DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

COURSE STRUCTURE AND SYLLABUS
For PG –R22
M. TECH – COMPUTER SCIENCE

(Applicable for batches admitted from 2022-2023)

St. ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
CHIRALA – 523187, ANDHRA PRADESH, INDIA

(Accredited by NBA, NAAC with 'A' Grade, accredited by IE (I) & Permanently Affiliated to JNTUK)
Recognized by UGC under Section 2(f) & 12(B) of UGC Act,

SEM I

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PC	22PCS01	Distributed Operating Systems	3	--	--	--	3	40	60	100	3
2	PC	22PCS02	Advanced Data Structures & Algorithms	3	--	--	--	3	40	60	100	3
3	PE	22PCS03	Big Data Analytics	3	--	--	--	3	40	60	100	3
		22PCS04	Digital Image Processing									
		22PCS05	Cyber Security									
4	PE	22PCS06	Advanced Computer Networks	3	--	--	--	3	40	60	100	3
		22PCS07	Internet of Things									
		22PCS08	Object Oriented Software Engineering									
5	CC	22PCS09	Research Methodology and IPR	--	--	--	--	--	40	60	100	2
6	PC	22PCS10	Advanced Data Structures & Algorithms Lab	--	--	4	--	4	40	60	100	2
7	PC	22PCS11	Advanced Computing Lab	--	--	4	--	4	40	60	100	2
8	MC	22PCS12	Audit Course-1*	2	--	--	--	2	40	60	100	0
Total				14	0	8	0	22	320	480	800	18

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

Audit Course 1 & 2:

22PAC01: English for Research Paper Writing
22PAC02: Disaster Management
22PAC03: Sanskrit for Technical Knowledge
22PAC04: Value Education
22PAC05: Constitution of India
22PAC06: Pedagogy Studies
22PAC07: Stress Management by Yoga
22PAC08: Personality Development through Life Enlightenment Skills

SEM II

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PC	22PCS13	Machine learning	3	--	--	--	3	40	60	100	3
2	PC	22PCS14	MEAN Stack Technologies	3	--	--	--	3	40	60	100	3
3	PE	22PCS15	Advanced Databases and Mining	3	--	--	--	3	40	60	100	3
		22PCS16	Computer Vision									
		22PCS17	Soft Computing									
		22PCS18	Block Chain Technologies									
4	PE	22PCS19	Cloud Computing	3	--	--	--	3	40	60	100	3
		22PCS20	Devops									
		22PCS21	Service Oriented Architecture									
5	PC	22PCS22	Machine Learning with python Lab	--	--	4	--	4	40	60	100	2
6	PC	22PCS23	Mean stack Technologies Lab	--	--	4	--	4	40	60	100	2
7	PR	22PCS24	Mini Project with Seminar	2	--	--	--	2	100	--	100	2
8	MC	22PCS25	Audit Course-2*	2	--	--	--	2	40	60	100	0
Total				16	0	8	0	24	380	420	800	18

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

Audit Course 1 & 2:

22PAC01: English for Research Paper Writing
22PAC02: Disaster Management
22PAC03: Sanskrit for Technical Knowledge
22PAC04: Value Education
22PAC05: Constitution of India
22PAC06: Pedagogy Studies
22PAC07: Stress Management by Yoga
22PAC08: Personality Development through Life Enlightenment Skills

SEM III

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PE	22PCS26	Deep Learning	3	--	--	--	3	40	60	100	3
		22PCS27	Social Network Analysis									
		22PCS28	MOOCs-1 (NPTEL/SWAYAM) 12 Week Program related to the programed which is not listed in the course structure									
2	OE	22PCS29	MOOCs-2 (NPTEL/SWAYAM)- Any 12 Week Course on Engineering/ Management/ Mathematics offered by other than parent department	3	--	--	--	3	40	60	100	3
		22PHS01	Operation Research									
		22PTE32	Waste to Energy									
3	PR	22PCS30	Dissertation-I/ Industrial Project	0	0	20	--	20	--	100	100	10
Total				6	0	20	0	26	80	220	300	16

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project
****Students going for Industrial Project/Thesis will complete these courses through MOOCs**

OE - Open Electives offered by the Department of CSE

22PCS19 : Cloud Computing

22PCS05 : Cyber Security

22PCS07 : Internet of Things

22PCS13 : Machine Learning

SEM IV

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PR	22PCS31	Dissertation-II	--	--	32	--	32	--	100	100	16
Total				0	0	32	0	32	0	100	100	16

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

Total Credits=68

HEAD OF THE DEPARTMENT

I Year - I Semester	22PCS01	L	T	P	C
		3	0	0	3

Distributed Operating Systems

Course Objectives:

- To study the concepts of Distributed Operating System
- Methods of understanding clock synchronization protocols
- Introduce the concepts of file system implementation in DOS.

Course outcomes:

Students who have successfully completed this course will have full understanding of the following concepts

- Distributed Operating Systems Overview
- Distributed clock synchronization Concepts and Algorithms
- Example Distributed Operating Systems

Program outcomes:

- Concepts of Distributed Operating System Concepts.
- Examine methods that have emerged from the
- Field of distributed operating systems in an application perspective.

Unit-I

FUNDAMENTALS OF DISTRIBUTED SYSTEMS:
Introduction to distributed systems, Goals of Distributed Systems, Hardware Concepts, Software Concepts, Design Issues, Network Operating Systems, True Distributed System and Time sharing, Multiprocessor Operating System, System Architectures

Unit-II

COMMUNICATION IN DISTRIBUTED SYSTEMS
Basics of Communication Systems, Layered Protocols, ATM Models, Client Server Model, Blocking Primitives and Non-Blocking Primitives, Buffered Primitives and Un buffered Primitives, Reliable and Unreliable primitives, Message Passing, Remote Procedure Call

Unit-III

SYNCHRONIZATION AND PROCESSS
Clock Synchronization, Mutual Exclusion, Election Algorithm, Atomic Transactions, Deadlock in Distributed Systems, Process and Threads, System Models, Processor Allocation, Process Scheduling

Unit-IV

CONSISTENCY, REPLICATION AND FAULT TOLERANCE:
Data Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency protocols, Fault Tolerance, Process Resilience, Distributed Commit, Reliable Client Server Communication, Reliable Client Server Communication

