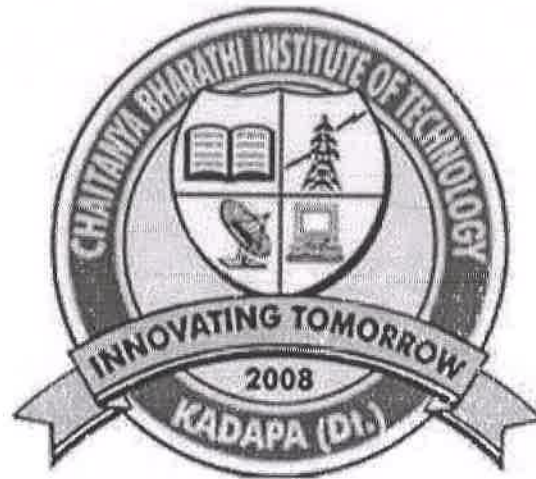# CHAITANYA BHARATHI INSTITUTE OFTECHNOLOGY
(AUTONOMOUS)

(An Autonomous College under JNTUA, Anantapuramu,
Approved by AICTE, Accredited by NBA, Accredited by NAAC with 'A' Grade)
Vidya Nagar, Pallavolu (V), Proddatur – 516362 (A.P) India

Department of
Computer Science and Engineering
(Data Science)

B. Tech. Course structure

R22 REGULATIONS

COURSE STRUCTURE(R22)
III B.Tech–I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	22E05501T	COMPUTER NETWORKS	3	0	0	3	3	30	70	100
2.	22E32501T	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	3	30	70	100
3.	22E32502T	FOUNDATIONS OF DATA ANALYTICS	3	0	0	3	3	30	70	100
4.	22E31501a 22E32503b 22E05503c	**Professional Elective Course-I** SOFTWARE ENGINEERING FULL STACK DEVELOPMENT DATA WAREHOUSING AND DATA MINING	3	0	0	3	3	30	70	100
5.		**Open Elective Course-I**	3	0	0	3	3	30	70	100
6.	22E05501L	COMPUTER NETWORKS LAB	0	0	3	3	1.5	30	70	100
7.	22E32501L	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	3	1.5	30	70	100
8.	22E05504SC	**Skill Advanced Course-I** ADVANCED WEB APPLICATION DEVELOPMENT	1	0	3	3	2	30	70	100
9	22E00504MC	**Mandatory Non-Credit Course** DESIGN THINKING FOR INNOVATION	2	0	0	2	0	30	0	30
10	22E32505	EVALUATION OF COMMUNITY SERVICE INTERNSHIP	0	0	0	0	1.5	0	100	100
11	22E00507	NSS	0	0	1	1	0	0	0	0
		Total	18	0	10	27	21.5	270	660	930

Open Elective-I

S.NO	Course Code	Course Name	Offered by the Dept
1	22E01504	Building Technology	CE
2	22E03505	Fundamentals of Additive Manufacturing	ME
3	22E04506b	Principles of Communication Systems	ECE
4	22E02505	Electric Vehicles	EEE
5	22E00503	Optimization Techniques	MATHEMATICS
6	22E00504	Materials Characterization Techniques	PHYSICS
7	22E00505	Chemistry of Energy Materials	CHEMISTRY

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III B.Tech–II Semester

Sl. No.	Course Code	Course Title	L	T	P	Total	Credits	Int. Marks	Ext. Marks	Total Marks
						Contact Periods per week		Scheme of Examination Max. Marks		
1.	22E05601T	AUTOMATA THEORY & COMPILER DESIGN	3	0	0	3	3	30	70	100
2	22E32601T	PREDICTIVE ANALYSIS	3	0	0	3	3	30	70	100
3	22E32602T	DATA VISUALIZATION	3	0	0	3	3	30	70	100
4.	22E05603a 22E32603b 22E32603c	**Professional Elective Course-II** SOFTWARE TESTING OBJECTIVE ORIENTED ANALYSIS AND DESIGN CRYPTOGRAPHY & NETWORK SECURITY	3	0	0	3	3	30	70	100
5.		**Open Elective Course-II**	3	0	0	3	3	30	70	100
6.	22E05601L	COMPILER DESIGN LAB	0	0	3	3	1.5	30	70	100
7.	22E32601L	PREDICTIVE ANALYSIS LAB	0	0	3	3	1.5	30	70	100
8.	22E32602L	DATA VISUALIZATION LAB	0	0	3	3	1.5	30	70	100
9	22E00505SC	**Soft Skill Course** SOFT SKILLS	1	0	2	3	2	30	70	100
10	22E00602MC	**Mandatory Non-Credit Course** INTELLECTUAL PROPERTY RIGHTS	2	0	0	0	0	30	00	30
		Total	18	0	11	27	21.5	300	630	930

Community Service Internship/Project (Mandatory) for 6 weeks duration during summer vacation

TOTAL CREDITS: 43

Open Elective-II

S.NO	Course Code	Course Name	Offered by the Dept
1	22E01605	Building Services and Maintenance	CE
2	22E03606	Introduction to Robotics	ME
3	22E04606	Basic VLSI Design	ECE
4	22E02605	Renewable Energy Systems	EEE
5	22E00601	Numerical Methods & Laplace Transforms	MATHEMATICS
6	22E00604	Physics of Electronic Materials and Devices	PHYSICS
7	22E00605	Chemistry of Polymers and its Applications	CHEMISTRY

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COURSE STRUCTURE(R22)
IV B.Tech–I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	22E05701a 22E32701b 22E32701c	**Professional Elective Course– III** CLOUD COMPUTING AGILE METHODOLOGIES CYBER SECURITY	3	0	0	3	3	30	70	100
2	22E32702a 22E32702b 22E32702c	**Professional Elective Course– IV** PROCESS MINING NATURAL LANGUAGE PROCESSING DEVOPS	3	0	0	3	3	30	70	100
3	22E33703a 22E05703b 22E32703c	**Professional Elective Course– V** RECOMMENDER SYSTEMS BLOCKCHAIN TECHNOLOGY AND APPLICATIONS DEEP LEARNING	3	0	0	3	3	30	70	100
4	22E00405T 22E00702T 22E00703T	**Humanities and Social Science Elective** MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS ENTREPRENEURSHIP & INCUBATION ORGANIZATIONAL BEHAVIOR	3	0	0	3	3	30	70	100
5		**Open Elective-III**	3	0	0	3	3	30	70	100
6		**Open Elective-IV**	3	0	0	3	3	30	70	100
7	22E32704SC	**Skill Advanced Course** NOSQL USING MONGODB	1	0	2	3	2	30	70	100
8	22E32707	EVALUATION OF INDUSTRY INTERNSHIP	0	0	0	0	3	100	0	100
		Total	19	0	2	21	23	310	490	800

Community Service Internship/Project (Mandatory) for 6 weeks duration during summer vacation

IV B.Tech–II Semester

Semester-VIII							
SNO	Course Code	Course Name	Category	L	T	P	Credits
1	22E32801	Full Internship & Project Work	PR				12

TOTAL CREDITS: 35
OVER ALL TOTAL CREDITS: 163

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Open Elective-III

S.NO	Course Code	Course Name	Offered by the Dept
1	22E01704	Disaster Management	CE
2	22E02704	IOT Applications in Electrical Engineering	EEE
3	22E03704	Introduction to Composite Materials	ME
4	22E04706	Principles of Cellular and Mobile Communications	ECE
5	22E00501	Complex Variable & Integral Transforms	MATHEMATICS
6	22E00704	Sensors and Actuators for Engineering Applications	PHYSICS
7	22E00705	Chemistry of Nano materials and Applications	CHEMISTRY

Open Elective-IV

S.NO	Course Code	Course Name	Offered by the Dept
1	22E01705	Global warming and climate change	CE
2	22E02705	Smart Electric Grid	EEE
3	22E03705	Product Design & Development	ME
4	22E04707a 22E04707b	Electronic Sensors Microcontrollers & Applications	ECE
5	22E00701	Number Theory & its Applications	MATHEMATICS
6	22E00707	Smart Materials and Devices	PHYSICS
7	22E00706	Green Chemistry and Catalysis for Sustainable Environment	CHEMISTRY

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III B.Tech – I Semester
(22E05501T) COMPUTER NETWORKS
(Common to CSE, CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
1. Understand the basic concepts of Computer Networks.
2. Introduce the layered approach for design of computer networks
3. Expose the network protocols used in Internet environment
4. Explain the format of headers of IP, TCP and UDP

Course Outcomes:
CO1: Identify the software and hardware components of a computer network
CO2: Design software for a computer network
CO3: Develop new routing, and congestion control algorithms
CO4: Explain the functionality of each layer of a computer network
CO5: Choose the appropriate transport protocol based on the application requirements

UNIT-I: Computer Networks and the Internet
What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission.

UNIT-II: The Data Link Layer, Access Networks, and LANs
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request

UNIT-III: The Network Layer
Routing Algorithms, Internetworking, The Network Layer in The Internet

UNIT-IV: The Transport Layer
Connectionless Transport: UDP, The Internet Transport Protocols: TCP, Congestion Control.

UNIT-V: Principles of Network Applications
Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks.

Textbooks:
1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

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Reference Books:

1. Forouzan, Data communications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Online Learning Resources:

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

III B.Tech – I Semester
(22E32501T) DATABASE MANAGEMENT SYSTEMS
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
The main objectives of the course is to
1. Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
2. Introduce the concepts of basic SQL as a universal Database language
3. Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
4. Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:
After completion of the course, students will be able to
CO1: Understand the basic concepts of database management systems (L2)
CO2: Analyze a given database application scenario to use ER model for conceptual design of the database (L4)
CO3: Utilize SQL proficiently to address diverse query challenges (L3).
CO4: Employ normalization methods to enhance database structure (L3)
CO5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases.(L4)

UNIT-I:
Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II:
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III:
SQ: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion). Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV:

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V:

Transaction Concept:Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

Text Books:

1) Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2) Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1) Introduction to Database Systems, 8thedition, C J Date, Pearson.
2) Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3) Database Principles Fundamentals of Design Implementation and Management, 10th edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022

Web-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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III B.Tech – I Semester
(22E32502T) FOUNDATIONS OF DATA ANALYTICS
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Course Objectives:
1. Discuss various jobs related to Data Science.
2. Understand MapReduce.
3. Study Bigdata patterns

Course Outcomes:
CO1: Understanding the Big Data and its Characteristics.
CO2: Analyze data, test claims, and draw valid conclusions using appropriate statistical methodology
CO3: Use various tools related to Big data.
CO4: Analyze the MapReduce patterns in Database
CO5: Obtain training to secure a job

UNIT I: Introduction
What are Analytics, what is Big Data, Characteristics of Big data, Domain specific examples of big data, Analytics flow for big data, Big data stack, Mapping analytics flow to big data stack, case studies: Genome and Weather data analysis, Analytics patterns.

UNIT II: Setting up Big data stack and Big data Patterns
Hortonworks data platform, Cloudera CDH stack, Amazon Elastic MapReduce, Azure HDInsight, Analytics architecture components and Design styles.

UNIT III: MapReduce, NoSQL
MapReduce patterns, Key-Value Databases, Document Databases, Column Family Databases, Graph databases.

UNIT IV: Serving databases and Web Frameworks, Big Data Jobs
Relational databases, Non-Relational Databases, Python web application framework – Django, Case study: Django application for viewing weather data, The big picture of Bigdata jobs.

UNIT V: Simulation, Monte Carlo integration & Variance reduction
Seeing yourself in a big data job, looking into big data platform, Big data jobs for business analytics, big data jobs for data scientists, big data jobs for software developers.

Textbooks:
1. Arshdeep Bahga, Vijay Madisetti, Big Data Science and Analytics: A Hands of Approach, Self-Published: www.hands-on-books-series.com.
2. Jason Williamson, Big Data job for Dummies, Willey, 2015.

Reference Books:
1. Exploratory Data Analysis with R – Roger D. Peng, Lean pub publications, 2015.
2. The Art of Data Science- A Guide for anyone Who Works with Data – Roger D. Peng and Elizabeth Matsui, Lean pub Publications, 2014.

Online Learning Resources:
1. https://www.mastersindatascience.org/learning/what-is-data-analytics/
2. https://www.techtarget.com/searchdatamanagement/definition/data-analytics
3. https://www.lotame.com/what-is-data-analytics/

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III B.Tech – I Semester
(22E31501a) SOFTWARE ENGINEEING
(Professional Elective Course – I)
(Common to CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object-oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

Course Outcomes: Upon Successful Completion of the course, the student will be able to:
CO1: Obtain basic software life cycle activity skills
CO2: Design software requirements specifications for given problems.
CO3: Implement structure, object-oriented analysis and design for given problems.
CO4: Design test cases for given problems.
CO5: Apply quality management concepts at the application level.

UNIT-I: Basic concepts in SE and SPM

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

UNIT-II: Requirements analysis and specification

The nature of software, The Unique nature of Web apps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees.

UNIT-III: Software Design

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function-oriented design. Overview of SA/SD methodology, Data flow diagram, Extending DFD technique to real life systems, UML Diagrams, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

UNIT-IV: Coding and Testing

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

UNIT-V: Software quality, reliability and other issues

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

TEXT BOOKS:
1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman R, "Software Engineering- Practioner Approach", McGraw Hill.

REFERENCE BOOKS:
1. Somerville, "Software Engineering", Pearson 2.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. Jalote Pankaj, "An integrated approach to Software Engineering", Narosa

ONLINE LEARNING RESOURCES:
1. https://nptel.ac.in/courses/106/105/106105182/
2. http://peterindia.net/SoftwareDevelopment.html

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(22E32503b) FULL STACK DEVELOPMENT
(Professional Elective Course – I)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Learn the core concepts of both the frontend and backend programming course, to get familiar with the latest web development technologies.

Course Outcomes:
After completion of the course, students will be able to
CO1: Develop a fully functioning website and deploy on a web server.
CO2: Gain Knowledge about the front end and back end tools
CO3: Find and use of code packages based on their documentation to produce working results in a project.
CO4: Create web pages that function using external data.
CO5: Apply database and deployment.

UNIT I: Web Development Basics
Web development Basics, HTML- HTML Tags, HTML Attributes , html forms, html table, div and span tags, image tag, audio and video tag, summary tag.

CSS-types of styles, CSS selectors.

Version control-Git and Github.

UNIT II: Frontend Development
Java script basics-datatypes, operators, conditional statements, loops in js. OOPS Aspects of Java Script-object, class, inheritance, encapsulation. Functions in JS. AJAX for data exchange with server. jQuery Frame work jQuery events, UI components etc. JSON data format.

UNIT III: REACT JS
Introduction to React, React app, React Forms, Introduction to Redux, Redux in React, Redux implementation, Client-Server Communication.

UNIT IV: Java Web Development
JAVA PROGRAMMING BASICS, Model View Controller (MVC) spring framework using MVC. Dependency injection, Inversion of control, spring container, spring MVC, REST API using Spring Framework, building an application using Maven.

UNIT V: Databases & Deployment
Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud.

Textbooks:
1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas

2. Learning PHP, MySQL, JavaScript, CSS & HTML Dept. Step-by-Step Guide to

3. AZAT MARDAN, FullStackJavaScript:LearnBackbone.js,Node.jsandMongoDB.2015

Reference Books:
1. Full-Stack JavaScript Development by Eric Bush.
2. Tomasz Dyl, KamilPrzeorski, MaciejCzarnecki, Mastering Full Stack React Web Development 2017

Online Learning Resources:
https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/

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III B.Tech – I Semester
(22E05503c) DATA WAREHOUSING AND DATA MINING
(Professional Elective Course – I)
(Common to CSE, CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
1. To understand data warehouse concepts, architecture, business analysis and tools.
2. To understand data pre-processing and data visualization techniques.
3. To study algorithms for finding hidden and interesting patterns in data.
4. To understand and apply various classification and clustering techniques using tools.

