KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES

(Autonomous)

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE & SYLLABUS

(Regulation –R20)

For B. Tech DEPARTMENT OF IT

(Applicable for Batches admitted from 2020-2021*)*

KKR&KSRINSTITUTEOFTECHNOLOGYANDSCIENCES

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(Accredited by NAAC with Grade "A" and Affiliated to JNTUK-Kakinada)

Vinjanampadu, Vatticherukuru Mandal,Guntur-522017.
Andhra Pradesh, INDIA

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Vinjanampadu, Vatticherukuru Mandal, Guntur, Andhra Pradesh-522017

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE & SYLLABUS – R20

I - B.Tech - SEMESTER-I

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH1T07	Linear Algebra & Vector Calculus	3	0	0	3	30	70	100
2	20SH1T02	Applied Physics	3	0	0	3	30	70	100
3	20SH1T01	Communicative English	3	0	0	3	30	70	100
4	20EC1T01	Digital Logic Design	3	0	0	3	30	70	100
5	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
6	20GE1M01	Environmental Sciences	2	0	0	0	--	--	--
PRACTICAL									
7	20SH1L01	English Communicative Skills Lab	0	0	3	1.5	15	35	50
8	20SH1L02	Applied Physics Lab	0	0	3	1.5	15	35	50
9	20CS1L01	Problem Solving and Programming Using CLab	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory:BSC-2,HSMC-1,ESC-2**Practical:**MC-1:BSC-1,HSMC-1,ESC-1

I - B.Tech - SEMESTER -II

S. No	course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH2T06	Differential Equations	3	0	0	3	30	70	100
2	20SH2T04	Applied Chemistry	3	0	0	3	30	70	100
3	20CS2T01	Python Programming	3	0	0	3	30	70	100
4	20ME2T01	Engineering Graphics	1	0	4	3	30	70	100
5	20EE2T02	Basics of Electrical & Electronics Engineering	3	0	0	3	30	70	100
PRACTICAL									
6	20SH2L04	Applied Chemistry Lab	0	0	3	1.5	15	35	50
7	20CS2L01	Python Programming Lab	0	0	3	1.5	15	35	50
8	20CS2L02	IT Workshop	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory:BSC-2,ESC-3**Practical:**BSC-1,ESC-2

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DEPARTMENT OF INFORMATION TECHNOLOGY

II

II- B.Tech - SEMESTER-III

S. No	course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20IT3T02	Principles of Software Engineering	3	0	0	3	30	70	100
2	20CS3T03	Data Structures & Algorithms	3	0	0	3	30	70	100
3	20IT3T01	Object Oriented Programming through Java	3	0	0	3	30	70	100
4	20IT3T03	Discrete Mathematics	3	0	0	3	30	70	100
5	20CS3T02	Computer Organization and Architecture	3	0	0	3	30	70	100
6	20GE3M01	Constitution of India	2	0	0	0	--	--	--
PRACTICAL									
7	20IT3L01	Object Oriented Programming through Java lab	0	0	3	1.5	15	35	50
8	20CS3L02	Object Oriented Analysis and Design Lab	0	0	3	1.5	15	35	50
9	20CS3L03	Data Structures & Algorithms Lab	0	0	3	1.5	15	35	50
10	20IT3S01	Skill Oriented Course - I (R Programming)	1	0	2	2.0	--	50	50
Total Credits						**21.5**	**195**	**505**	**700**

Theory:PCC-5,MC-1**Practical:**PCC-3,SC-1

II - B.Tech - SEMESTER-IV

S. No	course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH4T01	Probability & Statistics	3	0	0	3	30	70	100
2	20IT4T03	Theory of Computation	3	0	0	3	30	70	100
3	20CS4T01	Database Management Systems	3	0	0	3	30	70	100
4	20IT4T02	Web Technologies	3	0	0	3	30	70	100
5	20SH4T05	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
PRACTICAL									
6	20CS4L01	Database Management Systems Lab	0	0	3	1.5	15	35	50
7	20IT4L02	Web Technologies Lab	0	0	3	1.5	15	35	50
8	20CS4L02	Data Visualization Lab	0	0	3	1.5	15	35	50
9	20IT4S01	Skill Oriented Course - II (MongoDB)	1	0	2	2.0	--	50	50
Total Credits						**21.5**	**195**	**505**	**700**

Theory:BSC-1,PCC-3,HSMS-01**Practical:**PCC-3,SC-1

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DEPARTMENT OF INFORMATION TECHNOLOGY

3 - B.Tech - SEMESTER-V

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20CS5T01	Computer Networks	3	0	0	3	30	70	100
2	20IT5T02	Design and Analysis of Algorithms	3	0	0	3	30	70	100
3	20IT5T01	Operating systems	3	0	0	3	30	70	100
4	20EC5O01	**Open Elective-I-** Principles of Communications	3	0	0	3	30	70	100
5	**Professional Elective-I**		3	0	0	3	30	70	100
	20IT5E01	1.Artificial Intelligence							
	20IT5E02	2.Software Project Management							
	20IT5E03	3.Distributed systems							
	20IT5E04	4.Fundamentals of Data Science							
PRACTICAL									
6	20CS5L01	Computer Networks Lab	0	0	3	1.5	15	35	50
7	20IT5L01	Unix Operating Systems Lab	0	0	3	1.5	15	35	50
8	20IT5S01	**Skill Oriented Course-III-**REACT JS	1	0	2	2.0	15	35	50
9	20GE5M04	IPR & PATENTS	2	0	0	0	0	0	0
10	20IT5I01	**SummerInternship2Months**(Mandatory) After second year(to be evaluated during V-semester)	0	0	0	1.5	15	35	50
Total Credits						**21.5**	**210**	**490**	**700**

III - B.Tech - SEMESTER -VI

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20IT6T01	Data Mining	3	0	0	3	30	70	100
2	20CD6T01	Big Data Analytics	3	0	0	3	30	70	100
3	20CS6T01	Cryptography and Network Security	3	0	0	3	30	70	100
4	20EC6O04	**Open Elective-II-**Introduction to Internet of Things	3	0	0	3	30	70	100
5	**Professional Elective-II**		3	0	0	3	30	70	100
	20IT6E01	1.Cloud Computing and Security							
	20IT6E02	2.Object Oriented analysis and design							
	20IT6E03	3.Design Patterns							
	20IT6E04	4.Scripting Languages							
PRACTICAL									
6	20IT6L01	Data Mining Lab	0	0	3	1.5	15	35	50
7	20CD6L01	Big Data and Hadoop Lab	0	0	3	1.5	15	35	50
8	20CS6L01	Cryptography and Network Security Lab	0	0	3	1.5	15	35	50
9	20IT6S01	Skill Oriented Course - IV	1	0	2	2.0	--	50	50
10	20SH6S01	Soft Skills	2	0	0	0	0	0	0
11	20SH5M02	Professional Ethics and Human Values	2	0	0	0	0	0	0
Total Credits						**21.5**	**195**	**505**	**700**

IV - B.Tech - SEMESTER-VII

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	**Professional Elective-III**		3	0	0	3	30	70	100
	20IT7E01	1.Mobile Computing							
	20IT7E02	2.Internet of Things							
	20CS7E03	3.Cyber Security							
	20CS7E 04	4.Neural Networks and Soft Computing							
2	**Professional Elective-IV**		3	0	0	3	30	70	100
	20IT7E05	**1.**Deap Learning Techniques							
	20IT7E06	2. DevOps							
	20IT7E07	3.Software Testing Methodologies							
		4.4.MOOCS-NPTEL / SWAYAM							
3	**Professional Elective-V**		3	0	0	3	30	70	100
	20IT7E08	**1.**Computer Vision							
	20IT7E09	2.Block Chain Technologies							
	20IT7E10	3.3.Ethical Hacking							
		4.MOOCS-NPTEL / SWAYAM							
4	20EC7O03	**Open Elective-III-**Bio Medical Engineering	3	0	0	3	30	70	100
5	20ME7O01	**Open Elective-IV-**Optimization Techniques	3	0	0	3	30	70	100
6	20SH7T01	Management Science	3	0	0	3	30	70	100
PRACTICAL									
7	20IT7I01	**Industrial/Research Internship 2months(Mandatory)after third year (to be evaluated during VII semester)**	0	0	0	3	15	35	50
8	20IT7S01	Skill Oriented Course(Advanced) Selenium	1	0	2	2	15	35	50
Total Credits						**23**	**210**	**490**	**700**