UNIT V

DISTRIBUTED OBJECT BASED SYSTEMS AND DISTRIBUTED FILE SYSTEMS
Distributed object based systems, DOO Architecture, DOO Process, DOO Communication, Synchronization, Consistency and Replication, Distributed File Systems, Process and Communications, Synchronization in Object Based Systems, Consistency and Replication

Text Books:

1. Andrew S.Tanenbaum, "Distributed Operating Systems", Pearson Education, Reprint, 2011.
2. Andrew S.Tannenbaum, Maarten Van Steen, "Distributed Systems-Principles and Paradigms", Second Edition, PHI, 2007
3. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design", PHI, 2007

Reference Books:

1. Distributed Operating Systems concepts and design-P.K. Sinha (PHI).
2. Advanced Operating System - Singhal
3. Distributed Systems concepts and design-G.Coulouris,1 Dollimore & T. Kindberg
4. Modern Operating System - A.S. Tanenbaum (PHI).

I Year - I Semester	22PCS02	L	T	P	C
		3	0	0	3

Advanced Data Structures & Algorithms

Course Objectives:
From the course the student will learn

- Priority Queues, Priority Queues using heaps, search trees.
- AVL trees, Operations of AVL trees, Red-Black trees, Splay Trees, Comparison of search trees.
- Algorithm Analysis, Radomised Algorithms and Approximation Algorithms
- AVL trees, operations of AVL trees, Red- Black trees, Splay trees, comparison of search trees.
- NP Hard and NP Complete Problems

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

- Ability to write and analyze algorithms for algorithm correctness and efficiency
- Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
- Demonstrate various searching, sorting and hash techniques and be able to apply and solve Problems of real life
- Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
- Ability to compare various search trees and find solutions for IT related problems

UNIT I:
Priority Queues- Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion. Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion, Deletion.

UNIT II:
Search Trees- AVL Trees: Definition, Height of AVL Tree, Operations- Insertion, Deletion and Searching, Introduction to Red-Black and Splay Trees, K-D Trees: Operations-Insertion, Deletion and Searching, Comparison of Search Trees.

UNIT III:
Amortized Analysis: Introduction, Aggregate method, Accounting Method, Potential Method, Amortized analysis of insertion in Red-Black Tree.

UNIT IV:
Randomized algorithms: Basics of Probability Theory, Randomized Algorithms: An Informal Description, Identifying the Repeated Element, Primality Testing, Advantages and Disadvantage Approximation algorithms: Introduction, Absolute approximations, planar graph coloring, maximum programs stored problem, NP Hard Absolute Approximations.

UNIT V:
NP-Hard and NP-Complete problems: Basic concepts, Non deterministic Algorithms The classes NP-hard and NP -complete, cook's theorem, NP Hard graph problems, clique decision problem, chromatic number decision problem.

Text Books:

1. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press
2. Data Structures: A Pseudo Code Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon and Cengage
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
4. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co, 2009

I Year - I Semester	22PCS03	L	T	P	C
		3	0	0	3
Big Data Analytics					

Course Objectives:

This course is aimed at enabling the students to

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, No SQL, Map Reduce, HIVE, Cassandra, and Spark.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on No SQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

UNIT I:

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT II:

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra ,Table creation, loading and reading data.

UNIT III:

Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance, with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization. Introduction to Hive, data types and file formats, Hive QL data definition, Hive QL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

UNIT IV:

Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data, Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN , Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

UNIT V:

Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj
2. SPARK: The Definitive Guide, Bill Chambers & Matai Zaharias, O'Reilley, 2018 Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional, 2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer, 2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012
3. "H Base: The Definitive Guide", O'Reilley, Lars George, 2011
4. "Cassandra: The Definitive Guide", O'Reilley, E ben Hewitt, 2010
5. "Programming Pig", O'Reilley, Alan Gates, 2011

I Year - I Semester	22PCS04	L	T	P	C
		3	0	0	3
Digital Image processing					

Course Objectives:

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

Course Outcomes:

After the completion of the course, student will be able to

- demonstrate the components of image processing
- explain various filtration techniques.
- Apply image compression techniques.
- Discuss the concepts of wavelet transforms.
- Analyze the concept of morphological image processing.

UNIT I:

Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. Image Enhancement Techniques: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT II:

Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT III:

Image Compression: Redundancies- Coding, Inter pixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT IV:

Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.

UNIT V:

Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition. Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

Text Books:

1. Digital Image Processing.2nded.Gonzalez, R.C. and Woods, R.E. India: Person Education, (2009)

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, (2001)
2. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjan, S. (2009), Tata McGraw-Hill

I Year - I Semester	22PCS05	L	T	P	C
		3	0	0	3

Cyber Security

Course Objectives:

1. To understand various types of cyber-attacks and cyber-crimes
2. To learn threats and risks within context of the cyber security
3. To have an overview of the cyber laws & concepts of cyber forensics
4. To study the defensive techniques against these attacks

Course Outcomes:

After the completion of the course, student will be able to

1. Analyze and evaluate the cyber security needs of an organization.
2. Understand Cyber Security Regulations and Roles of International Law.
3. Design and develop a security architecture for an organization.
4. Understand fundamental concepts of data privacy attacks

UNIT - I

Cyber Security Fundamentals: Network and Security Concepts-Information Assurance Fundamentals, Basic Cryptography, Symmetric and Asymmetric Encryption, Public Key Encryption, the Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification.

UNIT - II

Threats and vulnerabilities: Types of Threats- Malware, Phishing, Ransomware, Adware and Spyware, Trojan, Virus, Worms, Man-in-the-middle-attack, Scareware, Distributed Denial-Of- Service Attack, Rootkits, click-fraud. Vulnerability-Shellcode, Integer Overflow Vulnerabilities, Buffer Overflows, SQL Injection.

UNIT- III:

Defense and mitigation measures: Anti-virus scanners, static and dynamic methods, ant analysis, evading obfuscations and run-time attacks.

UNIT-IV:

Cyber Forensics: Memory and network Forensics for Windows and Linux internals, Forensic tools, OS hardening and RAM dump analysis, data acquisition, data extraction, volatility analyses for OS artifacts and other information. Automated malicious code analysis.