Course Outcomes:
CO1: Design a Data warehouse system and perform business analysis with OLAP tools.
CO2: Apply suitable pre-processing and visualization techniques for data analysis.
CO3: Apply frequent pattern and association rule mining techniques for data analysis.
CO4: Apply appropriate classification techniques for data analysis.
CO5: Apply appropriate clustering techniques for data analysis

UNIT-I:
Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT-II:
Data Mining – Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT-III:
Data Mining - Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT-IV:
Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy.

UNIT-V:
Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.

Text Books:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson,2016.

Reference Books:

1. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, ShyamDiwakar and V. Ajay, —Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

e-Resources:
1. https://www.saedsayad.com/data_mining_map.htm
2. https://nptel.ac.in/courses/106/105/106105174/ (NPTEL course by Prof.Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran)
3. http://www.saedsayad.com/data_mining_map.htm

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III B.Tech – I Semester
(22E05501L) COMPUTER NETWORKS LAB
(Common to CSE, CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		0	0	3	1.5

Course Objectives:
1. To understand the different types of networks
2. To discuss the software and hardware components of a network
3. To enlighten the working of networking commands supported by operating system
4. To impart knowledge of Network simulator 2/3
5. To familiarize the use of networking functionality supported by JAVA
6. To familiarize with computer networking tools.

Course Outcomes:
   CO1: Design scripts for Wired network simulation
   CO2: Design scripts of static and mobile wireless networks simulation
   CO3: Analyze the data traffic using tools
   CO4: Design JAVA programs for client-server communication
   CO5: Construct a wired and wireless network using the real hardware

List of Experiments:

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.
   - Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
   - Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.

2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup.

3. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.

4. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.

5. Use Packet tracer software to build network topology and configure using Link State routing protocol.

6. Using JAVA RMI Write a program to implement Basic Calculator

7. Implement a Chatting application using JAVA TCP and UDP sockets.

8. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbour. Implement Hello and Echo commands using JAVA.

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9. Using Wireshark perform the following operations:

    a. Inspect HTTP Traffic
    b. Inspect HTTP Traffic from a Given IP Address,
    c. Inspect HTTP Traffic to a Given IP Address,
    d. Reject Packets to Given IP Address,
    e. Monitor Apache and MySQL Network Traffic.

10. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

11. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

12. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

References:
1. Shivendra S. Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials A Lab-Based Approach", Cambridge University Press, 2004.
2. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
3. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.

Online Learning Resources/Virtual Labs:

1. https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
2. Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
3. https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
4. https://nptel.ac.in/courses/106105183/25
5. http://www.nptelvideos.in/2012/11/computer-networks.html
6. https://nptel.ac.in/courses/106105183/3
7. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

III B.Tech – I Semester
(22E32501L) DATABASE MANAGEMENT SYSTEMS LAB
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Course Objectives:
This Course will enable students to
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers,

Experiments covering the topics:
- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

5.
    i.   Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

13. Write a Java program that connects to a database using JDBC

14. Write a Java program to connect to a database using JDBC and insert values into it

15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books/Suggested Reading:
1. Oracle: The Complete Reference by Oracle Press

2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007

3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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III B.Tech – I Semester
(22E05504SC) ADVANCED WEB APPLICATION DEVELOPMENT
(Skill Advanced Course-I)
(Common to CSE, CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Course Objectives:
1. Learn how to create dynamic websites using PHP and establish database connectivity.
2. Explore SMS API and session management
3. Understand the common Web Application Vulnerabilities and provide Security.
4. Acquire the knowledge of external libraries to generate various types of documents and files.
5. Understand the difference between traditional hosting services and Cloud Hosting services

Course Outcomes:
CO1: Create dynamic websites using PHP and MySQL
CO2: Handle Authentication using Sessions, JWT.
CO3: Secure Web applications from common attacks like Injection, XSS.
CO4: Integrate Libraries to dynamically generate documents, spreadsheets, pdfs, etc.
CO5: Host Websites in traditional web hosting platforms and also Cloud based infrastructure

Module 1:
Introduction: Web Server, Database Server, Private IP Address, Port Address, Server-side Programming, Web Server solution stack.
Task: Installation of XAMPP/WAMP. Access a test page using a device (Laptop/Desktop/Mobile) within LAN or hotspot using its private IP address.

Module 2:
PHP My Admin: Create, Browse, Drop, Copy, Rename and Alter databases, tables, views, fields and indexes, Import data from CSV and SQL, Export (back-up) data.
Task: Design a Student Profile Data Management System for a college. Create a Database and its associated tables.

Module 3:
Php basics: Basic Syntax, primitive types, Variables, Constants, Expressions, Operators, Control structures, functions.
Task: Develop a PHP application and run it with a command-line interpreter

Module 4:
Handling HTML Forms: Predefined Variables, Reading data from web form controls like input, textarea, select etc., Handling File Uploads.
Task: Develop an Add Student Profile Page which accepts all student details including photo and display them in order.

Module 5:
Predefined Functions and Files: Arrays, Associative Arrays, Multidimensional Arrays, Array functions, String functions, Date and Time functions, File Handling: Open, Close, Create, Read, Write, Append.
Task: Implement an effective Logging System using files in PHP.

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Module 6:

Classes and Objects: Creating classes and objects, Visibility, Constructor and Destructor, Inheritance, static keyword, interfaces, class Abstraction, namespaces

Task: Design and implement Class diagram representation of Student Management System for a college using PHP.

Module 7:

Database Connectivity with MySql: Establish a database Connection using mysqli, Prepare SQL Statement, Bind parameters, Execute the statement, bind the result.

Task: Develop Add Student Profile Page to store data into the database and develop a webpage to retrieve the student details based on the Roll Number or any unique ID.

Module 8:

HTTP is a Stateless Protocol: Handling Cookies and Sessions, Implementation of JSON Web Tokens (JWT), SMS API.

Task: Design and develop a User Authentication System (Login-Logout functionality) using cookies, sessions, JWT, and SMS API. Also, identify which is suitable for your application

Module 9:

Exception Handling and Security: Handle Database connectivity exceptions, SQL Injection Vulnerability, Cross-site scripting, Session hijacking, and Session fixation

Task: Secure all your PHP applications from common vulnerabilities like Injection, XSS, Session hijacking and fixation, and other exceptions

Module 10:

PHP Libraries: Read data from Excel Files, Generate dynamic Excel Files, PDF files, and Word Documents.

Task: Design an Administrator Portal through which administrators can be able to upload student data into the database, Download the student data, Generate certificates, etc.

Module 11:

Hosting service provider: Public IP Address, Nameservers, Domain Name, Understand cPanel Modules: File Manager, Databases, Email Accounts, One-Click Installers, DNS, Other Configuration & Monitoring Controls.

Task: Host a PHP-MySQL based application on the internet using the Web Hosting Service Provider of your choice (000webhost, Hostinger, Heroku, Godaddy, etc.)

Module 12:

Cloud Hosting: Advantages of Cloud Hosting, Creating Instances or droplets, Managing Roles, Scaling the Application, Securing the instances, Monitoring Tools, etc.

Task: Host a PHP-MySQL based application on the internet using the Cloud Hosting Provider of your choice (Amazon Web Services, Google Cloud Platform, DigitalOcean, etc.)

References:

1. MacIntyre, Peter, and Tatroe, Kevin. Programming PHP: Creating Dynamic Web Pages. United States, O'Reilly Media, 2020.
2. Valade, Janet. PHP and MySQL Web Development All-in-One Desk Reference For Dummies. Germany, Wiley, 2011.
3. Gulabani, Sunil. Amazon Web Services Bootcamp: Develop a Scalable, Reliable, and Highly Available Cloud Environment with AWS. United Kingdom, Packt Publishing, 2018.

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Online Learning Resources/Virtual Labs:

1. https://www.apachefriends.org/
2. https://www.wampserver.com/en/
3. https://www.php.net/
4. https://in.godaddy.com/
5. https://www.hostinger.in/
6. https://aws.amazon.com/
7. https://cloud.google.com/

III B.Tech – I Semester
(22E00504MC) DESIGN THINKING FOR INNOVATION
(Mandatory Non-Credit Course)
(Common to All Engineering Branches)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	00	30		2	0	2	0

Pre-Requisites: NIL

Course Objectives:
- To explain the basic knowledge and evolution of design thinking
- To familiarize the students with design thinking process as a tool for break through innovation
- To give an overview on creativity and innovation in organizations
- To explain various innovations towards product design

Course Outcomes:
After successful completion of the course, students will be able to:
C01: Define the concepts related to design thinking.
C02: Explain the fundamentals of Design Thinking and innovation
C03: Apply the design thinking techniques for solving problems in various sectors.
C04: Analyze to work in a multidisciplinary environment
C05: Formulate specific problem statements of real time issues

UNIT-I: Introduction to Design Thinking
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT-II: Design Thinking Process
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT-III: Innovation
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT-IV: Product Design
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies
Activity: Importance of modelling, how to set specifications, Explaining their own product design.

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UNIT-V: Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups-Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

TEXT BOOKS:
1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

REFERENCE BOOKS:
1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/
2. https://swayam.gov.in/nd1_noc19_mg60/preview

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III B.Tech – I Semester
(22E00507) NSS
(Common to All Engineering Branches)

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Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	00	100	0	0	2	0

Pre-Requisites: NIL

Course Objectives:
- To impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes:
After successful completion of the course, students will be able to:
C01: Understand the importance of discipline, character and service motto.
C02: Solve some societal issues by applying acquired knowledge, facts, and techniques.
C03: Explore human relationships by analyzing social problems.
C04: Determine to extend their help for the fellow beings and downtrodden people.
C05: Develop leadership skills and civic responsibilities.

UNIT-I: Orientation
General Orientation on NSS/NCC/ Scouts & Guides/Community, Service activities,career guidance.
Activities:
i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students–future plans-activities releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT-II: Nature & Care
Activities:
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT-III: Community Service
Activities:
i) Conducting One Day Special Camp in a village contacting village-area leadersSurvey in the village, identification of problems- helping them to solve via mediaauthorities experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes - Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

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Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6).
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi.
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008.
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007.
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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(22E01504) BUILDING TECHNOLOGY
(Open Elective -I)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PRE-REQUISITES: Nil

COURSE OBJECTIVES: The goal of this course for students is:

1. To understand fundamental concepts and principles of building design and planning.
2. To identify and implement measures for termite proofing, lightning protection, and fire safety.
3. To analyze and plan different types of vertical transportation systems
4. To explore environmentally friendly and durable building materials.
5. To evaluate the characteristics and applications of smart materials in building design

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1: Analyze factors affecting building planning and apply principles to design efficient buildings.
CO2: Evaluate and implement termite proofing, lightning protection, and fire safety measures.
CO3: Design efficient vertical transportation systems using stairs, lifts, and escalators.
CO4: Assess the suitability of innovative building materials for various projects.
CO5:Apply smart building materials to enhance energy efficiency and functionality in buildings.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION

Introduction, basic definitions-buildings-types-components-economy and design-principles of planning of buildings and their importance-factors affecting planning of building-Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

UNIT-II: PRECAUTIONS FOR BUILDINGS

Termite proofing-types of termite proofing-Inspection-control measures and precautions-lighting protection of buildings-mechanism of lightning - effects of lightning - protection of structures from lightning - general principles of design of openings- fire protection - various types of fire protection measures to be considered while panning a building.

UNIT-III: TRANSPORT SYSTEMS IN BUILDINGS

Vertical transportation in a building - Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators.

UNIT-IV: INNOVATIVE BUILDING MATERIALS

Introduction – environmentally friendly, reliable and durable Building Materials, Permeable Concrete, Nanocellulose composite brick, Agro bricks (Date Palm Fibers, Rice Husk, Rice Husk Ash), Fabrick- cotton and textile ash bricks.

UNIT-V: SMART BUILDING MATERIALS

Introduction- Characteristics of smart materials in comparison to common architectural materials, Types of Smart Materials, Application of smart materials on building components - Facade systems - smart windows, Control of solar radiation transmitting through the building envelope Suspended particle panels - Liquid crystal panels – Photochromics, Electrochromics, Control of solar radiation transmitting through the building envelope Suspended particle panels Thermotropic, Thermochromics.

TEXT BOOKS:

1.Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015.
2.Building construction by Punmia.B.C, Jain. A. K and Jain. A. K Laxmi Publications
  11th edition 2016.

REFERENCE BOOKS:

1. National Building Code of India, Bureau of Indian Standards.
2. Building Construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P. Arora and S.P.BindraDhanpat Rai and Sons Publications, New Delhi 2014 edition.

WEB RESOURSES:

1.https://nptel.ac.in/courses/105102206
2.https://nptel.ac.in/courses/105103206
3. https://hemanthbana.wordpress.com/

(22E03505) FUNDAMENTALS OF ADDITIVE MANUFACTURING
(Open Elective-I)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PREREQUISITES: NIL

COURSE OBJECTIVES

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1 :   Use techniques for processing of CAD models for additive manufacturing
CO2 :   Understand and apply fundamentals of rapid prototyping techniques.
CO3 :   Use of powder based additive manufacturing process / techniques
CO4 :   Use appropriate tooling and reverse for rapid prototyping process.
CO5 :   Identify Various errors and applications in RP processes. (K3)

DETAILED SYLLABUS:

UNIT-I: Introduction
History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Generic of RP process, Types of Additive manufacturing processes, Nomenclature of AM Machines, Extrusion, Beam deposition, sheet lamination, photo polymerization, sintering, powder bed fusion.

UNIT-II:
Solid and Liquid Based RP Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications.
Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications.
Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

UNIT-III: Powder Based RP Systems

Powder Based RP Systems: Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

UNIT-IV: Other Additive Manufacturing Systems

Other RP Systems: Three-Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

UNIT-V: Rapid Tooling And Additive Manufacturing Applications

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Additive Manufacturing Applications : Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis.

TEXT BOOKS:
1. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Rapid Prototyping: Principles and Applications, by -Chee Kai Chua, Kah Fai Leong, Chu Sing Lim

REFERENCE BOOKS:
1. Pham D.T. and Dimov S.S., "Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling", Springer, London 2001.
2. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC Press, 2005.

WEB RESOURCES:
1. https://archive.nptel.ac.in/courses/112/103/112103306/

III B.Tech – I Semester
(22E02505) ELECTRIC VEHICLES
(Open Elective -I)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PRE-REQUISITES: - DC Machines and Transformers, Power Electronics

COURSE OBJECTIVES: By the end of the course, the student will be able to
1. Understand the concepts of electric vehicles, hybrid electric vehicles and their impact on environment
2. Analyze the drive-train topologies and advanced propulsion techniques
3. Analyze hybrid energy storage methodologies
4. Design suitable power converter topologies for motor control and hybrid energy storage.
5. Design Energy management systems.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1.Understand the concepts of electric vehicles, hybrid electric vehicles and their impact on environment
CO2. Analyze the drive-train topologies and advanced propulsion techniques
CO3. Analyze hybrid energy storage methodologies
CO4. Design suitable power converter topologies for motor control and hybrid energy storage
CO5. Design a micro hybrid vehicle.

DETAILED SYLLABUS:
UNIT I: INTRODUCTION

Conventional vehicle, basics of vehicle performance, History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II: HYBRID ELECTRIC VEHICLES

Micro hybrid vehicles, mild hybrid vehicles, full hybrid vehicles, Parallel hybrid vehicles, series Hybrid Vehicles, Series-Parallel Hybrid vehicles ,plug-in hybrid vehicles, power flow diagrams for various operating modes. Plug-in Hybrid Vehicles: Operating principle, architectures: series-parallel-series-parallel, challenges related to grid connection. Range-extended Electric Vehicles: Classification and configurations, Fuel Cell Electric Vehicles, Solar electric Vehicles, Electric Bicycles and their propulsion systems, Vehicle-to-grid, vehicle to-home concepts, Concept of Hybrid Electric Vehicles.

