Gurugram University Gurugram

Curriculum for UG Degree Course in

Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology)

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - V

S.No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	**PCC**		Design and Analysis of Algorithm	3	0	0	3	3	30	70		100
2.	**PCC**		Formal Languages & Automata	3	0	0	3	3	30	70		100
3.	**PCC**		Cryptocurrency With Ethereum	3	0	0	3	3	30	70		100
4.	**PCC**		Computer Networks	3	0	0	3	3	30	70		100
5.	**PEC**		Professional Elective Course - I	3	0	0	3	3	30	70		100
6.	**OEC**		Open Elective Course - I	3	0	0	3	3	30	70		100
7.	**LC**		Design and Analysis of Algorithm Lab	0	0	2	2	1	50		50	100
8.	**LC**		Computer Networks Lab	0	0	2	2	1	50		50	100
9.	**HSMC**		Economics for Engineers*	3	0	0	3	0	30	70		100*
10.	**PT**		Practical Training - I	0	0	2	2	1	100			100
			Total	**21**	**0**	**4**	**27**	**21**	**380**	**420**	**100**	**900**

NOTE:

1. ***The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.**
2. **Choose any one from Professional Elective Course – I**
3. **Choose any one from Open Elective Course – I**

Professional Elective Course – I

1. Software Engineering
2. Digital Image Processing
3. Distributed System
4. Web Technology
5. Big data analytics

Open Elective Course – I

1. Sensors, Actuators and Signal Processing
2. R – Programming
3. Communication Skills for Professionals
4. Soft Skills and Interpersonal Communication
5. Human Resource Management

DESIGN & ANALYSIS OF ALGORITHMS

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Design & Analysis of Algorithms				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNIT - I

Introduction to Algorithms: Algorithm, Performance Analysis (Time and Space complexity), Asymptotic Notation (Big O, Omega and Theta)-best, average and worst-case behaviour. Elementary Data Structures (Basic terminology of Stacks and Queues, Tree, Graph), Sets and Disjoint Set Union.

Divide and Conquer: General method, Binary Search, Merge Sort, Quick Sort, and other sorting algorithms with divide and conquer strategy, Strassen's Matrix Multiplication algorithms and analysis of these problems.

UNIT - II

Greedy Method: General method, Fractional Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest paths.

Dynamic Programming: General method, Optimal Binary Search Trees, 0/1 knapsack, The Traveling Salesperson problem.

UNIT - III

Back Tracking: General method, The 8-Queen's problem, Sum of subsets, Graph Colouring, Hamiltonian Cycles.

Branch and Bound: The method, 0/1 knapsack problem, Traveling Salesperson problem, Efficiency considerations.

UNIT - IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph problems, NP hard scheduling problems, NP hard code generation problems, and Some simplified NP hard problems.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: state terminology and concepts algorithmic techniques.
CO2: discuss various algorithmic techniques.
CO3: apply appropriate algorithmic techniques to solve computational problems.
CO4: analysing algorithms for their efficiency by determining their complexity.
CO5: compare the pros and cons of applying the different algorithmic techniques to solve problems.
CO6: formulate efficient and effective algorithmic solutions for different real- world problems.

TEXT AND REFERENCE BOOKS:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
5. Writing Efficient Programs, Bentley, J.L., PHI
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.
7. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.
8. Fundamentals of Algorithms: The Art of Computer Programming Vol Knuth, D.E.: 1985, Naresh Publication.

FORMAL LANGUAGES & AUTOMATA THEORY

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Formal Languages & Automata Theory				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To understand basic concepts of formal languages and automata theory.
2. To study the types of Automata i.e., NFA, DFA, NFA with ϵ-transition and their interconversion methods and importance.
3. To Study formal languages of different kinds, such as regular and context-free languages. Understand the concept of grammar and its types. Removal of ambiguity and reduced form and Normal forms of grammar.
4. To develop the concepts and design of higher-level automata to accept the language not accepted by finite automata such as PDA &Turing machine.
5. To study the various properties of Turing machines and their design.

UNIT - I

Finite Automata: Introduction: Set, Power Set, Super Set, Alphabet, languages and grammars, productions and derivation, Deterministic finite automata (DFA), Non-Deterministic finite automata (NDFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA, minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.
Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore machines.

UNIT - II

Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of the regular expression, Regular expression conversion to Finite Automata, and vice versa.
Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

UNIT - III

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal,

Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form (CNF) and Greibach Normal Form (GNF),

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

UNIT - IV

Turing machines: The basic model for Turing machines I, Deterministic and Non- Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by a designed Turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators.

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: define terminology related to the theory of computation.
CO2: explain the basic concepts and applications of Theory of Computation.
CO3: apply the principles of Theory of Computation to solve computational problems.
CO4: compare and contrast the hierarchy of grammars.
CO5: design various types of automata for given problems.
CO6: To solve various problems of applying normal form techniques, push-down automata, and Turing Machines.

TEXT AND REFERENCE BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
3. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
4. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
5. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata McGraw-Hill, 2007

CRYPTOCURRENCY WITH ETHEREUM

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Cryptocurrency With Ethereum				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To introduce the concepts of cryptocurrency.
2. To understand working of Bitcoin and Ethereum
3. To study the security issues and safeguards related to bitcoin trading
4. To study governing cryptocurrency regulations and its impact on economy.

UNIT - I

Cryptocurrency: History, Distributed Ledger Technology (DLT), cryptocurrency in blockchain, Cryptographic basics for cryptocurrency: overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography.

UNIT - II

Bitcoin: Creation of coins, Wallet, Genesis Block, Merkel Tree, Bitcoin Scripts, Bitcoin P2P Network, hardness of mining, Transaction in Bitcoin Network, transaction verifiability, anonymity, forks, payments and double spending, Consensus in a Bitcoin network, mathematical analysis of properties of Bitcoin, Bitcoin protocols – Bitcoin Mining strategy and rewards, life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT - III

Ethereum: Ethereum Virtual Machine (EVM), Wallets for Ethereum, Ethereum Programming Language: Solidity, Smart Contracts, The turing completeness of smart contract languages, attacks on smart contracts, Ethereum Construction, DAO, GHOST, Vulnerability, Attacks, Sidechain: another type of blockchain, Namecoin

UNIT - IV

Cryptocurrency Regulation: Stakeholders, Roots of Bitcoin, Bitcoin scripting vs Ethereum smart contracts, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy, Global Acceptability perspective.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Cryptocurrency: Bitcoin and Ethereum

CO2: Building efficient blockchain models to carry out tasks with the practical approach.

CO3: Evaluating the use and risks involved with cryptocurrency

CO4: Smart contracts and their implications.

CO5: Demonstrate a sound technical knowledge of their selected project topic.

CO6: Undertake problem identification, formulation and solution.

TEXT AND REFERENCE BOOKS:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press (July 19, 2016).
2. Mastering Bitcoin: Unlocking Digital Cryptocurrencies by Antonopoulos
3. Bitcoin: A Peer-to-Peer Electronic Cash System by Satoshi Nakamoto
4. ETHEREUM: A Secure Decentralized Transaction Ledger by Gavin Wood, Yellow paper.2014.
5. A survey of attacks on Ethereum smart contracts by Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli

COMPUTER NETWORKS

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Computer Networks				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To develop an understanding of modern network architectures from a design and Performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs).
3. To provide an opportunity to do Network programming.
4. To provide WLAN measurement ideas.

UNIT - I

Introduction: Data communication, Components, Data Representation, Simplex, Half Duplex, and Full Duplex Transmission, Modulation, Multiplexing, Computer networks, distributed processing, Internet, Topologies, Packet and circuit switching, connectionless and connection-oriented services.

Network Models: OSI model and TCP/IP Model

Physical Layer – LAN: Ethernet.

UNIT - II

Data Link Layer and Medium Access Sub Layer: MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.

Medium Access Control: Random access, Controlled Access, and channelization protocols.

Network Layer: Logical addressing, classful and classless addressing, subnetting, Ipv4, ICMPv4, ARP, RARP and BOOTP, Ipv6, Ipv6 addressing.

UNIT - III

Network Devices: Repeater, hub, switch, router, and gateway.

Routing Algorithms: introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State, and Distance Vector Routing

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP connection management.

UNIT - IV

Congestion Control, Quality of Service, QoS Improving techniques.

Application Layer: Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

Network Security: Firewalls, security goals, types of attack, symmetric and asymmetric key ciphers.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Explain the functions of the different layers of the OSI Protocol.

CO2: Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs) and describe the function of each.

CO3: Identify and connect various connecting components of a computer network.

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, and Firewalls using open-source available software and tools.

CO5: outline various models, topologies and devices of Computer Networks.

CO6: Design engineering solutions to complex problems utilizing a systems approach.

TEXT AND REFERENCE BOOKS:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, latest Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, latest Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

ECONOMICS FOR ENGINEERS

Semester	V				
Course code					
Category	Humanities & Social Sciences, Including Management				
Course title	Economics for Engineers				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Understand how economic analysis can be applied to engineering decision-making processes.
2. Understand the implications of economic factors on engineering design, production, and operation decisions.
3. Apply economic principles to analyze and interpret the behavior of markets and industries.
4. Gain awareness of the relationship between economics and sustainable development in engineering practices.

UNIT - I

Definition of Economics- Various definitions, types of economics- Micro and Macro-Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors effecting it, its practical application and importance.