Unit-V

Cybersecurity law and Regulations: Introduction, Cyber Warfare, Deception in the Cyber World, Legal Frameworkof CyberSecurity.

Text Books/Reference Books:

1. James Graham, Richard Howard, Ryan Olson, CYBER SECURITY ESSENTIALS, Taylor and Francis Group, 2011.
2. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation, Springer, 2015
3. David Salomon, Foundations of Computer Security, Springer, 2006

I Year - I Semester	22PCS06	L	T	P	C
		3	0	0	3

ADVANCED COMPUTER NETWORKS

Course Objectives:

This course is aimed at enabling the students to

- The course is aimed at providing basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
- Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing.
- Provide the mathematical background of routing protocols.
- Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks.

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate reference models with layers, protocols and interfaces.
- Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6.
- Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
- Describe the emerging trends in networks-MANETS and WSN

Unit-I:

Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, congestion control algorithms :Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets

Unit-II:

Internetworking and IP protocols: How networks differ, How networks can be connected, internetworking, tunneling, The network layer in the internet,IPV4 Protocol, IP addresses, Subnets, CIDR, class full and Special addressing, network address translation (NAT),IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP

Unit-III:

Transport Layer Protocols: Introduction, Services, Port numbers,
User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control.

Unit- IV:

Wireless LANS: Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers Other Wireless Networks: WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites.

Unit–V:

Emerging trends in Computer networks:

Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security. Wireless Sensor Networks: WSN functioning, Operating system support in sensor devices, WSN characteristics, sensor network operation, Sensor Architecture: Cluster management, Wireless Mesh Networks: WMN design , Issues in WMNs, Computational Grids, Grid Features, Issues in Grid construction design, Grid design features,P2P Networks: Characteristics of P2P Networks, Classification of P2P systems, Gnutella, Bit Torrent, Session Initiation Protocol(SIP) , Characteristics and addressing, Components of SIP, SIP establishment, SIP security.

Text Books:

1. Data communications and networking 4th edition Behrouz A Forgan, TMH
2. Computer networks 4th edition Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE

Reference Books:

1. Computer networks, a system Approach, 5th end, Larry L Peterson and Bruce S Davie, Elsevier

I Year - I Semester	22PCS07	L	T	P	C
		3	0	0	3

Internet of Things

Course Objectives:

- To Understand Smart Objects and IOT
- Architectures. To learn about various IOT-related
- protocols
- To build simple IOT Systems using Arduino and Raspberry
- Pi. To understand data analytics and cloud in the context of IOT to develop IOT infrastructure for popular applications.

Course Outcomes:

After the completion of the course, student will be able to

- Summarize on the term 'internet of things' in different contexts.
- Analyze various protocols for IOT.
- Design a POC of an IOT system using Rasperry
- PiiArduino Apply data analytics and use cloud offerings
- related to IOT. Analyze applications of IOT in real time scenario

UNIT I:

FUNDAMENTALS OF IOT: Evolution of internet of Things, Enabling Technologies, IOT Architectures,oneM2M, IOT World Forum (IOT WF) and Alternative IOT models, Simplified IOT Architecture and Core IOT Functional Stack, Fog, Edge and Cloud in IOT, Functional blocks of an IOT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT I I :

IOT PROTOCOLS: lT Access Technologies: Physical and MAC layers, topology and Security of lEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: lP versions, Constrained Nodes and Constrained Networks, Optimizing lP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: COAP and MQTT.

UNIT III:

DESIGN AND DEVELOPMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IOT system building blocks, Arduino, Board details, lDE programming, Raspberry Pi, lnter faces and Raspberry Pi with Python Programming.

UNIT IV:

DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IOT, Python Web Application Framework, Django, AWS for IOT, System Management with NETCONF-YANG.

UNIT V:

CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IOT system, lBM Watson IOT platform, Manufacturing, Converged Plant wide Ethernet Model (CPWE), Power Utility industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Text Books:

1. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for lnternet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

Reference Books:

1. lnternet of Things A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
2. The lnternet of Things Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
3. "From Machine-to-Machine to the lnternet of Things Jan Ho' ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
4. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.
5. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and

I Year - I Semester	22PCS08	L	T	P	C
		3	0	0	3

Object Oriented Software Engineering

Course Objectives:

- To elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.
- To understand the what software life cycle is, how software projects are planned and managed, types of resources involved in software development projects, risks are identified and assessed, predictions and assessments are made.
- To identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, perform~~a~~nce, maintenance and quality requirements

Course Outcomes:

After the completion of the course, student will be able to

- Apply the Object Oriented Software-Development Process to design software
- Analyze and Specify software requirements through a SRS documents.
- Design and Plan software solutions to problems using an object-oriented strategy.
- Model the object oriented software systems using Unified Modeling Language (UML)
- Estimate the cost of constructing object oriented software.

UNIT I:

Introduction to Software Engineering: Software, Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges. Software Processes: Software Process, Process Classification, Phased development life cycle, Software Development Process Models, Process, use, applicability and Advantages/limitations.

UNIT II:

Object oriented Paradigm, Object oriented Concepts, Classes, Objects, Attributes, Methods and services, Messages, Encapsulation, Inheritance, Polymorphism, Identifying the elements of object model, management of object oriented Software projects, Object Oriented Analysis, Domain Analysis, Generic Components of OOA model, OOA Process, Object Relationship model, Object Behavior Model.

UNIT III:

Object Oriented Design: Design for Object- Oriented systems, The Generic components of the OO design model, The System design process, The Object design process, Design Patterns, Object Oriented Programming.

UNIT IV:

Object Oriented testing: Broadening the view of Testing, Testing of OOA and OOD models, Object-Oriented testing strategies, Test case design for OO software, testing methods applicable at the class level, Interclass test case design.

UNIT V:

Technical Metrics for Object Oriented Systems: The Intent of Object Oriented metrics, The distinguishing Characteristics, Metrics for the OO Design model, Class-Oriented metrics, Operation-Oriented Metrics, Metrics foe Object Oriented testing, Metrics for Object Oriented projects. CASE Tools.