IV - B.Tech - SEMESTER-VIII

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20IT8P01	Major Project Work, Seminar, Internship in industry	0	0	0	12	60	140	200
		INTERNSHIP(6 MONTHS)							
Total Credits						12	60	140	200

OPEN ELECTIVES (OFFER TO OTHER DEPARTMENTS)
1. Database Management System 2. Principles of Software Engineering 3. Oops through Java 4. Introduction to Machine Learning

OPEN ELECTIVES (OFFER BY OTHER DEPARTMENTS)

S. No.	Course Title	Offering Dept.
1	Electrical Safety Management	EEE
2	Non – conventional Energy Sources / Green Engineering Systems	
3	Electrical Vehicle & Hybrid Vehicles	
4	Electrical Energy Conservation and Auditing	
1	Elements of Civil Engineering	CE
2	Disaster Management	
3	Intelligent Transport Systems	
4	Remote sensing & Geographical Information systems	
1	Optimization Techniques	ME
2	Robotics	
3	Industrial Management Sciences	
4	Automation in Manufacturing	
1	Computer Graphics	CSE
2	Computer Networks	
3	Cryptography and Network Security	
1	Python Programming	CSE-AI
2	Fundamentals of Artificial Intelligence	
3	Human Computer Interaction	
4	Applications of AI	
1	Object Oriented Programming (C++)	CSE-DS
2	Data Structures	
3	Data warehouse and Mining	
4	Big Data Analysis	
1	Principles of Communication	ECE
2	Digital image Processing	
3	Bio Medical Engineering	
4	Design of IOT System (IOT)	
5	MEMS	
6	Mechtronics	
1	Entrepreneurship Development	SH (MBA)
2	Business Environment	
3	Digital Marking	
4	Human Resource development and OB	

CONSOLIDATION

SEM.	No. Theories	No. Practical's	Mini/ Final Project	MC/ MOOCS	Skill orient/ Advance	Internship	Credits	IM	EM	TM
I	5	3	-	1	-	-	19.5	195	455	650
II	5	3	-	-	-	-	19.5	195	455	650
III	5	3	-	1	1	-	21.5	195	505	700
IV	5	3	-	-	1	-	21.5	195	505	700
V	5	2	-	1	1	1	21.5	210	490	700
VI	5	3	-	1	1	-	21.5	210	490	700
VII	6	0	-	2	1	1	23.0	210	490	700
VIII	-	-	1	-	-	-	12.0	60	140	200
Total	**36**	**17**	**1**	**4**	**5**	**2**	**160**	**1410**	**3590**	**5000**

SEMESTER -V

Course Code	Course Name	L	T	P	C
20CS5T01	**COMPUTER NETWORKS**	**3**	**0**	**0**	**3**

Course Objectives:
The main objectives are
- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols
- Gain core knowledge of Network layer routing protocols and IP addressing
- Study Session layer design issues, Transport layer services, and protocols
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols

Course Outcomes:
At the end of the course, the students will be able to:
CO-1: Illustrate the OSI and TCP/IP reference model
CO-2: Analyze MAC layer protocols and LAN technologies
CO-3: Summarize various Routing algorithms and Congestion control principles.
CO-4 : Describe Transport layer protocols.
CO-5: Develop application layer protocols

UNIT I
Introduction: History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN)
Physical layer: Different types of transmission media Guided and unguided, Multiplexing methods : TDM, FDM

UNIT-II
Data Link Layer: Design Issues and services: framing, error control, flow control, medium access control. Error & Flow control mechanisms: sliding window protocols: stop and wait, Go back N and selective repeat. MAC Sub Layer: MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

UNIT III
Network Layer: Network Layer Services, packet switching, Network Layer Performance, IPv4 addresses, Forwarding of IP packets, Internet Protocol (IP), IPv6 Protocol and addressing, Transition from IPv4 to IPv6, Mobile IP. Routing Algorithms: Least Cost Routing, Distance vector Routing, Link- State Routing, and Hierarchical Routing. Congestion control: : Approaches to Congestion Control, Traffic-Aware Routing, Traffic Throttling, Load shedding, traffic shaping. Internet Control Protocols: ARP, RARP, ICMP and DHCP.

UNIT IV

Transport Layer: The Transport Service-Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols –Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Congestion control-Desirable Bandwidth

allocation, Regulating the sending rate, The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, SCTP

UNIT V

Application Layer: Domain Name Space (DNS), SNMP, Electronic mail: MIME, SMTP, IMAP, WWW, FTP, HTTP

Text Books:

1) Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5th Edition, 2013
2) Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

Reference Books:

1) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman, 5th Edition, 2011.
2) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
3) Data and Computer Communications, William Stallings, Pearson, 8th Edition, 2007

e-Resources:

1)https://nptel.ac.in/courses/106/105/106105183/

SEMESTER -V

Course Code	Course Name	L	T	P	C
20IT5T01	**DESIGN AND ANALYSIS OF ALGORITHMS**	**3**	**0**	**0**	**3**

Course Objectives:
- To provide an introduction to formalisms to understand, analyze and denote time complexities of Algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:
CO-1: Describe asymptotic notation used for analyze the performance of algorithms, denote its time complexity, apply sets and graph search algorithms to real world problems
CO-2: Solve problems using divide and conquer and greedy method algorithmic approaches
CO-3: Solve problems using dynamic programming algorithmic approaches
CO-4: Solve problems using backtracking and branch and bound algorithmic approaches
CO-5: Demonstrate an understanding of NP- Completeness theory and string matching

UNIT-I
Introduction: Algorithm Definition, Algorithm Specification, Pseudo code for expressing algorithm, performance Analysis, asymptotic notation.
Sets & Disjoint set union: introduction, union and find operations.
Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT-II
Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.
The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT-III
Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem

UNIT-IV
Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles
Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT-V
NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.
String Matching: Introduction, String Matching-Meaning and Application, Naive String Matching

Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata.

Text Books:

1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2) Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1) Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
2) S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

e-Resources:

1)http://nptel.ac.in/courses/106101060/

SEMESTER -V

Course Code	Course Name	L	T	P	C
20IT5T02	**OPERATINGSYSTEMS**	**3**	**0**	**0**	**3**

Course Objectives:
The objectives of this course is to
- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory Management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:
After learning, the course the students should be able to:
CO-1: Describe various generations of Operating System and functions of Operating System
CO-2: Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO-3: Solve Inter Process Communication problems using Mathematical Equations by various methods
CO-4: Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
CO-5: Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I
Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls.

UNIT II
Process Concept: Process scheduling, Operations on processes, Inter-process communication.
Multithreaded Programming: Multithreading models, Thread libraries, threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Classical IPC Problems - Dining philosopher's problem.

UNIT III
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.
Virtual Memory Management: Introduction, Demand paging, Page replacement Algorithms.

UNIT IV
Deadlocks: Resources, Conditions for resource deadlocks, Deadlock detection and recovery,

Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access control.
System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, implementing security defenses, Firewalling to protect systems and networks.
Case Studies: Linux, Microsoft Windows.

Text Books:

1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems.)

