handling, concurrent programming practices to develop a parallel processing application3. Read and write the IO operations using console and file streams to develop an Interactive Java application.4. Design a robust java utility using the collection framework5. Develop event driven enabled GUI for a java application using Swing constructs.

UNIT – I

Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.

Java Programming Fundamentals: Introduction, Overview of Java, Data types, Variables and Arrays, Operators, Control Statements, Classes and Methods, Garbage Collection, this keyword, final, Inheritance, Method Overriding.

UNIT – II

Singleton class, Abstract class, Nested class, Interface, Package. Exception Handling, Multithreaded Programming, String Handling.

UNIT - III

Java.lang: Type Wrapper, Process, Runtime, Object class, Generics
IO: Java I/O Classes and Interfaces, Files and Directories, Byte and Character Streams, Serialization.

Regular Expressions: Pattern, Matcher, Regular expression Syntax

UNIT – IV

Collections: Overview, Collection Interfaces, Collection Classes, Iterators, List, Set, Maps, Comparator, Arrays, Legacy Classes and Interfaces, StringTokenizer, BitSet, Date, Calendar, Random, Observable, Timer.

UNIT – V

GUI and event Programming: Applet Class, Applet architecture, The Delegation Event Model, Event Classes, Source of Events, Events Listener Interfaces, Working with Graphics, Layout Managers.

Java Swing: Basics of Swing, Difference between AWT & Swing, MVC Architecture, Components and Container, Swing Components.

Suggested Books:

1. Herbert Schildt, *The Complete Reference Java*, 7th Edition, Tata McGraw Hill 2005.

Reference Books:

1. James M Slack, *Programming and Problem Solving with JAVA*, Thomson Learning 2002.
2. Timothy Budd, *An introduction to Object-Oriented Programming*, 3rd Edition, Pearson Education, 2008
3. C Thomas Wu, *An Introduction to Object Oriented Programming with Java*, Tata McGraw Hill, 2005.
4. P. Radha Krishna, *Object Oriented Programming through Java*, Universities Press, 2007.
5. Sachin Malhotra, Saurabh Choudhary, *Programming in Java*, 2nd Edition, Oxford Press, 2014.

Online Resources:

1. <https://docs.oracle.com/javase/tutorial/java>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
DISCRETE STRUCTURES

Instruction: 3+1Hrs /week	SEE Marks :60	Course Code : PC330CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">• Understand the concepts of set theory, arithmetic logic and proof techniques• Build mathematical models to solve the real world problems by using appropriate methods	<ol style="list-style-type: none">1. Construct compound statements using logical connectives and verify the validity of conclusion using inference rules2. Compare types of relations and functions and also apply principle of inclusion and exclusion to solve counting problems3. Solve types of recurrence relations to find the complexity of an algorithm4. Develop crypto system using Ring and modular arithmetic5. Develop group codes for error detection and correction

UNIT – I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.

Properties of the Integers: The well – ordering principle, Recursive definitions, The division algorithms, The Greatest Common Divisor, The Fundamental theorem of arithmetic.

UNIT – II

Functions: Cartesian Product, One-to-one, Onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.

Relations: Partial Orders, Equivalence Relations and Partitions.

Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalizations of Principle, Derangements, Rook Polynomials, Arrangements with Forbidden Positions.

UNIT – III

Generating Functions: Introductory Examples, Definition and Examples, Partitions of Integers, Exponential Generating Function, Summation Operator.

Recurrence Relations: First – Order Linear Recurrence Relation, Second – Order Linear Homogenous Recurrence Relation with Constant Coefficients, Non Homogenous Recurrence Relation.

UNIT – IV

Rings and Modular Arithmetic

The Ring structure: Definition and Examples, Ring Properties and Substructures, The Integers modulo n , Ring Homomorphism and Isomorphism, RSA cryptosystem.

Number Theory

Prime Numbers, Fermat's and Euler Theorems , Testing for Primality, The Chinese Remainder Theorem.

UNIT – V

Algebraic Structures: Algebraic System – General Properties, semi **groups, Monoids, Homomorphism, Cosets and Lagrange's** Theorem, Elements of Coding Theory, The Hamming Metric, The Parity Check generating Matrices, Group Codes: Decoding with Coset Leaders.

Suggested Books:

1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4th Edition (2003), Pearson Education.
2. William Stallings, Cryptography and Network Security , 4th Edition (2009), Pearson.
3. Kenneth H Rosen, Discrete mathematics and its applications, 5th Edition (2006), Tata McGraw-Hill Edition, New Delhi.

Reference Books:

1. J.P. Tremblay, R. Manohar, Discrete Mathematical Structure with Applications to Computer Science, 4th Edition (1987), McGraw Hill , New Delhi.
2. Joe L. Mott, A. *Kandel*, T.P. *Baker*, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition (1986), Prentice Hall.
3. Thomas Koshy, Discrete Mathematics with Applications, 1st Edition (2004), Elsevier Inc.

Online Resources:

1. <http://nptel.ac.in/courses/106106094/>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
LOGIC AND SWITCHING THEORY

Instruction: 3+1Hrs /week	SEE Marks :60	Course Code : PC340CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course objectives	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">Understand the use of logic minimization methods and to solve the Boolean logic expressions.Design combinational and sequential circuits.	<ol style="list-style-type: none">Apply Boolean logic, postulates and Karnaugh-Map to simplify the Boolean expressionsApply Tabulation procedure to minimize Boolean expressionsDesign combinational circuits like adders, encoders, multiplexersApply state reduction method to design sequential circuits like counters and registersDesign combinational circuits like Programmable Read Only Memory(PROM) using programmable logic devices

UNIT-I

Boolean Algebra: Axiomatic definition of Boolean Algebra, Postulates and Theorems, Boolean Functions, Canonical Forms and Standard Forms, Simplification of Boolean Functions Using Theorems and Karnaugh Map Method.

UNIT-II

Minimization of Switching Functions: Quine-McCluskey Tabular Method, Determination of Prime Implicants and Essential Prime Implicants. Implementation of Boolean Functions: Single-Output and Multiple-Output Combinational Circuit Design, AND-OR, OR-AND and NAND & NOR Realizations, Exclusive-OR and Equivalence functions.

UNIT-III

Design of Combinational Logic Circuits: Analysis Procedure, Design Procedure, Modular Combinational Logic Elements- Decoders, Encoders, Priority Encoders, Multiplexers and De-multiplexers.

Design of Integer Arithmetic Circuits using Combinational Logic: Integer Adders – Binary Adders, Subtractors, Ripple Carry Adder and Carry Look Ahead Adder, and Carry Save Adders.

UNIT-IV

Introduction to Sequential Circuit Elements: Latches, Various types of Flip-Flops, Excitation Tables.

Models of Sequential Circuits: Moore Machine and Mealy Machine, Analysis of Sequential Circuits-State Table and State Transition Diagrams. Design of Sequential Circuits - Counters. Moore and Mealy State Graphs for Sequence Detection, Methods for Reduction of State Tables and State Assignments.

UNIT-V

Design of Combinational Circuits using Programmable Logic Devices (PLDs): Read Only Memory (ROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL) devices.

Suggested Books:

1. Morris Mano M and Michael D Ciletti, Digital Design, 4th Edition (2008), Prentice Hall of India.

Reference Books:

1. Zvi Kohavi, Switching and Finite Automata Theory, 2nd Edition (1978), Tata McGraw Hill.
2. Charles H. Roth, Jr., Larry L. Kenny, Fundamentals of Logic Design, 7th Edition (2013), Cengage Learning.
3. Anand Kumar A, Switching Theory and Logic Design, 2nd Edition (2014), PHI Publishers.
4. CH Roth , Fundamentals of Logic Design, 4th Edition (2006), Jaico Publishers.

Online Resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-111-introductory-digital-systems-laboratory-spring-2006/>
2. <http://www.facweb.iitkgp.ernet.in/~isg/SWITCHING/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
HUMAN VALUES AND PROFESSIONAL ETHICS – I

Instruction: 01 Hrs /week	SEE Marks :40	Course Code : MC300EH
Credits : 01	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objectives	Course Outcomes
<ul style="list-style-type: none">• Get a holistic perspective of value- based education.• Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations.• Understand professionalism in harmony with self and society.• Develop ethical human conduct and professional competence.• Enrich their interactions with the world around, both professional and personal.	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Gain a world view of the self, the society and the profession and obtain a holistic vision about value-based education and professional ethics.2. Make informed decisions.3. Start exploring themselves in relation to others and their work –constantly evolving into better human beings and professionals4. Inculcate Human values into their profession.5. Validate their aspirations through right understanding of human relationship and see the co-relation between the human values and prevailing problems.6. Strike a balance between physical, mental, emotional and spiritual parts their being

UNIT-1

A. Human and Ethical values

What are they? --The Indian concept of values-- Modern approach to the study of values - Basis for Moral Judgement--- A new approach to Human Values-- freedom, creativity, love, wisdom, concern.

UNIT-2

Canons of Ethics

Virtue Ethics-- Ethics of Duty-- Ethics of Responsibility-- Factors to be considered in making Ethical Judgments.

UNIT-3

The Value of time

The importance of managing time-- Factors that hinder time management--Benefits of time management-- Using time judiciously-- practical strategies to manage time.

UNIT-4

The Power of Positive thinking

Nature and Scope of Positive thinking-- Methods to change one's thinking---Strategies to change the cycle of one's thinking.

UNIT-5

The Value of Setting Goals

Goal setting-- Importance of setting goals for oneself--Achieving excellence through SMART goals.

Learning Resources:

1. B.L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. A.N Tripathy, 2003 Human values, New Age International Publishers.
3. EG Seebauer& Robert L. Berry,2000,Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.
4. Mike Martin and Ronald Schinzinger "Ethics in Engineering "McGraw Hill
5. Charles E Haris, Micheal J Rabins, " Engineering Ethics "Cengage Learning
6. Caroline Whitback< Ethics in Engineering Practice and Research, Cambridgs University Press
7. Georgs Reynolds, Ethics in Information Technology", Cengage Learning
8. Charles D.Fleddermann, " Engineering Ethics", Pearson Education /Prentice Hall, New Jersey,2004 (Indian Reprint)

RelavantWebsites,CD's and Documentaries

- Value Education website, <Http://www.universalhumanvalues.info>
- UPTU webiste, <Http://www.uptu.ac.in>
- Story of stuff, <Http://www.storyofstuff.com>
- AlGore, As Inconvenient Truth, Paramount Classics ,USA
- Charlie Chaplin, Modern Times, United Artists, USA
- IIT Delhi, Modern Technology-The Untold story-Anand Gandhi, Right Here Right Now, Cyclewala production

SYLLABUS FOR B.E III SEMESTER
FS – I : COMMUNICATION SKILLS IN ENGLISH-I

Instruction: 2+2 Hrs week	SEE Marks :60	Course Code : HS310EH
Credits : 02	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> The four major skills of language learning listening, speaking reading and writing provide the right key to success. The main objective of this finishing school curriculum is to involve content for all the above mentioned four skills in teaching English and to get students proficient in both receptive and productive skills 	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none"> Respond to questions and Engage in an informal conversation. Narrate a message/story/incident, both verbally and in writing. Describe an event / a session / a move / an article and recognize and list the key points in a topic/message/article. Debate on a topic by picking up the key points from the arguments placed.. Respond to others while being in a casual dialogue and participate in group and form discussions by providing factual information, possible solutions, and examples. Comprehend facts given and respond in an appropriate manner and provide logical conclusions to the topics under discussion. Construct sentences in a coherent form and provide explanations to prepare, present, and analyze reports.

UNIT I – FUNDAMENTALS OF COMMUNICATION

Competencies:

- Basic conversational ability.
- Write e-mails introducing themselves & their purpose

Topics covered

Greeting and Introductions

Small Talk

Recalling

Topic Level Details

Greeting & Introductions

Competencies:

- Greeting appropriately
- Introducing themselves, a friend

- Responding to simple statements and questions both verbally and in writing
- Seeking introduction from others about themselves or about any topic.
- Writing an email with appropriate salutation, subject lines, self introduction, and purpose of mail.

Small Talk

Competencies:

- Identifying the topic of conversation.
- Speaking a few sentences on a random list of topics
- Reading simple information like weather reports, advertisements
- Seeking clarifications.

Recalling

Competencies:

- State takeaways from a session or conversations

UNIT II: NARRATIONS AND DIALOGUES

Competencies:

- Framing proper phrases and sentences to describe in context
- Speaking fluently with clarity and discrimination
- Responding to others in the dialogue.

Topics covered

Paraphrasing

Describing

Topic Level Details

Paraphrasing

Competencies:

- Listen for main ideas and reformulating information in his/her own words
- Draw appropriate conclusions post reading a passage.
- Writing an email confirming his/her understanding about a topic

Describing

Competencies:

- Speaking, Reading, and Writing descriptive sentences and paragraphs.

UNIT-III:RATIONAL RECAP

Competencies:

- Organizing and structuring the communication
- Detailing a topic
- Summarizing a topic.

Topics Covered:

Organizing

Sequencing

Explaining

Summarizing

Topic Level Details

Organizing

Competencies:

- Organizing the communication based on the context and audience

Sequencing

Competencies:

- Structuring the content based on the type of information.

Explaining

Competencies:

- Explaining a technical/general topic in detail.
- Write an email giving detailed explanation/process

Summarizing

Competencies:

- Recapitulating

UNIT-IV: PROFESSIONAL DISCUSSIONS AND DEBATES

Competencies:

- Analytical and Probing Skills
- Interpersonal Skills

Topics Covered:

Discussing

Debating

Topic Level Details

Discussing

Learning Outcome:

The students should be able to explore and support issues by adding explanations and examples.

Competencies:

- Thinking
- Assimilating

Debating

Competencies:

- Comprehending key points of the debate and note decisive points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes, and effects

UNIT - V: DRAWING CONCLUSIONS AND REPORTING

Competencies:

- Reasoning skills - Coherent and logical thinking
- Reporting and Analyzing skills.