Text Books:

1. Object oriented and Classical Software Engineering, 7/e, Stephen R.Schach, TMH.
2. Object oriented and Classical Software Engineering, Timothy Lethbridge, Robert Laganiere, TMH
3. Software Engineering by Roger S Pressman, Tata McGraw Hill Edition.

Reference Books:

1. Component based software engineering: 7th International symposium, ivicaCrnkovic, Springer, CBSE 2004

I Year - I Semester	22PCS09	L	T	P	C
		2	0	0	2

RESEARCH METHODOLOGY AND IPR

UNIT 1:
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT 2:
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT 3:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT 4:
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 5:
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

(1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
(2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
(3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
(4) "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
Halbert, Mayall, "Industrial Design", McGraw Hill, 1992.
(5) Niebel, "Product Design", McGraw Hill, 1974.
(6) Asimov, "Introduction to Design", Prentice Hall, 1962.
(7) l, Mark A. Lemley, " Intellectual Property in New
(8) **P. Robert Merges, Peter S. Menel**
T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008
(9)

I Year - I Semester	22PCS10	L	T	P	C
		0	0	4	2

Advanced Data Structures & Algorithms Lab

Course Objectives:

From the course the student will learn

- Knowing about oops concepts for a specific problem.
- Various advanced data structures concepts like arrays, stacks, queues, linked lists, graphs and trees.

Course Outcomes:

After the completion of the course, student will be able to

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Examine algorithms performance using Prior analysis and asymptotic notations.
- Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
- Apply and analyze functions of Dictionary

Experiment 1:

Write a java program to perform various operations on single linked list

Experiment 2:

Write a java program for the following

a) Reverse a linked list
b) Sort the data in a linked list
c) Remove duplicates
d) Merge two linked lists

Experiment 3:

Write a java program to perform various operations on doubly linked list.

Experiment 4:

Write a java program to perform various operations on circular linked list.

Experiment 5:

Write a java program for performing various operations on stack using linked list.

Experiment 6:

Write a java program for performing various operations on queue using linked list.

Experiment 7:

Write a java program for the following using stack

a) Infix to postfix conversion.
b) Expression evaluation.
c) Obtain the binary number for a given decimal number.

Experiment 8:

Write a java program to implement various operations on Binary Search Tree
Using Recursive and Non-Recursive methods.

Experiment 9:

Write a java program to implement the following for a graph.

a) BFS b) DFS

Experiment 10:

Write a java program to implement Merge & Heap Sort of given elements.

Experiment 11:

Write a java program to implement Quick Sort of given elements.

Experiment 12:

Write a java program to implement various operations on AVL trees.

Experiment 13:

Write a java program to perform the following operations:

a) Insertion into a B-tree b) Searching in a B-tree

Experiment 14:

Write a java program to implementation of recursive and non-recursive functions to Binary tree Traversals

Experiment 15:

Write a java program to implement all the functions of Dictionary (ADT) using Hashing.

I Year - I Semester	22PCS11	L	T	P	C
		0	0	4	2

Advanced Computing Lab

Course Objectives:

From the course the student will learn

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course Outcomes:

After the completion of the course, student will be able to

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
- Development and use of s IOT technology in Societal and Industrial
- Applications. Skills to undertake high quality academic and industrial research
- in Sensors and IOT. To classify Real World IOT Design Constraints, Industrial Automation in IOT.

Experiment 1:

Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

Experiment 2:

Study and Install IDE of Arduino and different types of Arduino.

Experiment 3:

Study and Implement Zigbee Protocol using Arduino / RaspberryPi.

Experiment 4:

Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 5:

Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that

- Transposes the original Amazon food dataset, obtaining a PairRDD of the type<user_id>→ <list of the product_ ids reviewed by user_id>
- Counts the frequencies of all the pairs of products reviewed together.
- Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Experiment 6:

Write a program to Implement Bankers algorithm for Dead Lock Avoidance.

Experiment 7:

Write a program to Producer-consumer problem Using semaphores.

Experiment 8:

Write a program for an image enhancement using pixel operation.

Experiment 9:

Write a Program to enhance image using image arithmetic and logical operations.

Experiment 10:

Write a program of bit stuffing used by Data Link Layer.

Experiment 11

Write a program to configure a Network using Distance Vector Routing protocol.

Experiment 12:
Write a program to perform the function oriented diagram: DFD and Structured chart.
Experiment 13:
Write a program to perform the system analysis: Requirement analysis, SRS.
Experiment 14:
Write a program to draw the structural view diagram: Class diagram, object diagram.
Experiment 15:
Write C programs for implementing the Demorgan's law.

I Year - II Semester	22PCS13	L	T	P	C
		3	0	0	3

Machine learning

Course Objectives:

Machine Learning course will

- Develop an appreciation for what is involved in learning
- From data. Demonstrate a wide variety of learning Algorithms.
- Demonstrate how to apply a variety of learning algorithms to data.
- Demonstrate how to perform evaluation of learning algorithms and model selection.

Course Outcomes:

After the completion of the course, student will be able to

- Domain Knowledge for Productive use of Machine Learning and Diversity
- of Data. Demonstrate on Supervised and Computational Learning
- Analyze on Statistics in learning techniques and Logistic Regression
- Illustrate on Support Vector Machines and Perceptron Algorithm
- Design a Multilayer Perceptron Networks and classification of decision tree

Unit I:

Introduction: Towards Intelligent Machines Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit II:

Supervised Learning: Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit III:

Statistical Learning: Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit IV:

Support Vector Machines (SVM): Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly separable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, and Regression by Support vector Machines.

Learning with Neural Networks:

Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptron's, linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

Unit V:

Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. Decision Tree Learning: Introduction, Example of classification decision tree, measures

of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Textbooks:

1. Applied Machine Learning, 1st edition, M.Gopal, McGraw Hill Education, 2018
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC) 1st Edition-2014

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge Univ Press. 1 edition (August 31, 2009)
2. Richard o.Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & SonsInc., 2nd Edition-20
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
4. Machine Learning by Peter Flach , Cambridge-1st Edition 2012

I Year - II Semester	22PCS14	L	T	P	C
		3	0	0	3

MEAN Stack Technologies

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Writing optimized front end code HTML and JavaScript.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications**.**

Course Outcomes:

- After the completion of the course, student will be able to
- Identify the Basic Concepts of Web & Markup Languages.
- Develop web Applications using Scripting Languages & Frameworks.
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js.
- Adapt to Deployment Techniques & Working with cloud platform.