Reference Books:

1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

1)https://nptel.ac.in/courses/106/105/106105214/

SEMESTER –V

Course Code	Course Name	L	T	P	C
20ECxxx	**OPEN ELECTIVE-I** **1. PRINCIPLES OF COMMUNICATION**	**3**	**0**	**0**	**3**

Course objectives:
This course will enable students to: Understand simple systems for generating and demodulating AM, DSB, SSB and VSB signals
- Understand the concepts in Angle modulation for the design of communication systems
- Study simple systems for generating and demodulating frequency modulated signals
- Learn the concepts of random process and various types of noise.
- Study the performance of the communication system in presence of noise.
- Learn pulse modulation and sampling techniques.

Course Outcomes:
At the end of the course, students will be able to:
CO-1: Analyze the performance of analog modulation schemes in time and frequency domains.
CO-2: Analyze the performance of angle modulated signals.
CO-3: Characterize analog signals in time domain as random processes and noise
CO-4: Characterize the influence of channel on analog modulated signals
CO-5: Determine the performance of analog communication systems in terms of SNR
CO-6: Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

UNIT-1
Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector. Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency-Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II
Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-III
Random variables & process: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions. Noise: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth, Noise Figure.

UNIT-IV
Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in

AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasize in FM.

UNIT-V

Digital representation of analog signals: Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Text books:

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2ndEdition.
2. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.

Course Code	Course Name	L	T	P	C
20IT5E01	**PROFESSIONAL ELECTIVE-I** **1. Artificial Intelligence**	**3**	**0**	**0**	**3**

Course Objectives:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.

Course Outcomes:

CO-1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
CO-2: Apply the language/framework of different AI methods for a given problem
CO-3: Implement basic AI algorithms- standard search algorithms or dynamic programming
CO-4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

UNIT I

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT II

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.
Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT III

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT IV

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT V

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster shafer theory

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2) Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA

Reference Books:

1) Artificial Intelligence- Deepak Khemani, TMH, 2013
2) Introduction to Artificial Intelligence, Patterson, PHI
3)Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105077/
2)http://aima.cs.berkeley.edu/

Course Code	Course Name	L	T	P	C
20IT5E02	**PROFESSIONAL ELECTIVE-I** **2. SOFTWARE PROJECT MANAGEMENT**	**3**	**0**	**0**	**3**

Course Objectives:

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

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO-1: Apply the process to be followed in the software development life-cycle models.
CO-2: Apply the concepts of project management & planning.
CO-3: Implement the project plans through managing people, communications and change
CO-4: Conduct activities necessary to successfully complete and close the Software projects
CO-5: Implement communication, modeling, and construction & deployment practices in software development.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.
Work Flows of the Process: Software process workflows, Iteration workflows. Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

1) Software Project Management, Walker Royce, Pearson Education, 2005.
2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1) Software Project Management, Joel Henry, Pearson Education.
2) Software Project Management in practice, PankajJalote, Pearson Education, 2005.
3) Effective Software Project Management, Robert K. Wysocki, Wiley, 2006.

Course Code	Course Name	L	T	P	C
20IT5E03	**PROFESSIONAL ELECTIVE-I** **3. DISTRIBUTED SYSTEMS**	**3**	**0**	**0**	**3**

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to availability of facilities for data transmission, IPC Mechanism.
- To learn distributed Objects and Remote Invocation and the operating system layer Protection.
- To understand the significance Distributed System File Service Architecture, Characteristics of peer-to-peer Systems, Group Communication & concurrency in Distributed System.
- To learn the Mutual exclusion and deadlock detection algorithms.

Course Outcomes:

At the end of the course, the students will be able to:
CO-1: Elucidate the foundations and issues of distributed systems
CO-2: Illustrate the various Interposes Communication techniques and Message ordering.
CO-3: Understand the concepts of Distributed Objects and Remote Invocation Techniques.
CO-4: Describe the Distributed File systems and the features of peer-to-peer System.
CO-5: Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems.

UNIT I

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures ,Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT II

Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication, Client Server Communication. Message Ordering & Snapshots: Message ordering and group communication:, Group communication, Causal order (CO), Total order.

UNIT III

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications. Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Threads – Address Space, Creation of a New Process, Threads.

UNIT IV

Distributed File Systems: Introduction, File Service Architecture, Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication. Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

UNIT V

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

Text Books:

1) Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2) Distributed computing: Principles, algorithms, and systems, Ajay D Kshem kalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1) Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
2) Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
3)Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.

e-Resources:

1)https://nptel.ac.in/courses/106/106/106106168/

SEMESTER -V

Course Code	Course Name	L	T	P	C
20IT5E04	**Professional Elective-I** **4. Fundamentals of Data Science**	**3**	**0**	**0**	**3**

Course Objectives:

- To provide a comprehensive knowledge of data science using Python.
- To learn the essential concepts of data analytics and data visualization

Course Outcomes:

At the end of the Course, the student will be able to

CO1 : Apply principles of NumPy and Pandas to the analysis of data.

CO2 : Make use of various file formats in loading and storage of data.

CO3 : Identify and apply the need and importance of pre-processing techniques.

CO4 : Show the results and present them in a pictorial format.

UNIT I

Data science: definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

NumPy Basics: The NumPy ndarray: A Multidimensional Array Object, Creating nd arrays ,Data Types for nd arrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.

UNIT II

Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Re indexing, Dropping entries from an axis, Indexing, selection, and filtering),Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

UNIT III

Data Loading, Storage, and File Formats : Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping, Binary Data Formats, Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and Loading Data in MongoDB

UNIT IV

Data Wrangling: Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap , Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.

UNIT V

Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Text Books :

1. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2012.
2. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013

Reference Books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015
Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.

SEMESTER- V

Course Code	Course Name	L	T	P	C
20CS5L01	**COMPUTER NETWORKS LAB**	**0**	**0**	**3**	**1.5**

Course Objectives:

- Understand and apply different network commands
- Analyze different networking functions and features for implementing optimal solutions Apply different networking concepts for implementing network solution
- Implement different network protocols

Course Outcomes:

CO-1: Apply the basics of Physical layer in real time applications
CO-2: Apply data link layer concepts, design issues, and protocols
CO-3: Apply Network layer routing protocols and IP addressing
CO-4: Implement the functions of Application layer and Presentation layer paradigms and Protocols

Experiments:

1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
2) Write a C program to develop a DNS client server to resolve the given hostname.
3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16 and CRC-CCIP.
4) Implement Dijkstra's algorithm to compute the shortest path in a graph.
5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
6) Take an example subnet of hosts. Obtain broadcast tree for it.
7) Write a client-server application for chat using UDP
8) Implement programs using raw sockets (like packet capturing and filtering)
9) Write a C program to perform sliding window protocol.
10) Get the MAC or Physical address of the system using Address Resolution Protocol.
11) Simulate the Implementing Routing Protocols using border gateway protocol(BGP)
12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.

SEMESTER- V

Course Code	Course Name	L	T	P	C
20IT5L01	**UNIX OPERATING SYSTEM LAB**	**0**	**0**	**3**	**1.5**

Course Objectives:
- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:
CO-1: To use UNIX utilities and perform basic shell control of the utilities
CO-2: To use the UNIX file system and file access control
CO-3: To use of an operating system to develop software
CO-4: Students will be able to use Linux environment efficiently
CO-5: Solve problems using bash for shell scripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
d) Study of Unix/Linux files system (tree structure)
e) Study of .bashrc, /etc/bashrc and Environment variables.

2) Write a C program that makes a copy of a file using standard I/O, and system calls
3) Write a C program to emulate the UNIX ls –l command.
4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort
5) Simulate the following CPU scheduling algorithms:
(a) Round Robin (b) SJF (c) FCFS (d) Priority
6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec () and exit (), System calls
7) Simulate the following:
a) Multiprogramming with a fixed number of tasks (MFT)
b) Multiprogramming with a variable number of tasks (MVT)
8) Simulate Bankers Algorithm for Dead Lock Avoidance
9) Simulate Bankers Algorithm for Dead Lock Prevention.
10) Simulate the following page replacement algorithms:
a) FIFO b) LRU c) LFU
11) Simulate the following File allocation strategies
(a) Sequenced (b) Indexed (c) Linked
12) Write a C program that illustrates two processes communicating using shared memory
13) Write a C program to simulate producer and consumer problem using semaphores
14) Write C program to create a thread using pthreads library and let it run its function.
15) Write a C program to illustrate concurrent execution of threads using pthreads library.