Topics Covered:

Concluding

Reporting

Topic Level Details

Concluding

Competencies:

- Analyzing the points discussed.
- Connecting all points without gaps.
- Identifying clinchers.
- Communicating the decisions

Reporting

Competencies:

- Reporting an incident
- Writing/Presenting a project report

SYLLABUS FOR B.E III SEMESTER
INTRODUCTION OF ENTREPRENEURSHIP

Instruction: 1 Hr / week	SEE Marks : 40	Course Code : MC310ME
Credits : 01	CIE Marks: 30	Duration of SEE : 2 Hrs

Course objectives	Course Outcomes
<ol style="list-style-type: none"> inspire students and help them imbibe an entrepreneurial mind-set. introduce key traits and the DNA of an entrepreneur provide the information about the facilities , schemes available to start enterprise in INDIA improve the entrepreneur skills 	<p><i>At the end of the course, students will be able to:</i></p> <ol style="list-style-type: none"> Develop awareness about entrepreneurship and successful entrepreneurs. Understand the supporting organizations available to establish the business in the country Understand the different government policies which support the entrepreneur Develop how to improve the communication and sales skills and generate and analyze the business ideas

UNIT -I

Entrepreneurship, myths about entrepreneurship, entrepreneur characteristics and its styles – Classification of Entrepreneurship – Forms of Business organizations –Role of Entrepreneurship in economic development. Managing risks and learning from failures.

E-cells, successful entrepreneurs, start-ups and incubators, institutions supporting small business enterprises.

UNIT -II

Central level supporting institutions: NABARD, SIDBI, NIC, KVIC, NIESBUD, SIDO, DST, EDI, FICCI, CII, ASSOCHAM etc. – state level institutions – DICs – SFC – SIDC. Design thinking and its process

Idea Generation and evaluation: Ideas in Entrepreneurships – Sources of New Ideas – Techniques for generating ideas – Opportunity Recognition and evaluation, Entrepreneurial skills, selling and selling skills – communication and modes of it, be an entrepreneur.

Learning Resources:

1. **Bruce R. Barringer and R. Duane Ireland, "Entrepreneurship: successfully launching new ventures", 3rd edition, Pearson Prentice Hall, 2009.**
2. **P. Denning and R. Dunham, "The Innovator's Way", MIT Press: Cambridge, Massachusetts, 2010.**
3. **Arya Kumar, "Entrepreneurship", Pearson Education, Delhi, 2012.**
4. **Michael H. Morris, D.F.Kuratko, J G Covin, "Corporate Entrepreneurship and Innovation", Cengage learning, New Delhi,2010**
5. Peter F. Drucker, "Innovation and Entrepreneurship", Routledge Classics, 2015 .
6. <https://www.wfglobal.org/initiatives/national-entrepreneurship-network/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
DATA STRUCTURES LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code : PC311CS
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">• Design and analyze linear and nonlinear data structures• Acquire programming skills to implement sorting and searching techniques• Identify and apply the suitable data structure for the given real world problem	<ol style="list-style-type: none">1. Implement insert, delete, search, sort and traverse operations on array and linked list2. Develop applications using stack and queue3. Apply nonlinear data structures to solve computing problems4. Implement optimized sorting technique for a given data set5. Implement hashing techniques to perform dictionary operations

Programming Exercise:

1. Implementation of Formula based representation.
2. Implementation of Singly Linked List, Doubly Linked List and Circular Linked List.
3. Implementation of Polynomial Arithmetic using Linked List.
4. Implementation of String Matching algorithms.
5. Implementation of Stacks, Queues.(Using both Arrays and Linked Lists)
6. Implementation of Infix to Postfix Conversion, Postfix Expression Evaluation.
7. Implementation of Recursive and Iterative Traversals on Binary Tree.
8. Implementation of Binary Search Tree.
9. Implementation of Operations on Binary Tree (Delete Entire Tree, Copy Entire Tree, Mirror Image, Level Order, Search for a Node etc.)
10. Implementation of Traversal on Graphs.

11. Implementation of Selection, Merge, Quick, Heap, and Insertion Sort.
12. Implementation of Binary Search and Hashing
13. Implementation of operations on AVL Trees.
14. Implementation of B-Trees.
15. Develop application using appropriate data structures.

Suggested Books:

1. Horowitz E, Sahni S and Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd Edition(2008), Universities Press

Reference Books:

1. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition(2002), Pearson
2. Kushwaha D. S and Misra A.K, Data structures A Programming Approach with C, Second Edition(2014), PHI.,
3. Gilberg R. F and Forouzan B. A, Data structures: A Pseudocode Approach with C, Second Edition(2007), Cengage Learning
4. Tanenbaum A. M , Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Third Edition(2009), MIT Press
6. Yedidyah Langsam , Moshe J. Augenstein ,Aaron M. Tenenbaum, Data Structures Using C and C++ , Second Edition(2009), PHI

Online Resources :

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos>
2. <http://nptel.ac.in/courses/106106127/>
3. <http://www.nptel.ac.in/courses/106102064>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
JAVA LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code : PC321CS
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course objectives	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">● Implement object oriented system development using Java constructs● Develop robust Java application applying right data structures, IO streams and graphical user interface.	<ol style="list-style-type: none">1. Implement object oriented system development using OOP concepts2. Develop applications using multi threaded programming by handling exceptions.3. Handle users input output using console and file streams for performing complex data operations.4. Apply appropriate data structures for modeling a given user situation using collection framework5. Develop end to end dynamic Java application by using JApplets and JFrames implementation using java swing framework

LIST OF PROGRAMS

1. A program to illustrate the concept of class with constructors, methods and overloading.
2. A program to illustrate the concept of inheritance and dynamic polymorphism
3. A program to illustrate the usage of abstract class & Interface
4. A program to create Packages.
5. A program to illustrate Exception Handling.
6. A program to illustrate Thread Synchronization.
7. A program to work on strings using String classes.
8. A program to illustrate the usage of Filter and Buffered I/O streams
9. A program to demonstrate Serialization and Deserialization
10. A program to demonstrate usage of Regular Expressions
11. A program using List & Set interfaces, Iterator & ListIterator

12. A program using Map interface, Date, Calendar & Timer.
13. A program to implement object comparison using comparator
14. A program to implement Applets and parameterized Applets
15. A program to develop Layouts and implement Event Handling
16. An application involving GUI with different controls, menus using Swing classes.

Suggested Books:

1. Herbert Schildt, *The Complete Reference Java*, 7th Edition, Tata McGraw Hill 2005.

Reference Books:

1. James M Slack, *Programming and Problem Solving with JAVA*, Thomson Learning 2002.
2. Timothy Budd, *An introduction to Object-Oriented Programming*, 3rd Edition, Pearson Education, 2008
3. C Thomas Wu, *An Introduction to Object Oriented Programming with Java*, Tata McGraw Hill, 2005.
4. P. Radha Krishna, *Object Oriented Programming through Java*, Universities Press, 2007.
5. Sachin Malhotra, Saurabh Choudhary, *Programming in Java*, 2nd Edition, Oxford Press, 2014.

Online Resources:

1. <https://docs.oracle.com/javase/9/docs/api/overview-summary.html>

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS
B.E- III SEMESTER (2018-19)

B.E- III SEM OPEN ELECTIVE-I COURSES			
Dept	Title	Code	credits
CIVIL	Geographical Information Systems	OE310CE	2
	Building Materials	OE320CE	2
CSE	Introduction to Data Structures	OE310CS	2
ECE	Introduction to Signals & Systems	OE310EC	2
	Introduction to Communication Systems	OE320EC	2
EEE	Electrical Installation and Safety	OE310EE	2
Mech	Basic Mechanical Engineering	OE300ME	2
	Mechanical Technology	OE310ME	2
IT	Introduction to Scripting Languages	OE310IT	2
Maths	Linear Algebra and its Applications	OE310MA	2

DEPARTMENT OF CIVIL ENGINEERING
 SYLLABUS FOR B.E. III -SEMESTER
 GEOGRAPHICAL INFORMATION SYSTEMS
 Open Elective – I (to other branches)

Instruction : 2Hours/week	SEE Marks: 60	Course Code: OE310CE
Credits : 2	CIE Marks: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>Objectives of this course are to:</i>	<i>Upon the completion of this course the students will be expected to:</i>
1. Provide theoretical framework on fundamentals and basic concepts of GIS applications with its capabilities 2. have an in-depth understanding of the functionality of GIS and be critically aware of the potential and limitations of GIS in integrated analysis of spatial and non-spatial data	1. Explain Geographic Information Systems, become familiar with the basic principles of map projections and coordinate systems and understand the requirements of different user disciplines for applying GIS technology. 2. Describe the basics of working of geographical databases, various data structures and understand the concepts of data capture, storage, 3. Analyse outputs in a GIS environment. 4. Identify various analytical tools and functions in GIS and address various geospatial problems.

UNIT-I

Introduction: Map, definitions, representations-Point, line, polygon, common coordinate systems, Map projections – Transformations – Coordinate system – Map Analysis. History of development of Geographic Information Systems (GIS) - Standard GIS packages.

UNIT-II

Data Entry, Storage and Maintenance: Data types – spatial, non-spatial (attribute data) – data structure, data format – point line vector – Raster – Polygon – Object structural model –filters and files data in computer – Keyboard entry, Manual Digitizing, Scanner, Remotely sensed data, Existing Digital data Cartographic database, Digital elevation data, data compression.

UNIT-III

Data Analysis and Modelling: Spatial analysis, data retrieval, query (SQL) – Simple analysis, Recode overlay, Vector data analysis, Raster data analysis – Modeling in GIS – Digital elevation model – Cost and path analysis – Knowledge based systems.

UNIT-IV

Geographic Information Systems (GIS) Analysis Functions: Organizing data for analysis, classification of GIS, analysis function, maintenance and analysis of spatial data – transformations, conflation, edge matching and editing. Maintenance and analysis of non-spatial attribute data – editing and query functions.

Suggested Books:

1. Kang-Tsung Chang, Introduction to GIS, Tata McGraw Hill Edition, 2015.
2. Burrough, P.A., Principles of GIS for land resource assessment, Oxford publication, 1986.
3. nji Reddy M., Remote Sensing and Geographic Information System, 2012

References Books

1. John R Jensen, Ryan R Jensen, Introduction to Geographic Information System, 2013.
2. Krawkiwsky E.J. and Wells D. E., Coordinate Systems in Geodesy, 1984.
3. Stan Aronoff, Geographic Information Systems: A management perspective, Wdl Publications, 1991.

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III -SEMESTER
BUILDING MATERIALS

Open Elective – I (to other branches)

Instruction : 2Hour/week	SEE Marks : 60	Course Code : OE 320CE
Credits : 2	CIE Marks : 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>In this subject the students will</i>	<i>Upon the completion of this course students will be able to</i>
<ol style="list-style-type: none">1. Acquire basic knowledge on building materials such as stones, bricks, cement, aggregates, mortar and concrete.2. Study various aspects of paints, varnishes and timber.	<ol style="list-style-type: none">1. Explain the characteristics of stones and bricks.2. Describe the properties of cement, aggregate, concrete, mortar.3. Identify the suitability of timber4. Application of paints and varnishes for building works.

UNIT-I

Stones: Classifications of stones, uses of stones as building materials, characteristics of good building stones.

Bricks: Composition of brick clay. Process of manufacturing bricks. Characteristics of good building bricks, classification of bricks. Introduction to light weight bricks.

Timber: Timber as a building material and its uses. Various types of timber. Seasoning and its importance. Preservation of wood. Plywood & Laminates and their uses.

UNIT-II

Cement: Chemical composition of cement, manufacturing process. Specifications for Ordinary Portland Cement, Types of cements.

Fine Aggregate: Characteristics of good sand and its classifications, bulking of sand. Quarry sand.

Coarse Aggregate: Characteristics of good coarse aggregates for manufacture of concrete.

UNIT-III

Cement Mortar :Types and uses.

Concrete: Designation, workability of concrete – factors affecting, Slump test, Ready Mix Concrete (RMC).

UNIT-IV

Reinforcing steel: Types of reinforcement, specifications - M.S., HYSD, TMT.

Paints :Constituents, characteristics of good paints, varnishes.

Suggested Books:

1. Gambhir M.L., Neha Jamwal, Building Materials: Products, Properties and Systems, McGraw Hill Education (India) Private Limited, 2014.
2. Varghese P.C., Building Materials, PHI Learning Pvt. Ltd., Delhi, 2015.
3. Advances in Building Materials and Construction, Central Building Research Institute, Roorkee, 2004.

References Books:

1. Duggal S.K., Building Materials, New Age Publishers, 2012
2. Rangwala, Engineering Materials, Charotar Publishers, 2015

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
INTRODUCTION TO DATA STRUCTURES
Open Elective-I (for other Departments)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code :OE310CS
Credits :2	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">Identify and use appropriate data structure for a given problem with effective utilization of space and time.Describe the linear and nonlinear data structures.	<ol style="list-style-type: none">Implement linear data structures.Develop an application using stacks and queues.Choose the appropriate nonlinear data structure and perform operations on them.Analyze the time and space complexities of Algorithms.

UNIT - I

Arrays: Arrays - ADT, Polynomials, Sparse matrices.

Linked Lists: Singly Linked Lists, Circularly linked lists, Doubly Linked Lists.

UNIT – II

Stacks: Array Representation, Linked Representation, Applications.

Queues: Array Representation, Linked Representation, Applications.

UNIT – III

Introduction to non-linear Data Structures :Tree Definitions and Properties, Representations of Binary Trees, Operations, Binary Tree Traversal, Graph Definitions, properties and representations.

UNIT – IV

Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations

Suggested Books:

- Horowitz E, Sahni S and Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd Edition(2008), Universities Press

Reference Books:

1. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition (2002), Pearson
2. Kushwaha D. S and Misra A.K, Data structures A Programming Approach with C, Second Edition (2014), PHI.,
3. Gilberg R. F and Forouzan B. A, Data structures: A Pseudocode Approach with C, Second Edition (2007), Cengage Learning
4. Tanenbaum A. M ,Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Third Edition (2009), MIT Press
6. YedidyahLangsam , Moshe J. Augenstein ,Aaron M. Tenenbaum, Data Structures Using C and C++ , Second Edition (2009), PHI.

Online Resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos>
2. <http://nptel.ac.in/courses/106106127/>
3. <http://www.nptel.ac.in/courses/106102064>

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
INTRODUCTION TO SIGNALS & SYSTEMS (Open Elective-I)
(for other Departments)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code : OE310EC
Credits : 2	CIE Marks: 40	Duration of SEE : 3Hrs

Course Objectives	Course Outcomes
<ol style="list-style-type: none">1. Define and classify continuous and discrete time signals and systems.2. Determine frequency domain characteristics of continuous and discrete time signals.	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Analyze basic signals and systems in continuous and discrete time domain.2. Apply the properties of different transformation techniques to convert a continuous time domain signal to frequency domain.3. Apply the properties of different transformation techniques to convert a discrete time domain signal to frequency domain.4. Describe the distortion less transmission through an LTI system.

UNIT - I

Continuous time signals, types of signals, representation of signals, basic elementary signals, operations on signals.

Continuous time systems, classification of systems: static and dynamic, linear and non linear, time invariant and time variant.