UNIT I:

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II:

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS

UNIT III:

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV:

REST ful Web Services: Using the Uniform Interface, Designing URIs,
Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

UNIT V:

Mongo DB: Introduction, Architecture, Features, Examples, and Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Pro Mean Stack Development, ELadElrom, Apress
4. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5. JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6. Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books

1. Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. Express.JS Guide, the Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

I Year - II Semester	22PCS15	L	T	P	C
		3	0	0	3
Advanced Databases and Mining					

Course Objectives:

- **This Subject deals with dealing data in the real world, maintaining data without any redundancy, several techniques involved in DBMS to recover the problems caused due to redundancy, storing data for quick insertion, manipulation and deletion operations in order to retrieve data from the database.**
- **This subject provides an introduction to multidisciplinary field of data mining, the general data features, techniques for data preprocessing, general implementation of data warehouses and OLAP, the relationship between data warehousing and other generalization methods**
- **The concepts of data clustering includes a different methods of clustering such as k-means, k- mediods, db scan algorithm, role of data mining in web mining.**

Course Outcomes:

After the completion of the course, student will be able to

- **Analyze on normalization techniques.**
- **Elaborate on concurrency control techniques and query optimization.**
- **Summarize the concepts of data mining, data warehousing and data preprocessing**
- **strategies. Apply data mining algorithms.**
- **Assess various classification & cluster techniques.**

UNIT I: Introduction: Concepts and Definitions, Relational models, Data Modeling and Query Languages, Database Objects. Normalization Techniques: Functional Dependency, INF, 2NF, 3NF, BCNF; Multi valued Dependency; Loss-less Join and Dependency Preservation.

UNIT II: Transaction processing: Consistency, Atomicity, Isolation and Durability, Serializable

Schedule, Recoverable Schedule, Concurrency Control, Time-stamp based protocols, Isolation Levels, Online Analytical Processing,

Database performance Tuning and Query optimization: Query Tree, Cost of Query, Join, Selection and Projection Implementation Algorithms and Optimization Database Security: Access Control, MAC, RBAC, Authorization, SQL Injection Attacks.

UNIT III: Data Mining: stages and techniques, knowledge representation methods, data mining approaches (OLAP, DBMS, Statistics and ML). Data warehousing: data warehouse and DBMS, multidimensional data model, OLAP operations. Data processing: cleaning, transformation, reduction, filters and discretization with weka.

UNIT IV: Knowledge representation: background knowledge, representing input data and output knowledge, visualization techniques and experiments with weka. Data mining algorithms: association rules, mining weather data, generating item sets and rules efficiently, correlation analysis.

UNIT V: Classification & Clustering: lR algorithm, decision trees, covering rules, task prediction, statistical classification, Bayesian network, instance based methods, linear models, Cluster/2, Cobweb, k- means, Hierarchical methods. Mining real data: preprocessing data from a real medical domain, data mining techniques to create a comprehensive and accurate model of data. Advanced topics: text mining, text classification, web mining, data mining software.

Text Books:

1. **Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Addison-Wesley, 6th Edition-**
2. **Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann C.J. Date, Database Systems, Pearson, 3rd edition-**

Reference Books:

1. **Principles of Distributed Database Systems, Prentice Hall, P. Valduriez, M. TamerOzsu 3rd edition-**
   2000
2. **Database systems: Design, implementation and Management, C.M. Coronel, S. Morris, P. Rob, Boston: Cengage Learning, 9th edition-20ll**

I Year-II Semester	22PCS16	L	T	P	C
		3	0	0	3

Computer Vision

Course Objective:

- **Computer vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us.**

The objective of this course is to

- **Understand the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc.**
- **Explore and contribute to research and further developments in the field of computer vision applications range from Biometrics, Medical diagnosism document processing, mining of visual content to surveillance advanced rendering etc.**

Course Outcomes:

After completing the course student will be able to:

- **identify basic concepts, terminology, theories, models and methods in the field of computer vision**
- **To know multi-dimensional signal processing, segmenetation, feature extraction, pattern analysis, motion analysis etc.**

UNIT I

Digital Image Formation and low-level processing: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT II

Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

UNIT III

Feature Extraction: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT IV

Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

UNIT V

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis,

Dynamic Stereo; Motion parameter estimation.

Textbooks

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

References

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004

2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

4. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

I Year - II Semester	22PCS17	L	T	P	C
		3	0	0	3

Soft Computing

Course Objectives:

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

Course Outcomes:

After the completion of the course, student will be able to

- **Elaborate fuzzy logic and reasoning to handle uncertainty in engineering**
- **problems. Make use of genetic algorithms to combinatorial optimization problems.**
- **Distinguish artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.**
- **Formulate and apply the principles of self-adopting and self-organizing neuro fuzzy inference systems.**
- **Evaluate and compare solutions by various soft computing approaches for a given problem**

UNIT I: Fuzzy Set Theory: Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT II: Optimization: Derivative based Optimization, Descent Methods, and The Method of Steepest
Descent, Classical Newton's Method, Step Size Determination, Derivative**-free Optimization, Genetic Algorithms, Simulated Annealing, and Random Search, Downhill Simplex Search.**

UNIT III: Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent-directed Search Production System and Learning.

UNIT IV: Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum.

UNIT V: Applications of Computational Intelligence: Printed Character Recognition, Inverse

Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Coloripe Prediction.

Text Books:

1. "Neuro Fuzzy and Soft Computing", J.S.R.Jang, C.T.Sun and **E.Mizutani, PHI, 2004, Pearson Education 2004**

2. Artificial Intelligence by Saroj Koushik, Cengage Learning

3. "Artificial Intelligence and Intelligent Systems", N.P.Padhy, Oxford University Press, 2006

Reference Books:

1. Artificial Intelligence, Second Edition, Elaine Rich & Kevin Knight, Tata McGraw Hill Publishing Comp., New Delhi,, 2006

2. "Fuzzy Logic with Engineering Applications", Timothy J.Ross, McGraw-**Hill, 1997**

I Year - II Semester	22PCS18	L	T	P	C
		3	0	0	3
BLOCK CHAIN TECHNOLOGY					

Course Objectives:

The objective of this course is to make student understand

- **Understand how block chain systems (mainly Bitcoin and Ethereum) work,**
- **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: At the end of the course, student will be able to

1. **Explain design principles of Bitcoin and Ethereum.**
2. **Explain Naka moto consensus.**
3. **Explain the Simplified Payment Verification protocol.**
4. **List and describe differences between proof-of-work and proof-of-stake consensus.**
5. **Interact with a block chain system by sending and reading transactions.**
6. **Design, build, and deploy a distributed application.**
7. **Evaluate security, privacy, and efficiency of a given block chain system.**

Unit I:

Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop
Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.
Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II:

Block chain: Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain.