UNIT - II

Production- Meaning of Production and factors of production, Law of variable proportions, and returns to scale, Internal external economies and diseconomies of scale. Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Realcost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT - III

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).

Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT - IV

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits.

Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions,Difference between Commercial & Central Bank.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: outline the principles of economics in general and economics in Indian context.
CO2: discuss concepts related to economics in general and particularly relevant to Indian scenario.
CO3: apply the principles of economics for solving problems related to Engineering sector.
CO4: carry out cost/benefit/, life cycle and breakeven analyses on one or more economic alternatives.
CO5: judge the issues and challenges of sustainable development.
CO6: Undertake problem identification, formulation and solution.

TEXT AND REFERENCE BOOKS:

1. Alfred William Stonier, D. C. Hague, A text book of Economic Theory, 5th edition, Longman Higher Education, 1980.
2. K. K. Dewett, M. H. Navalur, Modem Econornic Theory, S. Chand, 2006.
3. H. L. Ahuja, Modern Microeconomic: Theory and Applications, S. Chand, 2017.
4. N. Gregory Mankiw, Principles of Economics, 7th edition, South-Western College Publishing, 2013.
5. Ruddar Dutt & K. P. M. Sundhram, Indian Economy, S. Chand, 2004.
6. V. Mote, S. Paul, G. Gupta, Managerial, Economics, McGraw Hill Education, 2017.
7. Saroj Pareek, Text book of Business Economics, Neha Publishers and Distributors, 2013.
8. William McDonough and Michael Braungart, Cradle to Cradle Remaking the Way We Make Things, North Point Press, New York, 2002.
9. Sustainable Development Challenges, World Economic and Social Survey, United Nations Publication, 2013.

DESIGN & ANALYSIS OF ALGORITHMS LAB

Semester	V				
Course code					
Category	Laboratory course				
Course title	Design & Analysis of Algorithms Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

1. Write a Program for iterative and recursive Binary Search.
2. Write a Program to sort a given set of elements using the Quick Sort/Merge Sort/Selection Sort method and determine the time required to sort the elements.
3. Write a Program for the implementation of the Fractional Knapsack problem using Greedy Method and 0/1 Knapsack problem using Dynamic Programming.
4. Write a Program to find the shortest path from a given vertex to other vertices in a weighted connected graph using Dijkstra's algorithm.
5. Write a Program to find the minimum cost spanning tree (MST) of a given undirected graph using Kruskal's algorithm/Prim's Algorithms.
6. Write a Program to implement the N-Queens problem using backtracking.
7. Write a Program to check whether a given graph is connected or not using the DFS method.
8. Write a program to implement the Travelling Salesman Problem (TSP).

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Develop and code program for the algorithms and analyze it to determine its computational complexity.

CO2: Identify and analyze worst-case running times of algorithms.

CO3: Model given engineering problem using graph and trees and write the corresponding algorithm to solve the problems.

CO4: Identify and apply the suitable algorithm for the given real-world problem.

CO5: Undertake problem identification, formulation and solution.

CO6: Design engineering solutions to complex problems utilising a systems approach.

WEB TECHNOLOGY LAB

Semester	V				
Course code					
Category	Laboratory course				
Course title	Web Technology Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

1. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital
2. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 99 and shows it in words. It should not accept three and above digits, alphabets and special characters.
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE
5. Write JavaScript to validate the following fields of the Registration page.
   a) First Name
   b) Last Name
   c) Password
   d) E,mail id
   e) Mobile Number
   f) Address
6. Write a program for implementing XML document for CUSTOMER DETAILS
7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not
8. Write a program to design a simple calculator using (a) JavaScript (b) PHP
9. Develop and demonstrate JavaScript with POP,UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function
   Output: Display date in the textbox
   b) Input: A number n obtained using prompt
   Output: Factorial of n number using alert
   c) Input: A number n obtained using prompt
   Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm
Output: Sum of the entire n numbers using alert

10. (Mini Project) Create your own website using all constructs studied in theory paper

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Design and implement dynamic websites with good aesthetic sense of designing and latest technical know, how's
CO2: Create web pages using HTML and Cascading Styles sheets
CO3: Analyze a web page and identify its elements and attributes
CO4: Create dynamic web pages using JavaScript
CO5: Build web applications using PHP •
CO6: Create XML documents and XML Schema

COMPUTERS NETWORK LAB

Semester	V				
Course code					
Category	Laboratory course				
Course title	Computer Network Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

1. Study of Socket Programming and Client – Server model
2. Write a code simulating ARP /RARP protocols.
3. Write a code simulating PING and TRACEROUTE commands
4. Create a socket for HTTP for web page upload and download.
5. Write a program to implement RPC (Remote Procedure Call)
6. Implementation of Subnetting .
7. Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
8. Applications using TCP and UDP Sockets like. DNS e. SNMP f. File Transfer
9. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
11. To learn handling and configuration of networking hardware like RJ,45 connector, CAT,6 cable, crimping tool, etc.
12. Configuration of router, hub, switch etc. (using real devices or simulators)
13. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
14. Network packet analysis using tools like Wireshark, tcpdump, etc.
15. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
16. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative &concurrent servers).

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Develop Client, Server architectures and prototypes by the means of correct standards and technology

CO2: Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.

CO3: Analyse & Implement various framing methods of Data Link Layer.

CO4: Demonstrate basic configuration of switches and routers.

CO5: Analyse & Implement various Error and flow control techniques.

CO6: Implement network routing and addressing techniques

PRACTICAL TRAINING - I

Semester	V				
Course code					
Category	Training				
Course title	Practical Training - I				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	100 Marks				
Exam					
Total	100 Marks				
Duration of Exam	03 Hours				

Professional Elective Course - I

SOFTWARE ENGINEERING

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Software Engineering				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Be successful professionals in the field with solid fundamental knowledge of software engineering.
2. To enable students to apply a systematic application of scientific knowledge in creating and building cost-effective software solutions to business and other types of problems.
3. To make students understand different phases to make a software & study them in detail.
4. To make students understand different testing techniques for different projects, making the students understand to develop quality software, its maintenance & software reliability.
5. To make students aware about the design models & its principles (data design, component design, interface design & architectural design).

UNIT - I

Introduction:- Evolving role of software, Software Characteristics, Software crisis, Software myths, Software process, Software development Models: Waterfall Model, Prototype Model, Spiral, Model, RAD Model, Iterative Model, Incremental Model, Aspect-oriented Model, **Agile Methodology:** Pair and mob programming, high performance teams with core protocols, test driven development, behaviour driven development, continuous delivery, clean code, refactoring, extreme programming, Scrum.

UNIT - II

Requirements, Analysis & Specification:- Software Requirements engineering, Requirement Engineering Process, Requirement Engineering Tasks, Types of requirements, SRS.

System Modeling:- Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling, The mechanics of structured analysis: Creating entity/ relationship diagram, data flow model, control flow model, the data dictionary.

UNIT - III

System Design:- Design principles, the design process; Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding; Effective modular design: Functional independence, Cohesion,

Coupling; Design Heuristics for effective modularity, Data Design, Architecture Design, Interface Design.

Software Testing And Maintenance:- Testing terminology: error, bug/defect/fault, failure, Verification and validation, Test case design, Static testing, Dynamic testing, Black box testing, Boundary value analysis, White box testing, basis path testing, Unit testing, Integration testing, Acceptance Testing, debugging, debugging process debugging approaches. Software maintenance categories, Models.

UNIT - IV

Software Quality Models And Standards:- Quality concepts, Software Quality Assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO 9126 Standard, Configuration Management, Software reengineering, reverse engineering, restructuring, forward engineering,

Software Project Management:- Project management concepts, Planning the software project, Software Estimations, empirical estimation COCOMO, staffing, team structures, staffing, risk analysis and management.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand basic concepts of software engineering, implement Software life cycle models and have knowledge of different estimation models.
CO2: Understand requirements and modelling concepts in software development.
CO3: Understand the different design principles of a software project and prepare soft testing strategies.
CO4: Understand and incorporate the Software Quality standards and build a robust software.
CO5: Undertake problem identification, formulation and solution.
CO6: Design engineering solutions to complex problems utilising a systems approach.

TEXT AND REFERENCE BOOKS:

1. Software Engineering – A Practitioner's Approach, Roger S. Pressman, 1996, MGH.
2. Fundamentals of software Engineering, Rajib Mall, PHI
3. Software Engineering by Ian sommerville, Pearson Edu., 5th edition, 1999,AW,
4. Software Engineering – David Gustafson, 2002, T.M.H
5. Software Engineering Fundamentals Oxford University, Ali Behforooz and Frederick J. Hudson1995, JW&S
6. An Integrated Approach to Software Engineering by Pankaj jalote, 1991, Narosa.

DIGITAL IMAGE PROCESSING

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Digital Image Processing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To become familiar with digital image fundamentals.
2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. To learn concepts of degradation function and restoration techniques.
4. To study the image segmentation and representation techniques.
5. To become familiar with image compression and recognition method.

UNIT - I

Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.

UNIT - II

Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.

Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.

UNIT - III

Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

UNIT - IV

Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.
CO3: Understand the restoration concepts and filtering techniques.
CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for colour models.
CO5: Undertake problem identification, formulation and solution.
CO6: Design engineering solutions to complex problems utilizing a systems approach.