UNIT - II

Continuous time Fourier transforms: Introduction, existence, properties, magnitude and phase spectrums.

Laplace transforms: Introduction, existence, Laplace transform of basic elementary signals, properties, inverse Laplace transforms.

UNIT - III

Discrete time signals, types of signals, representation of signals, basic elementary signals, operations on signals.

Discrete time systems, classification of systems: static and dynamic, linear and non linear, time invariant and time variant.

UNIT - IV

Introduction to continuous and discrete time LTI systems, properties, impulse response, causality, stability, transfer function, distortion less transmission through systems. Z-transform: Introduction, existence, Z-transform of basic elementary signals, properties, inverse Z-transforms.

Suggested Readings:

1. P. Ramakrishna Rao, *Signals and Systems*, McGraw Hill, 2008.
2. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, *Signals and Systems*, 2nd ed., PHI, 2009.
3. Nagoorkani, *Signals and Systems* McGraw Hill, 2013

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. III SEMESTER

Introduction to Communication Systems (Open Elective-I)
(for other Departments)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code : OE320EC
Credits : 2	CIE Marks: 40	Duration of SEE : 3Hrs

Course Objective:	Course Outcomes
<ol style="list-style-type: none">1. Distinguish between Amplitude and Frequency modulation methods and their application in Communication Receivers2. Explain why multiplexing methods are necessary in communications and compare FDM with TDM3. Compare and contrast FSK and BPSK modulation schemes employed in digital data transmission4. Draw the block diagrams of different types of communication systems and explain their operation	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Identify the Radio frequency spectrum and the bands of different types of radio systems2. Analyze the power, efficiency and transmission bandwidth of Amplitude and Frequency Modulated signals.3. Convert the Radio frequency to Intermediate frequency and explain the operation of Superheterodyne Receiver.4. Compare and contrast Frequency Division Multiplexing and Time Division Multiplexing used in the Communication systems5. Detect and correct errors present in bit stream data using parity check6. Explain the basic principles of different types of communication systems.

UNIT - I

Introduction to Electronic Communication: Communication systems, Types of Electronic Communication, Modulation and Multiplexing, The Electromagnetic Spectrum, Bandwidth, Communication Applications, Gain and Attenuation definitions

Amplitude Modulation Fundamentals: AM concepts, Modulation Index and Percentage of Modulation, Sidebands and the Frequency Domain, AM Power.

UNIT - II

Fundamentals of Frequency Modulation: Basic principles of Frequency Modulation, Principles of Phase Modulation, Modulation Index and

Sidebands, Noise – Suppression Effects of FM, Frequency Modulation versus Amplitude Modulation.

Communication Receivers: Basic Principles of Signal Reproduction, Superheterodyne Receivers, Frequency Conversion, Intermediate Frequency and Images, Noise.

UNIT - III

Digital Communication Techniques: Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Modulation.

Multiplexing and De-multiplexing: Multiplexing Principles, Frequency Division Multiplexing, Time Division Multiplexing, PCM Multiplexing.

UNIT - IV

Transmission of Binary Data in Communication Systems: Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction. Different Types of Communication Systems: Microwave Concepts, Optical Principles, Optical Communication System.

References:

1. Louis E. Frenzel, Principles of Electronic Communication Systems, 3rd Edition. Tata Mcgraw Hill.
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E III - SEMESTER
ELECTRICAL INSTALLATION AND SAFETY (Open Elective –I)

Instruction: 2Hrs /week	SEE Marks :60	Course Code :OE310EE
Credits :2	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Enable the student to	After completion of the course student will be able to
Have a fair knowledge about the fundamentals of wiring systems, electrical safety procedures, Estimation of lighting & Power loads.	<ol style="list-style-type: none">1. Identify and choose the proper type wiring for domestic & industrial applications.2. Apply and implement the Electrical safety procedures for repairs & hazards.3. Design and Estimate the domestic lighting installation.4. Design and Draw the wiring layout for a big office building, electrical laboratory, big industry and big hotel with lift arrangement

Unit – I

Wiring Systems: Introduction, size of wires, standard wires, types of wires, CTC, PVC, Lead sheathed VIR, weather proof wires, flexible wires different types of cable wires – Types and Installation of House Wiring Systems & Wirings Accessories : Methods of installing wiring, clips, screws -round blocks switch boards, sockets socket pins - CTS wiring - Installation of surface conduit wiring - Rigid conduits, flexible conduits – Conduit accessories - elbows bushings - reducers, conduit box saddles, PVC conduit wiring - Concealed wiring.

Unit – II

Safety Procedures: Distribution fuse boards - Main switches – Different types of fuses and fuse carriers - Safety procedures – Electric shock and first aid, causes for fire hazards in Electrical installations

Unit – III

Estimation of Lighting: Estimation of domestic lighting installation service main - types of wire - specification - quantity of materials required for service main – estimation and selection of interior wiring system suitable to a given building - number of circuits - quantity of accessories required -

estimates of materials for execution of the domestic wiring installation as per National Electrical act 2003.

Unit – IV

Estimation of power loads: Power wiring installation - Drawing wiring layout for a big office building, electrical laboratory, big industry, big hotel with lift arrangement and a residential building with 2 bed room house.- estimation upto 20 kVA calculation of load current based on ratings of **various equipment's to be installed** - size of wire.

Suggested Books:

1. J.B.Gupta –A course in Electrical installation Estimating & costing-9th edition 2014, S.K.Kataria& Sons.
2. S.L.Uppal-Electrical Wiring ,Estimating& costing Electrical wiring.

Reference Books:

1. Balbir Singh-Electrical Drawing
2. Arora -Electrical wiring
3. BVS Rao -Maintenance and Operation of Electrical Equipment –Vol-I-TMH
4. S.Rao -Testing, Commissioning Operation & Maintenance of Electrical equipment -TMH
5. CRDargar -Electrical Installation design and drawing -New Asian publishers.

Online resources:

1. <http://ocw.tufts.edu>
2. <http://ocw.upm.es>
3. www.open.edu/openlearn/
4. <http://nptel.ac.in/courses/>

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. III SEMESTER
INTRODUCTION TO SCRIPTING LANGUAGES (Open Elective-I)
(for other Departments)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code :OE310IT
Credits : 2	CIE Marks: 40	Duration of SEE : 3Hrs

Course Objectives	Course Outcomes
The course will enable the students to:	At the end of the course student will be able to:
This course will enable the students to acquire basic skills for writing python scripts.	<ol style="list-style-type: none">1. Write a python script to solve a basic problem using structured programming constructs2. Write a python script to solve a basic problem using object oriented programming constructs3. Create and use python modules.4. Create a project skeleton5. Use automated testing to test a python module

Unit – I

Introduction to Python, running a python script, writing comments, using variables, operators, strings and text, format specifiers , printing information. passing command line arguments, prompting users, parameters, unpacking variables.

Unit – II

Decision making : if and else if, repetition : while loops and for loops, lists , operations on list , tuples, dictionaries , operations on dictionaries.

Unit – III

Defining functions, passing arguments to functions , returning values from functions, Exception handling.

Unit – IV

Modules , Classes and Objects, is – a relationship : inheritance, has-a relationship : composition. Creating project skeleton and automated testing.

Learning Resources

1. Allen B. Downey, Think Python, 2nd Edition, Green Tea Press
2. <https://www.python.org>

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
BASIC MECHANICAL ENGINEERING (Open Elective-I)
(for other Departments)

Instruction : 2Hours/week	SEE Marks : 60	Course Code : OE300ME
Credits : 2	CIE Marks : 40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The course will enable the students to: <ul style="list-style-type: none">learn the basic principles of Mechanical Engineering in the areas of Heat transfer, Refrigeration, power generation and Manufacturing processes.	At the end of the course, students will be able to: <ol style="list-style-type: none">understand the modes of heat transfer and different types heat exchangers.Study the working principles of IC engines and gas turbines.know the principles of refrigeration and psychrometry.study the basic manufacturing processes.

UNIT– I

Heat Transfer: **Basic modes of heat transfer, Fourier’s law of conduction, Newton’s Law of cooling, Stefan– Boltzman Law of radiation** and one dimensional steady state conduction heat transfer through plane walls without heat generation.

Heat Exchangers: classification and applications of heat exchangers in industry, derivation of LMTD in parallel and counter– flow heat exchangers and problems.

UNIT– II

IC Engines: Working of Four Stroke and Two Stroke Petrol and Diesel Engine with p– V diagrams, Valve timing diagram, Calculation of Indicated power, Brake power, Specific Fuel Consumption, Mechanical and Thermal efficiencies.

Gas Turbines: Classification, calculation of efficiency of simple open gas turbine cycle (Joule cycle/Brayton cycle) and applications.

UNIT– III

Refrigeration: Types of Refrigeration systems–Air Refrigeration system, vapor compression system, COP and representation of cycle on T-S and p-h diagrams, Types and properties of refrigerants, eco– friendly refrigerants, Introduction to Psychrometry and Psychrometry processes.

UNIT– IV

Manufacturing Processes: Welding, Brazing, Soldering, brief description of process and parameters, associated principles of gas welding, arc welding.

Machining Processes: Turning, Milling and Drilling.

Introduction to Additive Manufacturing and its applications.

Learning Resources:

1. **RK Rajput, "Thermal Engineering", Laxmi Publications, 2005**
2. **C. Sachdeva," Fundamentals of Engineering heat and mass transfer", Wiley Eastern Ltd., 2004.**
3. **PN Rao,"Manufacturing Technology, Vol. 1 & 2", Tata McGraw hill Publishing Co., 2010.**
4. **V K Manglik , "Elements of Mechanical Engineering", PHI Learning Pvt Ltd, 2013**
5. **Chua CK, Leong K.F, "Rapid Prototyping Principles – Principles and applications in Manufacturing", 3rd Edition, Cambridge University Press India Private Limited, 2000**

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
MECHANICAL TECHNOLOGY (Open Elective-I)
(for other Departments)

Instruction : 2 Hours / week	SEE Marks :60	Course Code : OE310ME
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The objective of this course is to: <ul style="list-style-type: none">learn the basic principles of excavating equipment, conveying equipment, hoisting equipment, concrete producing equipment and pneumatic equipment	On completion of the course the student will be able to: <ol style="list-style-type: none">1. Identify the operations of various earth moving equipments for maintenance and selection with respect to their applications.2. Justify various conveying equipment for transporting material based on working principles.3. Study various types of hoisting equipment in civil engineering applications.4. Examine various aggregate and concrete producing equipments used in concrete production and working of pneumatic equipment.

UNIT-I

Excavating Equipment: General description, operation, maintenance and selection of the following: Earth moving and Excavating Equipment: Shovels, Dragline, Clamshell, Cable excavator, Bucket wheel excavator, Tractor, Bulldozer, Scraper, Trenchers, Grader, Earth Compactors.

UNIT-II

Conveying Equipment: Belt conveyor, Screw Conveyor, Bucket Conveyor, Apron Conveyor, Aerial Ropeway.

UNIT-III

Hoisting Equipment: Hoist winch, Differential and Worm geared chain hoists, Fork lift trucks, Guyed and stiffly derricks, swing and non– swing mobile crane, whirler crane, Construction elevator, passenger lift and Bucket elevators.

UNIT– IV

Aggregate and Concrete Producing Equipment: Crushers – Jaw, Gyratory, Hammer and Roll Crushers, Screens – Stationary, Shaking and Vibrating screens. Concrete mixers and Concrete pumps.

Pneumatic Equipment: Reciprocating air– compressor, construction pneumatic tools; jack hammer, paving breaker, Rock drill, concrete vibrator.

Learning Resources:

1. **R.L. Peurifoy, "Construction Planning Equipment and Methods", 7th Ed., McGraw-Hill Publishers, 1956**
2. **Mahesh Varma, "Construction Equipment and its planning and application", Metropolitan books Co, Delhi, 2004**
3. **Goodes Spence, "Building and Civil Engineering Plant", Crosby Lock Wood, 1995**

DEPARTMENT OF MATHEMATICS
SYLLABUS FOR B.E. III SEMESTER
LINEAR ALGEBRA AND ITS APPLICATIONS (Open Elective-I)

Instruction : 2 Hours / week	SEE Marks : 60	Course Code : OE310MA
Credits : 2	CIE Marks : 40	Duration of SEE : 3 Hours

Course Outcomes: At the end of the course the students will learn:

1. The concepts of vector spaces, bases and dimension and change of bases. These concepts are useful to generate Code Words to improve the quality of transmissions.
2. The concepts of linear transformations and isomorphism and these concepts are useful in Computer Graphics.
3. The concepts of inner product spaces Orthonormal bases. These concepts are useful in Least Square Approximations, which is used in engineering applications and statistics.