SEMESTER –V

Course Code	Course Name	L	T	P	C
20GE5M04	**Mandatory Course IPR & PATENTS**	**2**	**0**	**0**	**0**

Course Objectives:

• To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines

• Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Course Outcomes:

CO-1: IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents

CO-2: Student gets an insight on Copyrights, Patents and Software patents which are Instrumental for further advancements.

UNIT – I:

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

UNIT – II:

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

UNIT – III:

Law of Patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent litigation. Dilution of patent rights.

UNIT – III:

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter (strength and categories of trade marks), selecting, and evaluating trade mark, trade mark registration processes.

UNIT - IV:

Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.
Real time examples must be added to the concepts requires.

REFERENCES:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.

Course Code	Course Name	L	T	P	C
20IT6T01	DATA MINING	3	0	0	3

Course Objectives:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools

Course Outcomes:

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

CO 1. : Design a Data warehouse system and perform business analysis with OLAP tools

CO 2. : Apply suitable pre-processing and visualization techniques for data analysis

CO 3. : Apply frequent pattern and association rule mining techniques for data analysis

CO 4. : Apply appropriate classification techniques for data analysis

CO 5. : Apply appropriate clustering techniques for data analysis

UNIT I

Data Warehousing : Basic Concepts, Data Warehousing Components, Data Warehouse Architecture , Multidimensional Data Model, Data Warehouse Schemas, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP vs OLTP.

UNIT II

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing Techniques, Data Visualization, Data similarity and dissimilarity measures.

UNIT III

Association Analysis: Basic Concepts and Algorithms, Frequent Item set Generation, The Apriori Principle, Frequent Item set Generation in the Apriori, Algorithm, Candidate Generation and Pruning, Support Counting, Rule Generation, Confidence-Based Pruning, Rule Generation in Apriori, Algorithm, Compact Representation of Frequent Item sets, Maximal Frequent Item sets, Closed Frequent Item sets, FP-Growth Algorithm, FP-tee Representation, Frequent Item set Generation in FP-Growth Algorithm

UNIT IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation , General Approach to Solving a Classification Problem, Decision Tree Induction, How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, Model Overfitting, Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, Evaluating the Performance of a Classifier, Methods for Comparing Classifiers

UNIT V

Cluster Analysis: Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means

Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin).

Text Books:

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

Reference Books:

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

e-Resources:

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

SEMESTER - VI

Course Code	Course Name	L	T	P	C
20CD6T01	**BIG DATA ANALYTICS**	**3**	**0**	**0**	**3**

Pre- Requisites:
Students should have knowledge of one Programming Language (Java preferably), Practiceof SQL (queries and sub queries), exposure to Linux Environment.

Course Objectives:
1. Describe Big Data and its use cases from selected business domains.
2. Provide an overview of HDFS Architecture and its daemon services.
3. Perform Map Reduce analytics with YARN using Hadoop.
4. Understand the working of data ingestion tools and PIG Latin.
5. Use Hadoop related tools such as Hive and HBase for big data analytics.

Course Outcomes:
At the end of the Course, the student will be able to
1. Understand the concepts of Big Data and navigation of the Hadoop Ecosystem.
2. Illustrate the HDFS Architecture and the coordination service of Hadoop.
3. Implement distributed processing Map Reduce Paradigm with YARN.
4. Analyze importing and exporting data from Hadoop using Sqoop, Flume and workingwith PIG.
5. Examine the data stores - Hive and HBase on Hadoop

UNIT I

Introduction to Big Data and Hadoop:
Challenges of Traditional Decision Making, Solution with Big Data Analytics, Classification of Digital Data, Definition of Big Data, Characteristics of Big Data, Definition of Big Data Analytics, Features of Hadoop, History of Hadoop, RDBMS Vs. Hadoop, Hadoop Distributors, Ecosystems of Hadoop.

UNIT II

HDFS and Zoo Keeper:
HDFS: Concepts – Blocks, HDFS Components, Block Caching, Characteristics of HDFS, HDFS High Availability Architecture and its types, HDFS Command Line, Data Flow – Anatomy of File read and File write operations.
Zoo Keeper: Characteristics of Zoo Keeper, Zoo keeper Services, Zoo keeper Data Model.

UNIT III

Map Reduce and YARN
YARN: Elements of YARN Architecture, Map Reduce: Characteristics of Map Reduce, Phasesof Map Reduce with an Example, Anatomy of MR Job Run with YARN, Handling Failures, Task Execution, Map Reduce Input and Output Formats, Shuffle and Sort, Built - in Countersof MR, Joins in MR,

UNIT IV

Data Ingestion Tools and PIG

Data Ingestion Tools: Data Ingestion, Big Data Ingestion Tools, SQOOP - Benefits of SQOOP, SQOOP Connectors, Importing and Exporting to and from Hadoop using SQOOP, Limitations of SQOOP, FLUME – Apache Flume, Data Sources for FLUME, Components of FLUME Architecture.

PIG: Introduction to PIG, Components of PIG, Data Types in PIG – Simple and Complex, PIG Execution Modes, PIG Interactive Modes, Comparison of PIG with databases, Data Processing Operators.

UNIT V

HIVE and HBASE

HIVE: Features of HIVE, HIVE Architecture, HIVE Meta store, Data types in HIVE,HIVEQL, Tables, File Format Types – Text, Sequence, AVRO, Parquet, Querying Data.

HBASE: NOSQL Database, Types of NOSQL Database, Characteristics of HBASE, Architecture, HBase Vs. RDBMS, HBASE Shell Commands.

Text Books:

1. Tom White "Hadoop: The Definitive Guide" 4thedition, O'reily Media,2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley2015

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRCpress(2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw- Hill/Osborne Media (2013), Oracle press.
4. AnandRajaraman and Jefrey David Ulman, "Mining of Massive Datasets",Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons,2007
7. Pete Warden, "Big Data Glossary", O'Reily, 2011.
8. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game",MC Press,2012
10. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles, David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications,2012.

SEMESTER -VI

Course Code	Course Name	L	T	P	C
20CS6T01	**Cryptography and Network Security**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims at training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

By the end of the course the student

CO-1: Identify information security goals, classical encryption techniques and acquire Fundamental knowledge on the concepts of finite fields and number theory

CO-2: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO-3: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO-4: Apply different digital signature algorithms to achieve authentication and create secure applications

CO-5: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO-6: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Classical Encryption Techniques: Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Cyber Threats, Phishing Attack, Web Based Attacks, SQL Injection Attacks, Buffer Overflow& Format String Vulnerabilities, TCP session hijacking, UDP Session Hijacking.

Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT II

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, the Chinese Remainder Theorem, Discrete Logarithms.

UNIT III

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography. Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message

Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution.

UNIT IV

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.
IP Security:IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH)
Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems.

Text Books:

1) Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
2) Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:

1) Cryptography and Network Security- Behrouz A Forouzan, DebdeepMukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

e-Resources:

1)https://nptel.ac.in/courses/106/105/106105031/lecture by Dr.DebdeepMukhopadhyayIITKharagpur [Video Lecture]
2) https://nptel.ac.in/courses/106/105/106105162/ lecture by Dr. SouravMukhopadhyay IIT Kharagpur [Video Lecture]
3)https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections.

SEMESTER -VI

Course Code	Course Name	L	T	P	C
20MEXOXX	**OPEN ELECTIVE II** **OPERATIONS RESEARCH**	**3**	**0**	**0**	**3**

Course Objectives:

• The objective of the course is to understand the availability of resources and constraints in an industry and optimize them through the applications of appropriate resource management tools.