UNIT III: ELECTRIC DRIVE-TRAINS & PROPULSION UNIT

Electric drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

Electric propulsion unit: Electric components used in electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, Switch Reluctance

Motor drives, Drive system efficiency.

UNIT-IV: ENERGYSTORAGE

Storage requirements for Electric Vehicles, Battery based energy storage, Fuel Cell based energy storage, Super Capacitor based energy storage and their analysis. Power pack management systems, Cell balancing techniques, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices, compressed air storage systems, super conducting magnetic storage systems and Energy management systems.

UNIT-V: E-MOBILITY

E-mobility: electrification challenges, business, connected mobility and autonomous mobility casestudy in Indian Roadmap Perspective, Policy- EVs in infrastructure system, integration of EVs insmart grid, social dimensions of EVs.

TEXT BOOKS:

1. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, Taylor & Francis Group 2015.
2. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003, 2nd Edition.
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press,2011.
4. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003

REFERENCE BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, MehrdadEhsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, CRC Press, 2005.
2. Electric Vehicle Technology Explained, James Larminie, John Lowry, Wiley, 2003.

ONLINE LEARNING RESOURSES:

1. https://nptel.ac.in/courses/108/106/108106170/
2. https://nptel.ac.in/courses/108/102/108102121/

III B.Tech – I Semester
(22E04506b) PRINCIPLES OF COMMUNICATION SYSTEMS
(Open Elective -I)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PRE-REQUISITES: Engineering Mathematics and Basics of Communication systems.

COURSE OBJECTIVES:
1. Understand the concept of various modulation schemes and multiplexing
2. Apply the concept of various modulation schemes to solve engineering problems

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand the concept of various modulation schemes.
C02: Understand the concept of multiplexing.
CO3: Apply the concept of various modulation schemes to solve engineering problems
CO4: Analyze various modulation schemes.
CO5: Evaluate various modulation scheme in real time applications

DETAILED SYLLABUS:

UNIT-I: AMPLITUDE MODULATION:
Introduction to Noise and Fourier Transform, An overview of Electronic Communication Systems, Need for Frequency Translation. Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB. Frequency Division Multiplexing, Radio Transmitter and Receiver

UNIT-II: ANGLE MODULATION:
Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation, Stereophonic FM Broadcasting.

UNIT-III: TONE MODULATION:
Sampling Theorem: Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.

UNIT-IV: DIGITAL MODULATION:
Binary Amplitude Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater

UNIT-V: COMMUNICATION SYSTEMS:

Satellite, RADAR, Optical, Mobile and Computer Communication (Block diagram approach only)
Note: The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.

TEXT BOOKS:

1. Herbert Taub, Donald L Schilling and Goutam Saha, "Principles of Communication Systems", 3rdEdition, Tata McGraw-Hill Publishing Company Ltd., 2008.

REFERENCE BOOKS:

1. B. P. Lathi, Zhi Ding and Hari M. Gupta, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.

2. K. Sam Shanmugam "Digital and Analog Communication Systems", Wiley India Edition, 2008.

WEB RESOURSES:

1. https://onlinecourses.nptel.ac.in/noc22_ee05/preview

2. https://onlinecourses.nptel.ac.in/noc22_ee73/preview

III B. Tech. – I Semester
(22E00505) CHEMISTRY OF ENERGY MATERIALS
(Open Elective- I)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PRE-REQUISITES: - Students should know about fundamentals and basic principles in chemistry

COURSE OBJECTIVES:

- To make the student understand basic electro chemical principles such as standard electrode potentials, emf and applications of electro chemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

COURSE OUTCOMES:
Ability to perform simultaneous material and energy balances.
   CO1: Students learn about various electro chemical and energy systems
   CO2: Knowledge of solid, liquid and gaseous fuels
   CO3: To know the energy demand of world, nation and available resources to fulfill the demand
   CO4: To know about the conventional energy resources and their effective utilization
   CO5: To acquire the knowledge of modern energy conversion technologies
   CO6: To be able to understand and perform the various characterization techniques of fuels
   CO7: To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

DETAILED SYLLABUS:
UNITI: Electro chemical Systems:
Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries - Lead-acid and Lithium-ion batteries.

UNIT II: Fuel Cells:

Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell

UNIT III: Hydrogen Storage:

Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods, Liquifaction method.

UNIT IV: Solar Energy:

Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

UNIT V: Photo and Photo electrochemical Conversions:

Photochemical cells and applications of photo chemical reactions, specificity of photo electro chemical cell, advantage of photo electron catalytic conversions.

REFERENCE BOOKS:

1. Physical chemistry by IraN.Levine
2. Essentials of Physical Chemistry, Bahland BahlandTuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG & Gtechnical services and corporation)
5. Handbook of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by KlausJagaret.al.
7. Hydrogen storage by Levine Klebonoff

Web links

1. https://scholar.google.co.in/scholar?q=NPTEL+Electrochemical+Systems&hl=en&as_sdt=0&as_vis=1&oi=scholart
2. https://archive.nptel.ac.in/courses/103/102/103102015/
3. https://onlinecourses.nptel.ac.in/noc22_ch66/preview
4. https://archive.nptel.ac.in/courses/115/103/115103123/https://archive.nptel.ac.in/content/storage2/courses/102104043/AM09.pdf

(22E00503) OPTIMIZATION TECHNIQUES
(Open Elective -I)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: Techniques of Simple addition & Subtraction.

Course Objectives:
The course is designed to
- This course enables the students to classify and formulate real-life problem for modeling as optimization problem.
- Solving and applying for decision making.

Course Outcomes:

CO1	:	Formulate a linear programming problem and solve it by various methods.
CO2	:	Give an optimal solution in assignment jobs; give transportation of items from sources to destinations.
CO3	:	Implement project planning.
CO4	:	Solve game theory and sequencing problems.
CO5	:	Solve queuing problems and replacement problems.

UNIT-I: FRIC INTRODUCTION TO OR
Introduction to operational research-Linear programming problems (LPP)-Graphical method Simplex Method - Big M Method-Dual simplex method. Introduction to Duality & Dual Variables

UNIT-II: TRANSPORTATION AND ASSIGNMENT PROBLEMS
TRANSPORTATION MODELS: Finding an initial feasible solution – North West Corner method, least cost method, Vogel's Approximation Method; Finding the optimal solution using MODI method, Special cases in Transportation problems – Unbalanced Transportation problem,
ASSIGNMENT PROBLEMS: Hungarian method of Assignment problem, maximization in Assignment problem, unbalanced Assignment problem, prohibited Assignments, multiple optimum solutions

UNIT-III: CPM & PERT
CPM and PERT –CPM–Network Diagram-Events and activities- and PERT- Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT-IV: GAME THEORY & JOB SEQUENCING

GAME THEORY: Introduction, Two-person zero sum games, Maxi-min and Mini-max Principles, Principle of dominance, solution of mixed strategy problems.

JOB SEQUENCING: Introduction to Job shops Scheduling and flow shop scheduling, Solution of Job Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through machines, graphical method.

UNIT-V: REPLACEMENT MODELS

REPLACEMENT MODELS: Introduction, replacement of items that deteriorate gradually ignoring change in money value, replacement of items that deteriorate considering change in money value with time, Individual replacement policy, Group replacement policy

TEXT BOOKS:

1. Operations Research, S.D. Sharma
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers

REFERENCE BOOKS:

1. Problems on Operations Research, Er. Prem kumargupta, Dr.D.S. Hira, Chand publishers
2. J.E. Shiegley, "The theory of machine", Mcgrawhill .
3. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav

WEB RESOURCES:

1. https://www.slideshare.net/slideshow/introduction-to-operations-research-88270414/88270414
2. https://www.slideshare.net/slideshow/replacement-model/231301023

III B. Tech. – I Semester
(22E00504) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective- I)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basic knowledge in Physics and Chemistry as well as a Solid background in Physical and Chemical aspects of Materials Science and Engineering.

Course Objectives:
• To provide an exposure to different characterization techniques.
• To enlighten the basic principles and analysis of different spectroscopic techniques.
• To explain the basic principle of Scanning electron microscope along with its limitations and applications.
• To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
• To educate the uses of advanced electric and magnetic instruments for characterization.

Course Outcomes: At the end of the course the student will be able
CO1: To explain the structural analysis by X-ray diffraction.
CO2: To understand the morphology of different materials using SEM and TEM.
CO3: To recognize basic principles of various spectroscopic techniques.
CO4: To study the electric and magnetic properties of the materials.
CO5: To make out which technique can be used to analyse a material.

UNIT I :
Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II:
Microscopy technique -1 –Scanning Electron Microscopy (SEM) Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III:

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT IV :

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) Xray photoelectron spectroscopy (XPS).

UNIT V :

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic
Methods –Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Handbook of Materials Characterization -by Sharma S. K. - Springer

References:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and
Elaine M.McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks,
Prentice Hall, 2001
3. Materials Characterization: Introduction to Microscopic and Spectroscopic
Methods-Yang Leng- John Wiley & Sons
4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John
Wiley (Bp)

III B.Tech – II Semester
(22E05601T) AUTOMATA THEORY AND COMPILER DESIGN
(Common to CSE, CSE-DS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences betweendecidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart theknowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use ofsymbol tables, intermediate code generation.

Course Outcomes:
CO1: Able to employ finite state machines for modeling and solving computing problems.
CO2: Able to design context free grammars for formal languages.
CO3: Able to distinguish between decidability and undecidability.
CO4: Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
CO5: Acquire skills in using lex tool and design LR parsers

UNIT – I
Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT – II
Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. closure properties in Regular Languages.
Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.
Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III
Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state
Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

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UNIT – IV
Introduction: The structure of a compiler,
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex,
Syntax Analysis: Introduction, Context-Free Grammars, writing a Grammar, top down parsing-recursive descent parsing, bottom up parsing-shift reduce parsing.

UNIT – V
Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax-Directed Translation Schemes.
Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code
Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, HeapManagement

TEXT BOOKS:
1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft,Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science–Automata languages and computation, Mishra and Chandra shekaran, 2nd Edition, PHI.

REFERENCE BOOKS:
1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan,RamaR, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. Lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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III B.Tech – II Semester
(22E32601T) PREDICTIVE ANALYTICS
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Course Objectives:
- Discuss the concept Predictive Analytics
- Illustrate the uses and applications of Predictive Analytics
- Demonstrate building of Predictive Analytics models

Course Outcomes:
- **CO1:** Visualize and explore data to better understand relationships among variables
- **CO2:** Understand how ensemble models improve predictions
- **CO3:** Organize the predictive modelling task and data flow
- **CO4:** Apply predictive models to generate predictions for new data
- **CO5:** Choose and implement appropriate performance measures for predictive models

UNIT I
Overview of Predictive Analytics: What Is Analytics? What Is Predictive Analytics? Business Intelligence Predictive Analytics vs. Business Intelligence, Predictive Analytics vs. Statistics, Predictive Analytics vs. Data Mining, Who Uses Predictive Analytics? , Challenges in Using Predictive Analytics, What Educational Background Is Needed to Become a Predictive Modeler?

UNIT II
Setting Up the Problem: Predictive Analytics Processing Steps: CRISP-DM, Business Understanding, Defining Data for Predictive Modelling, Defining the Target Variable, Defining Measures of Success for Predictive Models, Doing Predictive Modelling Out of Order, Case study-Recovering Lapsed Donors, Fraud Detection.

UNIT III
Data Understanding: What the Data Looks Like, Single Variable Summaries, Data Visualization in One Dimension, Histograms, Multiple Variable Summaries, Data Visualization, Two or Higher Dimensions, The Value of Statistical Significance, Pulling It All Together into a Data Audit.
Data Preparation: Variable Cleaning, Feature Creation.

UNIT IV
Item sets and Association Rules: Terminology, Parameter Settings, How the Data Is Organized, Measures of Interesting Rules, Deploying Association Rules, Problems with Association Rules, Building Classification Rules from Association Rules.
Descriptive Modelling: Data Preparation Issues with Descriptive Modelling, Principal Component Analysis, Clustering Algorithms.
Interpreting Descriptive Models: Standard Cluster Model Interpretation.

UNIT V
Predictive Modelling: Decision Trees, Logistic Regression, Neural Networks, K-Nearest Neighbour, Naïve Bayes, Regression Models, Linear Regression, Other Regression Algorithms.
Assessing Predictive Models: Batch Approach to Model Assessment, Assessing Regression Models.

Textbooks:
1. Dean Abbott, Applied Predictive Analytics, Published by Jhon Wiley &Sons, Inc,2014.

Reference Books:
1. Eric Siegel, Predictive Analytics, Published by Jhon Wiley & Sons, inc,2013.
2. Data Analytics using Python Kindle Editionby Bharti Motwani, 2020.

Online Learning Resources:

1. Predictive Analytics: Introduction to Business Forecasting | Udemy

III B.Tech – II Semester
(22E32602T) DATA VISUALIZATION
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Discuss the importance of Data Visualization
- Demonstrate story telling
- Explain the environment of Tableau

Course Outcomes:
After completion of the course, students will be able to
   CO1: Effectively present the data
   CO2: Draw insights from the data
   CO3: Use Tableau

UNIT I
Introduction, the importance of Context, Choosing and effective visual

UNIT II
Clutter is your enemy, Focus your audience's attention, Lessons in Storytelling

UNIT III
Communicating data: A step in the process, a model of communication, Three types of communication problems, six principles of communicating data.
Introduction to Tableau: Using Tableau, Tableau products, Connecting to data. How much and How many: Communicating how much, communicating how manyRatios and Rates: Ratios, Rates

UNIT IV
Proportions and Percentages: Part to whole, current to historical, actual to target. Mean and Median.
Variation and Uncertainty: Respecting variation, Variation over time-Control charts, Understanding uncertainty.

UNIT V
Multiple Quantities: Scatterplots, Stacked Bars, Regression and Trend Lines, The Quadrant Chart Changes over time: The origin of time charts, the line chart, the dual axis line chart, the connected scatterplot, the date filed type and seasonality, the timeline, the slope graph.
Maps and Location: One special map, circle maps, filled maps, dual encoded maps.

Textbooks:
1. Cole Nussbaumer Knaflic, Storytelling with data, Wiley
2. Ben Jones, Communicating Data with Tableau, O'Reilly

Reference Books:
1. A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Reilly.
2. Andy Kirk, Data Visualization: A Successful Design Process, PAKT.
3. Scott Murray, Interactive Data Visualization for Web, O'Reilly.

Online Learning Resources:
1. Data Analysis and Visualization Foundations | Coursera
2. Data Visualization | Coursera.

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III B.Tech – II Semester
(22E05603a) SOFTWARE TESTING
(Professional Elective Course – II)
(Common to CSE & CSE-DS)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Course Objectives:
1. Introduce the fundamentals of various testing methodologies.
2. Describe the principles and procedures for designing test cases.
3. Teach debugging methods.

Course Outcomes:
> **CO1:** Understand the basic testing procedures.
> **CO2:** Develop reliable software
> **CO3:** Apply domain testing
> **CO4:** Design test cases for testing different programming constructs
> **CO5:** Test the applications by applying different testing methods and automation tools

UNIT I: Introduction
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs. Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT II: Flow Testing
Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

UNIT III: Domain Testing
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

UNIT IV: Logic Based Testing
Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

UNIT V: Graph Matrices and Application
State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, Testability Tips. Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools.

Textbooks:
1. Boris Beizer, "Software testing techniques", Dreamtech, second edition, 2002.