UNIT – I : 8 hrs

Vector Spaces: Definition of Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis

UNIT – II : 7 hrs

Linear Transformations: The Null Space and Range, Isomorphisms, Matrix Representation of a Linear Transform

UNIT – III : 6 hrs

Inner Product Spaces: The Dot Product on R^n and Inner Product Spaces

UNIT – IV : 6 hrs

Inner Product Spaces: Orthonormal Bases, Orthogonal Complements

Text Books:

1. Introduction to linear algebra with applications, Jim DeFranza, Daniel Gagliardi, Tata McGraw-Hill
2. An introduction to Linear Algebra, V.P Mainra, J.L Arora, Affiliated to East-West Press Pvt Ltd

Reference Books:

1. Elementary Linear algebra, Anton and Rorres, Wiley India Edition
2. Advanced Engineering Mathematics, Erwin Kreysing, Wiley Publication
3. Elementary Linear algebra, ron Larson, Cengage Learning

With effect from the A.Y 2018-19

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.E. IV-SEMESTER w.e.f. 2018-19 (2017-18 Joined Batch)

S. No	Course Code	Course name	Scheme of Instruction				Scheme of Examination			Credits
			Hours / Week				Duration in Hrs	Max Marks		
			L	T	D	P		SEE	CIE	
THEORY										
1	BS410MA	Engineering Mathematics -IV	3	1	0	0	3	60	40	3
2	PC410CS	Micro Processors & Interfacing	3	0	0	0	3	60	40	3
3	PC420CS	Operating Systems	3	0	0	0	3	60	40	3
4	PC430CS	Design & Analysis of Algorithms	3	0	0	0	3	60	40	3
5	PC440CS	Computer Architecture	3	1	0	0	3	60	40	3
6	HS420EH	FS –II : Communication Skills in English-II	2	2	0	0	3	60	40	2
7	MC320CE	Environmental Science	2	0	0	0	3	60	40	2
8	OE4XXXX	Open Elective-II	1	0	0	0	2	40	30	1
9	OE4XXXX	Open Elective-III	2	0	0	0	3	60	40	2
PRACTICALS										
1	PC411CS	Micro Processors & Interfacing Lab	0	0	0	2	3	50	30	1
2	PC421CS	Operating Systems Lab	0	0	0	2	3	50	30	1
3	PC431CS	Design & Analysis of Algorithms Lab	0	0	0	2	3	50	30	1
		Total	22	4	0	6	-	670	440	25
		Grand Total	32				-	1110		

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
 SYLLABUS FOR BE IV SEMESTER
 ENGINEERING MATHEMATICS – IV
 (For CSE, ECE, MECH Branches)

Instruction : 3+1Hrs / week	SEE Marks :60	Course Code: BS410MA
Credits : 3	CIE Marks :40	Duration of SEE : 3 Hours
Course Objectives		Course Outcomes
<ol style="list-style-type: none"> Understand the Definition of Laplace and inverse Laplace Transforms-Shifting Properties and various theorems and how to apply them in solving Differential Equations. Analyze the characteristics and properties of and Z – transforms and solve the Difference Equations. Study the concept of Fourier and inverse Fourier Transform of a function and various Properties. Understand the Analytic functions, to evaluate a line integral of a function of a complex variable using Cauchy's integral formula, to evaluate real integrals using complex integration and how to evaluate Laurent Series and residues. 		<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none"> Evaluate Laplace transforms and inverse Laplace transforms of functions. Apply Laplace transforms to solve ordinary differential equations arising in engineering problems. Apply Z-transform in the analysis of continuous time and discrete time systems and also solve the Difference Equations using Z-transform. Determine Fourier transform, Fourier sine and cosine transform of a function. Know the condition(s) for a complex variable function to be analytic and/or harmonic and state and prove the Cauchy Riemann Equation and use it to show that a function is analytic and to define singularities of a function, know the different types of singularities, evaluate contour integrals using the Cauchy Integral Theorem and the Cauchy Integral Formula and will be able to determine transformation in complex space.

UNIT - I

Laplace Transforms: Introduction to Laplace transforms - Inverse Laplace transform - Sufficient Condition for Existence of Laplace Transform –Properties of Laplace Transform- Laplace Transform of Derivatives - Laplace Transform of Integrals - Multiplication by t^n - Division by t – Evaluation of Integrals by Laplace Transforms- Convolution Theorem - Application of Laplace transforms to Linear Differential Equations with Constant Coefficients.

UNIT - II

Fourier Transforms: Mathematical Transforms, Fourier Integral Theorem - Fourier Transforms – Inverse Fourier Transform - Properties of Fourier Transform –Fourier Cosine & Sine Transforms - Convolution Theorem.

UNIT - III

Z-Transforms: Introduction - Z-transforms of Standard sequences - Linearity Property – Damping Rule - Shifting Properties- Multiplication by n - Initial and Final value theorems – Inverse Z-Transforms- Convolution Theorem – Application of Z-Transforms to Difference Equations.

UNIT - IV

Functions of Complex Variables: Limits and Continuity of function - Differentiability and Analyticity - Necessary & Sufficient Condition for a Function to be Analytic - Milne-**Thomson's method** - Cauchy-Riemann Equations in Polar Form - Harmonic Functions - Complex Integration - **Cauchy's Theorem** - **Extension of Cauchy's Theorem** for multiply connected regions- **Cauchy's Integral Formula**.

UNIT - V

Power series - **Taylor's Series** - **Laurent's Series (without proofs)** - Zeros and Singularities –Residues – **Cauchy's Residue Theorem** -Evaluation of Real Integrals using Residue Theorem -Bilinear Transformation.

Suggested Reading:

1. R.K.Jain&S.R.K.Iyengar , Advanced Engineering Mathematics - 3rd Edition, Narosa Publications
2. Dr.B.S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publishers.
3. **Goyal & Gupta, Laplace's and Fourier transforms**, 23rd Edition, PragatiPrakashan, 2009
4. Kreyszig E, Advanced Engineering Mathematics, 8 th Edition, John Wiley & Sons Ltd, 2006.
5. N.P.Bali& Manish Goyal A text book of Engineering Mathematics, Laxmi Publication.
6. H.K. Dass, Er.RajnishVerma, Higher Engineering Mathematics, 2011 Edition S.Chand& company Ltd.
7. **R.V. Churchill, "Complex Variables & its Applications".McGraw-Hill Book Company, INC**

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR BE IV SEMESTER
MICROPROCESSORS AND INTERFACING

Instruction : 3 Hrs /week	SEE Marks :60	Course Code : PC410CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">• Understand the architecture and organization of microprocessor along with instruction coding formats.• Write programs in assembly language.• Understand the memory and addressing concepts for interfacing I/O devices to the microprocessor.	<ol style="list-style-type: none">1. Explain the architecture and organization of microprocessor.2. Write Programs in assembly language.3. Apply knowledge for interfacing I/O devices to the microprocessor.4. Illustrate the Architecture and pin configurations of 8086.5. Design applications using 8086 Microprocessor.

UNIT-I

8085 Architecture: Introduction to microprocessors and microcontrollers, 8085 Processor Architecture, Internal operations, Instructions and timings, Programming the 8085 – Introduction to 8085 instructions, Addressing modes and Programming techniques with Additional instructions.

UNIT-II

Stacks and subroutines, interfacing peripherals - Basic interfacing concepts, interfacing output displays, Interfacing input keyboards. Interrupts - 8085 Interrupts, Programmable Interrupt Controller (8259A). Direct Memory Access (DMA) – DMA Controller (Intel 8257), Interfacing 8085 with Digital to Analog and Analog to Digital converters.

UNIT-III

Programmable peripheral interface (Intel 8255A), Programmable communication interface (Intel 8251), Programmable Interval timer (Intel

8253 and 8254), Programmable Keyboard / Display controller (Intel 8279).
Serial and Parallel bus standards RS 232 C, IEEE 488.

UNIT-IV

Introduction to 8086 Microprocessor: Architecture, Pin details of 8086, Minimum and Maximum mode. Segment flags, memory banks, Interrupts and Interrupt responses. Hardware and software Interrupt applications, Interrupt example.

UNIT-V

Addressing modes, Instruction set of 8086 and assembler directives. Assemble Language Programming – Modular Programming – Linking and Relocation – Stacks – Procedures - Macros

Suggested books:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and applications with 8085, 5th Edition (2012), Prentice Hall.
2. D.V Hall, Microprocessors and Interfacing, 2nd Edition(2006), McGraw Hill.

Reference Books:

1. Barry B. Brey, The Intel Microprocessor, 8086/8088,80186/80188, 80286, 80386, 80486, Pentium and Pentium pro-processors – Architecture, Programming and interfacing, 8thEdition(2013), Prentice Hall.
2. N. Senthil Kumar, M. Saravanan, S. Jeevananthan ,S.K. Shah , Microprocessors and Interfacing ,Oxford university press 2016.

Online resources:

1. <http://nptel.ac.in/courses/108107029/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
OPERATING SYSTEM

Instruction: 3 Hrs /week	SEE Marks :60	Course Code : PC420CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course objectives	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">• Understand different Operating system Structures, Services and threading models• Learn various operating system services by considering case studies such as Linux and Windows10	<ol style="list-style-type: none">1. Compare CPU scheduling algorithms and Operating system structures2. Apply techniques for Main memory management and File allocation3. Design solutions for classical synchronization problems and describe deadlock handling methods4. Analyze Disk scheduling algorithms and I/O operation implementation techniques5. Compare the features of Linux and Windows Operating systems

UNIT-I

Introduction to operating systems: Definition, Mainframe, Multiprocessor, Clustered and Real time systems, Distributed, OS System structure, OS Services, Virtual machines, Containers, System calls.

Process: Process concept, Process Scheduling, Inter-process communication, Threads, Multithreading Models.

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiprocessor scheduling.

UNIT-II

Memory Management: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging.

Virtual memory: Demand paging, Page replacement Algorithms, Thrashing.

File System Interface: File Concept, Access Methods, Directory Structure, File System Mounting.

File System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free Space management.

UNIT –III

Process synchronization: Critical Section problem, Two process solution, Synchronization Hardware, Semaphores, Classical problems of Synchronization, Monitors.

Deadlocks: Necessary conditions, Resource allocation graph, Methods for handling deadlocks: Prevention, Avoidance, Detection and Recovery.

UNIT -IV

Device Management: Disk Structure, Disk Scheduling, Disk Management, Swap Space Management, RAID structure, Disk Attachment, Stable storage Implementation.

I/O System: I/O hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O request to hardware operation.

UNIT-V

Protection: Goal, Domain of protection, Access matrix, Implementation of Access matrix.

Security: The Security Problem, User Authentication, Program threats, System threats, Securing Systems and facilities, Intrusion detection

Case Studies: Linux System: Design Principles, Kernel Modules, Process Management

Windows - Design Principles, Architecture

Android: Architecture, Activity and Service life cycle

Suggested Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th Edition (2016), Wiley India.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition (2001), Pearson Education, Asia.
2. Dhananjay, Dhamdhere.M, Operating System-concept based approach, 3rd edition (2009), Tata McGraw Hill, Asia
3. Robert Love, Linux Kernel Development, (2004)Pearson Education
4. Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, 3rd Edition (2013), Pearson Education

Online Resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
DESIGN AND ANALYSIS OF ALGORITHMS

Instruction: 3 Hrs /week	SEE Marks :60	Course Code : PC430CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">Analyze the asymptotic performance of algorithmsApply various algorithm design strategies to solve engineering problems.	<ol style="list-style-type: none">1. Compare asymptotic behavior of functions obtained by elementary composition of polynomials, exponentials and logarithmic functions.2. Apply fundamental algorithmic paradigms like the divide and conquer paradigm and greedy strategy in designing algorithms.3. Design algorithms by using Dynamic Programming4. Adapt and design algorithms for specific problems by using backtracking and branch & bound algorithm design techniques5. Distinguish complexity classes P, NP, NP-Hard, and NP-complete.

UNIT – I

Introduction: What is an algorithm, algorithm specification.

Performance analysis: Space complexity, time complexity. Asymptotic notations, amortized analysis

UNIT – II

Divide and Conquer: General method, binary search, finding maximum and minimum, Merge sort, Quick sort, performance measurement, Masters theorem.

The Greedy Method: The general method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT – III

Dynamic Programming: The general method, Matrix-chain multiplication problem, Multistage graph, All Pairs Shortest Paths, Optimal Binary Search Trees (OBST), 0/1 Knapsack, Reliability Design, Traveling Salesman Problem, Bi-connected Components and DFS, Longest Common Subsequence (LCS) problem.

UNIT – IV

Backtracking: General method, the 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Knapsack Problem.

Branch and Bound: The method, 0/1 Knapsack problem, Traveling Salesperson problem.

UNIT – V

NP-Hard and NP-Complete problems: **Basic concepts, Cook's** theorem, NP-hard graph problems- clique decision problem, Node cover decision problem, NP-Hard scheduling problems- scheduling Identical processors. NP-Hard code generation problems-code generation with common sub expressions.

Suggested Books:

1. Ellis Horowitz, **Sartaj Sahani, Sanguthevar Rajasekaran, " Fundamentals of computer Algorithms", Second edition (2008),Universities Press.**
2. Thomas H. Cormen, Leiserson C.E, Rivest.R.L , Stein.C, Introduction to Algorithm, 2nd edition (2001), MIT press, USA.

Reference Books:

1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, foundations, analysis, and internet examples, WIELEY student edition (2006).
2. Aho, Hopcroft, Ulman, The Design and Analysis of Computer Algorithms, (2000), Pearson Education.
3. Steven S.Skiema, The Algorithm Design Manual, Springer (1997).

Online Resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm>.
2. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>
3. <http://nptel.ac.in/courses/106101060/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
COMPUTER ARCHITECTURE

Instruction: 3+1 Hrs /week	SEE Marks :60	Course Code : PC440CS
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">Learn the structure and behavior of various functional modules of a computer and identify how they interact to provide the processing needs of the user.Understand memory hierarchy and analyze different ways of communicating with I/O of digital computer.	<ol style="list-style-type: none">Analyze the major components of a computer and design basic hardware for functional modules of digital computer.Analyze micro programmed control unit for designing a digital computer.Apply pipeline concepts to increase computational speed of CPU and analyze the flow of data and instructions in the CPU operations.Analyze techniques used by a computer to communicate with I/O devices.Evaluate the memory organization techniques and assess the performance of a CPU.

UNIT-I

Overview of Computer Function and Interconnection: Computer Components, Interconnection Structures, Bus Interconnection, Bus Structure, Data Transfer.

Register Transfer Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic, Shift Micro operations, Arithmetic Logic Shift Unit.

UNIT-II

Basic Computer organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instruction, Input-Output and Interrupt.

Micro programmed Control: Control memory, Address Sequencing, Micro program Example, Design of Control Unit.

UNIT-III

Central Processing Unit: General Register organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC.

Pipeline: Parallel processing, Pipelining, Arithmetic pipeline, Instruction Pipeline.

Computer Arithmetic: Addition and Subtraction, Multiplication, Division, Floating Point Arithmetic Operations, Decimal Arithmetic Unit.

UNIT-IV

Input-Output organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor (IOP), Serial Communication.

UNIT-V

Memory Organization: Memory Hierarchy, Main Memory, RAM and ROM, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Assessing and Understanding Performance: CPU Performance and its Factors, Evaluating Performance.

Suggested Books:

1. M.Morris Mano, Computer System Architecture, 3rd Edition (2007), Pearson Education Asia.

Reference Books:

1. William Stallings, Computer Organization & Architecture, 8th Edition (2011), Pearson Education Asia.
2. David A Patterson, John L Hennessy, Computer Organization and Design, 4th Edition (2014), Morgan Kaufmann.
3. Carl.V Hamacher, Vranesic Z.G, Zaky S.G, Computer Organization, 5th Edition (2011), McGraw Hill.
4. Pal Chaudhuri.P, Computer Organization and Design, , 3rd Edition(2009), Prentice Hall of India.