Course Outcomes:

After studying the course, the students are able to

CO-1: Formulate the resource management problems and identify appropriate methods to solve them

CO-2: Apply LPP, transportation and assignment models to optimize the industrial resources

CO-3: Solve decision theory problems through the application of game theory

CO-4: Apply the replacement and queuing models to increase the efficiency of the system

CO-5: Model the project management problems through CPM and PERT.

UNIT – I

Development – definition– characteristics and phases – operation research models – applications.

LINEAR PROGRAMMING: problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy, assignment problem – formulation – optimal solution - variants of assignment problem-traveling salesman problem.

SEQUENCING – Introduction – flow –shop sequencing – n jobs through two machines – n jobs through three machines – job shop sequencing – two jobs through 'm' machines.

UNIT – III

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction to decision theory – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games– dominance principle – m x 2 & 2 x n games -graphical method.

WAITING LINES: Introduction to Kendallis notation–classification of queuing models, single channel – with infinite population and finite population models– multichannel – with infinite population.

UNIT – V

Network Analysis: Project planning, scheduling and controlling – tools for project management – critical path method – programme evaluation and review technique (PERT) – cost analysis and crashing – resource leveling – updating.

TEXT BOOKS:

1. Operations Research-An Introduction/HamdyATaha/Pearson publishers
2. Operations Research –Theory & publications / S.D.Sharma-Kedarnath/McMillan publishers India Ltd

REFERENCES:

1. Introduction to O.R/Hiller &Libermann/TMH
2. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
3. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan& Lawrence Friedman/Wiley
4. Operations Research / R.Pannerselvam/ PHI Publications.
5. Operations Research / Wagner/ PHI Publications.
6. Operation Research /J.K.Sharma/MacMilan Publ.
7. Operations Research/ Pai/ Oxford Publications
8. Operations Research/S Kalavathy / Vikas Publishers
9. Operations Research / DS Cheema/University Science Press
10. Operations Research / Ravindran, Philips, Solberg / Wiley publishers

SEMESTER -VI

Course Code	Course Name	L	T	P	C
20IT6E01	**PROFESSIONAL ELECTIVE- II CLOUD COMPUTING & SECURITY**	**3**	**0**	**0**	**3**

OBJECTIVES:

• The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internetcloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

OUTCOMES:

CO-1: Understanding the key dimensions of the challenge of Cloud Computing
CO-2: Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization
CO-3: Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO-4: Assessment of own organizations' needs for capacity building and training in cloudcomputing-related IT areas.
CO-5: Outline on cloud security concepts.

UNIT -I:

Systems modeling, Clustering and virtualization Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency

UNIT- II:

Virtual Machines and Virtualization of Clusters and Data Centers Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT- III:

Cloud Platform Architecture Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT -IV:

Cloud Programming and Software Environments Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

UNIT- V:

Cryptographic Key Management Overview: Key Types, Key States, Key Management Functions, Key Management: Generic Security Requirements, Security outsourcing

TEXT BOOKS:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
4. Secure Cloud Computing, Sushil jajodia . Krishna Kant, Pierangela Samarati . Anoop Singhal and Vipin Swarup . CliffWang, Springer Publications.

REFERNCE BOOKS:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

E-Resources:

1) https://archive.nptel.ac.in/courses/106/105/106105167/

SEMESTER -VI

Course Code	Course Name	L	T	P	C
20IT6E02	**PROFESSIONAL ELECTIVE-II** **2. OBJECT ORIENTED ANALYSIS AND DESIGN**	**3**	**0**	**0**	**3**

OBJECTIVE:
- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language

OUTCOME:
CO-1: Ability to find solutions to the complex problems using object oriented approach
CO-2: Represent classes, responsibilities and states using UML notation
CO-3: Identify classes and responsibilities of the problem domain

UNIT-I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

UNIT-II:
Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

UNIT-III:
Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

UNIT-IV:
Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-V:
Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Case Study: The Unified Library application.

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

12th Impression, 2012, PEARSON.

REFERENCE BOOKS:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, OReilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
4. "The Unified modeling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison

Course Code	Course Name	L	T	P	C
20IT6E03	**PROFESSIONAL ELECTIVE- II** **3. DESIGN PATTERNS**	**3**	**0**	**0**	**3**

Course Objectives:

- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications
- Analyze a software development problem and express it
- Design a module structure to solve a problem, and evaluate alternatives
- Implement a module so that it executes efficiently and correctly

Course Outcomes:

1. Construct a design consisting of a collection of modules
2. Examine well-known design patterns (such as Iterator, Observer, Factory and Visitor)
3. Distinguish between different categories of design patterns
4. Ability to understand and apply common design patterns to incremental/iterative development
5. Identify appropriate patterns for design of given problem
6. Design the software using Pattern Oriented Architectures

UNIT I

Introduction: Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

UNIT II

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT III

Structural Pattern: Adapter, Bridge, Composite, Decorator, açade, Flyweight, Proxy.

UNIT IV

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer.

UNIT V

Behavioral Patterns: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, a Brief History, the Pattern Community an Invitation, a Parting Thought.

Text Books:

1) "Design Patterns", Erich Gamma, Pearson Education.

Reference Books:

1) "Head First Design patterns", Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
2) "Design Patterns in Java", Steven John Metsker & William C. Wake, Pearson education, 2006
3) "J2EE Patterns", Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
4) "Design Patterns in C#", Steven John metsker, Pearson education, 2004.
5) "Pattern Oriented Software Architecture", F.Buschmann & others, John Wiley & Sons.

e-Resources:

1) https://www.javatpoint.com/design-patterns-in-java
2) https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm

Course Code	Course Name	L	T	P	C
20IT6E04	PROFESSIONAL ELECTIVE- II 4 SCRIPTING LANGUAGES	3	0	0	3

Course Objectives:
From the course the student will

- Understand the concepts of scripting languages for developing web based projects
- Illustrates object oriented concepts like PHP, PYTHON, PERL
- Create database connections using PHP and build the website for the world
- Demonstrate IP address for connecting the web servers
- Analyze the internet ware application, security issues and frame works for application

Course Outcomes:
After the completion of the course, student will be able to do the following

- Ability to understand the differences between scripting languages
- Create PHP authentication Methodology for security issues
- Identify PHP encryption functions and Mcrypt Package
- Explain syntax and variables in TCL
- Able to gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages
- Master an understanding of python especially the object oriented concepts

UNIT I
Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT II
Advanced PERL: Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.
PHP Basics: PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III
Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies-Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

UNIT IV
TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures,input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name

spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bol Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

UNIT V

Python: Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text Books:

1) The World of Scripting Languages, David Barron, Wiley Publications.
2) Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3) Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech).

References Books:

1) Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education. Programming Python,M.Lutz,SPD.
2) PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning publications.
3) Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
4) PHP and MySQL by Example, E.Quigley, Prentice Hall (Pearson).
5) Perl Power, J.P.Flynt, Cengage Learning.

SEMESTER -VI

Course Code	Course Name	L	T	P	C
20IT6L01	**DATA MINING LAB**	**0**	**0**	**3**	**1.5**

Course Objectives:

- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavours of algorithms
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization
- To enable students to use R to conduct analytics on large real life datasets
- To familiarize students with how various statistics like mean median etc

Course Outcomes:

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

CO 1. : Extend the functionality of R by using add-on packages

CO 2. : Examine data from files and other sources and perform various data manipulation tasks

CO 3. : Code statistical functions in R

CO 4. : Use R Graphics and Tables to visualize results of various statistical operations on data

CO 5. : Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

1. Implement all basic R commands.
2. Interact data through .csv files (Import from and export to .csv files).
3. Get and Clean data using swirl exercises. (Use 'swirl' package, library and install that topic from swirl).
4. Visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure

.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

a) Extract two column names using column name.

b) Extract the first two rows and then all columns.

c) Extract 3rd and 5th row with 2nd and 4th column.

6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into

i) 0 to 1 range with min-max normalization.

ii) a value around 0 with z-score normalization.

Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.

8. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
9. Implement k-means clustering using R.
10. Implement k-medoids clustering using R.
11. implement density based clustering on iris dataset.
12. implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.
14. Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Text Books:

1) R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Sprnger, 2012.
2) R for Everyone, Advanced Analytics and Graphics, 2nd ed, Jared Lander, Pearson, 2018.

e-Resources:

1) www.r-tutor.com

SEMESTER - VI

Course Code	Course Name	L	T	P	C
20CD6L01	**BIG DATA & HADOOP LAB**	**3**	**0**	**0**	**3**

Course Objectives:

1. Provide the knowledge to setup a Hadoop Cluster.
2. Impart knowledge to develop programs using MapReduce.
3. Discuss Pig, PigLatin and HiveQL to process bigdata.
4. Present latest big data frameworks and applications using Spark
5. Integrate Hadoop with R (RHadoop) to process and visualize.

Course Outcomes:

1. Understand Hadoop working environment.
2. Apply Map Reduce programs for real world problems.
3. Implement scripts using Pig to solve real world problems.
4. Analyze queries using Hive to analyze the datasets
5. Understand spark working environment and integration with R

TASK 1: a) Understanding and using basic HDFS commands
b) Run a basic word count Map Reduce program to understand Map Reduce Paradigm.

TASK 2: Write a Map Reduce program that mines weather data

TASK 3: Implement matrix multiplication with Hadoop Map Reduce.

TASK 4: Working with files in Hadoop file system: Reading, Writing and Copying

TASK-5: Write Pig Latin scripts sort, group, join, project, and filter your data.

TASK 6: Run the Pig Latin Scripts to find Word Count and max. temp for each and every year.

TASK-7: Writing User Defined Functions/Eval functions for filtering unwanted data in Pig

TASK-8: Working with Hive QL, Use Hive to create, alter, and drop databases, tables, views, functions, and indexes

TASK 9: Writing User Defined Functions in Hive

TASK 10: Understanding the processing of large dataset on Spark framework.

TASK 11: Ingesting structured and unstructured data using Sqoop, Flume

TASK 12: Integrating Hadoop with other data analytic framework like R

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Inc,2015.
2. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2ndEdition, Packt Publishing, 2016

Reference Books:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Inc,2012.
2. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing,2013

Course Code	Course Name	L	T	P	C
20CS6L01	**CRYPTOGRAPHY AND NETWORK SECURITY LAB**	**0**	**0**	**3**	**1.5**

Course Objectives:

This course aims at training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

By the end of the course the student

CO-1: Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory

CO-2: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO-3: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO-4: Apply different digital signature algorithms to achieve authentication and create secure applications

CO-5: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO-6: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using JAVA.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

SEMESTER –VI

Course Code	Course Name	L	T	P	C
20SH5M01	**Mandatory Course** **Professional Ethics and Human Values**	**2**	**0**	**0**	**0**

Course Objectives:
- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course outcomes:
Students will be able to:
CO-1: Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO-2: Identify the multiple ethical interests at stake in a real-world situation or practice and articulate what makes a particular course of action ethically defensible
CO-3: Assess their own ethical values and the social context of problems and Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
CO-4: Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
CO-5: Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

UNIT I:
Human Values & Principles for Harmony: Morals, Values and Ethics – Integrity – Work Ethics–Service Learning–Civic Virtue –Respect for others–Living Peacefully–Caring –Sharing–Honesty–Courage–Value Time –Co-operation–Commitment–Self-confidence–Spirituality-Character. Truthfulness–Customs and Traditions-Value Education –Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence.

UNITII:
Engineering Ethics and Social Experimentation: History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism ––Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory -Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments –– Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law -Role of Codes–Codes and Experimental Nature of Engineering.

UNITIII:
Engineers' Responsibilities towards Safety and Risk: Concept of Safety - Safety and Risk –

Types of Risks – Voluntary v/s Involuntary Risk –Consequences-RiskAssessment–Accountability–Liability-ReversibleEffects-ThresholdLevelsof Risk-Delayedv/s Immediate Risk-Safety andtheEngineer–DesigningforSafety–Risk-BenefitAnalysis-Accidents.

UNIT IV:

Engineers'DutiesandRights: ConceptofDuty-ProfessionalDuties–Collegiality-TechniquesforAchievingCollegiality – Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes –Industrial Espionage-Price Fixing-Whistle Blowing.

UNITV:

GlobalIssues: GlobalizationandMNCs–CrossCultureIssues-BusinessEthics–MediaEthics-Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics-Intellectual Property Rights.

References:

1. Professional Ethics, R .Subramaniam–Oxford Publications, New Delhi.
2. Ethics in Engineering Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill–2003.
3. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana – Maruthi Publications.
4. Engineering Ethics, Harris , Pritchardand Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics, S.B.Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values, M. Govindarajan,S. NatarajanandV.S.SenthilKumar-PHI Learning Pvt. Ltd–2009.
7. Professional Ethics and Human Values, A. Alavudeen, R. Kalil Rahman and M.Jayakumaran–niversity Science Press.
8. Professional Ethics and Human Values, D. R.Kiran-TataMcGraw-Hill-2013
9. Human Values andProfessionalEthics,JayshreeSureshandB.S.Raghavan,S.ChandPublications

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E01	**PROFESSIONAL ELECTIVE-III** **1. MOBILE COMPUTING**	**3**	**0**	**0**	**3**

Course Objectives:
- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

Course Outcomes:
At the end of the course, student will be able to
CO-1: Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI
CO-2: Discuss fundamental challenges in mobile communications and potential Techniques in GSM
CO-3: Demonstrate Mobile IP in Network layer
CO-4: Elaborate TCP/IP Protocols and database issues
CO-5: Illustrate different data delivery methods and synchronization protocols
CO-6: Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts.

UNIT I
Mobile Communications: An Overview- Mobile Communication-guided transmission, unguided transmission- signal propagation frequencies, antennae, modulation, modulation methods and standards for voice-oriented data communication standards, modulation methods and standards for data and voice communication, mobile computing- novel applications and limitations, mobile computing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Mobile smart phones, Smart mobiles and systems, handheld pocket computers, Handheld devices, Smart systems, Limitations of mobile devices.

UNIT II
GSM and other 2G Architectures: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication: Modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, IMT-20003G wireless communication standards, WCDMA3G communication standards, CDMA 3G communication standards, Broadband wireless access, 4G networks, 5G Networks.

UNIT III

Mobile IP Network layer: IP and Mobile IP network layers: OSI layer functions, TCP/IP and Internet protocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Adhoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network; Wireless sensor networks; sensor network applications.

UNIT IV

Synchronization: Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependent specific rules for data synchronization, Personal information manager, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.

UNIT V

Mobile Wireless Short Range Networks and Mobile Internet: Wireless networking and wireless LAN, Wireless LAN (WLAN) architecture, IEEE 802.11protocol layers, Wireless application protocol(WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transport Layer Security (WTLS), wireless transaction and session layers, wireless application environment.

Text Books:

1) Mobile Computing, 2nd edition, Raj kamal, Oxford, 2011
2) Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa R Yavagal, McGraw Hill, 2017

Reference Books:

1) "Principles of Mobile Computing," 2nd Edition, UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, Springer.2003

E-Resources:

1) https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E02	**PROFESSIONAL ELECTIVE-III** **2. INTERNET OF THINGS**	**3**	**0**	**0**	**3**

Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Formalize a given problem in the language/framework of different AI methods
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Course Outcomes:

1. Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
2. Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
3. Develop critical thinking skills
4. Compare and contrast the threat environment based on industry and/or device type

UNIT I

The Internet of Things: An Overview of Internet of Things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices

UNIT II

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV

Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6lowPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks Communication protocols for IoT, Service oriented protocol(COAP), Communication protocols based on the exchange of messages(MQTT), Service discovery protocols

UNIT V

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems. Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications /Services

Text Books:

1)Internet of Things: Architecture, Design Principles And Applications,Rajkamal, McGraw Hill Higher Education.
2) Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.
3) Internet of Things from Hype to Reality: The road to Digitization, Ammar Rayes Samersalam.