Unit III:

Distributed Consensus:
Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency:

History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Name coin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.
Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain
Text
Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies

2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System

3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.

4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

I Year - II Semester	22PCS19	L	T	P	C
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Cloud Computing

Course Objectives:

- **To implement Virtualization**
- **To implement Task Scheduling**
- **algorithms. Apply Map-Reduce concept**
- **to applications. To build Private Cloud.**
- **Broadly educate to know the impact of engineering on legal and societal issues involved.**

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

- **Interpret the key dimensions of the challenge of Cloud Computing.**
- **Examine the economics, financial, and technological implications for selecting cloud computing for own organization.**
- **Assessing the financial, technological,** and organizational capacity of employer's for actively **initiating and installing cloud-based**
- **Evaluate** applications.
  own organizations' needs for capacity building anc training in cloud computing**related IT Areas.**
- **To Illustrate Virtualization for Data-Center Automation.**

UNIT I: Introduction: Network centric computing, Network centric content, peer-to peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: Introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II: Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing: Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

UNIT III: Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

UNIT IV: Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud Security: Cloud security risks, security a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V: Cloud Application Development: Amazon Web Services: EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2).

Text Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH

Reference book:

1. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH

I Year - II Semester	22PCS20	L	T	P	C
		3	0	0	3
DEVOPS					

Course Objective:
The Objective of this course is to give a strong foundation of the Development and its Operations.

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

- **Understand the traditional software development.**
- **Learn the rise of agile methodologies.**
- **Define and design purpose of DevOps.**

UNIT-I
TRADITIONAL SOFTWARE DEVELOPMENT: The Advent of Software Engineering - Waterfall method - Developers vs IT Operations conflict

UNIT-II
RISE OF AGILE METHODOLOGIES: Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over -comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan

UNIT-III
DEFINITION OF DEVOPS: Introduction to DevOps - DevOps and Agile

UNIT-IV
PURPOSE OF DEVOPS: Minimum Viable Product - Application Deployment - Continuous Integration - Continuous Delivery

UNIT -V
CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING): CAMS- Culture - CAMS - Automation - CAMS- Measurement - CAMS - Sharing - Test-Driven Development - Configuration Management - Infrastructure Automation - Root Cause Analysis - Blamelessness - Organizational Learning

Text Books:
I.The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
2. Getting Started with DevOps - by Ojasvi Jagtap, Subodh Jain

Reference Books:
I. What is DevOps - by Mike Loukides
2. Learning DevOps: The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and
Azure DevOps by Mikael Krief.

I Year - II Semester	22PCS21	L	T	P	C
		3	0	0	3

SERVICE ORIENTED ARCHITECTURE

Course Objectives:

The objective of the subject is to

- **To provide an overview of XML Technology and modeling databases in XML**
- **To provide an overview of Service Oriented Architecture and Web services and their importance**
- **To introduce Security solutions in XML and Web Services and to introduce Security standards for Web Services**

Course Outcomes:

After the completion of the course, student will be able to

- **The students will understand the basics of XML**
- **The students will learn the concepts of SOA and Web services, some of the prevailing standards and technologies of Web Services**
- **The students will also learn the approaches for providing security for XML documents as well as messages exchanged among Web Services**

UNIT I -ML Technology

XML – XML and Web - Name Spaces – XML Document Structure - Structuring with Schemas and DTD - Modeling Databases in XML – XQuery

UNIT II SOA Basics

Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA – Benefits of SOA -- Principles of Service orientation – Service layers - Business Process management

UNIT III Web Services (WS)

SOA and Web Services – Web Services Protocol Stack – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI. Service-Level Interaction patterns – XML and Web Services - Enterprise Service Bus - .NET and J2EE Interoperability.

UNIT IV WS Technologies and Standards

Web Services Technologies - JAX-RPC, JAX-WS. Web Service Standards – WS-RM, WS-Addressing, WS-Policy. Service Orchestration and Choreography – Composition Standards - BPEL. Service Oriented Analysis and Design.

UNIT V XML and WS Security

XML Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Signature – XKMS Structure. Web Services Security - XACML - WS-Security.

Text Books:

1. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008. (Unit 1 and 3)
2. Thomas Erl, " Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005 (Unit 2, 3, 4, and 5)
3. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002 (Unit 5)

Reference Books:

1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Addison Wesley, 2005.

2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2011.
3. Mark O' Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2003.
4. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004

I Year - II Semester		L	T	p	C
		3	o	o	3
AGILE METHODOLOGIES					

Course Objectives:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of agile development and testing techniques.
- To understand the benefits and pitfalls of working in an agile team.
- To understand agile development and testing.

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

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

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

UNIT II AGILE PROCESS

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

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT

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

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE

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

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, -Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, -Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

REFERENCES:

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

I Year - II Semester	22PCS22	L	T	P	C
		0	0	4	2
Machine Learning with python Lab					

Course Objectives:

This course will enable students to

- **To learn and understand different Data sets in implementing the machine learning**
- **algorithms. Implement the machine learning concepts and algorithms in any suitable Language of choice.**

Course Outcomes (COs): At the end of the course, student will be able to

- **Implement procedures for the machine learning algorithms**
- **Design Python programs for various Learning algorithms**
- **Apply appropriate data sets to the Machine Learning algorithms**
- **Identify and apply Machine Learning algorithms to solve real world problems**

Experiment-I:

Exercises to solve the real-world problems using the following machine learning methods:

a) Linear Regression

b) Logistic Regression.

Experiment-2:

Write a program to Implement Support Vector Machines.