Online Resources:

1. <http://nptel.ac.in/courses/106102157/>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-823-computer-system-architecture-fall-2005/>

SYLLABUS FOR B.E IV SEMESTER
 FS - II: COMMUNICATION SKILLS IN ENGLISH - II

Instruction : 2+2Hrs / week	SEE Marks :60	Course Code: HS420EH
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> 1. identify the various features and functions of human language and communication. 2. develop the habit of listening effectively so as to analyze the speaker's tone and tenor. 3. choose appropriate words so as to speak and write accurately. 4. read various types of texts and sift information correctly. 5. study organizational structures and behavioral patterns and adapt appropriately. 	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Participate in group and forum discussions by providing factual information, possible solutions, and examples. 2. Debate on a topic by picking up the key points from the arguments placed. 3. Provide logical conclusions to the topics under discussions and summarize with 70% comprehension. 4. Prepare, present, and analyze reports. 5. Choose appropriate words and tone to present accurate, specific, and factual reports and apply reading skills, including how to approach different types of literature 6. Compose a summary of beginning high level reading text that identifies the thesis and key supporting details.

Unit 1: Professional Discussions and Debates

Module Overview:

The module enables the students to build strategies for effective interaction and help them in developing decisive awareness and personality maintaining emotional balance.

Learning Outcome:

The students should be able to:

- Participate in group and forum discussions by providing factual information, possible solutions, and examples.
- Debate on a topic by picking up the key points from the arguments placed.

Competencies:

- Analytical and Probing Skills

- Interpersonal Skills

Topics Covered:

Topic1 - Discussing

Topic 2 - Debating

Topic Level Details

Topic1 - Discussing

Learning Outcome:

The students should be able to explore and support issues by adding explanations and examples.

Competencies:

- Thinking
- Assimilating

Topic 2 - Debating

Learning Outcome:

The students should be able to develop their case and present their points using relevant facts and logic.

Competencies:

- Comprehending key points of the debate and note decisive points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes, and effects

Unit 2: Drawing Conclusions

Unit Overview:

This module is intended to provide necessary inputs that enable the students to draw conclusions out of a discussion and provide reports.

Learning Outcome:

Students should be able to:

- Provide logical conclusions to the topics under discussion.
- Prepare, present, and analyze reports.

Competencies:

- Reasoning skills - Coherent and logical thinking
- Reporting and Analyzing skills.

Topics Covered:

Topic 1 - Concluding

Topic 2 - Importance of Logic

Topic Level Details:

Topic 1 - Concluding

Learning Outcome:

The students should be able to conclude a discussion or deliberation with appropriate reasoning.

Competencies:

- Analyzing the points discussed.
- Connecting all points without gaps.
- Identifying clinchers.
- Communicating the decisions

Unit 3 - Reporting

Learning Outcome:

The Students should be able to choose appropriate words and tone to present accurate, specific, and factual reports.

Competencies:

- Reporting an incident
- Writing/Presenting a project report

Unit 4 - Reading for Context

Learning Outcomes

Upon completion of the course, students should be able to:

1. Compose a summary of beginning high level reading text that identifies the thesis and key supporting details.
2. Summarize with 70% comprehension..
3. Apply reading skills, including how to approach different types of literature.

Competencies

Develop metacognitive strategies

Topics

- a. **Recognition of author's purpose**
 - b. Awareness of stylistic differences
 - c. Discernment of fact and opinion
 - d. Evaluation of fact and opinion
 - e. Recognition of propaganda techniques
2. Present vocabulary building methods
 3. Use comprehension and vocabulary strategies to raise reading rate.

Unit 5- Develop critical reading skills:

- Theme Detection
- Note making and Inference
- Summary and main idea identification

SYLLABUS FOR B.E III SEMESTER
ENVIRONMENTAL SCIENCE

Instruction : 2Hrs / week	SEE Marks :60	Course Code: MC320CE
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> 1. Describe various types of natural resources available on the earth surface. 2. Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems. 3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity. 4. Explain the causes, effects and control measures of various types of environmental pollutions. 5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, various types of disasters and their mitigation measures. 	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the various types of natural resources. 2. Differentiate between various biotic and abiotic components of ecosystem. 3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India. 4. Illustrate causes, effects, control measures of various types of environmental pollutions. 5. Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, various types of disasters and their mitigation measures.

UNIT-I

Environmental Studies: Definition, importance of environmental studies. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Food resources; Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources: Renewable and non-renewable energy resources. Land Resources, soil erosion and desertification.

UNIT-II

Ecosystems: Structure and function of an ecosystem, producers, consumers and decomposers, food chains, food webs, ecological pyramids, aquatic ecosystem (ponds, oceans, estuaries).

UNIT-III

Biodiversity: Genetic species and ecosystem diversity. Values of

biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste & e-waste management.

UNIT-V

Social Aspects and the Environment: Water conservation, Climate change, global warming, acid rain, ozone layer depletion. Environmental Impact Assesment, population explosion.

Suggested Books:

1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2013.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2006.
3. Suresh K. Dhameja, Environmental Studies, S.K. Kataria& Sons, 2010.
4. De A.K., Environmental Chemistry, New Age International, 2003.
5. Odum E.P., Fundamentals of Ecology, W.B. Sunders Co., USA, 2004.
6. Sharma V.K., Disaster Management, National Centre for Disaster Management, IIPe, Delhi, 2013.
7. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR BE IV SEMESTER
MICROPROCESSORS AND INTERFACING LAB

Instruction: 2Hrs /week	SEE Marks :50	Course Code : PC411CS
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">• Implement assembly language programs in microprocessor.• Interfacing I/O devices to Microprocessor.• Design simple applications using 8086 Microprocessor.	<ol style="list-style-type: none">1. Identify instruction set and addressing modes of 8085 microprocessor.2. Implement Arithmetic and logical operations in 8085 microprocessor.3. Apply knowledge of interfacing and design programs in microprocessor.4. Design solution to a given situation using different Interfacing devices.5. Develop applications using 8086 Microprocessor.

8085 PROGRAMMING USING MICROPROCESSOR TRAINER KIT

1. Simple programming examples using 8085 addressing modes.
2. Programming examples using 8085 Data transfer and Arithmetic instructions.
3. Programming examples using 8085 Logical instructions.
4. Programming examples using arrays.
5. Programming examples using 8085 multi byte Arithmetic Operations.
6. Interfacing and programming of 8255. (E.g. traffic light controller).
7. Interfacing and programming of 8254. (E.g. Timer Programs).
8. Interacting and programming of 8279. (E.g. Display Character, Rolling Display).

8086 PROGRAMMING

1. Simple Programming examples using 8086 Microprocessor.
2. Programming examples using segments.
3. Programming examples using Arithmetic instructions.
4. Programming examples for searching and sorting.

5. Programming examples for Data Block moves.
6. Programming examples for Data Block comparisons.

Suggested books:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and applications with 8085, 5th Edition (2012), Prentice Hall.
2. D.V Hall, Microprocessors and Interfacing, 2nd Edition(2006), McGraw Hill.

Reference Books:

1. Barry B. Brey, The Intel Microprocessor, 8086/8088,80186/80188, 80286, 80386, 80486, Pentium and Pentium pro-processors – Architecture, Programming and interfacing, 8thEdition(2013), Prentice Hall.

Online resources:

1. <http://nptel.ac.in/courses/108107029/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
OPERATING SYSTEMS LAB

Instruction: 2Hrs /week	SEE Marks :50	Course Code : PC421CS
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">• Implement system calls related to files and process• Implement techniques related to CPU Scheduling, Main memory management, Process synchronization and deadlock avoidance and detection	<ol style="list-style-type: none">1. Implement operations on Files and Process by using system calls2. Develop CPU Scheduling mechanisms3. Implement Contiguous memory allocation techniques and Page Replacement techniques4. Design solutions for Inter-Process Communication5. Develop Deadlock handling techniques

Programming Exercise:

1. Implement Shell script programs
2. Implement system calls for
 - i) File system management
 - ii) Process management
3. Implementation of CPU scheduling algorithms (FCSF, SJF, Priority, RR, Multi level)
4. Implement contiguous Memory management techniques
 - i) Best Fit
 - ii) Worst Fit
 - iii) First Fit
5. Implementation of Page Replacement algorithms
 - i) FIFO
 - ii) LRU
 - iii) OPTIMAL

6. Implement Inter-process communication using
 - i) Pipes
 - ii) Message Queues
 - iii) Shared Memory
7. Implementation of Process Synchronization for Bounded buffer, Readers-Writers and Dining philosophers problems
8. Implementation of Deadlock handling
 - i) Resource Allocation Graph
 - ii) Safety Algorithm
 - iii) Resource Request algorithm
 - iv) Wait for graph
9. Build a real operating system kernel by using an open source operating system (Linux) kernel to implement services such as Process Scheduling, Process synchronization, Virtual memory and File system

Suggested Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th Edition (2016), Wiley India.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition (2001), Pearson Education, Asia.
2. Dhananjay, Dhamdhere.M, Operating System-concept based approach, 3rd edition (2009), Tata McGraw Hill, Asia
3. Robert Love: Linux Kernel Development, (2004)Pearson Education
4. Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, 3rd Edition(2013), Pearson Education

Online Resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction: 2Hrs /week	SEE Marks :50	Course Code : PC431CS
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">• Implement solutions for the set of problems by using divide and conquer• Implement solutions for the set of problems by using greedy and dynamic programming• Implement solutions for the set of problems by using backtracking and branch and bound.	<ol style="list-style-type: none">1. Implement sorting , searching and hashing by using basic data structures .2. Apply divide and conquer strategy to implement algorithms for a set of problems.3. Implement algorithms for set of problems using Greedy design strategy.4. Apply dynamic programming to implement algorithms for a set of problems.5. Implement algorithms for set of problems by using backtracking and branch and bound.

Programming Exercise:

1. Implementation of Merge Sort, Quick Sort, Heap Sort, Binary Search and Hashing.
2. Implementation of Traversal on Graphs.
3. Implementation of Traversal on Trees and DAG.
4. Implement Single source shortest path algorithm.
5. Implement Minimum cost spanning tree algorithm.
6. Implement fractional Knapsack algorithm.
7. Implement Optimal merge patterns -Huffman encoding algorithm.

8. Implement Matrix –chain multiplication algorithm with dynamic programming.
9. Implement LCS algorithm and print Longest common subsequence.
10. Implement All-pairs shortest path algorithm.
11. Implement 0/1 Knapsack algorithm.
12. Implement multi-stage graph.
13. Implementation of N-queens problem with back tracking.
14. Implement Graph coloring problem with back tracking.
15. Implement TSP by branch and bound.
16. Implement 0/1 knapsack by branch and bound.

Suggested Books:

1. Horowitz E, Sahni S and Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd Edition(2008), Universities Press

Reference Books:

1. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition(2002), Pearson
2. Kushwaha D. S and Misra A.K, Data structures A Programming Approach with C, Second Edition(2014), PHI.,
3. Gilberg R. F and Forouzan B. A, Data structures: A Pseudocode Approach with C, Second Edition(2007), Cengage Learning
4. Tanenbaum A. M , Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Third Edition(2009), MIT Press
6. Yedidyah Langsam , Moshe J. Augenstein ,Aaron M. Tenenbaum, Data Structures Using C and C++ , Second Edition(2009), PHI

Online Resources :

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos>
2. <http://nptel.ac.in/courses/106106127/>
3. <http://www.nptel.ac.in/courses/106102064>

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS
B.E- IV SEMESTER (2018-19)

B.E- IV SEM OPEN ELECTIVE-III COURSES			
Dept	Title	Code	credits
CIVIL	Disaster Management	OE420CE	2
CSE	Introduction to Python Programming	OE420CS	2
ECE	Sensors for Engineering Applications	OE420EC	2
	Basics of Wireless Communications	OE430EC	2
EEE	Electric Heating and Illumination	OE420EE	2
IT	Introduction to Database Management Systems	OE420IT	2
Mech	Cooling of Electronic Components	OE410ME	2
B.E- IV SEM OPEN ELECTIVE-II COURSES			
CIVIL	Green Buildings	OE410CE	1
CSE	Cyber Security	OE410CS	1
ECE	Medical Electronics	OE 410EC	1
EEE	Non-Conventional Energy Sources	OE410EE	1
IT	Introduction to Software Engineering	OE410IT	1
Mech	Value Analysis and Value Engineering	OE400ME	1

B.E- IV SEM OPEN ELECTIVE-I COURSES			
Dept	Title	Code	credits
CHEM	Electronic engineering materials	OE400CH	1
	Polymer Technology	OE410CH	1
	Industrial Pollution and its Control	OE420CH	1
PHY	Display Devices	OE400PH	1
	Fundamentals of Vacuum technology	OE410PH	1
	Introduction to Non- Destructive Testing	OE420PH	1
B.E- IV SEM OPEN ELECTIVE-II COURSES			
CHEM	Electrochemical Energy Systems	OE430CH	2
	Corrosion Science and Technology	OE440CH	2
PHY	Fundamentals of Cryogenics	OE430PH	2
	Smart Materials and Applications	OE440PH	2
	Fundamentals of thin film Technology	OE450PH	2

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
GREEN BUILDINGS
Open Elective-II (to other Branches)

Instruction :1 Hours/week	SEE Marks : 40	Course Code : OE410CE
Credits :1	CIE Marks : 30	Duration of SEE: 3 Hours

Course Objective:	Course Outcomes
<ul style="list-style-type: none">Learn the principles of the planning and the orientation of the buildings.Acquire the knowledge on various aspects of green buildings.	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Explain the principles of the building planning2. Study the by-laws and provide facilities for rain water harvesting.3. Application of renewable energy system for green building4. Benefit to the environment with the green building technique

UNIT-I

Planning of building: Principles of planning, Relevant building bylaws, site selection for buildings, orientation of buildings, common errors in planning, Provision of rain water harvesting

UNIT-II

Green Building Technologies: 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- Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED), case studies

Suggested Books:

1. Shahane, V. S, "Planning and Designing Building", Poona, 2004.
2. Michael Bauer, Peter Mösele and Michael Schwarz "Green Building – Guidebook for Sustainable Architecture" Springer, 2010.
3. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison "Green Building Handbook" Volume I, Spon Press, 2001.

References Books:

1. MiliMajumdar, "Energy-efficient buildings in India" Tata Energy Research Institute, 2002.
2. TERI "Sustainable Building Design Manual- Volume I & II" Tata Energy Research Institute, 2009.

With effect from the A.Y 2018-19

DEPARTMENT OF CIVIL ENGINEERING
 SYLLABUS FOR B.E. IV-SEMESTER
 DISASTER MANAGEMENT
 Open Elective-III (to other Branches)

Instruction : 2 Hours/week	SEE Marks : 60	Course Code : OE420CE
Credits : 2	CIE Marks : 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>Objectives of this course are to:</i>	<i>Upon the completion of this course the students will be expected to:</i>
1. Know about the state of art of disaster management in world and explore the history of the disasters and comprehend how past events have helped shape the future. 2. Study the various natural and manmade disasters and apply the mitigation measures 3. Expose students to various technologies used for disaster mitigation and management.	1. Attain knowledge on various types, stages, phases in disaster with international & national policies and programmes with reference to the disaster reduction. 2. Understand various types of natural disaster, their occurrence, Effects, Mitigation and Management Systems in India 3. Understand different types of manmade disasters, their occurrence, Effects, Mitigation and Management Systems in India. 4. Explain the utility of geography information systems (GIS), Remote sensing technology in all phases of disaster mitigation and management.