Reference Books:
1. Brian Marick, "The craft of software testing", Pearson Education.
2. Yogesh Singh, "Software Testing", Camebridge
3. P.C. Jorgensen, "Software Testing" 3rd edition, Aurbach Publications (Dist.by SPD).
4. N.Chauhan, "Software Testing", Oxford University Press.
5. P.Ammann&J.Offutt, "Introduction to Software Testing" , Cambridge Univ. Press.
6. Perry, "Effective methods of Software Testing", John Wiley, 2nd Edition, 1999.

Online Learning Resources:
1. http://www.nptelvideos.in/2012/11/software-engineering.html.
2. https://onlinecourses.nptel.ac.in/noc16_cs16/preview
3. https://nptel.ac.in/courses/117105135

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III B.Tech – II Semester
(22E32603b) OBJECT ORIENTED ANALYSIS AND DESIGN
(Professional Elective Course – II)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
1. Become familiar with all phases of OOAD.
2. Master the main features of the UML.
3. Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
4. Learn the Object design Principles and understand how to apply them towards Implementation.

Course Outcomes:
CO1: Analyze the nature of complex system and its solutions.
CO2: Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
CO3: Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
CO4: Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
CO5: Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

UNIT I: Introduction
The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems.

UNIT II: Introduction to UML
Importance of modeling, principles of modeling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT III: Class & Object Diagrams
Terms, concepts, modeling techniques for Class & Object Diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT IV: Basic Behavioral Modeling
Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams.

UNIT V: Advanced Behavioral Modeling
Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams

Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education

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III B.Tech – II Semester
(22E32603c) CRYTOGRAPHY & NETWORK SECURITY
(Professional Elective Course–II)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
This course aims at training students to master the:
1. The concepts of classical encryption techniques and concepts of finite fields and number theory
2. Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
3. Design issues and working principles of various authentication protocols, PKI standards
4. Various secure communication standards including Kerberos, IPsec, TLS and email
5. Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:
CO1: After completion of the course, students will be able to
CO2: Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
CO3: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
CO4: Apply network security basics, analyse different attacks on networks and evaluate the performance of firewalls and security protocols like TLS, IPSec, and PGP
CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I
Computer and Network Security Concepts: Computer Security Concepts, The OSI Security Architecture, Security Attacks,Security Services, Security Mechanisms ,A Model for Network Security, Classical Encryption Techniques : Symmetric Cipher Model ,Substitution Techniques ,Transposition Techniques ,Steganography, Block Ciphers : Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard :AES Structure, AES Transformation Functions

UNIT II
Number Theory:
The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2n).Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT III
Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure

UNIT IV
User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.
IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT V
Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH)
Firewalls: Firewall Characteristics and Access Policy, Types of Firewalls, Firewall Location and Configurations.

Textbooks:
1. Cryptography and Network Security- William Stallings, Pearson Education, 7thEdition.
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:
1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-Graw Hill, 3rd Edition,2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

Online Learning Resources:
1. https://nptel.ac.in/courses/106/105/106105031/lecture by Dr. Debdeep Mukhopadhyay IIT Kharagpur.
2. https://nptel.ac.in/courses/106/105/106105162/lecture by Dr. Sourav Mukhopadhyay IIT Kharagpur [Video Lecture]
3. https://www.mitel.com/articles/web-communication-cryptography-and-network-securityweb articles by Mitel Power Connections

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III B.Tech – II Semester
(22E05601L) COMPILER DESIGN LAB
(Common to CSE & CSE-DS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Course Objectives:
1. To introduce LEX and YACC tools
2. To learn to develop algorithms to generate code for a target machine
3. To implement LL and LR parsers

Course Outcomes:
> **CO1:** Design, develop, and implement a compiler for any language
> **CO2:** Use LEX and YACC tools for developing a scanner and a parser
> **CO3:** Design and implement LL and LR parsers
> **CO4:** Design algorithms to perform code optimization
> **CO5:** Improve the performance of a program in terms of space and time complexity

List of Experiments:
1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.
2. Implementation of Lexical Analyzer using Lex Tool
3. Generate YACC specification for a few syntactic categories.
    a. Program to recognize a valid arithmetic expression that uses operator +, − , * and /.
    b. Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
    c. Implementation of Calculator using LEX and YACC.
    d. Convert the BNF rules into YACC form and write code to generate abstract syntax tree
4. Write program to find ε − closure of all states of any given NFA with ε transition.
5. Write program to convert NFA with ε transition to NFA without ε transition.
6. Write program to convert NFA to DFA.
7. Write program to minimize any given DFA.
8. Develop an operator precedence parser for a given language.
9. Write program to find Simulate First and Follow of any given grammar.
10. Construct a recursive descent parser for an expression.
11. Construct a Shift Reduce Parser for a given language.
12. Write a program to perform loop unrolling.
13. Write a program to perform constant propagation.
14. Implement Intermediate code generation for simple expressions.

References:
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.
3. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
4. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
5. Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

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Online Learning Resources/Virtual Labs:
1. http://cse.iitkgp.ac.in/~bivasm/notes/LexAndYaccTutorial.pdf

III B.Tech – II Semester
(22E32601L) PREDICTIVE ANALYTICS LAB
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		0	0	3	1.5

Course Objectives:
- Discuss the concept Predictive Analytics
- Illustrate the uses and applications of Predictive Analytics
- Demonstrate building of Predictive Analytics models

Course Outcomes:
CO1: Visualize and explore data to better understand relationships among variables
CO2: Understand how ensemble models improve predictions
CO3: Organize the predictive modelling task and data flow
CO4: Apply predictive models to generate predictions for new data
CO5: Choose and implement appropriate performance measures for predictive models

Predictive Analytics Lab Programs in Python

Introduction: Predictive analytics involves using historical data, statistical algorithms, and machine learning techniques to predict future outcomes. This document outlines various lab programs in Python that cover key aspects of predictive analytics, including data preprocessing, feature engineering, model training, evaluation, and deployment.

Lab Program Outline
1. **Data Pre-processing**
   - Loading data
   - Handling missing values
   - Encoding categorical variables
   - Normalizing/standardizing data
2. **Exploratory Data Analysis (EDA)**
   - Visualizing data distributions
   - Identifying correlations
   - Detecting outliers
3. **Feature Engineering**
   - Creating new features from existing data
   - Feature selection techniques
   - Dimensionality reduction methods
4. **Model Training and Evaluation**
   - Splitting data into training and testing sets
   - Training various machine learning models
   - Evaluating model performance using metrics
5. **Advanced Predictive Models**
   - Implementing ensemble methods
   - Tuning hyperparameters
   - Building neural networks
6. **Model Deployment**
   - Saving and loading models
   - Creating a simple API for model predictions
   - Integrating the model into a web application

7. Python Program for Linear Regression
Program will:
- o Load a dataset.
- o Preprocess the data (if needed).
- o Split the data into training and testing sets.
- o Train a linear regression model.
- o Evaluate the model's performance.

8. Python Program for Logistic Regression
program will:
- o Load a dataset.
- o Preprocess the data (if needed).
- o Split the data into training and testing sets.
- o Train a logistic regression model.
- o Evaluate the model's performance.

9. Python Program for Decision Tree Regression
This program will:
- o Load a dataset.
- o Preprocess the data (if needed).
- o Split the data into training and testing sets.
- o Train a decision tree regression model.
- o Evaluate the model's performance.
- o Visualize the results.

10. Python Program for Classification using Naive Bayes
This program will:
- o Load a dataset.
- o Preprocess the data (if needed).
- o Split the data into training and testing sets.
- o Train a Naive Bayes classification model.
- o Evaluate the model's performance.
- o Visualize the results.

Text Book:

1. Title: Predictive analytics : the power to predict who will click, buy, lie, or die / Eric Siegel. Copyright □ 2016 by Eric Siegel. All rights reserved.

2. "Predictive Analytics", Published by John Wiley & Sons, Inc., Hoboken, New Jersey. Published simultaneously in Canada.
3. Predictive Analytics and Data Mining, Vijay Kotu Bala Deshpande, PhD

Online Learning Resources:
1. https://www.geeksforgeeks.org/data-preprocessing-in-data-mining/
2. https://www.analyticsvidhya.com/blog/2022/03/exploratory-data-analysis-with-an-example/
3. https://www.geeksforgeeks.org/what-is-exploratory-data-analysis/
4. https://www.explorium.ai/blog/machine-learning/feature-engineering/
5. https://www.kdnuggets.com/2018/12/feature-engineering-explained.html
   https://www.geeksforgeeks.org/machine-learning-model-evaluation/

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III B.Tech – II Semester
(22E32602L) DATA VISUALIZATION LAB
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		0	0	3	1.5

Course Objectives:
- Discuss concepts and principles of data visualization particularly related to decision making.
- Investigate technologies and practices for visualizing data as part of a data management andanalytics system.
- Apply user interface design principles and practices to develop interactive data visualizations.
- Design effective dashboard for decision making at various levels.
- Conduct research on relevant data visualization topics.

Course Outcomes:
At the end of the course students will be able to:
CO1: Understand and describe the main concepts of data visualization
CO2: Publish the created visualizations to Tableau Server and Tableau Public
CO3: How to recognize good (and bad) data visualizations, how to interpret a data visualization, andUsing shapes, colors, text and layout appropriately
CO4: Identifying stories and insights in data, preparing data for visualization, and create several different charts using Tableau.

List of Experiments:

1. Connecting to the data
2. Formatting and insertion of data
3. Creating worksheets, navigating the sheets, applying filters, aggregating the data
4. Organize the data into dashboards
5. Create story
6. Develop interactive plots in Python
7. Create Time series Data Visualization in Python
8. Visualization of Semi-Structured data
9. Create Sales Growth Dashboard – for the tracking of sales teams progress
10. Design Social media Dashboard – find how well your sponsored social activating are performing, monitor your PPC campaigns.
11. Develop Healthcare Data Dashboard – Allows hospital administrators to manage and identify patient hazards from a single screen.

References:

1. Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016.
2. Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications,2010.

Online Learning Resources/Virtual Labs:

1. Data Visualization with Tableau | Coursera

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III B.Tech – II Semester
(22E00505SC) SOFT SKILLS
(Soft Skill Course)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks		L	T	P	C
30	70	100		1	0	2	2

Pre-Requisites: NIL

Course Objectives:
• To encourage all round development of the students by focusing on soft skills
• To make the students aware of critical thinking and problem-solving skills
• To enhance healthy relationship and understanding within and outside an organization
• To function effectively with heterogeneous teams

Course Outcomes:
After successful completion of the course, students will be able to:

CO1: Memorize various elements of effective communication skills
CO2: Interpret people at the emotional level through emotional intellegence
CO3: Explain impact of business in present scenario
CO4: Develop the accounting statements and evaluate the financial performance of Business entity
CO5: Analyze how to invest their capital and maximize returns

DETAILED SYLLABUS:

UNIT-I: Soft Skills & Communication Skills
Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities: Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT-II: Critical Thinking
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

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Activities: Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT-III: Problem Solving & Decision Making
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles

Activities: Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT-IV: Emotional Intelligence & Stress Management
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self Regulation – Stress factors – Controlling Stress – Tips

Activities: Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT-V: Leadership Skills
Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – RiskTaking - Team Building - Time Management

Activities: Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

TEXT BOOKS:
1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.) Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012).

2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher: K International Publishing House; 0 edition (February 28, 2018)

REFERENCE BOOKS:
1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, Renu Shorey) Publisher: Notion Press

Online Learning Resources:
1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hD17IU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo

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III B.Tech – II Semester
(22E00602MC) INTELLECTUAL PROPERTY RIGHTS
(Mandatory Non-Credit Course)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	00	30	2	0	0	0

Pre-Requisites: NIL

Course Objectives:
- To inculcate the basic knowledge of Intellectual Property Rights, Copy Right Laws, Cyber Laws, Trade Marks and Issues related to Patents
- To provide the knowledge on registration process of patent and trademarks
- To give an overview on startups and innovations

Course Outcomes:
After successful completion of the course, students will be able to:

CO1: Understand IPR law and Cyber law
CO2: Discuss about copy right law
CO3: Discuss registration process, maintenance and litigations associated with trademarks
CO4: Explain the process of registration of trademarks
CO5: Gain the knowledge on Information technology Act

DETAILED SYLLABUS:

UNIT-I: Introduction to Intellectual Property Law
Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT-II: Introduction to Copyrights
Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

UNIT-III: Introduction to Patent Law
Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT-IV: Introduction to Trade mark
Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

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UNIT-V: Introduction to Trade Secret
Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

TEXT BOOKS:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal &Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

REFERENCE BOOKS:

1. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Pub.

Online Learning Resources:
1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3217699/
2. https://www.wipo.int/about-ip/en/
3. https://copyright.gov.in/Exceptions.aspx
4. https://www.inta.org/fact-sheets/international-trademark-rights/
5. https://www.meity.gov.in/content/information-technology-act-2000

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(22E01605) BUILDING SERVICES AND MAINTENANCE
(Open Elective - II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Building Materials, Concrete Technology, Electronics Engineering

COURSE OBJECTIVES: The goal of this course for students is:
1. To perform essential building maintenance tasks for long-term functionality.
2. To execute special repair techniques to enhance building safety and durability.
3. To design efficient lighting solutions for various buildings, addressing special needs.
4. To understand and apply fundamentals of electrical systems and safety in building installations.
5. To implement fire safety measures to prevent and manage fire hazards in buildings.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Assess the requirements of building maintenance.
CO2: Identify the repairs to the existing buildings.
CO3: Design illumination requirements in a building.
CO4: Assess various types of power supply and their maintenance.
CO5: Design Fire safety requirements of a building.

DETAILED SYLLABUS:

UNIT-I: MAINTENANCE OF BUILDING
White washing, Colour washing and Distempering, painting, Replacement of glass panels, Re-polishing of terrazzo and mosaic flooring, easing of doors and windows, Repairs to damaged part of the flooring, Cleaning of fire chimneys and gutters, Removal of stains from concrete and terrazzo floor, Anti termite treatment (in building, foundations, floors and wood work) Repairing of Plumbing, Drain and Sanitary fixtures. Repair of water storage sumps and tanks, Repair of any joints i.e. wall-beam joint leak, beam column and slab beam, joints.

UNIT II: SPECIAL REPAIRS
Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drill ability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

UNIT III: PRINCIPLES OF ILLUMINATION & DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour –Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Laws of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV: ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations.

UNIT V: FIRE SAFETY INSTALLATION

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials in construction of staircases and lift lobbies. Special features required for physically handicapped and elderly in buildings – Heat and smoke detectors – Fire alarm system, Snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinkler.

TEXT BOOKS:

1. V.N. Vazirani and S.P. Chandola, Building Construction by by Khanna Publishers.
2. BRE Building elements, Building service by H.W. Harrison and P.M. Trotman.
3. Building repair and maintenance and management by B.S. Gahlot and Sanjay Sharma, CBS Publications.

REFERENCE BOOKS:

1.E.R. Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.
3. Philips Lighting in ArchitecturalDesign, McGraw-Hill, New York,1964.
4. R.G. Hopkinson and J.D. Kay, "The Lighting of buildings", Faber and Faber, London, 1969.
5. National Building Code.

WEB RESOURSES:

1. https://archive.nptel.ac.in/courses/105/102/105102176/
2. https://onlinecourses.nptel.ac.in/noc20_ce09/preview
3. https://onlinecourses.swayam2.ac.in/nou21_ce04/preview

III B. Tech. – II Semester
(22E03606) INTRODUCTION TO ROBOTICS
(Open Elective -II)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		2	1	0	3

PREREQUISITES: NIL

COURSE OBJECTIVES:

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1 : Illustrate the industrial applications of robot vision system.

CO2 : Understand the basic concepts of robot controlling systems.

CO3 : Evaluate D-H notations for simple robot manipulator.

CO4 : Define a robot and homogeneous transformations.