Reference Books:

1) Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
2) Getting Started with the Internet of Things Cuno Pfister , Oreilly.
3) Internet of Things and Data Analytics Handbook, HWAIYU GENG, Wiley publications

Course Code	Course Name	L	T	P	C
20CS7E03	**PROFESSIONAL ELECTIVE- III** **3 CYBER SECURITY**	**3**	**0**	**0**	**3**

Course Objectives:
In this course, the student will learn about

- The essential building blocks and basic concepts around cyber security
- Types of malware
- Types of Threats & Risks

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

1. Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection
2. Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
3. Illustrate the nature of secure software development and operating systems
4. Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

UNIT I
Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography. Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

UNIT II
Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

UNIT III
Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management . Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

UNIT IV
Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed. Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

UNIT V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

Text Books:

1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

Reference Books:

1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.

SEMESTER –VII

Course Code	Course Name	L	T	P	C
20CS7E04	**PROFESSIONAL ELECTIVE- III** **4.NEURAL NETWORKS AND SOFT COMPUTING**	**3**	**0**	**0**	**3**

Course Objectives:

- To have a detailed study of neural networks, Fuzzy Logic and uses of Heuristics based on human experience.
- To Familiarize with Soft computing concepts.
- To introduce the concepts of genetic algorithm and its applications to soft computing using some applications

Course Outcomes:

CO-1: Identify and describe soft computing techniques and their roles in building intelligent machines.
CO-2: Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO-3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

UNIT I:

INTRODUCTION: what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural

UNIT II:

LEARNING PROCESS: Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

UNIT III:

CLASSICAL & FUZZY SETS: Introduction to classical sets – properties, operations and relations; Fuzzy sets – memberships, uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT IV:

FUZZY LOGIC SYSTEM COMPONENTS: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods

UNIT V:

CONCEPT LEARNING: Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm
DECISION TREE LEARNING: Introduction, Decision tree representation, appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning

TEXT BOOKS:

1. Neural networks A comprehensive foundations, Simon Hhaykin, Pearson Education 2nd edition 2004
2. Neural Networks, Fuzzy Logic, Genetic Algorithms: Sysnthesis and Applications by Raja sekharan and Pai, PHI Publications
3. Machine Learning, Tom M. Mitchell, MGH

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E05	**PROFESSIONAL ELECTIVE- III** **1. DEEP LEARNING TECHNIQUES**	**3**	**0**	**0**	**3**

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

Course Outcomes:
CO-1: Demonstrate the mathematical foundation of neural network
CO-2: Describe the machine learning basics
CO-3: Differentiate architecture of deep neural network
CO-4: Build a convolutional neural network
CO-5: Build and train RNN and LSTMs

UNIT I
Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.
Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

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

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

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

UNIT V

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

Text Books:

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

Reference Books:

1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
2) Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E06	**PROFESSIONAL ELECTIVE- IV** **2. DevOps**	**3**	**0**	**0**	**3**

Course Objectives:

• DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

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

CO1 :. Enumerate the principles of continuous development and deployment, automation of

CO2 :. configuration management, inter-team collaboration, and IT service agility

CO3 :. Describe DevOps & DevSecOps methodologies and their key concepts

CO4 :. Illustrate the types of version control systems, continuous integration tools, continuous

CO5 :. monitoring tools, and cloud models

CO6 :. Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2) What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:

1) Building a DevOps Culture, 1 st Edition, Mandi Walls, O'Reilly publications, 2013.
2) The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized

Micro services, 1st Edition, Viktor Farcic, Create Space Independent Publishing Platform publications, 2016
3) Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4) Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019.

e-Resources:

1) https://www.javatpoint.com/devops
2) https://github.com/nkatre/Free-DevOps-Books-1/blob

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E07	**PROFESSIONAL ELECTIVE- IV** **3.SOFTWARE TESTING METHODOLOGIES**	**3**	**0**	**0**	**3**

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

By the end of the course, the student should have the ability to:

1. Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
2. Design and conduct a software test process for a software project
3. Analyze the needs of software test automation
4. Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
5. Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
6. Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.
Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.
Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation

UNIT II

Dynamic Testing-Black Box testing techniques**:** Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing
White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT III

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing
Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques

UNIT IV
Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite Software Quality Management: Software Quality metrics, SQA models
Debugging: process, techniques, correcting bugs.

UNIT V
Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.
Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Text Books:
1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
2) Software Testing- Yogesh Singh, CAMBRIDGE.

Reference books:
1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson.
2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-Resources:
1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E08	**PROFESSIONAL ELECTIVE- V** **1. COMPUTER VISION**	**3**	**0**	**0**	**3**

Course Objectives:

- Understanding basic concepts of image processing and their development.
- Knowledge of various configurations of image processing techniques used in industry, role in industry
- To know the application areas

Course Outcomes:

CO-1: To implement fundamental image processing techniques required for computer vision
CO-2: Understand Image formation process
CO-3: To perform shape analysis
CO-4: Extract features form Images and do analysis of Images
CO-5: Generate 3D model from images
CO-6: To develop applications using computer vision techniques

UNIT I

Introduction : Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

UNIT II

Image Formation Models : Monocular imaging system , Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination. shape from shading, Photometric Stereo, Depth from Defocus , Construction of 3D model from images.

UNIT III

Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis.

UNIT IV

Object recognition : Hough transforms and other simple object recognition methods, Shape correspondence and shape matching Principal component analysis, Shape priors for recognition Image Understanding : Pattern recognition methods, HMM, GMM and EM.

UNIT V

Applications: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters –Chamfer matching, tracking, and occlusion – combining views from multiple

cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.

Reference Books:

1. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992.
2. D. H. Ballard, C. M. Brown. Computer Vision.Prentice-Hall, Englewood Cliffs, 1982.
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010
4. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
5. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
6. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
7. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E09	**PROFESSIONAL ELECTIVE- V** **2. BLOCK CHAIN TECHNOLOGIES**	**3**	**0**	**0**	**3**

Course Objectives:

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

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:

CO-1: At the end of the course, student will be able to
CO-2: Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
CO-3: Identify the risks involved in building Block chain applications.
CO-4: Review of legal implications using smart contracts.
CO-5: Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
CO-6: Examine how to profit from trading crypto currencies.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEther Wallet, Ethereum Networks/Environments, Infura,

Etherscan, Ethereum Clients, Decentralized Application, Meta mask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts

UNIT V

Hyper ledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application. Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

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

Reference Books:

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

e-Resources:

1) https://github.com/blockchainedindia/resources

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20IT7E10	**PROFESSIONAL ELECTIVE- V** **3. ETHICAL HACKING**	**3**	**0**	**0**	**3**

Course Objectives:

The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.

The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes:

CO-1: Gain the knowledge of the use and availability of tools to support an ethical hack
CO-2: Gain the knowledge of interpreting the results of a controlled attack
CO-3: Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
CO-4: Comprehend the dangers associated with penetration testing.

UNIT- I

Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

UNIT - III

Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

UNIT - IV

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V

Deliverable: The Deliverable, the Document, Overal Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

TEXTBOOK:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

REFERENCE BOOKS:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

SEMESTER -VII

Course Code	Course Name	L	T	P	C
20SH7T01	**MANAGEMENT SCIENCE**	**3**	**0**	**0**	**3**

Course Objectives:

- To familiarize with the process of management and to provide basic insight in to organizational behavior
- To provide conceptual knowledge on functional management and project management

Course Outcome:

CO-1: After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.

CO-2: Will familiarize with the concept of functional management project management and strategic management.

UNITI:

Introduction to Management: Concept–nature and importance of Management ––Generic Functions of Management- Administration vs. Management –Evolution of Management thought-Decision making process- organization structure: Principles of organization & its types.