UNIT-I

Introduction – Hazard, vulnerability and risk, Types of disasters , Disaster management cycle, Progress of disaster management in world, vulnerability profile of India, Disaster management act, Disaster management in India

UNIT-II

Natural Disasters – Hydro- meteorological based disasters – Tropical cyclones, floods, drought and desertification zones, Geographical based disasters – Earthquake, Tsunamis, Landslides and avalanches – Causes, Types, effects and Mitigation measures.

UNIT-III

Human induced hazards – chemical industrial hazards, major power breakdowns, traffic accidents, etc.

UNIT-IV

Role of Remote Sensing and Geographical Information Systems (GIS) in Disaster Management: Introduction to remote sensing and GIS, its applications in disaster management.

Suggested Books:

1. **Rajib, S and Krishna Murthy, R.R.(2012) "Disaster Management Global Challenges and Local Solutions", Universities Press, Hyderabad, 2012.**
2. Navele, P & Raja, C.K. (2009), Earth and Atmospheric Disasters Management, Natural and Manmade, B.S. Publications, Hyderabad, 2009.
3. Battacharya, T. Disaster Science and Management, Tata McGraw Hill Company, New Delhi, 2012.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
CYBER SECURITY (open elective-II)
(for other Branches)

Instruction: 1Hr /week	SEE Marks :40	Course Code :OE410CS
Credits :1	CIE Marks: 30	Duration of SEE : 2Hrs

Course objectives	Course outcomes
Students should be able to	At the end of the course, Students will be able to
<ul style="list-style-type: none">Utilize the concepts of cyber security to safeguard from threats and infection spread through the internet	<ol style="list-style-type: none">1. Explain the concepts of confidentiality, availability and integrity2. Explain the basics of fraud techniques used by a hacker3. Explore the common exploitation mechanisms and inspect data sniffing over the network4. Determine the ways an organization attempts to discover threats

UNIT I - CYBER SECURITY FUNDAMENTALS

Network and Security concepts: Information assurance fundamentals, Basic Cryptography, Public key encryption, DNS, Firewalls, Virtualization. Attacker Techniques and Motivations: How hackers cover their tracks, Fraud Techniques, Threat Infrastructure

UNIT II – EXPLOITATION

Techniques to gain foothold: Shellcode, Integer overflow, Stack based buffer overflow, Format String Vulnerabilities, SQL Injection, Web Exploit Tools, Misdirection, Reconnaissance, and Disruption Methods. Malicious Code-Worms, Virus, Rootkits, Spyware, Escalation of privileges, Stealing information – MITM attack.

Suggested Books:

1. James Graham, Ryan Olson, **Rick Howard, "Cyber Security Essentials", Auerbach Publications , CRC Press, 2011**
2. **Mike Shema, "Anti-Hacker Tool Kit (Indian Edition)", Mc Graw Hill, 2014**
3. Cyber Security - Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and SunitBelpure, Publication Wiley , 2011

Online Resources:

1. <https://www.edx.org/micromasters/ritx-cybersecurity>
2. <https://www.coursera.org/specializations/cyber-security>
3. <http://nptel.ac.in/courses/106105031/>

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
INTRODUCTION TO PYTHON PROGRAMMING
(open elective-III for other Branches)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code :OE420CS
Credits :2	CIE Marks: 40	Duration of SEE : 3Hrs

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
<ul style="list-style-type: none">Acquire problem solving skillsDevelop flow chartsLearn programming and solve problems using Python language	<ol style="list-style-type: none">Design python programs using arithmetic expressions and decision makingDesign modular python programs using functionsDesign programs using strings and listDevelop programs using tuples and dictionaries

UNIT-I

Introduction to Python – variables, expressions and statements, order of operations

Conditionals-Modulus operators, Boolean expressions, logical operators, conditional execution, alternative executions, chained conditional, nested conditional

Iteration - while statement

UNIT-II

Functions- function calls, type conversion and coercion, mathematical functions, User-defined functions, parameters and arguments.

Recursion

UNIT-III

Strings – string length, string traversal, string slices and string comparison with examples, strings are immutable, find function, string module

List –list values, accessing elements, list traversal, list length, list membership, list and for loop, list operations with examples

UNIT-IV

Tuples-Mutability, tuple assignment, tuple as return values

Dictionaries- dictionary operations, dictionary methods, aliasing and copying, counting letters using dictionaries

Suggested Books:

1. Downey A, How to think like a Computer Scientist :Learning with Python, 1st Edition(2015), John Wiley
2. Lambert K.A, Fundamentals of Python –First Programs, 1st Edition(2015), Cengage Learning India
3. Perkovic L, Introduction to Computing using Python,2/e, (2015), John Wiley

Reference Books:

1. Stewart Venit and Elizabeth Drake, Prelude to Programming: Concepts and Design, 6th Edition(2015), Pearson India
2. Mark J Guzdial, Introduction to Computing and programming in Python, 3rd Edition(2013), Pearson India
3. Allen Downey, Think Python, 2nd Edition(2015), Shroff Publisher Orielly

Online Resources:

1. <http://nptel.ac.in/courses/117106113/34>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/python-tutorial/>
3. www.scipy-lectures.org/intro/language/python_language.html

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. IV SEMESTER
MEDICAL ELECTRONICS (Open Elective-II)
(for other Branches)

Instruction: 1 Hr /week	SEE Marks : 40	Course Code : OE410EC
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objective:	Course Outcomes
<ol style="list-style-type: none">1. Will study the human body and various physiological systems2. Will understand various transducers used in bio-medical applications3. Will acquire good knowledge about various ICU, Electro surgery and imaging equipment	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Identify the instruments used for various physiological measurements and bio-potential recordings2. Understand the working principles and operation of life supporting and medical imaging systems3. Learn and analyse the advanced hospital equipment used in health care industry.4. Apply different medical imaging techniques for diagnosis purposes.

UNIT – I

Human Body: An overview – the Cell Body fluids – Musculo Skeletal Systems – circulatory system respiratory system – Gastro Intestinal System – Nervous system – Endo Crine System – the body as a control system components of the man instrument system. Sources of Bio electric potentials – Bio-potential electrodes – Electrodes for ECG, EEG, EMG, EOG and ERG.

Bio Signal Acquisition: types of bio signals, noise reduction strategies, physiological signal amplifiers, differential amplifiers, isolation amplifiers, chopper stabilized amplifiers, multiple input circuits,

UNIT - II

Bio Medical Instruments/Equipment: Operation theatre: surgical diathermy - OT table - OT lamps – Anesthesia Machine – Multi-para patient monitor.

Therapeutic Equipment: Short wave diathermic, microwave diathermy, ultrasound diathermy - bladder simulators.

Life supporting: Ventilators, pace makers, dialysis machines.

Specialized Medical Equipment: Defibrillator, blood gas analyser blood cell counter – multi channel ECG and EEG m/c – foetal doppler and foetal monitor – Heart-lung machine.

Medical Imaging Systems: Operation and working principles – X-ray m/c – C-arm – CT Scanner – Ultra Sound Scanner – Colour Doppler – Gamma Camera – MRI – OPG – Pet Scanner – Video Endo scope.

Suggested Reading:

1. **Joseph J.Carr, John M. Brown** "Introduction to Biomedical Equipment Technology", 4/e, 2001.
2. **Leslie Cromwell, Fred J. Weibell, Erich A. P Feiffer,** "Biomedical Instruments and Measurements", 2/e, PHI.
3. **RS Khandpur** "Hand Book of Bio Medical Instrumentation", 3/e, McGraw Hill Education (I) Pvt. Ltd., 2014.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. IV SEMESTER
SENSORS FOR ENGINEERING APPLICATIONS (Open Elective-III)
(for other Branches)

Instruction: 2 Hrs /week	SEE Marks : 60	Course Code :OE420EC
Credits : 2	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objective:	Course Outcomes
<ol style="list-style-type: none">1. The student will come to know the various stimuli that are to be measured in real life instrumentation.2. He will be able to select the right process or phenomena on which the sensor should depend on3. He will be aware of the various sensors available for measurement and control applications.	<p>At the end of the course, students will be able to:</p> <ol style="list-style-type: none">1. Appreciate the operation of various measuring and control instruments which they encounter in their respective fields.2. Visualize the sensors and the measuring systems when they have to work in areas of interdisciplinary nature and also think of sensors and sensors systems when a for a new situation they encounter in their career.3. Identify & select the right process or phenomena on which the sensor should depend on.4. Know various stimuli that are to be measured in real life instrumentation.

UNIT - I

Introduction: What is a sensor and what is a transducer? Electrical sensor – need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors.

General characteristics and specifications of sensors – Implications of specifications uses of sensors – measurement of stimuli - block diagram of sensor system. Brief description of each block.

UNIT - II

Sensors for mechanical systems or mechanical sensors - Displacement - acceleration and force - flow of fluids – level indicators – pressure in fluids – stress in solids. Typical sensors - wire and film strain gauges, animometers, piezo electric and magnetostrictive accelerometers, potentiometric sensors, LVDT.

UNIT - III

Thermal sensors – temperature – temperature difference – heat quantity.
Thermometers for different situation – thermocouples thermistors – color pyrometry.

Optical sensors: light intensity – wavelength and color – light dependent resistors, photodiode, photo transistor, CCD, CMOS sensors.

Radiation detectors : radiation intensity, particle counter – Gieger Muller counter (gas based), Hallide radiation detectors.

UNIT - IV

Magnetic sensors: magnetic field, magnetic flux density – magneto resistors, Hall sensors, super conduction squids.

Acoustic or sonic sensors: Intensity of sound, frequency of sound in various media, various forms of microphones, piezo electric sensors.

Electrical sensors: conventional volt and ammeters, high current sensors, (current transformers), high voltage sensors, High power sensors.

High frequency sensors like microwave frequency sensors, wavelength measuring sensors.

MEMs and MEM based sensors.

Suggested Reading:

1. **Doebelin, "Measurement Systems: Application and Design", McGraw Hill Kogakusha Ltd.**
2. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim **"Microsensors, MEMS and Smart Devices", New York: Wiley, 2001.**
3. Henry Bolte, **"Sensors – A Comprehensive Sensors", John Wiley.**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. IV SEMESTER
BASICS OF WIRELESS COMMUNICATIONS (Open Elective-III)
(for other Branches)

Instruction: 2 Hrs /week	SEE Marks : 60	Course Code :OE430EC
Credits : 2	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objective	Course Outcomes
1. To provide fundamental principles and concepts required to understand the wireless communication systems.	At the end of the course, students will be able to: 1. Demonstrate the fundamental knowledge of wireless communication systems. 2. Differentiate between large scale & small scale fading channel effects. 3. Calculate the path loss, coverage area and power budgeting related aspects. 4. Acquaint with recent advancements and developments in the area of wireless communication systems.

UNIT - I

Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications, Examples of Wireless Communications Systems. The Cellular Concept – System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving Coverage and Capacity in Cellular Systems.

UNIT - II

Mobile Radio Propagation: Large Scale Path Loss: Introduction to Radio wave Propagation, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering. Mobile Radio Propagation: Small Scale Fading and Multipath: Small Scale Multipath Propagation, Small – Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading.

UNIT - III

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA).

UNIT - IV

Wireless Systems and Standards: Global System for Mobile (GSM), CDMA Digital Cellular Standard (IS-95), Bluetooth and Personal Area Networks (PANs).

Suggested Reading:

1. Theodore S. Rappaport, *Wireless Communications Principles and Practices*, 2nd edition, Pearson Education.
2. David Tse, Pramodh Viswanath, *Fundamentals of Wireless Communication*, 2005, Cambridge University Press.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E IV- SEMESTER
NON-CONVENTIONAL ENERGY SOURCES (Open Elective –II)

Instruction: 1Hrs /week	SEE Marks :40	Course Code :OE410EE
Credits :1	CIE Marks: 30	Duration of SEE : 2Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state-of-the-art energy systems.	After completion of the course, students will be able to: 1. Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells. 2. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation. 3. Explore the concepts involved in wind energy conversion system by studying its components, types and performance. 4. Illustrate ocean energy and explain the operational methods of their utilization. 5. Acquire the knowledge on Geothermal energy.

UNIT-I:

Need for Non-conventional energy sources, Types of Non-Conventional energy sources

Fuel cells: Definition-Design and Principle of operation with special reference to H₂O₂-Solid oxide electrolyte cells-Advantages and Disadvantages of fuel cells-Applications of Fuel cells.

Solar Energy: Solar radiation and its measurements-Solar energy collectors: Flat Plate and Concentrating Collectors- solar pond -Applications of Solar energy.

Biomass Energy: Definition-Biomass conversion technologies.

UNIT-II:

Wind Energy: Nature of wind-Basic components of Wind Energy Conversion System(WECS)-Wind energy collectors: Horizontal and vertical axis rotors-Advantages and Disadvantages of WECS - Applications of wind energy.

Ocean Energy: Ocean thermal electric conversion (OTEC) methods: Open cycle and Closed cycle- Principles of tidal power generation-Advantages and limitations of tidal power generation.

Geothermal Energy: Types of Geothermal resources- Applications of Geothermal Energy.

Suggested Reading:

1. G.D. Rai, *Non-Conventional Energy Sources* ,Khanna Publishers, New Delhi, 2011.
2. B H KHAN, *Non-Conventional Energy Resources*, McGraw Hill, 2nd Edition, 2009.
3. Ashok Desai V, *Non-Conventional Energy*, Wiley Eastern Ltd, 1990.
4. Mittal K.M, *Non-Conventional Energy Systems*, Wheeler Publishing Co. Ltd, 1997.
5. Ramesh R, Kurnar K.U, *Renewable Energy Technologies*, Narosa Publishing House, New Delhi, 1997.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E IV- SEMESTER
ELECTRIC HEATING AND ILLUMINATION (Open Elective –III)

Instruction: 2 Hrs /week	SEE Marks :60	Course Code :OE420EE
Credits :2	CIE Marks: 40	Duration of SEE : 3Hrs

Course objective: 1. This subject gives a comprehensive idea in utilization of electrical power such as electric heating, electric welding and illumination	Course Outcomes: At the end of the course, students will be able to: 1. Identify a heating schemes for heating application 2. Welding schemes for welding application 3. Describe and measure units illumination. 4. Identify various lamps and fittings for street, factory and flood lighting schemes.
---	--

UNIT-I

Industrial Heating: Advantages and methods of electric heating. Description, operation and performance of resistance ovens, Design of elements. Core type furnace, Coreless type furnace, High frequency eddy current heating, Dielectric heating, Arc furnace.