CO5 : Identify the applications of robot in manufacturing sectors

DETAILED SYLLABUS:

UNIT I: Fundamentals of Robots

Fundamentals of Robots: Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis

UNIT II: Kinematics of Robots:

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse
kinematic equations for position and orientation, Denavit-Hartenberg (D-H) representation of forward kinematic equations of robots, The inverse kinematic of robots, Degeneracy and Dexterity, simple problems with D-H representation.

UNIT III: Differential motions and Velocities

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian.

UNIT IV: Control of Manipulators

Control of Manipulators: Open- and Close-Loop Control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID Control Scheme, computer Torque control, force control of robotic manipulators, description of for cecontrol tasks, force control strategies, hybrid position/force control, impedance force/torque control.

UNITV: Robot Applications In Manufacturing

Robot Applications In Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , "Industrial Robotics" — Mc Graw Hill, 1986.
2. John.J.Craig Addison, "Introduction to Robotics: Mechanics and Control", Wesley, 1999.
3. K.S. FU, R.C. Gonzalez and C.S.G Lee, "Robotics: Control, sensing, vision, and intelligence" . Mc Graw Hill, 1987.

REFERENCE BOOKS:

1. Saeed B. Niku, "Introduction to Robotics – Analysis, System, Applications", 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, "Robot Analysis and Control", 1st Edition Wiley- Interscience, 1986.
3. Robert J. Schillin, "Fundamentals of Robotics: Analysis and control", Prentice-Hall Of India Pvt. Limited, 1996.
4. Mohsen shahinpoor, "A robot Engineering text book", Harper & Row Publishers,1987.
5. Richard D. Klafter, "Thomas Robotic Engineering an integrated approach", PHI publications 1988.
6. R K Mittal and I J Nagrath, "Robotics and control", Illustrated Edition, Tata McGraw Hill India 2003.
7. Ashitava Ghoshal, "Robotics, Fundamental concepts and analysis", Oxford University Press,2006

WEB RESOURCES:

1. https://www.yumpu.com/en/document/view/18818306/lesson-3-course-name-design-of-machine-elements-1-nptel
2. https://www.digimat.in/nptel/courses/video/112105124/L01.html
3. https://dokumen.tips/documents/nptel-design-of-machine-elements-1.html
4. http://www.nitttrc.edu.in/nptel/courses/video/112105124/L25.html

(22E02605) RENEWABLE ENERGY SYSTEMS
(Open Elective -II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: -Engineering Physics & Electronic Devices, Electrical Power Generating Systems

COURSE OBJECTIVES:
1. Get Exposure On Installation of Solar Systems.
2. To Come Across Solar Policies Like Tax Incentives, Subsidies , Solar Purchase Obligations, Agreements and Certificates.
3. To Learn The Electrical Aspects of Wind Turbines.
4. To Learn The Turbine Design And Control Of Wind Turbines.
5. To Understand The Necessity of Hybrid Energy Systems and Integration Of Various Energy Systems.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1: To gain Knowledge about different types of solar systems, tracker selection and storage systems

CO2: To understand about the Subsystems of PV, criteria for installation, control, and monitoring system

CO3: To gain Knowledge about different Solar Policies, Solar Purchase obligation, Grid parity and to calculate Energy saving and payback

CO4: To understand Solar Thermal Systems, how to design Active Systems, Solar Distillation and Solar Drying

CO5: To understand MPPT techniques and analyze Effect of Shading, integration with grid systems and Multi layered cells.

DETAILED SYLLABUS:
UNIT-I: SOLAR SUBSYSTEMS AND INSTALLATION
Components and subsystems of PV systems, Converters, different configurations; Inverter location trade -off studies; Planning of solar installation, Conditions & limits, Yield/loss study, Yield assessment for photovoltaic systems; Monitoring and control system, diesel plants, other renewable sources.

UNIT-II: REGULATION
Solar Policies, Jawaharlal Nehru National Solar Mission, Tax Incentives and Subsidies, Power, Renewable; Solar Purchase Obligation, Renewable Energy Certificates; Grid Parity, Power Purchase Agreement, Energy saving and payback.

UNIT-III: ELECTRICAL ASPECTS OF WIND TURBINES

Overview, Basic Concepts of Electric Power, Power Transformers, Electrical Machines, Power Converters, Electrical Aspects of Variable Speed Wind Turbines, Ancillary Electrical Equipment.

UNIT-IV: WIND TURBINE DESIGN AND CONTROL

Design Procedure, Wind turbine topologies, Standards, Technical Specifications and Certification. Wind turbine Design Loads, Overview of Wind Turbine Control Systems, Typical Grid connected Turbine Operation, Supervisory Control Overview and Implementation.

UNIT-V: HYBRID RENEWABLE ENERGY SYSTEMS

Need for Hybrid Systems- Range and type of Hybrid Systems, Wind-Diesel hybrid system with no storage and with battery backup, Wind-Photovoltaic systems. Case study of Hybrid Systems.

TEXT BOOKS:

1. G.D Ray, Solar energy utilization, 5 thedition 1996, Khanna publications
2. D.YogiGoswami, Frank Reith, Jan F. Kreider, "Principles of Solar Engineering" 2nd Edition, Taylor & Francis, 2000, Indian reprint, 2003
3. Solanki: Solar Photovoltaics- Fundamentals, Technologies and Applications, PHI, Eastern Economy Edition, 2012.
4. J.F. Manwell, J.G. Mc Gowan and A.L.Rogers-"Wind Energy Explained-Theory,Design and Applications" 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. CS Solanki: Solar Photovotaics – Fundamentals, Technologies and Applications, PHI Learning Pvt. Ltd., 2011.
2. Martin A. Green, Solar Cells Operating Principles, Technology, and System Applications Prentice- Hall, 2008.
3. Kalogirou .S, "Solar Energy Engineering", Processes and Systems, Elsevier, 2009
4. Renewable Energy Systems, 2nd Edition, Henrik Lund, Academic Press.

ONLINE LEARNING RESOURSES:

1. http://1.droppdf.com/files/xIrVf/principles-of-solar-engineering-3rd-ed 2015-.pdf
2. https://ocw.mit.edu/courses/edgerton-center/ec-711-d-lab-energy-spring-2011/solar/
3. http://nptel.ac.in/courses/112105050/
4. https://www.edx.org/course/solar-energy-delftx-et3034x-0
5. http://www.springer.com/in/book/9789027719300

III B. Tech. – II Semester
(22E04606) BASIC VLSI DESIGN
(Open Elective- II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basics of Analog and Digital Electronics.

COURSE OBJECTIVES:
- Understand the fundamental aspects of circuits in silicon.
- Relate to VLSI design processes and design rules.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Identify the CMOS layout levels, and the design layers used in the process sequence.
CO2: Describe the general steps required for processing of CMOS integrated circuits.
CO3: Design static CMOS combinational and sequential logic at the transistor level.
CO4: Demonstrate different logic styles such as complementary CMOS logic, pass transistor Logic, dynamic logic, etc.
CO5: Interpret the need for testability and testing methods in VLSI.

DETAILED SYLLABUS:
UNIT-I: INTRODUCTION TO MOS TECHNOLOGY:
Moore's law, speed power performance, nMOS fabrication, CMOS fabrication: n-well, pwell processes, BiCMOS, Comparison of bipolar and CMOS. Basic Electrical Properties of MOS and BiCMOS Circuits: Drain to source current versus voltage characteristics, threshold voltage, transconductance

UNIT-II: BASIC ELECTRICAL PROPERTIES OF MOS AND BI-CMOS:
Basic Electrical Properties of MOS And BiCMOS Circuits: nMOS inverter, Determination of pull upto pull down ratio: nMOS inverter driven through one or more pass transistors, alternative forms ofpull up, CMOS inverter, BiCMOS inverters, latch up. Basic Circuit Concepts: Sheet resistance, area capacitance calculation, Delay unit, inverter delay, estimation of CMOS inverter delay, super buffers, BiCMOS drivers.

UNIT-III: MOS AND BI-CMOS CIRCUIT DESIGN PROCESS:
MOS and BiCMOS Circuit Design Processes: MOS layers, stick diagrams, nMOS design style, CMOS design style Design rules and layout & Scaling of MOS Circuits: λ- based design rules, scaling factors for device parameters.

UNIT-IV: SUB SYSTEM DESIGN-1:

Subsystem Design and Layout-1: Switch logic pass transistor, Gate logic inverter, NAND gates, NOR gates, pseudo on MOS, Dynamic CMOS Examples of structured design: Parity generator, Bus arbitration, multiplexers, logic function block, code converter.

UNIT-V: SUB SYSTEM DESIGN-2:

Subsystem Design and Layout-2: Clocked sequential circuits, dynamic shift registers, bus lines, General considerations, 4-bit arithmetic processes, 4-bit shifter, Regularity Definition & Computation Practical aspects and testability: Some thoughts of performance, optimization and CAD tools for design and simulation.

TEXT BOOKS:

1. "Basic VLSI Design", Douglas A Pucknell, Kamran Eshraghian, 3rd Edition, Prentice Hall of India publication, 2005.
2. Modern VLSI Design-Wayne Wolf, 3 Ed., 1997, Pearson Education.

REFERENCE BOOKS:

1. "CMOS Digital Integrated Circuits, Analysis And Design", Sung–Mo(Steve) Kang, Yusuf Leblebici, Tata Mc Graw Hill,3rd Edition, 2003.
2. VLSI Technology", S.M.Sze, 2nd edition, Tata McGraw Hill,2003
3. Behzad Razavi , "Design of Analog CMOS Integrated Circuits", McGraw Hill 2003.

WEB RESOURSES:

1. https://vlsiresources.com/frontendvlsi/
2. https://www.tutorialspoint.com/vlsi_design/vlsi_design_quick_guide.htm

III B.Tech. - II Semester
(22E00605) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS
(Open Elective- II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: - Students should know about fundamentals and basic principles in chemistry

COURSE OBJECTIVES:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials
- To impart knowledge to the students about fundamental concepts of Hydrogels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

COURSE OUTCOMES:
At the end of the course the student will be able to:
CO1: Understand the state of art synthesis of Polymeric materials
CO2: Understand the hydrogels preparation, properties and applications
CO3: Characterize polymers materials using plastics
CO4: Analyze surface phenomenon fomicelles

DETAILED SYLLABUS:

UNIT I: Polymers-Basics and Characterization:
Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, poly dispersity and molecular weight distribution Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit II : Synthetic Polymers:
Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD.

UNIT III: Natural Polymers:

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEAK.

UNIT IV: Hydrogels of Polymer networks:

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery. Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

UNITV: Surface phenomena:

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

REFERENCE BOOKS:
1. A Text book of Polymer science, Billmayer
2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
3. Advanced Organic Chemistry, B.Miller, Prentice Hall
4. Polymer Chemistry–G.S.Mishra
5. Polymer Chemistry–Gowarikar
6. Physical Chemistry–Galston
7. Drug Delivery-Ashim K.Misra

Web links:
1. https://onlinecourses.nptel.ac.in/noc23_ch41/preview
2. https://archive.nptel.ac.in/courses/113/105/113105077/
3. https://scholar.google.co.in/scholar?q=nptel+Natural+Polymers&hl=en&as_sdt=0&as_vis=1&oi= scholart
4. https://archive.nptel.ac.in/content/storage2/courses/112104118/lecture-2/2-7-surface-tension-liquids.htm

(22E00601) NUMERICAL METHODS & LAPLACE TRANSFORMS
(Open Elective -II)

Int.Marks	Ext.Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Pre-Requisites: Differentiation & Integration

COURSE OBJECTIVES:
- This course aims at providing the student with the knowledge on various numerical methods for solving equations.
- The student develops the idea of using by Interpolating the polynomials.
- To understand the integral equations and solution of differential equations.
- The student develops the idea of using continuous/discrete transforms.

COURSE OUTCOMES: At the end of the course, the student will be able to
CO1: Apply numerical methods to solve algebraic and transcendental equations
CO2: Derive interpolating polynomials using interpolation formulae
CO3: Solve differential and integral equations numerically
CO4: Understand the usage of Laplace transforms
CO5: Understand the usage of Inverse Laplace Transforms.

UNIT-I: Solution of Algebraic & Transcendental Equations:
Introduction-Bisection Method-Iterative method-Regulafalsi method-Newton Raphson method
System of Algebraic equations: Gauss Jacobi and Gauss Siedal iterative methods

UNIT-II: Interpolation
Finite differences-Newton's forward and backward interpolation formulae – Gauss forward and backward formula, Stirling's formula, Bessel's formula. Lagrange's formula.

UNIT-III: Numerical Integration & Solution of Initial value problems to Ordinary differential Equations
Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule
Numerical solution of Ordinary Differential equations: Solution by Taylor's
series- Picard's Method of successive Approximations- Euler's and Modified Euler's
Methods-Runge-Kutta Methods.

UNIT-IV: Laplace Transforms
Definition-Laplace transform of standard functions-existence of Laplace Transform,
First shifting Theorem, Unit step function, Second shifting theorem, Laplace
Transforms of derivatives and Integrals, Evaluation of integrals by Laplace transforms
Dirac's delta function, Laplace transform of Periodic function.

UNIT-V: Inverse Laplace transforms and its applications

Inverse Transform – First shifting Theorem, second shifting theorem, change of scale property, Inverse Laplace Transforms of derivatives and integrals, Multiplication by power of 'S' and Division by 'S', Convolution theorem and Application of Laplace transforms to ordinary differential equations of first and second order with constant coefficients

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.

REFERENCE BOOKS:

1. Peter O'neil, Advanced Engineering Mathematics, Cengage learning.
2. N. Bali, M. Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science press.
3. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

WEB RESOURCES:

1. https://www.slideshare.net/slideshow/algebraic-and-transcendental-equations/55260970
2. https://www.slideshare.net/slideshow/laplace-transform-59113100/59113100

(22E00604) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basic knowledge on important characteristics and properties of different electronic based materials.

Course Objectives:
• To impart the fundamental knowledge on various materials, their properties and applications.
• To provide insight into various semiconducting materials, and their properties.
• To enlighten the characteristic behaviour of various semiconductor devices.
• To provide the basics of dielectric and piezoelectric materials and their properties.
• To explain different categories of magnetic materials, mechanism and their advanced applications.

Course Outcome: At the end of the course the student will be able
• To understand the fundamentals of various materials.
• To exploit the physics of semiconducting materials
• To familiarize with the working principles of semiconductor-based devices.
• To understand the behaviour of dielectric and piezoelectric materials.
• To identify the magnetic materials and their advanced applications.

UNIT I :Fundamentals of Materials Science
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

UNIT II: Semiconductors
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III: Physics of Semiconductor devices
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT IV: Dielectric Materials and their applications:
Introduction, Dielectric properties, electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

UNIT V: Magnetic Materials and their applications

Introduction, Magnetism & various contributions to para and diamagnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Antiferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nanomagnetism, Super-para magnetism – Properties and applications.

Textbooks

1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, Dhanpat Rai and Co.
3. Introduction to Semiconductor Materials and Devices by M.S.Tyagi WILEY Publications 2008

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., 2nd Edition,2011
4. A First Course in Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland, Chapman& Hall Pub.

NPTEL courses links

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://onlinecourses.nptel.ac.in/noc20_mm02/preview
3. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

IV B.Tech – I Semester
(22E05701a) CLOUD COMPUTING
(Professional Elective Course–III)
(Common to CSE, CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
1. To explain the evolving computer model called cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. To describe the security aspects in cloud.

Course Outcomes (CO):
After completion of the course, students will be able to
CO1: Ability to create cloud computing environment
CO2: Ability to design applications for Cloud environment
CO3: Design & develop backup strategies for cloud data based on features.
CO4: Use and Examine different cloud computing services.
CO5: Apply different cloud programming model as per need.