UNITII:

Operations Management: production & its types, plant layout, Work study- method study and work measurement – Statistical Quality Control-Control charts –Simple problems

Material Management: Need for Inventory control- EOQ (simple problems), ABC analysis and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNITIII:

Human Resource Management: Concept of HRM, HRD - Functions of HR Manager- types of Wage payment plans – Job Evaluation and Merit Rating - Grievance & redressal mechanism,

Marketing Management: Functions of Marketing– Marketing Mix-Marketing strategies based on product Life Cycle, Channels of distribution.

UNIT-IV:

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path-Probability-Project Crashing (Simple Problems)

UNITV:

Organizational behavior:

Attitude & behavior; Leadership styles; motivation- significance, theories; Perception-Perceptual process-Group Dynamics: Types of Groups, Stages of Group Development, Group Behavior and Group Performance Factors.

Text Books

1. Dr.P. Vijaya Kumar & Dr.N. AppaRao,' *Management Science'*Cengage,Delhi,2012.
2. Dr.A.R.Aryasri, *Management Science'*TMH2011.
3. L. M. Prasad, ' *Organizational Behavior*' Sultan Chand Publications.

References:

1. Koontz & Weihrich:'Essentials *of management'*TMH2011
2. Anil Bhat & Arya Kumar: Principles of Management, Oxford University Press, NewDelhi,2015.
3. Robbins: Organizational Behaviour, Pearson publications,2011
4. Kanishka Bedi :Production & Operations Management, Oxford Publications,2011
5. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
6. K. Aswatappa: 'Human Resource Management – text & cases', TMH.

OPEN ELECTIVE offered to other departments

Course Code	Course Name	L	T	P	C
20ITXO01	**Data Base Management System**	**3**	**0**	**0**	**3**

Prerequisite :fundamentals of computers and basics of any programming language.

Course Outcomes:
At the end of the Course the student shall be able to
CO1: Describe a relational database and object-oriented database
CO2: Create, maintain and manipulate relational database using SQL
CO3: Describe ER model and normalization for database design
CO4: Examine issues in data storage and query processing and can formulate appropriate solutions.
CO5: Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNITI
Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Data base systems, Data base applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence.

UNITII
Relational Model: Introduction to relational model ,concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance
BASIC SQL: Table definitions(create, alter), different DML operations(insert, delete, update), basic SQL querying(select and project) using where clause, arithmetic & logical operations,
SQL functions: Date, Time, Numeric and String conversion

UNITIII
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams**.** ER Diagrams for Bus reservation system. Banking system and Library information system, Aggregation functions.

UNITIV
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NFand3NF),Boyce-codd normal form(BCNF).

UNITV
Transaction Concept: Introduction of Transaction Processing, DBMS Buffers, Types of Failures, Transaction states and Operations, System log, Transaction Properties, Schedules and Types of Schedules.
File Organizations and Indexing: File Organization and Indexing, Cluster Indexes,

Primary and Secondary Indexes..

TEXTBOOKS:

1) Database Management Systems,3/e, Raghurama Krishnan, Johannes Gehrke,TMH
2) DatabaseSystemConcepts,5/e, Silberschatz, Korth, TMH

REFERENCEBOOKS:

1) Introduction to Database Systems,8/eCJDate,PEA.
2) Database Management System,6/eRamez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175
2) https://www.geeksforgeeks.org/introduction-to-nosql

OPEN ELECTIVE offered to other departments

Course Code	Course Name	L	T	P	C
20ITXO02	**Principles of Software Engineering**	**3**	**0**	**0**	**3**

Prerequisite: fundamentals of computers and awareness of various computer applications.

COURSE OUTCOMES:
At the end of the Course, the student will be able to
- Transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT-I : The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT-II : Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements. Requirements Analysis

UNIT-III : Scenario-Based Modelling, UML Models That Supplement the Use Case, Data Modelling Concepts, Class-Based Modelling, Requirements Modelling Strategies, Flow-Oriented Modelling, Creating a Behavioural Model, Requirements Modelling for WebApps.

UNIT-IV: Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Styles, Architectural Mapping Using Data Flow, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development, The Golden Rules

UNIT-V: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for WebApps, Validation Testing, System Testing, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing and Black Box Testing.

TEXTBOOKS:
1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

REFERENCE BOOKS:
1. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2. Software Engineering, Ugrasen Suman, Cengage.

E-REFERENCES:

1. https://nptel.ac.in/Courses/SoftwareEngineering
2. https://www.Coursera.org/Courses?query=software engineering

.https://www.udemy.com/Courses/development/software-engineering

OPEN ELECTIVE offered to other departments

Course Code	Course Name	L	T	P	C
20ITXO03	**OOPs through JAVA**	**3**	**0**	**0**	**3**

Prerequisite: fundamentals of computers and programming knowledge in any programming language like C /C++ and basics of Object Oriented Programming.

COURSE OUTCOMES:
At the end of the Course the student shall be able to
CO1 :Able to realize the concept of object Oriented Programming & Java Programming Constructs.
CO2 :Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords.
CO3 :Apply the concept of exception handling and Input/ Output operations

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Command Line Arguments, User Input to Programs, Data Types in Java, Declaration of Variables, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Static Variables, Attribute Final, Introduction to Operators,
Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements

UNIT II
Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Final Class and Methods, Keyword this.
Methods: Introduction, Defining Methods, Overloaded Methods, Access Control, Overriding Methods, Static methods.

UNIT III
Arrays: Introduction, Declaration and Initialization of Arrays, Accessing Elements of Arrays, Dynamic Change of Array Size, Class Arrays, Two-dimensional Arrays, Three-dimensional Arrays.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces.

UNIT IV
Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Access Control, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing.
Exception Handling :Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Unchecked Exceptions, Checked

Exceptions ,Custom Exceptions, Nested try and catch Blocks, , Throws Clause

UNIT V

String Handling in Java: Introduction, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods.

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2) The complete Reference Java, 8thedition, Herbert Schildt, TMH

References Books:

1) IntroductiontojavaprogrammingbyYDanielLiang,Pearson
2) Murach's Java Programming, Joel Murach

E-Resources:

1)https://nptel.ac.in/courses/106/105/106105191/
2)https://www.w3schools.com/java/java_data_types.asp

OPEN ELECTIVE offered to other departments

Course Code	Course Name	L	T	P	C
20ITXO04	**Introduction to Machine Learning**	**3**	**0**	**0**	**3**

Prerequisite: awareness of latest trends in information technology ,fundamentals of databases and basics of data mining .

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Identify the characteristics of data sets and compare the trivial data and big data for various applications.
CO2 : Understand machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3 : Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
CO4 : Developscalingupmachinelearningtechniquesandassociatedcomputingtechnique sandtechnologiesforvariousapplications.
CO5 : Implement various ways of selecting suitable model parameters for different machine learning techniques.

UNIT-I : Brief Introduction to Machine Learning

What is Machine learning, Machine learning models, Machine learning applications, Challenges. Major advantages and drawbacks Types of Machine learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning

UNIT-II : Statistics basics

Mean, median, mode, Variance, standard deviation and correlation, Statistical Decision Theory, Regression & Classification Bias, Types of regression, Linear Regression, Multiple Regression

UNIT-III : Dimensionality Reduction

Subset Selection, Shrinkage Methods, Principal Components Regression Linear Classification, Logistic Regression, Linear Discriminant Analysis Optimization, Classification-Separating Hyper planes Classification

UNIT-IV :

Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation) Parameter Estimation (Maximum Likelihood Estimation, Bayesian Parameter Estimation) Decision Trees Evaluation Measures, Hypothesis Testing Ensemble Methods, Graphical Models

UNIT-V :

Clustering, Gaussian Mixture Models, Spectral Clustering Ensemble Methods Learning Theory, Reinforcement Learning

Text Book

1. T. Hastie, R.Tibshirani, J.Friedman. TheElementsofStatisticalLearning,2e, 2008.
2. Christopher Bishop. PatternRecognitionandMachineLearning. 2e.