UNIT-II

Electric Welding: Resistance welding, Welding transformer and its rating. Various types of Electric arc welding and Electric resistance welding.

UNIT-III

Illumination fundamentals: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, **Solid angle, Lighting calculations, Determination of M.S.C.P, Rouseau's** construction

UNIT-IV

Various illumination methods, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps, Fluorescent lamps, LED Lamps, Starting and power factor corrections, Stroboscopic effects, Noen signs, Application to factory lighting, Street lighting and Flood lighting.

SUGGESTED READING:

1. Art & Science of Utilization of Electrical Energy-Partab,Dhanpat Rai & Sons
2. Utilization of Electrical Power including Electric drives and Electric traction – J.B.Gupta, S.K. Kataria& Sons
3. Generation, Distribution and Utilization of Electrical Energy – C.L.Wadhwa New Age international (P) Limited,1997

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO SOFTWARE ENGINEERING(Open Elective-II)
(for other Branches)

Instruction: 1 Hr /week	SEE Marks : 40	Course Code : OE410IT
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objectives	Course Outcomes
The course will enable the students to:	At the end of the course student will be able to:
Understand the various SDLC models	<ol style="list-style-type: none">1. Apply SW engineering methods, practices and their appropriate application.2. Analyze the software engineering layered technology and Process frame work.3. Demonstrate the significance of software requirements.4. Develop the ability to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project..

UNIT- I

Software Engineering framework and process models: Software Engineering, Process Frameworks, Process pattern, Perspective Models, Evolutionary Process Models, Agile Process Models

UNIT-II

Requirements Engineering: Requirements Engineering and Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Creating a Behavioral Modeling.

Learning Resources:

1. Roger S.Pressman, Software Engineering: A Practitioner's Approach, Seventh Edition, McGraw Hill, 2009.
2. Pankaj Jalote An Integrated Approach To Software Engineering, Third Edition, Narosa Publishinghouse.2008
3. James F.Peter, Witold Pedrycz, Software Engineering. An Engineering Approach to John WileyInc.,2000
4. Ali Behforoz and Fedric J. Hadson, Softwre Engineering Fundamentals, Oxford University Press, 1997.
5. <http://www.nptelvideos.in/2012/11/softwre-engineering.html>

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
(Open Elective-III)
(for other Branches)

Instruction: 2 Hrs /week	SEE Marks : 60	Course Code :OE420IT
Credits : 2	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
The course will enable the students to:	At the end of the course student will be able to:
The objective of the course is to explain the need of database for storing, accessing and updating the data, eliminate redundant data, allow multiple users to be active at one time and protect the data from unauthorized access.	<ol style="list-style-type: none">1. Develop ER model for a given problem and understand functional components of the DBMS.2. Devise queries using SQL.3. Design a normalized database schema using different normal Forms.4. Comprehend the properties of a transaction and understand the concept of transaction processing.

UNIT – I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Databases Design, Database Architecture.

Database Design and the E-R Model: Overview of the Design Process, The E-R Model, Constraints, E-R Diagrams, Reduction of E-R model to relational schema.

UNIT – II

Relational Algebra: Fundamental Relational-Algebra Operations.

Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Joined Relations, Integrity Constraints.

UNIT – III

Relational Database Design: Features of Good Relational Design, Functional-Dependency Theory, Normalization-Decomposition Using Functional Dependencies.

UNIT – IV

Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability.

Learning Resources:

1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, Database System Concepts, Sixth Edition, McGrah-Hill International Edition, 2010.
2. Ramakrishnan, Gehrke, Database Management Systems, Third Edition, McGrah-Hill International Edition, 2003.
3. ElmasriNavathe, Somayajulu, Fundamentals of Database System, Fourth Edition, Pearson Education, 2006.
4. <http://www.nptelvideos.in/2012/11/database-management-system.html>

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
COOLING OF ELECTRONIC COMPONENTS (Open Elective -III)
(for other Departments)

Instruction : 2 Hours/week	SEE Marks : 60	Course Code : OE410ME
Credits : 2	CIE Marks: : 40	Duration of SEE : 3 Hours

Course Objective	Course Outcomes
The objectives of this course are to: expand the scope of the engineer to include the importance of effective heat transfer in electronic equipments. This should include the heat transfer processes occurring in electronic equipment, the methods of cooling and finally the analysis of thermal failure for electronic components.	On completion of the course the student will be able to: 1. analyse heat transfer processes involved in cooling of electronics components. 2. analyse and define solution for thermal failure of electronic components. 3. identify the best cooling method for each individual application. 4. design of heat sinks and heat pipes for cooling purpose.

UNIT – I

Introduction To Electronics Cooling: Needs, Goals. Temperature effects on different failure modes, Fundamentals of heat transfer: Conduction, Convection and Radiation, Electronic equipment for Airplanes, Missiles, Satellites and spacecraft; electronic equipment for Ships and Submarines; electronic equipment for Communication systems and Ground support system; chassis and circuit boards cooling.

UNIT – II

Heat Transfer Principles in Electronics Cooling-I: Conduction Heat Transfer, Contact resistance, Extended surfaces, Transient Conduction

UNIT – III

Heat Transfer Principles in Electronics Cooling-II: Natural Convection in Electronic Devices, Forced Convection Heat Transfer, Forced Convection Correlations, Radiation Heat Transfer.

UNIT – IV

Electronics Cooling Methods in Industry: Heat Sinks, Heat Pipes and its selection.

Learning Resources:

1. Dave S. Steinberg, "Cooling Techniques for Electronic Equipment", Second Edition, John Wiley & Sons, 1991.
2. Frank P. Incropera, "Introduction to Heat Transfer ", Fourth Edition, John Wiley, 2002.
3. Yunus A. Cengel, Heat Transfer: A Practical Approach. McGraw-Hill, 2003.
4. YounesShabany, Heat Transfer: Thermal Management of Electronics, CRC Press Inc, 2010.
5. Chapman, A. J., "Heat Transfer", Macmillan Publishing Company, New York, 1974.

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
VALUE ANALYSIS AND VALUE ENGINEERING (Open Elective -II)
(for other Departments)

Instruction: 1 Hour/week	SEE Marks : 40	Course Code: OE400ME
Credits: 1	CIE Marks: 30	Duration of SEE: 2 Hours

Course Objectives	Course outcomes
The objectives of this course are to: Understand the importance of value engineering and its application in their respective fields and its implementation.	On completion of this course, students will be able to: 1. choose the Concept of value engineering in their respective program to improve overall effectiveness. 2. Examine orientation and information phases of value engineering to provide training and analyse information. 3. Study the creative, evaluation and recommendation phases for implementation of value analysis. 4. perceive the concept of auditing process and its certification of value engineering.

UNIT-I

Introduction: Meaning of Value Engineering (VE), Difference from other initiatives, Value and its types, Relationship between value vis-à-vis person, time and environment, History of Value Engineering / Value Analysis / Value Management, World bodies of Value Engineering & their activities, Multi-disciplinary team approach in Value Engineering study.

VALUE ENGINEERING JOB PLAN: Introduction, comparison of job plans of various value engineering. Finance and human relations in VE.

ORIENTATION PHASE: training associates in Value Analysis and Value Engineering (VAVE). Different trainings and certifications available in VAVE, Method to conduct VAVE studies.

INFORMATION PHASE: information needed for VAVE, Method to collect and analyze information, ABC Analysis, Pareto Analysis, Breakeven analysis.

UNIT-II

FUNCTION ANALYSIS PHASE: Breakdown item into elements and sub-elements, questions to be asked, introduction to functions, practice session, types of functions (use and sell function), levels of function (basic and secondary), identify various functions, elements of cost, procedure for cost allocation, cost allocation to function, concept of worth, process flow for determining worth, discussions on worth, meaning of FAST, use of FAST, different types of FAST. Ground rules of FAST, FAST diagram.

CREATIVE PHASE: Definition of creativity, misconceptions about creativity, introduction to creative techniques like TRIZ, 3P, lateral adoption and others

EVALUATION PHASE: selection of criteria, feasibility analysis, weighted evaluation methods, decision matrix.

RECOMMENDATION PHASE: Need for recommendation, method to make presentation, impact analysis and justification report, implementation plan, presentation skills.

IMPLEMENTATION PHASE: Detailed design, verification and validation, certification, change implementation.

AUDIT PHASE: Need for audit, types of audit, how to do audit.

Learning Resources:

1. S.S.Iyer: Value Engineering: A How to Manual, New age International Publisher- 2nd edition 2009
2. Anil Kumar Mukhopadhaya: Value Engineering Mastermind: From Concept to Value Engineering Certification. SAGE, New Delhi
3. Del. L.Yonker: Value engineering analysis and methodology, CRC press, New York
4. **M.A.Bulsara, Dr.H.R. Thakkar, "Product Design And Value Engineering", charotar publishers, 1st edition 2015.**
5. Lawrence D.Miles: Techniques of Value Analysis and Engineering: 3rd Edition New York
6. K.R.Chari : Value engineering

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
DISPLAY DEVICES (Open Elective-I)

Instruction : 1 Hours / week	SEE Marks : 40	Course Code : OE400PH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">Basics of luminescence and display devices	At the end of the course students will be able to <ol style="list-style-type: none">List out different types of luminescence mechanismsClassify types of display devicesExplain working of some display devicesCompare the output intensities emitted by LED, OLED et

UNIT-I :

Introduction to Luminescence, fluorescence, phosphorescence, principle and classification, luminescence mechanisms for various types and its applications.

UNIT-II :

Classification of display devices, working of Liquid crystal displays, comparison of LED and LCD, dynamic scattering display, OLEDs and their applications.

SUGGESTED BOOKS:

- S. W. S. McKeever, Thermoluminescence of Solids, Cambridge University Press, 1988
- Adrian Kita, Luminescent Materials and Applications, John Willey & Sons

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF VACCUUM TECHNOLOGY (Open Elective-I)

Instruction : 1 Hours / week	SEE Marks :40	Course Code : OE410PH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">Fundamentals of vacuum technology	At the end of the course students will be able to <ol style="list-style-type: none">Define basic vacuum technology related notations.Enumerate methods production of vacuum.List out different vacuum gauges and their limitations.Identify types of vacuum leaks.

UNIT-I:

Definition of vacuum, units of vacuum Vacuum ranges, evaporation theory- rate of evaporation, Hertz- Knudsen equation, types of evaporation, adsorption, desorption, Production of Vacuum, vacuum measurement, Vacuum pumps: pumping speed, throughput, Rotary oil pump, multi stage rotary pumps, diffusion pump, cryo-pump. Vacuum applications in various areas of engineering.

UNIT-II:

Measurement of vacuum, Vacuum gauges: thermocouple gauge, Pirani gauge, ionization gauge, Penning gauge, leak detection, Leak detection methods

SUGGESTED BOOKS:

1. M. N. Avadhanulu and P.G. Kshirsagar, Textbook of Engineering Physics, Revised Edition, S.Chand, 2015
2. Dr. V.V. Rao, Dr. T.B. Gosh, Dr. K.L. Chopra, Vacuum Science and Technology, Allied Publishers, New Delhi, 2008
3. John F. O'Hanlon A User's Guide to Vacuum Technology, Jhon Willey and sons, 2006

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO NON- DESTRUCTIVE TESTING (Open Elective-I)

Instruction :1 Hours / week	SEE Marks :40	Course Code : OE420PH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">Basics of acoustics and non-destructive testing	At the end of the course students will be able to <ol style="list-style-type: none">1. Illustrate non-destructive testing2. Explain production mechanisms of ultrasonics3. Differentiate various methods of non-destructive testing4. Compare the non-destructive testing methods and identify suitable one for given application.

UNIT-I:

Ultrasonic waves and their properties, Production of ultrasonics by Piezo-electric and magnetostriction methods, Detection of ultrasonics, Acoustic grating; ultrasonic velocity measurement, cavitation, Applications: ultrasonic cleaning, Echo cardiogram (ECG), ultrasonic imaging.

UNIT-II:

Introduction to non- destructive testing (NDT)- objectives of NDT- advantages- types of defects-methods of NDT: Visual inspection, liquid penetration testing, acoustic detection: pulse echo method, ultrasonic inspection methods, Radiography: x-ray and gamma ray, Electromagnetic: eddy current testing, Acoustic Emission, Ultrasonic Testing (UT)

SUGGESTED BOOKS:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage learning, 2014
2. M. N. Avadhanulu and P.G. KshirSagar, Textbook of Engineering Physics: Revised Edition, S.Chand, 2015
3. R K Gaur and S L Gupta, Engineering Physics, Dhanpat Rai, 2012

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF CRYOGENICS (Open Elective-II)

Instruction :2 Hours / week	SEE Marks :60	Course Code : OE430PH
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">• Liquefaction of gases• Fundamentals of cryogenics	At the end of the course students will be able to <ol style="list-style-type: none">1. Define ranges of liquid temperatures2. Narrate regenerative and cascade cooling processes.3. Enumerate properties and use of cryogenic fluids.4. Explore applications and use of cryostats and cryocoolers.

UNIT-I:

Introduction to low temperature Physics- Porous plug experiment: Joule Thomson effect, Theory of porous plug experiment- J-K effect for a **Van der Waal's gas. Relation between inversion temperature, Boyle temperature and critical temperature.**

UNIT-II:

Gas-Liquefaction-Regenerative cooling and cascade process- Liquefaction of air: Linde Process, Liquefaction of hydrogen, nitrogen, helium and oxygen.

UNIT-III:

Properties of cryogenic helium and Properties of Materials at Cryogenic Temperatures.

UNIT-IV:

Adiabatic demagnetization, practical applications of low temperatures, super fluidity Liquid He-II and He-III cryostat- Cryocoolers, Cryogenic Insulations-applications.

SUGGESTED BOOKS:

1. D.S. Mathur, Heat and thermodynamics, S. Chand & Co, 2008
2. MamataMukhopadhyay, Fundamentals of Cryogenic Engineering, PHI, 2010

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
SMART MATERIALS AND APPLICATIONS (Open Elective-II)

Instruction :2 Hours / week	SEE Marks :60	Course Code : OE440PH
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">• Essentials of smart materials• Different types of smart materials	At the end of the course students will be able to <ol style="list-style-type: none">1. List out various properties of functional materials2. Identify smart materials based on properties and their appropriate usage.3. Write different types of smart materials4. Categorize suitable alloys for specific application.

UNIT I :

Introduction to functional materials, ferroelectricity, piezo electricity, pyroelectricity, Magnetostriction. Properties of smart materials such as piezo electric, magneto-strictive, electro-strictive, thermos-responsive

UNIT-II :

Electrochromic materials, photochromic materials, thermo-chromic materials, thermoelectric materials, smart gels, electro-rheological (ER) and Magnetorheological MR fluids

UNIT III :

Introduction to metal alloys, classification of metal alloys as ferrous and non-ferrous alloys. Properties and applications of ferrous and non-ferrous alloys.

Introduction to shape memory alloys (SMA)- advantages and disadvantages of SMAs- Austenite, martensite, shape memory effect and types of shape memory effects- temperature transformation

UNIT IV:

Properties and characteristics of engineering SMAs - Ni-Ti shape memory alloy, Cu-based shape memory alloys: Cu-Zn-Al, Cu-Al-Ni, ferromagnetic shape memory alloys Applications of SMAs.

SUGGESTED BOOKS:

1. K. Otsuka and C. M. Wayman, Shape memory Alloys, Cambridge University Press, 1999
2. Dimitris C. Lagoudas Shape Memory Alloys: Modeling and Engineering Applications, Springer, 2013
3. Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan, Smart Material Systems and MEMS, John Wiley & Sons, 2006

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF THIN FILM TECHNOLOGY (Open Elective-II)

Instruction :2 Hours / week	SEE Marks :60	Course Code : OE450PH
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course objectives	Course outcomes
Students will be able to learn <ul style="list-style-type: none">• Fundamentals of thin film technology• Properties and preparation mechanisms	At the end of the course students will be able to <ol style="list-style-type: none">1. Differentiate bulk materials and thin films2. Explore growth process of thin films.3. List out various thin film preparation techniques.4. Narrate properties of thin films

UNIT-I:

Classification of films- nucleation and growth- nucleation theories: capillarity and atomistic models, substrate effect, film thickness effect.

UNIT-II:

Thin film deposition techniques- simple thermal evaporation-electron beam evaporation-sputtering (d.c and a.c), flash evaporation, Laser ablation- spin coating- molecular beam epitaxy- Film thickness measurement- ellipsometry, Fizeu (Tolonsky) technique, quartz crystal oscillator techniques.

UNIT-III:

Electrical conduction in metallic films- Continuous and discontinuous films, electrical, optical and dielectric properties of thin films

UNIT-IV:

fabrication of thin film resistor, capacitor, diode, anti-reflection coatings, gas sensors and temperature sensors.

SUGGESTED BOOKS:

1. Kasturi Chopra Thin Film Device Applications, Mac Graw Hill, New York, 2012
2. A. Goswami, thin film fundamentals, New age international, 2006
3. K.L. Chopra, thin film phenomenon, Mac Graw Hill, New York, 1990

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
ELECTRONIC ENGINEERING MATERIALS (Open Elective-I)

Instruction : 1 Hours / week	SEE Marks : 40	Course Code : OE400CH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students:	At the end of the course students should be able to:
<ol style="list-style-type: none">1. To familiarize with various types of liquid crystals, their chemical constitution and behavior2. To acquaint with different types of sensors and chemistry involved in them3. To discuss the conductance in polymers and mechanism of conductance in undoped and doped polymers	<ol style="list-style-type: none">1. Explain the classification, types and applications of liquid crystals2. Discuss the principles, mechanism and applications of potentiometric and amperometric sensors3. Explain the principle, mechanism and applications of fluorophore based, chromophore based and enzyme based fibre optic biosensors4. Discuss the mechanism of conduction in undoped and doped polymers and applications of conducting polymers

UNIT-I: Liquid Crystals

Introduction, Classification: Thermotropic and Lyotropic liquid crystals. Chemical constitution & liquid crystalline behavior. Molecular ordering in liquid crystals: Nematic, Smectic and Cholesteric. Applications.

UNIT-II: Conducting Polymers and Sensors

- a) Conducting Polymers: Introduction, Classification: Extrinsic and Intrinsic Conducting Polymers. Mechanism of conduction of doped and undoped polyacetylene & Polyaniline. Applications.
- b) Sensors: Introduction, Potentiometric sensors, Amperometric sensors, Fluoride-ion-selective electrode. Fluorophore and Chromophore based Fiber-optic Biosensors. Enzyme Based Nonmediated Fiber Optic Biosensors.

Suggested Reading:

1. **P.C.Jain and Monica Jain, "Engineering Chemistry",** Dhanpat Rai Pub, Co., New Delhi (2002)
2. **S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd.,** New Delhi (2006).

5. Chemistry of Engineering Materials by R.P Mani and K.N.Mishra, CENGAGE learning
6. A textbook of Polymer Science: Fred, Billmeyer Jr., Wiley India Third edition.
7. Chemistry of Advanced Materials: CNR Rao, RSC Publication
8. **Billmeyer F. W., "Text book of Polymer Science", Wiley-Inter Science, New York, 2002.**
9. **Arora M. G., Singh M and Yadav M.S, "Polymer Chemistry", Anmol Publications, New Delhi, 2003.**

Online resources:

1. www.nptel.ac.in
2. <http://ndl.iitkgp.ac.in>
3. <http://ocw.mit.edu>

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
POLYMER TECHNOLOGY (Open Elective-I)

Instruction : 1 Hours / week	SEE Marks : 40	Course Code : OE410CH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students:	At the end of the course students should be able to:
1. To familiarize with various types of polymers and polymerization methods and effect of their structure on properties. 2. To acquaint with different types of moulding techniques. 3. To discuss the reinforced plastics and biomedical applications of polymers	1. Explain the classification and types of polymerization methods 2. Discuss the moulding constituents and moulding techniques. 3. Discuss the different polymer blends and engineering plastics. 4. Choose the polymers for different applications.

UNIT-I: Introduction, classification of polymers, methods of polymerization-Condensation polymerization (High temperature and low temperature methods), addition polymerization-bulk polymerization, solution polymerization, emulsion polymerization and suspension polymerization. Effect of polymer structure on properties.

UNIT-II: Moulding constituents of plastic, moulding techniques-Compression moulding, injection moulding, and extrusion moulding. Reinforced plastics, polymer blends and alloys, engineering plastics-polyamides, polycarbonates, polyurethanes. Polymers in medicine, biomedical applications of polymers.

Suggested Reading:

1. **P.C.Jain and Monica Jain**, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. **Shasi Chawla**, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi (2008).
3. **S.S. Dara** "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
4. Chemistry of Engineering Materials by R.P Mani and K.N.Mishra, CENGAGE learning

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
INDUSTRIAL POLLUTION PREVENTION AND CONTROL(Open Elective-I)

Instruction :1 Hours / week	SEE Marks :40	Course Code : OE420CH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	At the end of the course students should be able to:
1. An overview of pollution in industries 2. Principles of various processes the treatment of air and water pollution	1. Explain the causes of pollution. 2. Describe the various sources of pollution. 3. Understand the effects of uncontrolled emissions. 4. Apply various methods to dispose the waste and minimize the pollution.

UNIT-I:

Introduction, types of industrial waste, definition of pollutant, air pollutants- gases, hydro carbon pollutants, particulates - inorganic and organic particulates- effects of particulate pollutants, chlorofluro carbons(CFC)- cause of ozone depletion- harmful effects of cfc, photo chemical smog, air pollutant control methods: particulate emission control-gravitational setting chambers-cyclone separators, fabric filters, electrostatic precipitators.

UNIT-II:

Water pollution: Definition of water pollution, types of water pollutants-Inorganic pollutants, toxic metals, organic pollutants, detrimental effects of Inorganic pollutants, toxic metals and organic pollutants, water pollution control methods-primary and secondary treatment.

Treatment and disposal of industrial wastes, treatment of wastes or effluents with organic impurities, treatment of wastes or effluents with inorganic impurities, the nature, effect and treatment of some important chemical wastes.Case study.

Suggested Reading:

1. **B K Sharma**, "Industrial Chemistry", GOEL publishing house, Meerut.
2. **Pandey.G.N and Carney.G.C**, "*Environmental Engineering*", Tata McGrawHill, New Delhi,1989
3. **Rose.G.R.D**, "*Air pollution and Industry*", Van Nostrand Reinhold Co., NewYork 1972
4. **Freeman HM**, "Industrial pollution prevention hand book", McGraw Hill.
5. James **G Mann and Liu Y A**, "Industrial water reuse and waste water minimization, McGraw Hill.

Instruction : 2 Hours / week	SEE Marks : 60	Course Code : OE430CH
Credits : 2	CIE Marks : 40	Duration of SEE : 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	At the end of the course students should be able to:
6. To introduce the various terms to understand the efficiency of batteries. 7. To know the relevant materials required for the construction of primary and secondary batteries. 8. To familiarize with the reactions involved during charging and discharging processes. 9. To focus on the need of fuel cells and the concept of their construction and functioning 10. To emphasize on the merits and demerits of each type of battery.	1. Discuss the construction, electrochemistry, technology and applications of selected primary batteries 2. Discuss the construction, electrochemistry, technology and applications of few secondary batteries 3. Explain the working principle, electrochemistry, technology and applications of prominent fuel cells 4. Choose a suitable battery or a fuel cell for a given application 5. Evaluate different batteries or fuel cells in order to select a suitable battery or fuel cell for a given application

Unit-I: Batteries- Fundamentals

Types of cells: Reversible and Irreversible cells, Primary, Secondary and Reserve batteries.

Battery characteristics: Free energy change, Electromotive force of battery, Ampere-Hour, Capacity, Power, Power density, Energy density, Efficiency, Cycle life, Tolerance to service conditions, Performance characteristics.

Unit-II: Primary Batteries

Construction, electrochemistry and technology of Zinc-Air Battery, Nickel metal hydride battery,

Primary lithium batteries: Soluble Cathode Cells, Solid Cathode Cells- Lithium Manganese dioxide, Lithium-Vanadium Pentoxide battery, Solid electrolyte cells- Lithium polymer electrolyte Battery- Applications.

Unit-III: Secondary Batteries

Construction, electrochemistry and technology of Maintenance Free Lead Acid battery (MFLA), Valve Regulated Lead Acid battery (VRLA), Absorbed

Glass Mat Lead Acid battery (AGMLA). Nickel-Cadmium battery, Reserve battery.

Secondary Lithium batteries: Liquid organic electrolyte cells, polymer electrolyte cells, lithium ion cells, applications.

Unit –IV: Fuel Cells

Introduction, classification based on temperature and nature of electrolyte. Working principle, components, applications and environmental aspects of Alkaline fuel cell (AFC)- Hydrogen-Oxygen alkaline fuel cell, Methyl alcohol - Oxygen alkaline fuel cell, Phosphoric acid fuel cell (PAFC), Molten carbonate fuel cell (MCFC), Polymer Electrolyte membrane Fuel cell (PEMFC), Solid oxide fuel cell (SOFC).

Suggested Reading

1. **P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)**
2. **S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).**
3. **Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.**
4. Chemistry of Engineering Materials by R.P Mani and K.N.Mishra, CENGAGE learning
5. **Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).**
6. **Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.**
7. **Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993**

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
CORROSION SCIENCE AND TECHNOLOGY (Open Elective-II)

Instruction ; 2 Hours / week	SEE Marks : 60	Course Code : OE440CH
------------------------------	----------------	-----------------------

Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours
OBJECTIVES	OUTCOMES	
The course will enable the students :	At the end of the course students should be able to:	
<ol style="list-style-type: none"> To acquaint with the causes and factors influencing the rate of corrosion To understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact To familiarize with various preventive methods of corrosion such as cathodic protection, use of inhibitors, coatings, etc. To know various industrial methods like electroplating, electroless plating. 	<ol style="list-style-type: none"> Explain different types of corrosion with suitable examples Analyze the given case study and diagnose the type of corrosion in a given corrosion problem Discuss different factors that affect corrosion and passivation of metals Select a suitable metallic coating for corrosion control of the equipment in a given application Explain the mechanism by which organic coatings and inhibitors control corrosion of metals Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control 	

UNIT-I: Chemical and Electrochemical Corrosion

Introduction - gravity, cause, Chemical and Electrochemical corrosion, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion, Galvanic corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Differential aeration corrosion -pitting, water line corrosion & crevice corrosion, stress corrosion, corrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron (Pourbaix Diagram) and polarization curve of iron, application of Pourbaix diagram for corrosion mitigation.

Factors influencing corrosion

a. Nature of metal: Relative position of metal in galvanic series, Over voltage, Relative areas of anode & cathode and Nature of corrosion product.

b. Nature of environment: Temperature, pH and Humidity.

UNIT-II: Corrosion Control by Metallic Coatings

Metallic coatings: Types - anodic & cathodic. Pre treatment of surface of base metal. Methods of application of metallic coatings: Hot dipping-galvanization - applications of galvanized RCC steel bars. Cladding, Electro plating & Electroless plating- Principle and their differences.

Electroplating of Cu coating on Fe, Electroless plating of Ni coating on Insulators, Preparation of PCB using Electroless plating.

UNIT-III: Corrosion Control by Inhibitors and Organic Coatings

Corrosion Inhibitors: Anodic, Cathodic and Vapour phase inhibitors.

Organic Coatings: Paints – constituents and their functions. Vitreous enamel coatings. Varnishes. Super hydrophobic and self healing coatings. Epoxy coatings on RCC steel bars- Impervious coatings.

UNIT-IV: Corrosion Control by Cathodic Protection and Surface Conversion

Cathodic protection: Principle, Sacrificial Anodic Protection (SAP), Impressed Current Cathodic Protection (ICCP). Application of Cathodic protection for bridges, ship hulls and underground pipelines.

Surface conversion coatings: Carburizing, Nitriding, Cyaniding.

Suggested Reading:

1. **1.P.C.Jain and Monica Jain**, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. **S.S. Dara** "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
3. Chemistry of Engineering Materials by R.P Mani and K.N.Mishra, CENGAGE learning
4. **Shasi Chawla**, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
5. Principles and prevention of corrosion: Denny A Jones, Prentice Hall, 1996.
6. **Derek Pletcher and Frank C. Walsh**, "Industrial Electrochemistry", Chapman and Hall, New York, 1993
7. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering
8. Corrosion Engineering: Mars G Fontana, Mc Graw Hill, 1987

Online resources:

1. www.nptel.ac.in
2. <http://ndl.iitkgp.ac.in>
3. <http://ocw.mit.edu>