UNIT I: Basics of Cloud computing
Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications
Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.
Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II: Hadoop and Python
Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.
Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.
Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT III: Python for Cloud computing
Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.
Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT IV: Big data, multimedia and Tuning

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT V: Applications and Issues in Cloud

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven–step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Total Periods : 48

Textbooks:
1. Cloud computing A hands-on Approachl By ArshdeepBahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:
1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O 'Reilly, SPD, rp2011.
6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

Online Learning Resources:
Cloud computing - Course (nptel.ac.in)

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IV B.Tech – I Semester
(22E32701b) AGILE METHODOLOGIES
(Professional Elective Course–III)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
1. To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2. To provide good understanding of software design and a set of software technologies and APIs.
3. To carry out detailed examination and demonstration of Agile development and testing techniques.
4. To discuss Agile software development

Course Outcomes:
After completion of the course, students will be able to
CO1: Realize the importance of interacting with business stakeholders in determining the requirements for a software system
CO2: Perform iterative software development processes: how to plan them, how to execute them.
CO3: Point out the impact of social aspects on software development success.
CO4: Develop techniques and tools for improving team collaboration and software quality.
CO5: Perform Software process improvement as an ongoing task for development teams.

UNIT I: AGILE METHODOLOGY
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II: AGILE PROCESSES
Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III: AGILITY AND KNOWLEDGE MANAGEMENT
Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV: AGILITY AND REQUIREMENTS ENGINEERING
Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V: AGILITY AND QUALITY ASSURANCE

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Textbooks:

1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.

2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

Reference Books:

1. Craig Larman, —Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

Online Learning Resources:

https://www.nptelvideos.com/video.php?id=904

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IV B.Tech – I Semester
(22E32701c) CYBER SECURITY
(Professional Elective Course–III)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
> The course is designed
> - To provide awareness on different cyber-crimes,
> - To develop the awareness on cyber offenses,
> - To improve the knowledge in tools and methods used in cyber-crime.

Course Outcomes (CO):
> After completion of the course, students will be able to
> **CO1:** Classify the cyber-crimes and understand the Indian ITA 2000
> **CO2:** Analyze the vulnerabilities in any computing system and find the solutions
> **CO3:** Predict the security threats of the future
> **CO4:** Investigate the protection mechanisms
> **CO5:** Design security solutions for organizations.

UNIT-I   Introduction to Cybercrime

Introduction, Cybercrime, and Information Security, who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT-II   Cyber Offenses: How Criminals Plan Them

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT-III   Cybercrime: Mobile and Wireless Devices

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT-IV   Tools and Methods Used in Cybercrime

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT-V   Cyber Security: Organizational Implications

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Textbooks:
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, NinaGodbole and Sunil Belapure, Wiley INDIA.

Reference Books:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security ,Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group

Online Learning Resources:
> http://nptel.ac.in/courses/106105031/40
> http://nptel.ac.in/courses/106105031/39
> http://nptel.ac.in/courses/106105031/38

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IV B.Tech – I Semester
(22E32702a) PROCESS MINING
(Professional Elective Course–IV)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Discuss the basic concepts of Process mining
- Demonstrate how to apply process mining

Course Outcomes:
At the end of the course students will be able to:
> **CO1:** To Learn Transparency Is a Prerequisite for Digital Transformation
> **CO2:** Understand Process Modelling and Analysis
> **CO3**: To learn and apply process discovery techniques
> **CO4**: Applying process mining e
> **CO5**: Analysis of Lasagna and Spaghetti process and future of process mining.

UNIT-I
Introduction: Process Mining in a Nutshell, Purpose: Identifying the Right Use Cases, Challenges, Pitfalls, and Failures. Process Mining, RPA, BPM, and DTO.

UNIT-II
Process Mining: The Missing Link- Limitations of Modelling, Process Mining, Analysing an Example Log, Play-In, Play-Out, and Replay, Positioning Process Mining.
Process Modelling and Analysis: The Art of Modelling, Process Models, Model-Based Process Analysis.

UNIT-III
Process Discovery: A Simple Algorithm for Process Discovery, Rediscovering Process Models, Challenges.
Advanced Process Discovery Techniques: Characteristics, Heuristic Mining, Genetic Process Mining, Region-Based Mining, Inductive Mining.

UNIT-IV
Process Mining Software: Process Mining Not Included, Different Types of Process Mining Tools, ProM: An Open-Source Process Mining Platform, Commercial Software.
Process Mining in the Large: Big Event Data, Case-Based Decomposition, Activity-Based Decomposition, Process Cubes, Streaming Process Mining

UNIT-V
Analyzing "Lasagna Processes" – Characterization, Use Cases, Approach, Applications
Analyzing "Spaghetti Processes"- Characterization, Approach, Applications
Outlook: Future of Process Mining- Academic View: Development of the Process Mining Discipline. Business View: Towards a Digital Enabled Organization

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Text Books:

1. Reinkemeyer, Lars. "Process mining in action." Principles, Use Cases and Outlook, Santa Barbara, 2020.
2. Aalst, Wil van der. "Data science in action." Process mining. Springer, Berlin, Heidelberg, 2016.

Reference Books:

1. Ferreira, Diogo R. A primer on process mining: Practical skills with python and graphviz. Cham: Springer International Publishing, 2017.
2. Burattin, Andrea. "Process mining techniques in business environments." volume 207 of Lecture Notes in Business Information Processing. Springer International Publishing, 2015.
3. Huser, Vojtech. "Process mining: Discovery, conformance and enhancement of business processes." 2012.

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IV B.Tech – I Semester
(22E32702b) NATURAL LANGUAGE PROCESSING
(Professional Elective Course–IV)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approaches to machine translation.
- Teach machine learning techniques used in NLP.

Course Outcomes:
After completion of the course, students will be able to
- Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
- Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
- Understand the fundamentals of CFG and parsers and mechanisms in ATN's.
- Apply Semantic Interpretation and Language Modelling.
- Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

UNIT I Introduction to Natural language
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT II Grammars and Parsing
Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing withFeatures, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

UNIT III Grammars for Natural Language
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV
Semantic Interpretation
Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modelling
Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT-V
Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluationin Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitionsand Datasets.

Textbooks:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-DanielM.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, AksharBharathi, Vineetchaitanya,Prentice–Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, PrenticeHall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural LanguageProcessing, MIT Press, 1999.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105158/
2. http://www.nptelvideos.in/2012/11/natural-language-processing.html

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IV B.Tech – I Semester
(22E32702c) DevOps
(Professional Elective Course–IV)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives: The main objectives of the course are to
- Understand the importance and structure of a branch-based workflow.
- Understand the History and Necessity of JS Bundling
- Explore Popular Testing Libraries.
- Understanding CI/CD Concepts.
- Explore different deployment targets for Docker containers, including local development environments, staging servers, and production clusters.

Course Outcomes:

CO1: Apply DevOps principles to meet software development requirements.
CO2: Implement the general methodology of bundling to manage and optimize dependencies in JS projects.
CO3: Utilize popular testing libraries and frameworks to write and run tests for JavaScript applications.
CO4: Implement a CI/CD pipeline using a CI server and deployment scripts.
CO5: Be able to containerized applications in production environments, ensuring scalability, reliability, and performance.

UNIT-I:
Introduction to Dev ops: Dev ops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github, Introduction to GitLab, Introduction to Bit Bucket.

UNIT-II:
Compile and Build Using Maven: Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build Phases (compile build, test, package) Maven Profiles, Maven Repositories (local, central, global), Maven plugins, Maven Create and Build Artifacts, Dependency Management.

UNIT-III:
Continuous Integration Using Jenkins: Introduction to CI/CD, Install & Configure Jenkins, Jenkins Architecture Overview, Build Jobs and Configurations, Jenkins Plugins, Jenkins Integration with other Tools.

UNIT-IV:
Containerization with Docker: Introduction to Containerization, Introduction to Docker, Understanding Images and Containers, Working with Containers.

UNIT-V:
Building Dev ops Pipelines Using any Cloud Platform: Create Github Account, Create Repository, Create Organization, create a New Pipeline, Build a Sample Code

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Text Books:

1. DevOps Tools from Practitioner's Viewpoint. Deepak Gaikwad, Viral Thakkar,. Wiley publications.
2. Jenkins, The Definitive Guide, John Ferguson Smart,O'Reilly Publication.

Reference Books:

1. The DevOps2.1 Tool Kit : Docker Swarm, Building, Testing, Deploying, and Monitoring services inside Docker Swarm clusters by Viktor Farcic Packt Birmingham, Mumbai.
2. MariotTsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
3. https://maven.apache.org/guides/getting-started/

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IV B.Tech – I Semester
(22E33703a) RECOMMENDER SYSTEMS
(Professional Elective Course–V)
(Common to CSE-AI, CSE-DS, CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- To provide students with basic concepts and its application in various domain
- To make the students understand different techniques that a data scientist needs to know for analysing big data
- To design and build a complete machine learning solution in many application domains.

Course Outcomes:
After completion of the course, students will be able to
CO1: Aware of various issues related to Personalization and Recommendations.
CO2: Develop and apply model-based and content-based recommender systems.
CO3: Develop new Recommender Systems for a number of domains especially, Education, Health-care.
CO4: Assess and enhance recommender systems with context-sensitive and evaluation techniques.
CO5: Design and implement a set of well-known Recommender System approaches used in Ecommerce and Tourism industry

UNIT-I: //
An Introduction to Recommender Systems: Introduction, Goals of Recommender Systems, Basic Models of Recommender Systems, Domain-Specific Challenges in Recommender Systems. Advanced Topics and Applications. Introduction, Key Properties of Ratings Matrices.

Neighborhood-Based Collaborative Filtering Predicting Ratings with Neighborhood-Neighborhood-Based Collaborative Filtering: Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction andNeighborhood Methods, Graph Models for Neighborhood-Based Methods, A Regression Modeling View of Neighborhood Methods.

UNIT-II: Model-Based Collaborative Filtering:
Model-Based Collaborative Filtering: Introduction, Decision and Regression Trees, Rule-Based Collaborative Filtering, Naive Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-Box, Latent Factor Models, Integrating Factorization and Neighborhood Models.

Content-Based Recommender Systems: Introduction, Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations, Using Content-Based Models for Collaborative Filtering, Summary.

UNIT-III:
Knowledge-Based Recommender Systems: Introduction, Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems, Summary.

Ensemble- Based and Hybrid Recommender Systems: Introduction, Ensemble Methods from the Classification Perspective, Weighted Hybrids, Switching Hybrids, Cascade Hybrids, Feature Augmentation Hybrids, Meta-Level Hybrids, Feature Combination Hybrids, Summary.

UNIT-IV:
Evaluating Recommender Systems: Introduction, Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures, Limitations of Evaluation Measures.

Context-SensitiveRecommender Systems:
Introduction, The Multidimensional Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Modeling.

UNIT-V: Time- and Location-Sensitive Recommender Systems
Introduction, Temporal Collaborative Filtering, Discrete Temporal Models, Location-Aware Recommender Systems, Location-Aware Recommender Systems Location-Aware Recommender Systems, Summary.

Textbooks:
1. Charu C. Aggarwal, "Recommender Systems", Springer,2016.

Reference Books:
1. Francesco Ricci, Lior Rokach, "Recommender Systems Handbook", 2nd ed., Springer, 2015 Edition.

Online Learning Resources:
1. Recommendation System -Understanding The Basic Concepts (analyticsvidhya.com)
2. Recommender Systems | Coursera

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IV B.Tech – I Semester
(22E05703b) BLOCKCHAIN TECHNOLOGY AND APPLICATIONS
(Professional Elective Course–IV)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Understand how blockchain systems (mainly Bitcoin and Ethereum) work and to securelyinteract with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from blockchain technology into their own projects.

Course Outcomes:
At the end of the course students will be able to:
CO1: Demonstrate the foundation of the Block chain technology and understand the processes in ayment and funding.
CO2: Identify the risks involved in building Blockchain applications.
CO3: Review of legal implications using smart contracts.
CO4: Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets.
CO5: Examine how to profit from trading cryptocurrencies.

UNIT-I   Introduction
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT-II   Block Chain Concepts
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT-III   Architecting Blockchain Solutions
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT-IV   Ethereum Block chain Implementation
Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Meta mask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

UNIT-V   Ethereum Block chain Implementation

Hyperledger Blockchain Implementation, Introduction, Use Case − Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero- Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Textbooks:

1. Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2. Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly.

Reference Books:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, JosephBambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Online Learning Resources:

1. https://github.com/blockchainedindia/resources
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smitshttps://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0 401.htm
4. https://nptel.ac.in/courses/106105184
5. https://onlinecourses.nptel.ac.in/noc22_cs44/preview

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IV B.Tech – I Semester
(22E32703c) DEEP LEARNING
(Professional Elective Course–V)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Course Objectives:
- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:
After completion of the course, students will be able to
- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II

Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV
Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

UNIT V
Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Textbooks:
1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press,2016.
2. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition,2017.

Reference Books:
1. Fundamentals of Deep Learning, Designing next-generation machineintelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

Online Learning Resources:
1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf
4. https://www.cse.iitm.ac.in/~miteshk/CS7015.html
5. https://www.deeplearningbook.org
6. https://nptel.ac.in/courses/106105215

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IV B.Tech – I Semester
(22E00405T) MANAGERIAL ECONOMICS AND FINANCIALANALYSIS
(Humanities and Social Science Elective)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

Course Objectives:
- To inculcate the basic knowledge of micro economics and learn how demand is estimated for different products
- To make the students learn input-outputrelationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To provide fundamental skills on accounting and to explain the process of preparing financial statements
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions

Course Outcomes:
After completion of the course, students will be able to
CO1: Describe different functions happening in the economic environment
CO2: Describe various measurements of production which effects demand in the Markets
CO3: Explain impact of business in present scenario
CO4: Develop the accounting statements and evaluate the financial performance of Business entity
CO5: Analyze how to invest their capital and maximize returns

UNIT - I:
Introduction to Managerial Economics: Introduction, Nature and Scope of Managerial Economics. Demand-Concepts (Determinants of Demand, Types of Demand, Law of Demand) – Elasticity of Demand- Types and Measurements of Elasticity, Factors determining elasticity. Demand Forecasting (Steps in Demand Forecasting, Methods Of Demand Forecasting) - Relationship of Managerial Economics with other Subjects

UNIT-II:
Theory of Production & Cost Analysis: Introduction, Importance of Production, Types of Production functions- Cobb-Douglas Production Function. Internal and External Economies of scale. Cost Concepts. Break-Even Analysis (BEA) - Determination of Break-Even Point. Managerial significance and limitations of Break-Even Analysis.

UNIT-III:
Introduction to Markets and business Environment: Introduction, Characteristics of Markets, Types of markets, Pricing Methods and strategies. Introduction to Business. Forms of Business organizations (Sole Proprietary, Partnership, Joint Stock Company, Cooperative Societies). Public Enterprises

UNIT-IV:
Capital and Capital Budgeting: Importance of Capital. Types of Capital (Fixed Capital and Working Capital). Types of Working Capital. Working capital Life cycle. Sources of Capital (Long term, Medium term and Short term Sources). **Capital Budgeting:** Importance of capital budgeting, Techniques of Capital Budgeting (PBP, ARR, NPV, PI, IRR)

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UNIT-V:

Financial Accounting and Analysis: Introduction. Importance of Accounting, Principles of Accounting, Difference between Accounting and Book keeping. Types of Accounts. The Accounting Process (Journal, Ledger, Trial Balance, Trading And Profit and Loss A/c, Balance Sheet with Adjustments).Ratio Analysis-Types of Ratios, Simple Problems on different types of ratios

TEXT BOOKS:
1. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019.
2. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.