TEXT AND REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition,2010.
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt, Digital Image Processing John Wiley, New York, 2002
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

WEB TECHNOLOGY

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Web Technology				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To familiarize the students with the basic concepts of internet, its history, ways to connect to internet and basics of world wide web and search engines.
2. To familiarize the student with the fundamental language of internet i.e., HTML.
3. To teach the student aware of the concepts of cascading style sheets.
4. To teach the student the students the basics of client side and Server-side scripting.

UNIT - I

HYPERTEXT MARKUP LANGUAGE: The anatomy of an HTML document: Marking up for structure and style: basic page markup, absolute and relative links, ordered and unordered lists, embedding images and controlling appearance, table creation and use, frames, nesting and targeting. **STYLE SHEETS:** Separating style from structure with style sheets, Internal style specifications within HTML, External linked style specification using CSS, page and site design considerations.

UNIT - II

Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT - III

CLIENT SIDE PROGRAMMING: Introduction to Client side programming, Java Script syntax, the Document object model, Event handling, Output in JavaScript, Forms handling, cookies, Introduction to VBScript, Form Handling.

UNIT - IV

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Analyze given assignment to select sustainable web development and design methodology.
CO2: Identify the difference between the HTML PHP and XML documents.
CO3: Identify the engineering structural design of XML and parse tree
CO4: Analyze the difference between and PHP and XML.
CO5: Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.
CO6: Develop web based application using suitable client side and server side web technologie.

TEXT AND REFERENCE BOOKS:

1. "Fundamentals of the Internet and the World Wide Web", Raymond Greenlaw and Ellen Hepp, TMH , latest edition.
2. "Internet & World Wide Programming", Deitel,Deitel & Nieto, Pearson Education
3. "Complete idiots guide to java script". Aron Weiss, QUE.
4. "Network firewalls", Kironjeet syan - New Rider Pub.

DISTRIBUTED SYSTEM

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Distributed System				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To examine the fundamental principles of distributed systems, and provide students hands-on experience in developing distributed protocols.
2. Analyze the issues in distributed operating systems and to address these distributed systems issues in a broader sense. Emphasis will be placed on communication, process, naming, synchronization and fault tolerance.

UNIT - I

Introduction: Distributed Operating Systems Definition and goals, Hardware and Software concepts, Design issues.

Communication in Distributed System: Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC

UNIT - II

Synchronization in Distributed System: Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems

Processes and processors in Distributed systems: Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, real time distributed systems, Process migration and related issues

UNIT - III

Distributed File systems: Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study.

Distributed Shared Memory: Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing

UNIT - IV

Security Issues: Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

Distributed Web-based Systems: Architecture, Processes, Communication, Naming, Synchronization

Case Studies: JAVA RMI, Sun Network File System, Google Case Study

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: List the principles of distributed systems and describe the problems and challenges associated with these principles.

CO2: Understand Distributed Computing techniques, Synchronous and Processes.

CO3: Apply Shared Data access and Files concepts.

CO4: Design distributed system that fulfills requirements with regards to key distributed systems properties.

CO5: Understand Distributed File Systems and Distributed Shared Memory.

CO6: Apply Distributed web-based system and understand the importance of security in distributed system

TEXT AND REFERENCE BOOKS:

1. Distributed Operating Systems by Andrew S Tannebaum, Pearson
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
3. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore, TimKindberg, Pearson
4. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
5. Distributed Systems: Principles and Paradigms by Andrew S Tanebaum, Maarten Van Steen, PHI 6. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India

BIG DATA ANALYTICS

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Big Data Analytics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To describe the basic concepts of Big Data characteristics and Analytics.
2. To examine the Hadoop and MapReduce framework for processing large volume of data sets and various data analysis methods.
3. To store and retrieve the data effectively using MongoDB and report generation.
4. To analyze the big data for useful business applications and familiar with the Visualization.

UNIT - I

Introduction to Big Data: Types of Digital Data-Characteristics of Data, Evolution of Big Data, Definition of Big Data, Characteristics, Applications & Challenges with Big Data, 3Vs of Big Data, Non-Definitional traits of Big Data, Big Data workflow Management, Business Intelligence vs. Big Data, Distributed file systems.

UNIT - II

Big Data Analytics: Classification of analytics, Data Science, Terminologies in Big Data, CAP Theorem.

Introduction to Hadoop: Features, Advantages, Overview of Hadoop Eco systems, Hadoop distributions, SQL vs. Hadoop, Hadoop Components, Architecture, HDFS.

UNIT - III

Map Reduce: Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.

NoSQL: Types of Databases, Advantages, SQL vs. NoSQL, NewSQL

Mongo DB: Introduction, Features, Data types, Mongo DB Query language, CRUD operations, Arrays. Functions: Count, Sort, t – Limit, Skip, Aggregate, Map Reduce. Cursors: Indexes, Mongo Import, Mongo Export.

UNIT - IV

Cassandra: Introduction, Features, CQLData types, CQLSH, Key spaces, CRUD operations, Collections, Counter, TTL, alter commands, Import and Export, Querying System tables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify the characteristics and challenges of big data analytics.

CO2: Implement the Hadoop and MapReduce framework for processing massive volume of data.

CO3: Analyze data by utilizing various statistical and data mining approaches.

CO4: Implement CRUD operations effectively using MongoDB and Report generation using Jaspersoft studio.

CO5: Explore the usage of Hadoop and its integration tools to manage Big Data and use Visualization Techniques.

CO6: Adapt adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

TEXT AND REFERENCE BOOKS:

1. T. Erl , W.Khattak and P. Buhler., *Big Data Fundamentals, Concepts, Drivers & Techniques* (1e), The Prentice Hall Service Technology Series, 2016.
2. S. Acharya, *Big Data and Analytics*, Wiley India Pvt. Ltd., 2015
3. V. Prajapati, *Big Data Analytics with R and Hadoop*, Packt Publishing Ltd., 2013.
4. A. Holmes, *Hadoop in Practice*, (2e), Manning Publications, 2015
5. S. Ryza, *Advanced Analytics with Spark: Patterns for Learning from Data at Scale*, (2e), O'Reilly, 2017

Open Elective Course - I

SENSORS, ACTUATORS AND SIGNAL PROCESSING

Semester	V				
Course code					
Category	Open Elective Courses				
Course title	Sensors, Actuators And Signal Processing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

5. To understand the basic fundamentals of sensors and their characteristics.
6. To implement the principles of Resistive sensors and its signal conditioning circuit
7. To apply the concepts of Reactance variation and Electromagnetic sensors
8. To realize the Self-Generating sensors and its signal conditioning circuits
9. To interpret the concepts of Intelligent Sensors & other sensing methods

UNIT - I

Sensors / Transducers: Principles Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization. Mechanical and 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 Thermo-electric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors. 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, Synchronous, Synchronous resolvers, Eddy Current Sensors, Electromagnetic Flow meter, Switching Magnetic Sensors, SQUID Sensors.

Radiation Sensors: Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro Analytical Sensors: Introduction – 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 .

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.

UNIT - III

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems, Pneumatic and hydraulic systems, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves, Rotary actuators. Mechanical Actuation Systems Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

UNIT - IV

Introduction of Signal Processing: Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy Syllabus B. Tech., ICE: July 2018 admissions onwards Page36 and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation

Digital Signal Processors: Introduction – Architecture – Features – Addressing Formats – Functional modes – Introduction to Commercial Processors.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO7: Understand the concept of Sensors and Transducers.
CO8: Application of Sensors, Actuators and Signal Processing.
CO9: Understand the concept of Radiation Sensors and smart sensor.
CO10: Learn various types of sensors and actuators used.
CO11: Learn fundamentals of signal processors and digital signal processors.

TEXT AND REFERENCE BOOKS:

5. D. Patranabis," Sensors and Transducers", PHI Learning Private Limited.
6. W. Bolton, "Mechatronics", Pearson Education Limited.
7. Patranabis , "Sensors and Actuators", 2nd Edition, PHI, 2013.
8. Proakis JG and Manolakis DG, "Digital signal processing," Pearson Education India
9. Ifeacher EC and Jerris BW, "Digital signal processing – A practical approach," Pearson Education

R - PROGRAMMING

Semester	V				
Course code					
Category	Open Elective Coursee				
Course title	R - Programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Learn Fundamentals of R.
2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
3. Cover the Basics of statistical data analysis with examples.
4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.

UNIT - I

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments.

Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package.Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard.

R - Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame.

R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables

UNIT - II

R - Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators.

R - Decision Making: if statement, if – else statement, if – else if statement, switch statement.

R - Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

R - Function: function definition,Built-inn functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values.

UNIT - III

R – Strings: Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower().
R – Vectors: Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting.
R – List: Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector.
R – Matrices: Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division.
R - Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements.
R – Factors: creating factors, generating factor levels gl().
R - Data Frames: Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, **Expand Data Frame:** Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().

UNIT - IV

Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.
Data Visualization through various plots and charts: bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat and contour plots, plotting the above graphs in R, plotting with package ggplot2.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: outline concepts related to R programming and data analysis.
CO2: explain the basic concepts and tools that are used to solve problems in data analytics.
CO3: apply R programming for reading, cleaning, visualizing and analysing data.
CO4: analyse the trends in data through exploratory data analysis.
CO5: Understands the loading, retrieval techniques of data.
CO6: Minimize and maximize functions simulation and visualization and statistical analysis using R.

TEXT AND REFERENCE BOOKS:

1. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
2. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
3. Hadley Wickham and Garrett Grolemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
4. Paul Teeter, R Cookbook, O'Reilly, 2011.
5. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.
6. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.