Experiment-3:

Exploratory Data Analysis for Classification using Pandas and Matplotlib.

Experiment-4:

Implement a program for Bias, Variance, and Cross Validation.

Experiment-5:

Write a program to simulate a perception network for pattern classification and function approximation.

Experiment-6:

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-7:

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:

Write a program to implement the naive Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.

Experiment-9:

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-10:

Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k- Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-11:

Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

I Year - II Semester	22PCS23	L	T	p	C
		0	0	4	2

Mean Stack Technologies Lab

Course Objectives:

From the course the student will

- **Learn the core concepts of both the frontend and backend**
- **programming course. Get familiar with the latest web development technologies.**
- **Learn all about SQL and Mongo**
- **databases. Learn complete web development process.**

Course Outcomes:

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

- **Identify the Basic Concepts of Web & Markup Languages.**
- **Develop web Applications using Scripting Languages &**
- **Frameworks. Creating & Running Applications using JSP libraries.**
- **Creating Our First Controller Working with and displaying in Angular Js and Nested Forms with ng- form.**
- **Working with the Files in React JS and Constructing Elements with Data.**

Experiment-1:

Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist of the following pages.

Home page

- **Registration and user Login**
- **User**
- **profile**
- **page Books**
  catalog
  shopping
  cart
- **Payment by credit card Order Conformation**

Experiment-2:

Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

Experiment-3:

Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using on click ( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert

c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert

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

Experiment-4:

Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

Experiment-5:

Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

Experiment-6:

Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.

b) Write a PHP Script to check whether the given number is Palindrome or not

Experiment-7:

Implement the following in CSS

a) Implementation of 'get' and 'post' methods.

b) Implementation in colors, boarder padding.

c) Implementation button frames tables, navigation bars.

Experiment-8:

Implement the web applications with Database using a) PHP, b) Servlets and c) JSP.

Experiment-9:

Write a program to design a simple calculator using

a) JavaScript

b) PHP

c) Servlet

and d) JSP.

Experiment-l0:

Create registration and login forms with validations using Jscript query.

Experiment-11:

Jscript to retrieve student information from student database using database connectivity.

Experiment-l2:

Implement the following in React JS

a) Using React Js creating constructs data elements. b) Using React Js implementations DOM.

Experiment-l3:

Implement the following in Angular JS

a) Angular Js data binding.

b) Angular JS directives and Events.

c) Using angular Js fetching data from MySQL.

Experiment-l4:

Develop and demonstrate Invoking data using Jscript from Mongo DB.

Experiment-l5:

Create an Online fee payment form using JScript and Mango DB.

I Year - II Semester	22PCS24	L	T	P	C
		2	0	0	2
Mini project with seminar					

II Year - I Semester	22PCS26	L	T	P	C
		3	0	0	3

Deep Learning

Course Objectives:

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

- **Learn deep learning methods for working with sequential**
- **data, Learn deep recurrent and memory networks,**
- **Learn deep Turing machines,**
- **Apply such deep learning mechanisms to various learning problems.**
- **Know the open issues in deep learning, and have a grasp of the current research directions.**

Course Outcomes:

After the completion of the course, student will be able to

- **Demonstrate the basic concepts fundamental learning techniques and**
- **layers. Discuss the Neural Network training, various random models.**
- **Explain different types of deep learning network**
- **models. Classify the Probabilistic Neural Networks.**
- **Implement tools on Deep Learning techniques.**

UNIT I: Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Feed forward neural network: Artificial Neural Network, activation function, multi-layer neural network.

UNIT II: Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization.
Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

UNIT III: Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

UNIT IV: probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

UNIT V: Applications: Object recognition, sparse coding, computer vision, natural language processing. Introduction to Deep Learning Tools: Caffe, Theano, Torch.

Text Books:

1. **Good fellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.**
2. **Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.**

Reference Books:

1. **Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.**
2. **Matrix Computations, Golub, G., H., and Van Loan, C., F, JHU Press, 2013.**
3. **Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.**

II Year - I Semester	22PCS27	L	T	P	C
		3	0	0	3

Social Network Analysis

Course Objectives:

- **The learning objective of the course Social Network Analysis is to provide students with knowledge of network analysis applicable to real world data, with examples from today's most essential popular social networks.**

Course Outcomes:

- **After the completion of the course, student will be able to**
- **Demonstrate social network analysis and measures.**
- **Analyze random graph models and navigate social networks data**
- **Apply the network topology and Visualization tools.**
- **Analyze the experiment with small world models and clustering models.**
- **Compare the application driven virtual communities from social network Structure.**

UNIT I: Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II: Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III: Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV: Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT V: Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

1. **S. Wasserman and K. Faust. Social Network Analysis: Methods and Applications (Cambridge, Cambridge University Press, 1994)**
2. **D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world-2010**

Reference Books:

1. **Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman, Katherine Faust, 1994.**

II Year-II Semester	22PCS31	L	T	P	C
		0	0	32	16
Dissertation-II					

(DISSERTATION) DISSERTATION PHASE I AND PHASE II Syllabus contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- **Relevance to social needs of society**
- **Relevance to value addition to existing facilities in the institute**
- **Relevance to industry need**
- **Problems of national importance**
- **Research and development in various domain**

The student should complete the

- **following: Literature**
- **survey Problem Definition**
  Motivation for study and
  Objectives
- **Preliminary design / feasibility / modular approaches**
- **Implementation and Verification**
- **Report and presentation**

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- **Experimental verification / Proof of concept.**
- **Design, fabrication, testing of Communication System.**
- **The viva-voce examination will be based on the above report and work.**

Guidelines for Dissertation Phase I and II at M. Tech. (Electronics):

- **As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase I: July to December and Phase II: January to June.**
- **The dissertation may be carried out preferably in-house i.e.** and laboratories department's centers OR in industry allotted through department's P coordinator.
- **After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.**
- **Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.**

- **– Phase I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.**
- **Phase I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.**
- **During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.**
- **Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.**
- **Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work Course Outcomes:**

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

1. **Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.**
2. **Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.**
3. **Ability to present the findings of their technical solution in a written report.**
4. **Presenting the work in International/ National conference or reputed journals.**

I Year-I Semester	22PAC01	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING					

Course objectives:

Students will be able to:

Understand that how to improve your writing skills and level of readability

Learn about what to write in each section

Understand the skills needed when writing a Title Ensure the good quality of paper at very first- time submission

Syllabus

Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.
Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht
Heidelberg London, 2011

I Year-I Semester	22PAC02	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: DISASTER MANAGEMENT					

Course Objectives: -

Students will be able to:

learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries

They work in

SYLLABUS		
Units	**CONTENTS**	**Hours**
1	**Introduction** **Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.**	4
2	**Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem.** **Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.**	4
3	**Disaster Prone Areas In India** **Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special** **Reference To Tsunami; Post-Disaster Diseases And Epidemics**	4
4	**Disaster Preparedness And Management** **Preparedness: Monitoring of Phenomena Triggering A Disaster Or Hazard;** **Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.**	4
5	**Risk Assessment** **Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co Operation In Risk Assessment And Warning, People's Participation** **In Risk Assessment. Strategies for Survival**	4
6	**Disaster Mitigation** **Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India**	4

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi

I Year-I Semester	22PAC03	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE					

Course Objectives

1. **to get a working knowledge in illustrious Sanskrit, the scientific language in the world**
2. **Learning of Sanskrit to improve brain functioning**
3. **Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power**
4. **The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge From ancient literature**

Syllabus

Unit	Content	Hours
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	4
2	Order Introduction of roots Technical information about Sanskrit Literature	4
3	Technical concepts of Engineering-Electrical,	4
4	Technical concepts of Engineering - Mechanical.	4
5	Technical concepts of Engineering - Architecture.	4
6	Technical concepts of Engineering– Mathematics.	4

Suggested reading

1. "Abhyaspustakam" – **Dr.Vishwas, Samskrita-Bharti Publication, New Delhi**
2. "Teach Yourself Sanskrit" Prathama Deeksha **-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication**
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books **(P) Ltd., New Delhi.**

Course Output

Students will be able to

1. **Understanding basic Sanskrit language**
2. **Ancient Sanskrit literature about science & technology can be understood**
3. **Being a logical language will help to develop logic in students**

I Year-I Semester	22PAC04	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: VALUE EDUCATION					

Course Objectives

Students will be able to

1. **Understand value of education and self- development**
2. **Imbibe good values in students**
3. **Let the should know about the importance of character**

Syllabus

Unit	Content	Hours
1	Values and self-development– Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements	4
2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature ,Discipline	4
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault	4
4	Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	4
5	Character and Competence Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women.	4
6	All religions and same message. Mind your Mind, Self-control. Honesty, Studying	4

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course outcomes

Students will be able to 1.Knowledge of self-development

2. Learn the importance of Human values 3.Developing the overall personality

I Year-I Semester	22PAC05	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: CONSTITUTION OF INDIA					

Course Objectives:
Students will be able to:

1. **Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.**
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional **Role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.**
3. **To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.**

Syllabus		
Units	Content	Hours
1	History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	4
2	Philosophy of the Indian Constitution: Preamble Salient Features	4
3	Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to	4
4	Organs of Governance: Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications	4
5	Local Administration: Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
6	Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	4

1. **The Constitution of India, 1950 (Bare Act), Government Publication.**
2. **Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.**
3. **M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.**
4. **D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.**

Course Outcomes:

Students will be able to:

1. **Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.**
2. **Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.**
3. **Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.**
4. **Discuss the passage of the Hindu Code Bill of 1956.**

I Year-I Semester	22PAC06	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: PEDAGOGY STUDIES					

Course Objectives:

Students will be able to:

4. **Review existing evidence on the review topic to inform programmer design and policy making undertaken by the DfID, other agencies and researchers.**
5. **Identify critical evidence gaps to guide the development.**

Syllabus		
Units	**Content**	**Hours**
1	**Introduction and Methodology:** **Aims and rationale, Policy background, Conceptual framework and terminology** **Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and**	4
2	**Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.** **Curriculum, Teacher education.**	4
3	**Evidence on the effectiveness of pedagogical practices** **Methodology for the in depth stage: quality assessment of included studies.** **How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?**	4
4	**Theory of change.** **Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches.** Teachers attitudes and beliefs and Pedagogic strategies	4
5	**Professional development: alignment with classroom practices and follow-up support** **Peer support** **Support from the head teacher and the community. Curriculum and assessment** **Barriers to learning: limited resources and large class sizes**	4
6	**Research gaps and future directions** **Research design** **Contexts** **Pedagogy** **Teacher education** **Curriculum and assessment**	4

1. **Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.**
2. **Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.**
3. **Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.**
4. **Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272 282.**
5. **Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.**
6. **Chavan M (2003)** Read India: A mass scale, rapid, 'learning to read' campaign.
7. **www.pratham.org/images/resource%20working%20paper%202.pdf.**

Course Outcomes:

Students will be able to understand:

1. **What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?**
2. **What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?**
3. **How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?**

I Year-I Semester	22PAC07	L	T	P	C
		2	0	0	0
AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA					

Course Objectives

1. **To achieve overall health of body and mind**
2. **To overcome stress**

Syllabus

Unit	Content	Hours
1	Definitions of Eight parts of yog. (Ashtanga)	5
2	Yam and Niyam Do s and Don t s in life Ahinsa, satya, astheya, bramhacharya and aparigraha	5
3	Yam and Niyam Do s and Don t s in life Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	5
4	Asan and Pranayam Various yog poses and their benefits for mind & body	5
5	Regularization of breathing techniques and its effects-Types of pranayam	4

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita **Ashrama (Publication Department), Kolkata**

Course Outcomes:

Students will be able to:

1. **Develop healthy mind in a healthy body thus improving social health also**
2. **Improve efficiency**

I Year-I Semester	22PAC07	L	T	P	C
		2	0	0	0

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

1. **To learn to achieve the highest goal happily**
2. **To become a person with stable mind, pleasing personality and determination**
3. **To awaken wisdom in students**

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	4
2	Neetisatakam-Holistic development of personality Verses- 52 53 59 (dont s) Verses- 71 73 75 78 (do s)	4
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,	4
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	4
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18	4
6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	4

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam **(Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.**

Course Outcomes

Students will be able to

1. **Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life**
2. **The person who has studied Geeta will lead the nation and mankind to peace and prosperity**
3. **Study of Neetishatakam will help in developing versatile personality of students**