REFERENCE BOOKS:
1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age. International, 2013
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, NewDelhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013

Online Learning Resources:

1. https://www.slideshare.net/rossanz/production-and-cost-45827016
2. https://www.slideshare.net/darkyla/business-organizations-19917607
3. https://www.slideshare.net/balarajbl/market-and-classification-of-market
4. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
5.https://www.slideshare.net/ashu1983/financial-accountin

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IV B.Tech – I Semester
(22E00702T) ENTREPRENEURSHIP & INCUBATION
(Humanities and Social Science Elective)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Pre-Requisites: NIL

Course Objectives:
- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:
After completion of the course, students will be able to
CO1: Understand the concept of Entrepreneurship and challenges in the world of competition.
CO2: Apply the Knowledge in generating ideas for New Ventures.
CO3: Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO4:Evaluate the role of central government and state government in promoting Entrepreneurship.
CO5: Create and design business plan structure through incubations.

UNIT - I:
Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT II:
Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT III:
Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development –social entrepreneurship

UNIT IV:
Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

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UNIT V:

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship" - A South-Asian Perspective– Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

References:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.
2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.Janakiramand M.Rizwanal "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

ONLINE LEARNING RESOURCES:

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurship/50

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IV B.Tech – I Semester
(22E00703T) ORGANIZATIONAL BEHAVIOUR
(Humanities and Social Science Elective)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

Course Objectives:
- To enable student's comprehension of organizational behavior
- To offer knowledge to students on self-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

Course Outcomes:
After completion of the course, students will be able to
CO1: Understand the nature and concept of Organizational behaviour
CO2: Apply theories of motivation to analyse the performance problems
CO3: Analyse the different theories of leadership
CO4: Evaluate group dynamics
CO5: Develop as powerful leader

UNIT - I:
Introduction to Organizational Behavior: Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective Understanding Individual Behaviour –Attitude - Perception - Learning –Personality.

UNIT-II:
Motivation: Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

UNIT-III:
Leadership and Organizational Culture: Leadership –Factors influencing the leader- Traits Theory– Managerial Grid - Transactional Vs Transformational Leadership – Qualities of good Leader - Evaluating Leader. Introduction – Meaning, scope, definition, Nature - Organizational Culture and Climate

UNIT-IV:
Group Dynamics: Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building --Conflict Management- Conflict in the organization– Conflict resolution

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UNIT –V:

Organizational Change and Development: Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Stress Management - Organizational management – Managerial implications of organization's change and development

Textbooks:
1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12Th edition.
2. P Subba Ran,Organisational Behaviour, Himalya Publishing House.

Reference Books:
1. McShane, Organizational Behaviour,TMH
2. Nelson, Organisational Behaviour,Thomson.
3. Robbins,P.Stephen,TimothyA.Judge,Organisational Behaviour, Pearson.
4. Aswathappa, Organisational Behaviour,Himalaya.

Online Learning Resources:
1. https://www.slideshare.nct/Knight1040/organizational-culture9608857
2. httpss://www.slideshare.net/AbhayRajpoot3/motivation-165556714
3. https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
4. https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

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IV B.Tech – I Semester
(22E32704SC) NO SQL USING MONGO DB
(Skill Oriented Course - V)
(CSE-DATA SCIENCE)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

Pre-requisite: DBMS, Basic knowledge of Data Science

Course Objectives:
- This course elucidates concepts related to Mongo db.
- The students will get hands- on experience in working with NoSQL and Mongo db.

Course Outcomes (CO):
After completion of the course, students will be able to
- Understand the working of NoSQL, Mongo db, its features
- Explain and compare different types of Data
- Demonstrate the detailed architecture and performance tune of Document-oriented databases.
- Explain performance tune of Key-Value Pair NoSQL databases.
- Apply NoSQL development tools on MongoDB

UNIT I

Introduction, Getting Started- Documents, Collections, Databases, Getting and Starting MongoDB, Introduction to MongoDB Shell, Data Types, Using the MongoDB Shell
Creating, Updating, and Deleting Documents: Inserting and Saving Documents, Updating Documents, Setting a write concern

UNIT II

Indexing: Introduction to Indexing, Using explain () and hint(), When Not to use Index, Types of Indexes, Index Administration
Special Index and Collection Types: Capped Collections, Time-To-Live Indexes, Full-Text Indexes, Geospatial Indexing, Storing Files with GridFS

UNIT III

Aggregation: The Aggregation Framework, Pipeline Operations, MapReduce, Aggregation Commands
Application Design: Normalization versus Denormalization, Optimizations for Data Manipulation, Planning Out Databases and Collections, Managing Consistency, Migrating, Schemas, When Not to use MongoDB
Setting Up a Replica Set: Introduction to Replication, A One-minute Test Setup, configuring a ReplicaSet, changing your ReplicaSet Configuration, How to design a Set, Member Configuration Options

UNIT IV

Administration: Starting Members in Standalone Mode, Replica Set Configuration, ManipulatingMember State, Monitoring Replication, Master-Slave
Sharding Administration: Seeing the Current State, Tracking Network Connections, Server Administration, Balancing Data
Data Administration: Setting Up Authentication, Creating and Deleting Indexes, Preheating Data, Compacting Data, Moving Collections, Pre-allocating Data Files

UNIT V

Starting and Stopping MongoDB: Starting from the Command Line, Stopping MongoDB, Security,Logging

Monitoring MongoDB: Monitoring Memory Usage, Calculating the Working Set, Tracking Performance, Monitoring Replication

Making Backups: Backing Up a server, Backing Up a Replica Set, Backing Up a Sharded Cluster,Cresting Incremental Backups with mongoopolog

Designing the System, Virtualization, Configuring System Settings, Configuring your network,System Housekeeping

Textbooks:

1. "MongoDB: The Definitive Guide", SECOND EDITION by Kristina Chodorow, Publishedby O'Reilly Media, Inc.
2. "The Definitive Guide to MongoDB: The NoSQL Database for Cloud and DesktopComputing", by EelcoPlugge, Peter Membrey and Tim Hawkins, Apress

Reference Books:

1. MongoDB Complete Guide: Develop Strong Understanding of Administering MongoDB,CRUD Operations, MongoDB Commands,2021

Online Learning Resources:

1. What Is NoSQL? NoSQL Databases Explained | MongoDB

Projects:

1. Build a Content Management System using MongoDB
2. Build a File sharing application similar to Dropbox and Google drive using MongoDB

HEAD, Dept. of CSE (DS)
Chaitanya Bharathi Institute of Technology
(Autonomous)
Vidyanagar, PRODDATUR, Y.S.R. (Dt.) A.P-516360

(22E01704) DISASTER MANAGEMENT
(Open Elective-III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

COURSE OBJECTIVES: The goal of this course for students is:
- To learn the fundamental concepts, definitions, and theories related to disasters and emergency management.
- To study various mitigation strategies and measures to reduce the impact of disasters.
- To understand the importance of community education, drills, and exercises to enhance preparedness.
- To coordinate the mechanisms, resource management, and logistics in disaster situations.
- To explore the policy frameworks, legal regulations, and ethical issues in disaster management.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand comprehensive risk assessments, identify potential hazards.
CO2: Designing and applying effective mitigation measures to minimize the impact of various types of disasters.
CO3: Ensure readiness at individual, community, and organizational levels.
CO4: Implement recovery plans to restore normalcy after a disaster.
CO5: Navigate and influence regulatory environments effectively.

DETAILED SYLLABUS:
UNIT-I: INTRODUCTION
Definition and types of disaster Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

UNIT-II: STUDY OF IMPORTANT DISASTERS
Study of Important disasters, Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim Earthquakes, Landside. Social Economics and Environmental impact of disasters.

UNIT-III: MITIGATION AND MANAGEMENT TECHNIQUES OF DISASTER
Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

UNIT-IV: TRAINING AND AWARENESS PROGRAM

Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

UNIT-V: EMERGENCY RESPONSE

Emergency Response Procedures of Coordination, communication, and logistics during a disaster, Search and Rescue Operations of Techniques, equipment, and protocols, Medical and Psychological Care of Immediate care for injuries and trauma victims.

TEXTBOOKS:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012).
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

1. "Introduction to Emergency Management" by George Haddow, Jane Bullock, and Damon P. Coppola
2. "Disaster Management: International Lessons in Risk Reduction, Response and Recovery" by Alejandro López-Carresi, Maureen Fordham, Ben Wisner, Ilan Kelman, and JC Gaillard
3. "Handbook of Disaster Research" edited by Havidán Rodríguez, William Donner, and Joseph E. Trainor.

WEB RESOURSES:

1. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview
2. https://archive.nptel.ac.in/courses/105/104/105104183/
3. https://archive.nptel.ac.in/courses/124/107/124107010/

IV B. Tech. – I Semester
(22E03704) INTRODUCTION TO COMPOSITE MATERIALS
(Open Elective -III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	0	3

PREREQUISITES: NIL

COURSE OBJECTIVES

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1 : Identify the practical applications of composites.

CO2 : Identify the polymer matrix composites.

CO3 : Classify of bio- degradable composites.

CO4 : Outline the various types of ceramic matrix materials.

CO5 : Identify the Advanced Composite materials and its applications

DETAILED SYLLABUS:

UNIT I: Introduction To Composite Materials

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT II: Polymer Matrix Composites

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT III: Metal Matrix Composites

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT IV: Ceramic Matrix Composites

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT V: Advances & Applications of Composites

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

TEXT BOOKS:
1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

REFERENCE BOOKS:
1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

WEB RESOURCES:
1. https://nptel.ac.in/courses/112104229
2. https://nptel.ac.in/courses/112104168
3. https://nptel.ac.in/courses/101104010
4. https://nptel.ac.in/courses/105108124
5. https://nptel.ac.in/courses/112104221

IV B.Tech. – I Semester
(22E02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING
(Open Elective -III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Engineering Physics & Electronic Devices, Electrical Power Generating Systems

COURSE OBJECTIVES:
1. Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS)fundamentals in design and fabrication process
2. Analyze motion less and motion detectors in IoT applications
3. Understand about Analyze applications of IoT in smart grid.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand the concept of IoT in Electrical Engineering
CO2: Analyze various types of motionless sensors and various types of motion detectors
CO3: Apply various applications of IoT in smart grid
CO4: Design future working environment with Energy internet
CO5: Apply the concept of Internet of Energy for various applications.

DETAILED SYLLABUS:
UNIT-I: SENSORS
Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT-II: OCCUPANCY AND MOTION DETECTORS
Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT-III: MEMS
Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RFMEMS switches, Electric and Magnetic field sensors.

UNIT-IV: IoT FOR SMART GRID

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home.

UNIT-V: INTERNET of ENERGY (IoE)

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE,Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

TEXT BOOKS:

1. G.D Ray, Solar energy utilization, 5 thedition 1996, Khanna publications
2. D.YogiGoswami, Frank Reith, Jan F. Kreider, "Principles of Solar Engineering" 2nd
   Edition, Taylor & Francis, 2000, Indian reprint, 2003
3. Solanki: Solar Photovoltaics- Fundamentals, Technologies and Applications, PHI,
   Eastern Economy Edition, 2012.
4. J.F. Manwell, J.G. Mc Gowan and A.L.Rogers-"Wind Energy Explained-Theory,Design and Applications" 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD SundaramShriram, K. Vasudevan and Abhishek S.Nagarajan, Internet of Things, Wiley, 2019

ONLINE LEARNING RESOURSES:

1. https://onlinecourses.nptel.ac.in/noc22_cs96/preview
2. https://nptel.ac.in/courses/108108123
3. https://nptel.ac.in/courses/108108179

IV B. Tech. – I Semester
(22E04706) PRINCIPLES OF CELLULAR AND MOBILE COMMUNICATIONS
(Open Elective -III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basics of Communication Systems.

COURSE OBJECTIVES: The goal of this course for students is:
- Understand the concepts and operation of cellular systems.
- Design of cellular patterns based frequency reuse factor.
- Apply the concepts of cellular systems to solve engineering problems
- Apply the concept of multiple access to solve engineering problems
- Evaluate suitability of a cellular system in real time applications.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand the concepts and operation of cellular systems.
CO2: Understand the concept of frequency reuse and co-channel interference in cellular systems.
CO3: Apply handoff techniques to solve engineering problems.
CO4: Compare various types of multiple access techniques
CO5: Compare various types of digital cellular systems.

DETAILED SYLLABUS:
UNIT-I: INTRODUCTION TO CELLULAR MOBILE SYSTEMS:
Why cellular mobile communication systems? A basic cellular system, Evolution of mobile radio communications, Performance criteria, Characteristics of mobile radio environment, Operation of cellular systems, Hexagonal shaped cells, Examples for analog and digital cellular systems.

UNIT-II: CELLULAR RADIO SYSTEM DESIGN:
General description of the problem, Concept of frequency reuse channels, Co-channel interference reduction, Desired C/I ratio, Cell splitting and sectoring.

UNIT-III: HANDOFFS AND DROPPED CALLS:
Why handoffs and types of handoffs, Initiation of handoff, Delaying a handoff, Forced handoffs, Queuing of handoffs, Power-difference handoffs, Mobile assisted handoff and soft handoff, Cell site handoff, Intersystem handoff, Introduction to dropped call rate.

UNIT-IV: MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS:
Introduction, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access and Space Division Multiple Access

UNIT-V: DIGITAL CELLULAR SYSTEMS:

Global System for Mobile Systems, Time Division Multiple Access Systems, Code Division Multiple Access Systems. Examples for 2G, 3G and 4G systems. Introduction to 5G system

TEXT BOOKS:
1. William C. Y. Lee, "Mobile Cellular Telecommunications", 2ndEdition, McGraw-Hill International, 1995.
2. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2ndEdition, PHI, 2004.

REFERENCE BOOKS:
1. Aditya K. Jagannatham "Principles of Modern Wireless Communications Systems – Theory and Practice", McGraw-Hill International, 2015.
2. PandyaRaj, Mobile and Personal Communication Services and Systems, PHI, 2ndEdition, March, 2004.
3. Jochen SchillerH, Mobile Communications, PearsonEd, 2ndEdition, 2008.

WEB RESOURCES:
1. https://onlinecourses.nptel.ac.in/noc21_ee66/preview.
2. https://www.youtube.com/watch?v=4R1qHE0E8Le.
3. https://www.youtube.com/watch?v=tt1-Ohe9QQU.

IV B. Tech - I Semester
(22E00705) CHEMISTRY OF NANO MATERIALS AND APPLICATIONS
(Open Elective- III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: - Students should know about fundamentals and basic principles in chemistry

COURSE OBJECTIVES:
- To understand synthetic principles of Nanomaterials by various methods
- To characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

COURSE OUTCOMES:
CO1. Understand the state of art synthesis of nano materials
CO2. Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
CO3. Analyze nanoscale structure in metals, polymers and ceramics
CO4. Analyze structure-property relationship in coarser scale structures
CO5. Understand structures of carbon nano tubes

DETAILED SYLLABUS:

UNIT I:
Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials. Synthetic Methods: Bottom-Up approach: Sol-gel synthesis, microemulsions or reverse micelles, coprecipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

Unit II :
Top-Down approach: Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electro deposition method, high energy ball milling.

UNIT III:
Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT IV:

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals.

UNIT V:

Engineering Applications of Nano materials

TEXT BOOKS:

1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.

REFERENCE BOOKS:

1. ATextbookofPolymerscience, Billmayer
2 Organicpolymer Chemistry, K.J.Saunders,ChapmanandHall
3. AdvancedOrganicChemistry, B.Miller,PrenticeHall
4. PolymerChemistry–G.S.Mishra
5. PolymerChemistry–Gowarikar
6. PhysicalChemistry–Galston
7. DrugDelivery-AshimK.Misra

Web links

1.https://nptel.ac.in/courses/118102003
2. https://archive.nptel.ac.in/courses/113/106/113106093/
3. https://onlinecourses.nptel.ac.in/noc19_mm21/preview

IV B. Tech – I Semester
(22E00501) COMPLEX VARIABLES & INTEGRAL TRANSFORMS
(Open Elective -III)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: Differentiation & Integration

Course Objectives:
The course is designed to
1. This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables.
2. The student develops the idea of using Fourier transforms and Fourier series.