COMMUNICATION SKILLS FOR PROFESSIONALS

Semester	V				
Course code					
Category	Open Elective Courses				
Course title	Communication Skills for Professionals				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To hone verbal and written communication
2. To acquaint students with multiple forms and formats of various technical and business reports
3. To develop competence for report writing with a focus on its techniques
4. To develop English Language Proficiency

UNIT - I

Mechanics of Report Writing: Objectives of Report Writing; Types of Reports on the basis of forms and content. Introduction to Formats of Reports; Structure of Reports: Front Matter, Main Body, Back Matter.

UNIT - II

Writing Business and Technical Report: Preliminary Strategies for Report Writing: Data Collection, Report Planning, Use of Illustrations, Point Formation, Preparing Notes/Drafts Using Appropriate Formats: Memo Format, Letter Format, Manuscript Format, Printed Forms.

UNIT - III

Oral Communication and Soft Skills: Group Discussions; Interviews for jobs: preparation and facing them Professional Presentations: Power Point Presentation, Oral Presentation, Role of Kinesics (Body Language) in Communication, General Etiquettes in Office areas, corporate lunch and dinner Handling, Telephone calls

UNIT - IV

Resumes and Job application: Writing of Resume--Chronological Resume and Functional Resume, Request for Reference/Recommendation, Writing Application Letters for Job; Writing Covering letter

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Get acquainted with multiple forms and formats of various technical and business reports
CO2: Develop competence for report writing with a focus on its complex writing techniques and procedures.
CO3: Develop their speaking skills with professional proficiency.
CO4: Equip themselves for Letter Writing Skills.
CO5: Recognized different styles of communication that they and their colleagues use to communicate and make decisions.
CO6: Selected ways to adapt their communication style and methods to create understanding and engagement with others.

TEXT AND REFERENCE BOOKS:

1. Sharma,Sangeeta, and Binod Mishra. Communication Skills for Engineers and Scientists. PHI,2009.
2. Tyagi,Kavita, and Padma Mishra. Advanced Technical Communication. PHI, 2011.
3. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill Education, 2014.
4. Kumar, Sanjay, and PushpLata. Communication Skills. OUP, 2011.
5. Raman, Meenakshi and SangeetaSharma.Communication Skills. OUP,2011.
6. *Bhatnagar, Nitin, and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson Education,
7. Mitra,Barun K. Personality Development and Soft Skills. OUP,2011.
8. Kaul, Asha. Business Communication. PHI, 2nd Edition.
9. Namee, Patrick Mc. Success in Interviews: How to Succeed in any Job Interview, Ist Edition.
10. Argenti, Paul. Corporate Communication.6th Edition. McGraw Hill Education, 2012.

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

Semester	V				
Course code					
Category	Open Elective Courses				
Course title	Soft Skills and Interpersonal Communication				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To train students to learn Soft Skills and engage in a successful and fruitful Interpersonal Communication

UNIT - I

Soft Skills: Introduction to Soft Skills & their classification, Importance of Soft Skills: Writing Resume/CV, Engaging in Group discussion, Appearing for Job interviews

UNIT - II

Interpersonal Skills, Behaviour, Relationships and Communication: Development and Role of Effective Interpersonal Skills, Development of Effective Speaking and Listening Skills

UNIT - III

Non-Verbal Elements in Interpersonal Communication: Role of Body Language, Paralinguistic Features, Proxemics/Space Distance and Haptics in Interpersonal Communication

UNIT - IV

Personality Development for Personal and Professional Growth: Desirable Personality, Personality Types, Analysis of Personality Development (Freudian and Swami Vivekananda's Concept), Grooming Personality for Personal and Professional Life

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Know now how soft skills complement hard skills for career growth

CO2: Enhance communicative competence for professional enhancement

CO3: Learn desirable body language and other non-verbal elements in interpersonal communication

CO4: Groom personality for handling effectively various situations of personal and professional life.

CO5: Develop all-round personalities with a mature outlook to function effectively in different circumstances.

CO6: Take part effectively in various selection procedures adopted by the recruiters.

TEXT AND REFERENCE BOOKS:

1. Mitra, Barun K. Personality Development and Soft Skills. Delhi: OUP, 2nd Edition, 2016.
2. Butterfield, Jeff.Soft Skills for Everyone. Cengage Learning, 2017.
3. Raman, Meenakshi and Sangeeta Sharma. Communication Skills. OUP, 2011.
4. Ramesh, Gopalaswamy and Mahadevan Ramesh. The ACE of Soft Skills, Pearson India,2010.
5. Ribbons, Geoff and Richard Thompson.Body Language.Hodder& Stoughton, 2007.
6. Sharma, Sangeeta and Binod Mishra.Communication Skills for Engineers and Scientists. PHI, 2017.

HUMAN RESOURCE MANAGEMENT

Semester	V				
Course code					
Category	Open Elective Courses				
Course title	Human Resource Management				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To help the students develop an understanding of the management of human resources and develop abilities and skills required to manage them.

UNIT - I

Introduction – nature and scope of human resource management, HRM objectives and functions, HRM policies, HRM in globally competitive environment; strategic human resource management.

UNIT - II

Acquiring human resources – Man power planning, Job evaluation, job analysis and job design. Recruitment: Sources, Methods, constraints & challenges, selection: objectives and process, placement and induction.

UNIT - III

Developing human resources: Training: types, methods, training vs. development and evaluation of a training programme and training need assessment, career planning and development.

UNIT - IV

Performance appraisal: methods, process and challenges of performance appraisal, performance appraisal vs. potential appraisal, Compensation: wages & salaries administration and factors influencing compensation levels.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: To have an understanding of the basic concepts, functions and processes of human resource management

CO2: To be aware of the role, functions and functioning of human resource department of the organizations.

CO3: To Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behavior.

CO4: dentify and apply new ideas, methods and ways of thinking

CO5: Demonstrate competence in communicating and exchanging ideas in a group context

CO6: Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.

TEXT AND REFERENCE BOOKS:

1. Jyothi, Human Resource Management, Oxford University Press
2. Bohlander George and Scott Snell, Management Human Resources, Cengage, Mumbai
3. Bhattacharyya, Dipak Kumar, Human Resource Management, Excel Books, NewDelhi
4. Cascio Wayne F., Managing Human Resources, TMH, New Delhi
5. DeCenzo, David A, and Stephan P. Robbins, Fundamentals of Human Resource Management, Wiley India, New Delhi
6. Denisi, Angelo S, and Ricky W Griffin, Human Resource Management, Biztantra, New Delhi

6TH SEMESTER

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - VI

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	**PCC**		Compiler Design	3	0	0	3	3	30	70		100
2.	**PCC**		Advance JAVA Programming	3	0	0	3	3	30	70		100
3.	**PCC**		Cloud Computing	3	0	0	3	3	30	70		100
4.	**PEC**		Professional Elective Course - II	3	0	0	3	3	30	70		100
5.	**PEC**		Professional Elective Course - III	3	0	0	3	3	30	70		100
6.	**OEC**		Open Elective Course - II	3	0	0	3	3	30	70		100
7.	**LC**		Advance JAVA Programming Lab	0	0	2	2	1	50		50	100
8.	**PROJECT**		Project - I	0	0	4	4	2	50		50	100
			Total	**18**	**0**	**6**	**24**	**21**	**280**	**420**	**100**	**800**

NOTE:

1. **At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.**
2. **Choose any one from Professional Elective Course – II & III**
3. **Choose any one from Open Elective Course – II**

Professional Elective Course – II

1. Software Testing
2. Cybersecurity
3. Information Retrieval
4. Wearable computing, mixed reality and Internet of everything
5. Soft Computing

Professional Elective Course – III

1. Network Security and Cryptography
2. Internet Technologies
3. Mobile applications development
4. Advance Database Management System
5. Machine Learning

Open Elective Course – II

1. Open-Source Systems
2. Wireless Communication
3. Industrial Safety
4. Natural Language Processing
5. Disaster Management

COMPILER DESIGN

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Compiler Design				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis.
3. Design top-down and bottom-up parsers.
4. Identify synthesized and inherited attributes.
5. Develop syntax-directed translation schemes.

UNIT - I

Introduction to Compilers: Language Processors, The Structure of compiler: its different phases, Compiler Construction Tools, Applications of Compiler Technology.

Lexical Analysis: Role of lexical analyzer, Input Buffering, Specification, and recognition of tokens, design of lexical analyzer, regular expressions, A language specifying lexical analyzer, Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing the number of states of DFA, Implementation of lexical analyzer.

UNIT - II

Syntax Analysis: Role of parsers, context-free grammars.

Parsing Technique: Shift-reduce parsing, Operator precedence parsing, Top-down parsing, Predictive parsing.

UNIT - III

LR parsers, SLR, LALR, and Canonical LR parser.

Syntax Directed Translations: Syntax-directed definitions, construction of syntax trees, syntax-directed translation scheme, implementation of syntax-directed translation, Intermediate-Code Generation: three address code, quadruples and triples.

UNIT - IV

Symbol Table & Error Detection, and Recovery: Symbol tables: its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase

error, and Semantic error. **Code Optimization & Code Generation:** Code generation, forms of objects code, machine-dependent code, optimization, register allocation for temporary and user defined variables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: state principles of compiler design.
CO2: illustrate the essential phases for automatically converting source code into object code.
CO3: apply lexical analysis, syntax analysis and code optimization techniques for solving problems.
CO4: analyse a parse tree and a given BNF grammar.
CO5: compare and contrast syntax-oriented translation schemes.
CO6: design a lexical analyser from the specification of a language's lexical rules.

TEXT AND REFERENCE BOOKS:

1. Theory and practice of compiler writing, Tremblay & Sorenson, 1985, Mc. Graw Hill.
2. System software by Dhamdhere, 1986, MGH.
3. Principles of compiler Design, Narosa Publication
4. Elements compiler Design, Dr. M. Joseph, University Science Press
5. Compilers Principle, Techniques & Tools – Alfred V. AHO, Ravi Sethi & J.D. Ullman; 1998 Addison Wesley.

ADVANCE JAVA PROGRAMMING

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Advance Java Programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Programming in the Java programming language,
2. Knowledge of object-oriented paradigm in the Java programming language,
3. The use of Java in a variety of technologies and on different platforms.

UNIT - I

Servlet: Servlet introduction, web terminology, servlet API, servlet Interface, generic servlet, Http servlet, servlet lifecycle, servlet with IDE (eclipse, My eclipse, Net beans), servlet request, servlet collaboration, servlet configuration, context, attribute in servlet, session technique in servlet, event and listener, servlet filter, CRUD, pagination, input output stream, annotation, single thread model, SSI;

JSP: Lifecycle of JSP, JSPAPI, scripting elements, 9Implicit Objects, directive elements, Exceptions, action elements, expression language, MVC in JSP, JSTL, custom tags, pagination, CRUD, JSTL function, formatting, XML, SQL tags.

UNIT - II

Struts: Introduction, features, models, components, struts2 architecture, action, configuration, interceptors, validation method, aware Interfaces, stuts2withI18N, zero configuration, struts2withtiles, hibernate with struts2, spring with struts2, UI tags;

Mail API: java mail introduction, methods of sending email, sending mail by Gmail, receiving email, sending attachment, receiving attachment, sending html, forwarding, deleting email.

UNIT - III

Hibernate(HB): Introduction, architecture, HB with IDE, HB Log4j, inheritance mapping, HB mapping, transaction management, HB query language, HB criteria query language, named query, HB caching, integration, HB lifecycle;

Spring: Introduction, modules, spring with IDE, dependency injection methods, spring AOP, spring Jdbc template, spring ORM, SPEL, MVC tag library, applications, spring remoting, spring OXM, spring web, security models, spring boot, spring with angular.

UNIT - IV

Android: Introduction, history & versions, architecture, building blocks, emulator, android widgets, activity and intents, android fragments, android menu, android service, SQLite, XML & JSON, android speech, multimedia, telephony, maps;

Design Pattern: java design pattern, creational, structural, behavioral, J2EE patterns, presentation layers.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Knowledge of the structure and model of the Java programming language, (knowledge).
CO2: Use the Java programming language for various programming technologies (understanding).
CO3: Develop software in the Java programming language.
CO4: Demonstrate a sound technical knowledge of their selected project topic.
CO5: Undertake problem identification, formulation and solution.
CO6: Conduct an engineering project.

TEXT AND REFERENCE BOOKS:

1. Patrick Naught on and Herbertz Schidt, “Java-2 the complete Reference”,TMH
2. Sierra & bates, “Head First Java”, O’Reilly.
3. E. Balaguruswamy, “Programming with Java”,TMH
4. Horstmann, “Computing Conceptswith Java2 Essentials”, John Wiley.
5. Decker & Hirsh field, “Programming.Java”, Vikas Publication.

CLOUD COMPUTING

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Cloud Computing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

UNIT - I

INTRODUCTION TO CLOUD COMPUTING: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing.

UNIT - II

CLOUD COMPUTING ARCHITECTURE: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model Cloud Deployment Models Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise .

UNIT - III

SECURITY ISSUES IN CLOUD COMPUTING: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

SECURITY MANAGEMENT IN THE CLOUD: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS Privacy Issues Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

UNIT - IV

AUDIT AND COMPLIANCE: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a Cloud.

DATA INTENSIVE COMPUTING: Map-Reduce Programming Characterizing Data-Intensive Computations, Technologies for Data- Intensive Computing, Storage Systems, Programming Platforms, MapReduce Programming, MapReduce Programming Model, Example Application

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Recall and summarize the basic concepts of cloud computing
CO2: Discuss the architectural design of cloud and illustrate various programming models.
CO3: Outline the virtualization technology and determine their uses.
CO4: Explain the basic threats and security mechanism in cloud
CO5: Summarize the cloud available platforms for business and industry perspective

TEXT AND REFERENCE BOOKS:

1. "Cloud Computing Explained: Implementation Handbook for Enterprises", John Rhoton, Publication Date: November 2, 2009
2. "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)", Tim Mather, ISBN-10: 0596802765,O'Reilly Media, September 2009

ADVANCE JAVA PROGRAMMING LAB

Semester	VI				
Course code					
Category	Laboratory course				
Course title	Advance Java Programming Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

1. Servlet Program: User Registration Form
   a. Create a servlet to handle user registration form submission.
   b. Store the user data in a database using JDBC.
   c. Perform validation on the form inputs and display appropriate error messages.
   d. Redirect the user to a success page upon successful registration.
2. JSP Program: Employee Management System
   a. Create a JSP page to display a list of employees retrieved from a database.
   b. Implement CRUD operations (Create, Read, Update, Delete) for managing employee records.
   c. Use JSTL (JavaServer Pages Standard Tag Library) for iteration and conditional rendering.
   d. Apply formatting using JSTL functions and display data in a tabular format.
3. Struts Program: Employee Management with Struts
   a. Create an Employee Management web application using Struts framework.
   b. Implement actions, forms, and validation using Struts annotations.
   c. Apply interceptors for authentication and authorization.
   d. Integrate with Hibernate for database operations.
4. Mail API Program: Email Client Application
   a. Develop an email client application using Java Mail API.
   b. Implement features such as sending and receiving emails.
   c. Support attachments, HTML content, forwarding, and deleting emails.
   d. Use Gmail SMTP and IMAP servers for email communication.
5. Hibernate Program: Product Catalog Management
   a. Build a product catalog management system using Hibernate framework.
   b. Define Hibernate mapping for product and category entities.
   c. Perform CRUD operations on the database using Hibernate APIs.
   d. Utilize Hibernate query language and criteria queries for advanced querying.
6. Spring Program: Library Management System
   a. Develop a library management system using Spring framework.
   b. Utilize Spring's dependency injection for managing application components.
   c. Implement Spring AOP for logging and transaction management.
   d. Integrate with Spring JDBC Template for database operations.
7. Android Program: Weather Forecast App
   a. Create a weather forecast application for Android devices.

b. Fetch weather data from a web API using HTTP requests.
c. Display the weather information using Android widgets and RecyclerView.
d. Implement features like location-based weather, caching, and multi-day forecasts.

8. Design Pattern Program: Factory Method Pattern
   a. Implement the Factory Method design pattern in Java.
   b. Create a factory interface and concrete factories for creating different types of products.
   c. Define a common product interface and concrete product classes.
   d. Demonstrate the flexibility of the pattern by creating and using products through the factory.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Explore the usage of JSP scripting elements, implicit objects, and directive elements.
CO2: Familiarize yourself with the Java Mail API, its methods, and practical implementation for sending and receiving emails.
CO3: Understand Hibernate caching mechanisms and its integration with other technologies.
CO4: Understand the importance and implementation of design patterns in Java, including creational, structural, and behavioral patterns.
CO5: Explore J2EE patterns and presentation layers to develop scalable and maintainable enterprise-level applications.
CO6: Explore various Android components like widgets, activities, intents, fragments, menus, and services.

PROJECT - I

Semester	VI				
Course code					
Category	Project				
Course title	Project - I				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVE

1. To allow students to demonstrate skills learned during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation
2. To encourage research through the integration learned in a number of courses.
3. To allow students to develop problem solving skills.
4. To encourage teamwork.
5. To improve students' communication skills by asking them to produce both a professional report and to give an oral presentation and prepare a technical report.

Students will be assigned projects (Applications/Research based) individually or in a group of not more than 3 students depending on the efforts required for completion of the project.

The project will have 4 stages: (*Marks for internal evaluation are given in brackets)

1. Synopsis submission (5 marks),
2. 1st mid-term progress evaluation (Literature Survey in case of research project) (5 marks)
3. 2nd mid-term progress evaluation (Paper Publishing/acceptance in a reputed Journal or Conference acceptance/ Presenting) (5 marks)
4. Final submission evaluation

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and/or publication and viva.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Undertake problem identification and formulation.
CO3: Design engineering formula to complex problems utilising a systems approach.
CO4: Research and engineering project.
CO5: Communicate with engineers and the community at large in written and oral form.
CO6: Demonstrate the knowledge, skills and attitudes of a professional engineer.

Professional Elective Course - II

SOFTWARE TESTING

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Software Testing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To study fundamental concepts of software testing including software testing objectives, process, criteria, strategies, and methods.
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain an insight into techniques and skills on how to use modern software testing tools to support software testing projects.

UNIT - I

Introduction: Overview of Software Development Life Cycle (SDLC), Significance of Software Testing in SDLC, Objectives and Limitations of software testing. Difference between an Error, Fault and Failure (Software Bug), Software Testing Life Cycle (STLC) and Seven Principles of Software Testing, Role of Software Testing in Software Quality

UNIT - II

Test Case Design: Test Cases and Test Suite, Test Case Planning and Designing, Characteristics of Good Test Case Design, Format of test case.

Testing Activities: Levels of Testing- Unit, Integration Testing and System Testing. V Model for Software Testing.

UNIT - III

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis

and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

UNIT - IV

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis
and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand software testing and quality as a fundamental component of software development life cycle.
CO2: Understand and design the test cases for a given problem
CO3: Understand the process of Reporting of software failures(bugs) using tools like Bugzilla
CO4: Develop the knowledge of selection of appropriate test cases for execution during regression testing.
CO5: Compare and contrast the various activities of Quality Assurance, Quality planning and Quality Control.
CO6: Conduct formal inspections, record and evaluate results of inspections.

TEXT AND REFERENCE BOOKS:

1. "Software Testing: Principles and Practices", by Naresh Chauhan. Oxford University Press
2. "William Perry, Effective Methods for Software Testing, John Wiley & Sons, New York, 1995.
3. Boris Beizer, Software Testing Techniques, Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, Software Testing, Pearson Education Asia, 2002
5. Roger S. Pressman, Software Engineering – A Practitioner's Approach, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems, John Wiley & Sons Inc., New York, 1995.
7. K.K. Aggarwal & Yogesh Singh, Software Engineering, New Age International Publishers, New Delhi, 2003.

CYBERSECURITY

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Cybersecurity				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

The course has been designed to give students an extensive overview of cyber security issues, tools and techniques that are critical in solving problems in cyber security domains.The course aims at providing students with concepts of computer security, cryptography, digital money, secure protocols, detection and other security techniques. The course will help students to gauge understanding in essential techniques in protecting Information Systems, IT infrastructure, analysing and monitoring potential threats and attacks, devising security architecture and implementing security solutions. The students will also have a wider perspective to information security from national security perspective from both technology and legal perspective.

UNIT - I

Cyber Security Concepts

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning).

Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

UNIT - II

Cryptography and Cryptanalysis: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

Open Source/ Free/ Trial Tools: Implementation of Cryptographic techniques, OpenSSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools)

UNIT - III

Infrastructure and Network Security: Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks.

Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.
Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain & abel, iptables/ Windows Firewall, snort, suricata, fail2ban

UNIT - IV

Cyber Security Vulnerabilities& Safe Guard: Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment.
Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.
CO2: Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
CO3: Identify common trade-offs and compromises that are made in the design and development process of Information Systems
CO4: Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

TEXT AND REFERENCE BOOKS:

1. William Stallings, “Cryptography and Network Security”, Pearson Education/PHI, 2006.
2. V.K. Jain, “Cryptography and Network Security”, Khanna Publishing House.
3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi.
4. Atul Kahate, “Cryptography and Network Security”, McGraw Hill.
5. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning
6. Nina Godbole, “Information System Security”, Wiley
7. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi.

INFORMATION RETRIEVAL

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course Title	Information Retrieval				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To build an understanding of the fundamental concepts of Information Retrieval
2. To understand the elements of Web Search Engines and Crawlers
3. To familiarize students with the basic taxonomy and terminology of Indices and to understand Heap's Law for estimation and Zipf's law for modeling distribution of terms
4. To understand dictionary compression and posting list compression and to introduce the scoring , tf-idf weighting and vector space model for scoring

UNIT - I

Information retrieval problem, an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval, an inverted index, Bi-word indexes, Positional indexes, Combination schemes

UNIT - II

Search Engines: Basic Building Blocks and Architecture, Text Acquisition, Text Transformation, Index Creation, User Interaction, Ranking, Evaluation. **CRAWL AND FEEDS:** Crawling the Web, Retrieving Web Pages, The Web Crawler, Freshness, Focused Crawling, Deep Web, Crawling Documents and Email, Storing the Documents, Detecting Duplicates

UNIT - III

INDEX CONSTRUCTION AND COMPRESSION: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing **Index compression:** Statistical properties of terms in information retrieval, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression, Dictionary as a string, Blocked storage, Postings file compression

UNIT - IV

SCORING, TERM WEIGHTING AND THE VECTOR SPACE MODEL: Parametric and zone indexes, Weighted zone scoring, Learning weights, The optimal weight, Term frequency and

weighting, Inverse document frequency, Tf-idf weighting, The vector space model for scoring , Computing scores in a complete search system.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand basic Information Retrieval Systems and learn how Boolean queries are processed.

CO2: Realize the data structures like Inverted Indices used in Information retrieval systems.

CO3: understand the basic concept of Search Engines their architecture and its various functional components and understand the basic concept of Web crawlers and their architecture

CO4: identify the different types of indices: inverted index, positional index, biword index and be able make estimations and model distribution of terms and compressions

CO5: enumerate various types of indices and also understand the concept of efficient storage of indices and learn tf-idf scoring and vector space model scoring for ranking.

TEXT AND REFERENCE BOOKS:

1. C.D.Manning, P. Raghavan and H.Schutze “Introduction to Information Retrieval”, Cambridge University Press, Latest Edition
2. B.Croft, D.Metzler, T.Strohman, “Search Engines : Information Retrieval in Practice”, AddisionWesley, Latest Edition

SOFT COMPUTING

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Soft Computing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To provide students an hand-on experience on MATLAB to implement various strategies.

UNIT - I

INTRODUCTION TO SOFT COMPUTING: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT - II

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT - III

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT - IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify and describe soft computing techniques and their roles in building intelligent Machines.
CO2: Develop intelligent systems leveraging the paradigm of soft computing techniques.
CO3: Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
CO4: Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5: Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms.
CO6: Evaluate and compare solutions by various soft computing approaches for a given problem.

TEXT AND REFERENCE BOOKS:

1. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", PHI
2. Satish Kumar, "Neural Networks: A classroom approach" Tata McGraw Hill.
3. Haykin S., "Neural Networks-A Comprehensive Foundations", PHI
4. Anderson J.A., "An Introduction to Neural Networks", PHI
5. M.Ganesh, "Introduction to Fuzzy sets and Fuzzy Logic" PHI.
6. N P Padhy and S P Simon, " Soft Computing with MATLAB Programming", Oxford University Press

INTERNET OF THINGS

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course Title	Internet of Things				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Student will be able to learn the basics of IOT.
2. Student will be able to analyse basic protocols of wireless and MAC.
3. Students will get familiar with web of things.
4. Students will get basic knowledge of resource management.

UNIT - I

INTRODUCTION TO IOT: Introduction to IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs ,IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network, Challenges in IoT(Design ,Development, Security)

UNIT - II

NETWORK AND COMMUNICATION ASPECTS: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

UNIT - III

WEB OF THINGS: Web of Things vs Internet of things, two pillars of web, Architecture and standardization of IoT, Unified multitier-WoT architecture, WoT portals and Business intelligence, Cloud of things: Grid/SOA and cloud computing, Cloud middleware, cloud standards

UNIT - IV

RESOURCE MANAGEMENT IN IOT: Domain specific applications of IoT, Home automation, Industry applications, Surveillance applications, Other IoT applications Clustering, Synchronization, Software agents.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: **Understand** the basics of application areas of IOT.
CO2: Analyze basic protocols network.
CO3: Explain and realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
CO4: Discuss the architecture, operation, and business benefits of an IoT solution
CO5: Examine the potential business opportunities that IoT can uncover
CO6: Explore the relationship between IoT, cloud computing, and big data and Identify how IoT differs from traditional data collection system

TEXT AND REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

Professional Elective Course - III

NETWORK SECURITY AND CRYPTOGRAPHY

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Network Security And Cryptography				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

UNIT - I

Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

UNIT - II

Symmetric Key Algorithms: Introduction, algorithms types and modes, DES, AES.

Asymmetric Key Algorithms: Introduction, history of asymmetric key cryptography, RSA symmetric and asymmetric key cryptography together, Digital signature.

UNIT - III

Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

UNIT - IV

User Authentication And Kerberos: - Introduction, Authentication basics, Passwords, authentication tokens, certificate-based authentication, biometric-based authentication, Kerberos, key distribution center(KDC), Security handshake pitfalls, single Sign on(SSO) approach.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify services that enhance the security and its mechanism.

CO2: Classify security attacks on information over network. Describe and apply classical encryption techniques.
CO3: Explain and apply modern block cipher with modes
CO4: Compare conventional encryption algorithms & public key cryptography, and design Encryption algorithm to provide the Integration and confidentiality of a message.
CO5: Understand the concept of hash function with application and message authentication code in security system
CO6: Classify key management schemes and discuss web security and transport level security protocols.

TEXT AND REFERENCE BOOKS:

1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)
4. SNMP: A Guide to Network Management (MGH)
5. Telecom Network Management by H.H. Wang (MGH)
6. Network Management by U. Dlack (MGH)

INTERNET TECHNOLOGIES

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Internet Technologies				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

UNIT - I

WEB SERVERS: Web Protocols- Working of web browser - Browser & Server Communication - Web Server Functions - Web Security - Fire Wall - Proxy Servers - Virtual Directories - MIME - HTTP Headers - Deployment using web servers.

WEB PROGRAMMING: HTML5 Structural Elements-Images - HTML5 Form Elements and Attributes - DHTML - CSS3-Selectors-Box model-Positioning elements-Colors-Shadows-Gradients-Transitions and Transformations.

UNIT - II

JAVASCRIPT: Java Script - Core JavaScript - lexical structure- types-values and variables-expression and operators-statements-objects arrays-functions- classes and modules- pattern matching with regular expressions- java script in web browser-the window objects scripting documents-handling events.

UNIT - III

ANGULARJS: An Overview of the AngularJS Life Cycle-Integrating AngularJS with Existing JavaScript and jQuery-Adding AngularJS to the Node.js Environment-Bootstrapping AngularJS in an HTML Document- Creating a Basic AngularJS Application-Using AngularJS Templates to Create Views- Implementing Directives in AngularJS Views- Implementing AngularJS Services in Web Applications.

NODE.JS: Using Events, Listeners, Timers, and Callbacks in Node.js-5 Handling Data I/O in Node.js- Accessing the File System from Node.js- Implementing HTTP Services in Node.js-implementing Socket Services in Node.js- Scaling Applications Using Multiple Processors in Node.js- Implementing Express in Node.js

UNIT - IV

MONGODB: Understanding NoSQL and MongoDB- Manipulating MongoDB Documents from Node.js- Accessing MongoDB Documents from Node.js- Advanced MongoDB Concepts

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understanding of the concept of the web servers and its working.
CO2: Analyze a web page and identify its elements and attributes.
CO3: Build dynamic web pages using JavaScript (Client side programming).
CO4: Acquire in depth knowledge in web services using the latest server-side technologies.
CO5: Ability to design and develop web server applications using Node JS and Angular JS.
CO6: Demonstrate the connectivity of web pages and database like NoSQL and MongoDB.

TEXT AND REFERENCE BOOKS:

1. Deitel & Deitel, "Internet & World Wide Web How to Program", Pearson Education India, fifth Edition, 2011.
2. David Flanagan "JavaScript: The Definitive Guide, O'Reilly Media, Inc. May 2011.
3. Brad Dayley "Node.js, MongoDB, and AngularJS Web Development", Addison-Wesley Professional. 2014
4. Brad Green, Shyam Seshadri "AngularJS", O'Reilly; 1st Edition Apr 2013.
5. Negrino and Smith, "Javascript for the World Wide Web", 5th Edition, Peach pit Press,2003

WEARABLE COMPUTING, MIXED REALITY AND INTERNET OF EVERYTHING

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Wearable Computing, Mixed Reality And Internet of Everything				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1.

UNIT - I

INTRODUCTION: Introduction – History - Creative Coding Platforms - Open Source Platforms – PIC - Arduino, Sketch, Raspberry Pi, Iterative coding methodology – Python Programming - Mobile phones and similar devices - Arm Devices - Basic Electronics (circuit theory, measurements, parts identification) Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World

UNIT - II

SOFTWARE HARDWARE FRAMEWORKS: Software: open Frameworks as our IDE (C/C++) - "Arduino" Language (C/C++) - Hardware: Desktop / Laptop / Raspberry Pi - How to approach a programming problem? Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc. Analog to Digital Conversion (ADC) - Digital to Analog Conversion (DAC)– Microcontrollers - Communication – Serial& Parallel - Hardware to Hardware Communication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication

UNIT - III

CYBERNETICS AND HUMANISTIC INTELLIGENCE: Wearables - Augmented Reality – Mixed Reality. Case studies, Oculus Rift (2012, 2013), AR versus VR - IoT and Wearables: Smart Cites and Wearable Computing as a form of urban design - Advanced I/O – open Frameworks:Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL, sqLite, XML, PHP/Web) - Arduino: Wired/Wireless Networking (hardware vs. USB proxy) - Software serial (RS-232) talking to other devices - Advanced sensor/device communication SPI - Advance IC interfacing / Bitbanging (bitwise operators) - Linux –GPIO

UNIT - IV

THE WORLD OF THE FUTURE – INTERNET OF EVERYTHING: Humanistic Intelligence, Mann 1998. Wearable Computing and IoT (Internet of Things) The scalespace theory; sur/surveillance; integrity; Veillance Contract; Humanistic Intelligence; MedialityAxis? Overview of Mobile and Wearable Computing, Augmented Reality, and Internet of Things. The fundamental axes of the Wearables + IoT + AR space - Free-roaming AR: Wearable Computing, Wireless, Sensing, and Metasensing with light bulbs Phenomenal Augmented Reality: Real world physical phenomena as the fundamental basis of mobile and wearable AR.

FUTURE AND PERSPECTIVES: Internet of Everything – The Future and perspectives - Challenges

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand advanced and emerging technologies.
CO2: Obtain skills to do advanced research and programming.
CO3: Learn how to use software programs to perform varying and complex tasks.
CO4: Expand upon the knowledge learned and apply it to solve real world problems

TEXT AND REFERENCE BOOKS:

1. Practical Electronics for Inventors, Third Edition," by Paul ScherzandSimon Monk. 2016
2. Intel Galileo and Intel Galileo Gen 2API Features and Arduino Projects for Linux Programmers, Ramon, Manoel 2014 (Open Access)
3. Fundamentals of Wearable Computers and Augmented Reality, Second Edition by Woodrow Barfield 2015
4. Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design By OmeshTickoo, Ravi Iyer 2016
5. Programming Interactivity, Second Edition By Josha Noble, 2012
6. Programming the Raspberry Pi: Getting Started with Python 2E, 2016

ADVANCE DATABASE MANAGEMENT SYSTEM

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Advance Database Management System				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To understand DBMS Components, Advantages and Disadvantages.
2. Understanding Data modeling: ER, EER, Network, Hierarchical and Relational data models.
3. Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.
4. To understand transaction concept, schedules, serializability, locking and concurrency control protocols.

UNIT - I

Introduction: Architecture, Advantages, Disadvantages, Data models, relational algebra, SQL, Normal forms.

Query Processing: General strategies for query processing, transformations, expected size, statistics in estimation, query improvement. Query evaluation, view processing, query processor.

UNIT - II

Recovery: Reliability, Transactions, recovery in centralized DBMS, reflecting updates, Buffer management logging schemes, disaster recovery.

Concurrency: Introduction, Serializability, Concurrency control, locking schemes, Timestamp based ordering, Optimistic, Scheduling, Multi-version techniques, Deadlocks.

UNIT - III

Parallel and Distributed Databases: Distributed Data Storage – Fragmentation & Replication, Location and Fragment.

Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

UNIT - IV

Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Students will get understanding of DBMS Components, Its advantages and disadvantages.

CO2: Understanding about various types of Data modeling: ER, EER, Network, Hierarchical and Relational data models.

CO3: Explain the concept of distributed database architecture & design and web technology using databases.

CO4: Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.

CO5: Understanding transaction concept, schedules, serializability, locking and concurrency control protocols.

TEXT AND REFERENCE BOOKS:

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education,2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998
4. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007 2
5. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
6. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
7. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision Wesley

MACHINE LEARNING

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Machine Learning				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Understand the machine learning techniques.
2. Gain knowledge of linear regression models, Random Forests
3. KNN classifier Gain knowledge on the basics of probabilistic approaches like Naïve Bayes, Bayes Theorem
4. Acquire knowledge of Support Vector machines, K-means clustering techniques
5. Introduce the working principle of Artificial Neural networks

UNIT - I

Machine Learning: Definition, History, Need, Features, Classification of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement Learning, Machine Learning life cycle, Applications of Machine Learning, Parametric vs. non-parametric models. Learning theory-bias/variance tradeoff, Underfitting, Overfitting, Major differences between statistical modelling and machine learning, Steps in machine learning model development, Machine learning losses, when to stop tuning machine learning models, Train, validation, and test data Cross-validation, Grid Search.

UNIT - II

Dimensionality reduction: Definition, Row vector and Column vector, how to represent a dataset, how to represent a dataset as a Matrix, Data preprocessing in Machine Learning: Feature Normalization, Mean of a data matrix, Column Standardization, Co-variance of a Data Matrix, Principal Component Analysis for Dimensionality reduction.

UNIT - III

Supervised Learning: Definition, how it works. Types of Supervised learning algorithms k - Nearest Neighbours, Naïve Bayes, Decision Trees, Naive Bayes, Linear Regression, Logistic Regression, Support Vector Machines.

UNIT - IV

Unsupervised Learning: Clustering: K-means. Ensemble Methods: Boosting, Bagging, Random Forests.

Dimensionality reduction techniques: PCA, LDA, ICA, SVD

Evaluation: Performance measurement of models in terms of accuracy, confusion matrix, precision & recall, F1-score, receiver Operating Characteristic Curve (ROC) curve and AUC, Median absolute deviation (MAD), Distribution of errors

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Acquire the knowledge of machine learning model evaluation methods/measurements.

CO2: Understand different types of machine learning techniques and their applications in the real world.

CO3: Apply various mathematical models for supervised machine learning models.

CO4: Apply and evaluate the unsupervised machine learning models through various clustering algorithms.

CO5: Evaluate various machine learning algorithms through statistical learning techniques.

CO6: Apply reinforcement learning algorithms to solve real-time complex problems with an understanding of the trade-offs involved.

CO7: Design the recommendation system using natural language processing and evaluate the machine learning models through ANN.

TEXT AND REFERENCE BOOKS:

1. E. Alpaydin, Introduction to Machine Learning, (3e), PHI Learning 2015.
2. S Marsland, Chapman and Hall, Machine Learning: An Algorithmic Perspective, (2e), CRC,2014.
3. M. Bishop, Pattern Recognition and Machine Learning, (2e), Springer, 2013.
4. T. Mitchell, Machine Learning, (1e), McGraw Hill Education, 2017.
5. L.E. Sucar, Probabilistic Graphical Models: Principles and Applications (Advances in Computer Vision and Pattern Recognition), (1e), Springer, 2016

Open Elective Course - II

OPEN-SOURCE SYSTEMS

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Open-Source Systems				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

UNIT - I

FOSS PHILOSOPHY AND LINUX PACKAGE

Introduction to Software Terminologies - Overview of Free/Open-Source Software - Definition of FOSS & GNU - History of GNU/ Linux and the Free Software Movement, Advantages of Free Software and GNU/Linux, FOSS usage, trends and potential - global and Indian-Free Software Licenses (GPL, LGPL, AGPL). Installing software - from source code as well as using binary packages - Understanding build systems - constructing make files and using make, using Autoconf and autogen to automatically generate make files tailored for different development environments.

UNIT - II

OPEN-SOURCE NON-RELATIONAL DATABASES

NoSQL definition - relational Vs non-relational database - working with NoSQL - Running MongoDB - Getting A Database Connection - Inserting Data into A Collection - Accessing Data from a Query - CouchDB-Developing with CouchDB - Example application - Deploying CouchDB.

UNIT - III

OPEN-SOURCE PROGRAMMING LANGUAGES

PHP: Introduction - Programming in web environment - variables - constants - data types -operators - Statements - Functions - Arrays - OOP - String Manipulation and regular expression - File handling and data storage - PHP and SQL database - PHP and LDAP - PHP Connectivity - Sending and receiving E-mails - Debugging and error handling - Security - Templates.

PYTHON: Syntax and Style - Python Objects - Numbers - Sequences - Strings - Lists and Tuples - Dictionaries - Conditionals and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OOP - Execution Environment.

UNIT - IV

OPEN-SOURCE TOOLS AND TECHNOLOGIES

Web Server: Apache Web server -Google Web server- Working with Web Server - Configuring and Using Apache web services

MDA: Introduction to MDA - Genesis of MDA - Meta Object Facility - UML -UML Profiles - MDA Applications- case studies.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Students shall be able to understand the importance of FOSS.
CO2: Ability to create and manipulate non-relational data bases.
CO3: Understand various version control sytems.
CO4: Ability to write programs using PHP, Python and manipulate SQL data base.
CO5: Ability to configure and use Apache web services, acquire knowledge to develop software models using MDA.

TEXT AND REFERENCE BOOKS:

1. Mike McGrath, "Linux in easy steps, Sixth Edition", Tata McGraw-Hill, Sixth Edition 2010.
2. N. B. Venkateshwarlu, "Introduction to Linux: Installation and Programming", First Edition, BS Publishers, 2006.
3. Steve Suchring, "MySQL Bible", John Wiley, 2007.
4. Steven Holzner, "PHP: The Complete Reference", TMH Edition; 2007
5. J.Chris Anderson, "CouchDB : Definitive Guide", First Edition, O'Reilly series, 2010.
6. Wesley J.Chun, "Core Python Programming", Prentice Hall, 2007
7. Stephen J. Mellor, Marc Balces, "Executable UMS: A foundation for MDA", Addison Wesley, 2002.

WIRELESS COMMUNICATION

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Wireless Communication				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To know about the evolution of wireless communication systems and various generations of cellular systems.
2. To understand the basic design principles of cellular systems.
3. To understand the advanced multiple access techniques.
4. To understand the diverse reception techniques and applications of cellular networks.

UNIT - I

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, and comparison of various wireless systems.

MODERN WIRELESS COMMUNICATION SYSTEMS: Second-generation cellular networks, third-generation wireless networks, wireless in the local loop, wireless local area networks, Bluetooth and Personal Area networks.

UNIT - II

INTRODUCTION TO CELLULAR MOBILE SYSTEMS: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analogue cellular systems, digital Cellular Systems.

CELLULAR SYSTEM DESIGN FUNDAMENTALS: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and trade-off service, improving coverage and capacity.

UNIT - III

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum Multiple Access, space division multiple access, packet ratio, the capacity of cellular systems.

UNIT - IV

WIRELESS NETWORKING: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signalling, ISDN (Integrated Services Digital Networks), advanced intelligent network**.**

INTELLIGENT CELL CONCEPT AND APPLICATION: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand the evolution of wireless communication systems and various generations of cellular systems.
CO2: Summarize the challenges of wireless transmission and different design models.
CO3: To illustrate the working of a cellular network and discuss issues related to cellular network design.
CO4: Understand the advanced multiple access techniques.
CO5: Understand the diverse reception techniques and applications of cellular networks.

TEXT AND REFERENCE BOOKS:

1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill
3. Mobile Communications: Jochen Schiller; Pearson

INDUSTRIAL SAFTEY

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Industrial Saftey				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To teach the students the concept of industrial safety and provide useful practical knowledge for workplace safety.
2. To identify, evaluate control the hazards to prevent or mitigate harm or damage to people, property and the environment.
3. To understand about fire and explosion, preventive methods, relief and its sizing methods
4. To analyze industrial hazards and its risk assessment

UNIT - I

Introduction: Concept of loss prevention, origin of process hazards, types of process hazards, acceptable risks, accident and loss statics, nature of accident process, concepts of inherent safety in plants or Factories, dose Vs response curve, toxicants entry route, thresh limit values, safety regulations.

UNIT - II

Hazards: Fire, Chemical (industrial and laboratory scale), electrical, mechanical, biohazards (natural and anthropogenic), toxic materials, their types and preventive measures, Liquid and vapor phase hazardous methods, storage and handling, containment, precautions, Personal safety precautions.

UNIT - III

Risk management principles, risk analysis techniques, risk control, hazards operability studies, hazard analysis, Fault tree analysis, Consequences analysis, human error analysis, accidental error analysis, economics of risk management, check list, reliability theory, event tree, HAZOP, safety reviews, what if analysis.

UNIT - IV

Safety audit, procedure for safety auditing, audit report, safety report, safety training, emergency planning and disaster management, introduction to security risk factors tables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Analyze the effect of the release of toxic substances.

CO2: Understand the industrial laws, regulations and source models.

CO3: Understand the methods of hazard identification and preventive measures and develop safety programs to prevent the damage or loss.

CO4: Conduct safety audits and improve safety practices.

CO5: Identify relevant regulatory and national consensus standards along with best practices that are applicable.

CO6: Analyze injury and illness data for trends.

TEXT AND REFERENCE BOOKS:

1. Chemical Hazards and safety, 2nd Edition, DawandeDenet& Co. , 2012
2. Loss preventions in process industries, Lees Butterworth-Heinemann, 1980.
3. Industrial safety Handbook, William and Handley, McGraw Hill.
4. Safety and Hazard management in Chemical Industries, Vyas, Atlantic 2013.
5. Industrial safety, health environment & Security, Basudev Panda, Laxmi publication ISBN-97893-81159-43-9
6. Industrial Safety and Health Management, 4th Edition, C. Ray Asfahl, Prentice Hall International Series, 1984

NATURAL LANGUAGE PROCESSING

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Natural Language Processing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.
2. Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
3. Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthesis).
4. Evaluate the performance of NLP tools and systems.

UNIT - I

Introduction: A computational framework for natural language, description of English or an Indian language in the framework lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP (morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.

UNIT - II

Word level and syntactic analysis

Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of-Speech Tagging. Syntactic Analysis: Context-free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine-readable dictionaries and lexical databases, RTN, ATN.

UNIT - III

Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.

Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG.

Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

UNIT - IV

Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation

Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- **CO1:** Understand language and the tools that are available to efficiently study and analyse large collections of text.
- **CO2:** Understand the concepts of linguistic foundations that underlie natural language processing, which would provide the knowledge for building components of NLP systems.
- **CO3:** Learn computational frameworks for natural language processing.
- **CO4:** Demonstrate the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, and understanding them to apply in different research areas.
- **CO5:** Recognize the significance of research in natural language processing for common NLP tasks such as text classification, spam filtering, spell checking, machine learning, etc. to engage in lifelong learning.
- **CO6:** Understand the concepts of linguistic foundations that underlie natural language processing, which would provide the knowledge for building components of NLP systems.

TEXT AND REFERENCE BOOKS:

1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, 2016.
3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
5. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley
6. https://www.coursera.org/specializations/natural-language-processing

DISASTER MANAGEMENT

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Disaster Management				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To provide basic conceptual understanding of disasters and its relationships with development.
2. Provide an understanding of the social nature of natural hazards and disasters
3. Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

UNIT - I

Introduction: Definition of Disaster, hazard, Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

UNIT - II

Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion

Man-made Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

UNIT - III

Case Studies: Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kedarnath landslide, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

UNIT - IV

Disaster Management: Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: To know natural as well as manmade disaster and their extent and possible effects on the economy.

CO2: Explain the natural environment and its relationships with human activities and realize the importance of ecosystem and biodiversity for maintaining ecological balance and know the objective and scope of the course.

CO3: To Plan national importance structures based upon the previous history.

CO4: To acquaint with government policies, acts and various organizational structures associated with an emergency.

CO5: To know the simple dos and don'ts in such extreme events and act accordingly.

TEXT AND REFERENCE BOOKS:

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011