Course Outcomes:
CO1: Understand the analyticity of complex functions.
CO2: Understand the transformation and mapping.
CO3: Evaluate the Fourier series expansion of periodic functions.
CO4: Understand the apply Fourier transforms to solve difference equations.
CO5: Understand the apply z transforms to solve difference equations.

UNIT-I: Complex Variables
Introduction to functions of complex variable- Differentiation, Analytic functions, Cauchy-Riemann equations(Cartesian and polar co-ordinates), ,Harmonic Functions, Milne-Thompson's method

UNIT-II: Conformal mapping
Transformation by z,ez,lnz,z2,zn,sinz,cosz.Translation,rotation,inversion and bilinear transformation-fixed point –cross ratio- properties –invariance of circles and cross ratio- determination of bilinear transformation mapping 3 given points.

UNIT-III: Fourier series
Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions.

UNIT-IV:Fourier transforms
Fourier transform – Fourier sine and cosine transforms - Finite Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem.

UNIT-V: Z-Transforms

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms

Textbooks:
1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.

References:
1. Peter O'neil, Advanced Engineering Mathematics, Cengagelearning.
2. N.Bali, M. Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science press.
3. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

IV B. Tech. – I-Semester
(22E00704) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Open Elective-III)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basic knowledge on fundamentals of transducers, optics, electromagnetics, and mechatronics.

Course Objectives:
• To provide exposure to various kinds of sensors and actuators and their engineering applications.
• To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
• To enlighten the operating principles of various sensors and actuators
• To educate the fabrication of sensors
• To identify the required sensor and actuator for interdisciplinary application

Course Outcomes:
• To recognize the need of sensors and actuators
• To understand working principles of various sensors and actuators
• To identify different type of sensors and actuators used in real life applications
• To exploit basics in common methods for converting a physical parameter into an electrical quantity
• To make use of sensors and actuators for different applications

UNIT I: Introduction to Sensors and Actuators Sensors
Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching. Actuators Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezoresistive actuators, Simple applications of Actuators.

UNIT II Temperature and Mechanical Sensors
Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermoresistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermoelectric sensors: Thermocouples, PN junction temperature sensors Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: strain gauges, tactile sensors, Pressure sensors: semiconductor, piezoresistive, capacitive, VRP.

UNIT III Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT IV Magnetic, Electromagnetic Sensors and Actuators

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magnetoresistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT V Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors. Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, GeigerMueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd.
2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster,
CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation by D. Patranabhis

NPTEL courses links

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

IV B. Tech. – I Semester
(22E01705) GLOBAL WARMING AND CLIMATE CHANGE
(Open Elective-IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

COURSE OBJECTIVES: The goal of this course for students is:
1. To make the student understand about the climate and weather of India.
2. To study about the Greenhouse gases, Global warming.
3. To study about the Ozone layer depletion.
4. To explain the concepts of the Brundtland Commission, UN Environmental Agenda, IPCC.
5. To explain the d the Impact of Climate Change in India.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand about the climate and weather.
CO2: Understand about the Greenhouse gases, Global warming.
CO3: Understand the Ozone layer depletion.
CO4: Understand the Brundtland Commission, UN Environmental Agenda, IPCC.
CO5: Understand the Impact of Climate Change in India.

DETAILED SYLLABUS:
UNIT-I: INTRODUCTION
Climate in the spotlight climate and weather, climate of India, Natural greenhouse effect, climate change factors – Natural factor &Anthropogenic factor.

UNIT-II: GLOBAL WARMING
Greenhouse gases, role of CO_2, role of CH_4, Global warming potential, CO_2 Emission, human Emission of CO_2, Remedial measure to reduce global warming, Global cooling.

UNIT-III: OZONE LAYER DEPLETION
Vienna convention on the protection of ozone layer – 1985, Montreal protocol, protection and maintenance of ozone layer, Indian efforts for ozone layer protection. El-Nino and its effects, La-Nina, impact of climate change on India.

UNIT-IV: SUSTAINABLE DEVELOPMENT
Brundtland Commission, UN Environmental Agenda, role of U.N. agencies, World Environment Organization, climate change convention-1992, Earth Summit, Agenda 21, IPCC, Global Environment Facility.

UNIT-V: IMPACT OF CLIMATE CHANGE AND GLOBAL WARMING

Impact of Climate Change in India, Pattern change of Rainfall, Drought, Effects on water resources, Sea Level Rise, Impacts on Agriculture, Impacts on food security, Impacts on Glacier, Impacts on Health, Impacts on energy security, Impacts on Biodiversity, Climate change & disaster in India, Urban flood, Cyclone, Forest fire.

TEXT BOOKS:

1. Encyclopedia of Global Warming and Climate Change by George Philander, SAGE Publications Inc; First edition, 2008.
2. Atmosphere, Weather and Climate *by Roger G. Barry, Richard J Chorley, CRC Press, 2010.*

REFERENCE BOOKS:

1. Global Warming: The Complete Briefing by John Houghton, Cambridge University Press; 4th edition 2009.

WEB RESOURSES:

1. http://acl.digimat.in/nptel/courses/video/109107397/L24.html
2. https://www.youtube.com/watch?reload=9&v=fB9eBKP3Wm0
3. https://www.youtube.com/watch?v=Bmg0vxlNmHc

IV B. Tech. – I Semester
(22E03705) PRODUCT DESIGN AND DEVELOPMENT
(Open Elective-IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	0	3

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To design products creatively while applying engineering design principles.
- To identify Identify the Importance of Task Clarification.
- To analyze the steps in Conceptual Design.
- To illustrate the steps of Embodiment Design with the design principles.
- To implement Material connections, From Force connections.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1 : Apply knowledge in of general problem solving process in product development processes.

CO2 : Identify the Importance of Task Clarification, problem identification, formulation and solution.

CO3 : Analyze the steps in Conceptual Design of the principles of sustainable design and development.

CO4 : Discover the Steps of Embodiment Design with the design principles of Embodiment Design.

CO5 : Analyze the Mechanical Connections with General functions and Behaviour.

DETAILED SYLLABUS:

UNIT I: Product Development Process

General problem-solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behaviour.

UNIT II: Task Clarification

Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

UNIT III: Conceptual Design

Steps in Conceptual Design. Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem. Formulation, Identifying the essential problems from the requirements list,

establishing functions structures, Overall function, Breaking a function down into sub-functions. Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures. Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of working structures. Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

UNIT IV: Embodiment Design
Steps of Embodiment Design, Checklist for Embodiment Design Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force Transformations, Principles of Division of Tasks, Principles of Self-Help, Principles of Stability and Bi-Stability, Principles of Fault-Free Design Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design to Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards. Evaluation of Embodiment Designs

UNITV: Mechanical Connections Mechatronics And Adaptronics
Mechanical Connections - General functions and General Behaviour, Material connections, From Connections, Force connections, Applications. Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solution, Examples. Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples

TEXT BOOKS:
1. G.Paul; W. Beitzetal, Engineering Design, Springer International Education, 2010.
2. Kevin Otto: K. Wood, Product Design And Development, Pearson Education, 2013.

REFERENCE BOOKS:
1. Kenith B. Kahu, Product Planning Essentials, Yes dee Publishing, 2011.
2. 2. K.T. Ulrich, Product Design and Development, TMH Publishers, 2011.

WEB RESOURCES:
1. https://nptel.ac.in/courses/112107217
2. https://nptel.ac.in/courses/112104230
3. https://www.youtube.com/watch?v=mvaqZAFdL6U
4. https://nptel.ac.in/courses/107103082
5. https://quizxp.com/nptel-product-design-and-manufacturing-assignment-5/

IV B.Tech. – I Semester
(22E02705) SMART ELECTRIC GRID
(Open Elective -IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Engineering Physics & Electronic Devices, Electrical Power Generating Systems

COURSE OBJECTIVES:
- Understand recent trends in grids, smart grid architecture and technologies
- Analyze smart substations
- Apply the concepts to design smart transmission systems
- Apply the concepts to design smart distribution systems

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand trends in Smart grids, needs and roles of Smart substations
CO2: Design and Analyze Smart Transmission systems
CO3: Design and Analyze Smart Distribution systems
CO4: Apply the concepts of smart transmission systems
CO5: Analyze SCADA and DSCADA systems in practical working environment.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SMART GRID
Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

UNIT-II: SMART GRID TECHNOLOGIES
Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

UNIT-III: SMART SUBSTATIONS
Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation.

UNIT-IV: SMART TRANSMISSION SYSTEMS

Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid.

UNIT-V:SMART DISTRIBUTION SYSTEMS

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation.

TEXT BOOKS:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013

REFERENCE BOOKS:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012

ONLINE LEARNING RESOURSES:

1. https://onlinecourses.nptel.ac.in/noc22_ee82/preview

IV B. Tech. – I Semester
(22E04707a) ELECTRONIC SENSORS
(Open Elective -IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Semiconductor Physics.

COURSE OBJECTIVES:
- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Learn about sensor Principle, Classification and Characterization
CO2: Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
CO3: Understand the basic concepts of Smart Sensors
CO4: Design a system with sensors
CO5: Device different uses sensors in different applications

DETAILED SYLLABUS:
UNIT-I: SENSORS / TRANSDUCERS:
Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization **Electromechanical Sensors:** Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT-II: THERMAL SENSORS:
Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT-III: MAGNETIC SENSORS:

Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros

UNIT-IV: RADIATION SENSORS:

Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT-V: SMART SENSORS:

Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

TEXT BOOKS:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press, 2011

REFERENCE BOOKS:

1.Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2.Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH, 2009

WEB RESOURSES:

1. https://archive.nptel.ac.in/courses/108/108/108108147/

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Semiconductor Physics.

COURSE OBJECTIVES:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors •
- Able to use sensors in different applications.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1: Learn about sensor Principle, Classification and Characterization
CO2: Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
CO3: Understand the basic concepts of Smart Sensors
CO4: Design a system with sensors
CO5: Device different uses sensors in different applications

DETAILED SYLLABUS:

UNIT-I: SENSORS / TRANSDUCERS:

Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization **Electromechanical Sensors:** Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT-II: THERMAL SENSORS:

Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT-III: MAGNETIC SENSORS:

Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros

UNIT-IV: RADIATION SENSORS:

Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT-V: SMART SENSORS:

Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

TEXT BOOKS:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press, 2011

REFERENCE BOOKS:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH, 2009

WEB RESOURSES:

1. https://archive.nptel.ac.in/courses/108/108/108108147/

IV B. Tech. – I Semester
(22E04707b) MICRO CONTROLLERS AND APPLICATIONS
(Open Elective -IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Digital Electronics.

COURSE OBJECTIVES:
- Describe the Architecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
- Write 8051 Assembly level programs using 8051 instruction set.
- Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*
CO1: Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
CO2: Develop the 8051 Assembly level programs using 8051 Instruction set
CO3: Design the Interrupt system
CO4: Understand the operation of Timers/Counters and Serial port of 8051
CO5: Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports

UNIT-I: ARCHITECTURE OVERVIEW:
Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial cum asynchronous serial communication - Interrupts.

UNIT-II: INSTRUCTION SET:
Basic assembly language programming – Data transfer instructions – Data and Bit-manipulation instructions – Arithmetic instructions – Instructions for Logical operations on the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT-III: INTERRUPTS OVERVIEW:
Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT-IV: REAL TIME CONTROL:

Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints, Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.

UNIT-V: INTERFACING METHODS:

Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboard-cum-Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and Digital Filters.

TEXT BOOKS :
1. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems – Mazidi and Mazidi, PHI, 2000.

REFERENCE BOOKS :
1. Microcontrollers (Theory & Applications) – A.V. Deshmuk, WTMH, 2005.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

WEB RESOURSES:
1. https://archive.nptel.ac.in/courses/108/105/108105102/
2. https://archive.dev.nptel.ac.in/courses/117/104/117104072/
3. https://archive.nptel.ac.in/courses/106/108/106108100/

IV B. Tech. - I Semester
(22E00706) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT
(Open Elective- IV)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	0	0	3

PRE-REQUISITES: - Students should know about fundamentals and basic principles in chemistry

COURSE OBJECTIVES:
• Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
• Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

COURSE OUTCOMES:
CO1: Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

DETAILED SYLLABUS:

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY
Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

Unit II : CATALYSIS AND GREEN CHEMISTRY
Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS
Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbon dioxide, super critical water and water as a reaction solvent: water-based coatings, Ionic liquids as catalyst and solvent.

UNIT IV: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Renewable Feed stocks: Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency: Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis. Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions).

UNITV: GREEN PROCESSES FOR GREEN NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials.

TEXT BOOKS:

1.M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA.

REFERENCE BOOKS:

1.Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2.Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

Web links

1. https://onlinecourses.nptel.ac.in/noc22_ce55/preview
2. https://archive.nptel.ac.in/courses/103/102/103102012/
3. https://www.globalspec.com/reference/63172/203279/
4. https://archive.nptel.ac.in/courses/103/107/103107157/
5. https://www.digimat.in/nptel/courses/video/102107058/L03.html

IV B. Tech – I Semester
(22E00701) NUMBER THEORY AND ITS APPLICATIONS
(Open Elective -IV)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: Basics & logical Mathematics

Course Objectives:
- This course enables the students to learn the concepts of number theory and its applications to information security.

Course Outcomes:
CO1: Understand number theory and its properties.
CO2: Understand principles on congruences
CO3: Develop the knowledge to apply various applications
CO4: Develop various encryption methods and its applications.
CO5: Understand rho method and fermat factorization.

UNIT-I: Integers, Greatest common divisors and prime Factorization
The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT-II: Congruences
Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT-III: Applications of Congruences
Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem-Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT-IV: Finite fields & Primality, factoring
Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT-V: Cryptology

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers-Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:

1. Kenneth H Rosen "Elementary number theory and its applications", AT & T Information systems & Bell laboratories.
2. Neal Koblitz " A course in Number theory & Cryptography", Springer.

References:

1. Herbert S. Zuckerman, "An Introduction To The Theory Of Numbers", Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Tom M Apostol "Introduction to Analytic number theory", Springer
3. VK Krishnan "Elementary number theory", Universities press

IV B. Tech. – I-Semester
(22E00707) SMART MATERIALS AND DEVICES
(Open Elective-IV)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PRE-REQUISITES: Basics and properties of smart materials and fabrication of Devices

Course Objectives:
- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To enlighten the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Course Outcomes:
CO1: To recognize the need of smart materials
CO2: To understand the working principles of smart materials
CO3: To know different techniques used to synthesize and characterize smart materials
CO4: To exploit the properties of smart materials
CO5: To make use of smart materials for different applications

UNIT I:
Introduction: Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II:
Properties of Smart Materials: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

UNIT III:
Synthesis of smart materials: Solid state reaction technique, Chemical route:Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Co precipitaiton. Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Sol-gel, spray pyrolysis.

UNIT IV:
Characterization techniques: X-ray diffraction, Raman spectroscopy (RS),Fouriertransform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V:

Materials and Devices: Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magnetorheological materials and Composite materials. Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Textbooks:

1. Encyclopaedia of Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

References:

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, Elsevier, 2005.
2. Characterization and Application of smart Materials -R. Rai, Synthesis, Nova Science, 2011.
3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, 2nd Edn., John Wiley & Sons, 2003.
4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, 2002.
5. Optical Metamaterials: Fundamentals and Applications -W. Cai and V. Shalaev, springer,2010.
6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

1. https://nptel.ac.in/courses/112/104/112104173/
2. https://nptel.ac.in/courses/112/104/112104251/
3. https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec