R19

M. Tech – CSE

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Specialization: Computer Science and Engineering

I M. Tech. – I Semester

S.No	Course Code	Subject	L	T	P/Drg	C
1.	19HS0823	Research Methodology and IPR	2	-	-	2
2.	19HS0841	Discrete Mathematics and Applications	3	-	-	3
3.	19CS5001	Advanced Data Structures	3	-	-	3
Programme Elective - I						
4.	19CS5010	Machine Learning	3	-	-	3
	19CS5011	Wireless Sensor Networks				
	19CS5012	Introduction to Intelligent Systems				
Programme Elective - II						
5.	19CS5013	Data Science	3	-	-	3
	19CS5014	Distributed Systems				
	19CS5015	Advanced Wireless and Mobile Networks				
6.	19CS5002	Advanced Data Structures Lab	-	-	4	2
7.	19CS5016	Machine Learning Lab	-	-	4	2
Audit Course – I						
8.	19HS0818	English for Research Paper Writing	2	-	-	0
Contact Periods / Week			16	-	08	**18**
				Total/Week 24		

I M. Tech. – II Semester

1.	19CS5003	Advanced Algorithms	3	-	-	3
2.	19CS5004	Soft Computing	3	-	-	3
Programme Elective - III						
3.	19CS5017	Data Preparation and Analysis	3	-	-	3
	19CS5018	Secure Software Design & Enterprise Computing				
	19CS5019	Computer Vision				
Programme Elective – IV						
4.	19CS5020	Human and Computer Interaction	3	-	-	3
	19CS5021	GPU Computing				
	19CS5022	Digital Forensics				
5.	19CS5005	Advanced Algorithms Lab	-	-	4	2
6.	19CS5006	Soft Computing Lab	-	-	4	2
7.	19CS5007	Mini Project	2			2
Audit Course – II						
8.	19HS0829	Constitution of India	2	-	-	-
Contact Periods / Week			16		08	**18**
				Total/Week 24		

II M. Tech. – I Semester (CSE)

S.No	Course Code	Subject	L	T	P/Drg	C
Program Elective-V						
1.	19CS5023	Big Data Analytics	3	-	-	3
	19CS5024	Distributed Databases				
	19CS5025	Advanced Operating Systems				
Open Elective						
2.	19HS0824	Business Analytics	3	-	-	3
	19ME3121	Industrial Safety				
	19ME3021	Advances in Operations Research				
	19CE1028	Cost Management of Engineering Projects				
	19ME3022	Composite Materials				
	19EE2128	Waste to Energy				
3.	19CS5008	Phase-I Dissertation-I /Industrial Project	0	0	20	10
Contact Periods / Week			06	-	20	**16**
				Total/Week 26		

II M. Tech. – II Semester

1.	19CS5009	Phase –II Dissertation II	0	0	32	**16**
Contact Periods / Week				0	32	
				Total/Week 24		

Total Number of Credits= 18 +18+16+16 = 68

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I M. Tech – I Sem.

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2	-	-	2

(19HS0823) RESEARCH METHODOLOGY AND IPR

COURSE OBJECTIVES:

1. Understand some basic concepts of research and its methodologies.
2. Identify and discuss appropriate research topics, select appropriate research design, and implement a research project.
3. Understand the method of research writing and presenting research report and proposal
4. Provide an understanding on the importance of intellectual property rights
5. Understand the intricacies of grant of patent, patentability, licensing and revocation at national and international level.

COURSE OUTCOMES:

After the completion of the course, student would be able to:

1. Explain the key concepts and issues in research and basic framework of research process.
2. Formulate appropriate research problem and implement suitable research design for the research problem.
3. Identify various sources of information for literature review and data collection.
4. Develop an understanding of ethics in conducting applied research and make use of components of scholarly writing in report preparation.
5. Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
6. Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.

UNIT I:

Research Methodology: Meaning, Objective and importance of research - Types of research - steps involved in research - Motivation in Research, Types of Research - Significance of Research - Research Methods versus Methodology - Importance of Knowing How Research is done - Research Process - Criteria of Good Research defining research problem - Errors in selecting a research problem

UNIT II:

Research Design and Data Collection: Research design - Different Research Designs - Effective literature studies - Classification of Data - Methods of Data Collection – Sampling - Sampling techniques, procedure and methods - Ethical considerations in research - Responsibility of ethics in research

UNIT III:

Research Report Writing: 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 IV:

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 V:

Patent Rights: Scope of Patent Rights - Licensing and transfer of technology - Patent information and databases - Geographical Indications - 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

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students".
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007.
2. Mayall, "Industrial Design", McGraw Hill, 1992. Niebel , "Product Design", McGraw Hill, 1974.
3. Asimov, "Introduction to Design", Prentice Hall, 1962.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
5. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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(19HS0841) DISCRETE MATHEMATICS AND APPLICATIONS

COURSE OBJECTIVES:

1. To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning
2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.
3. To understand the various computer science applications and recent Trends.

COURSE OUTCOMES:

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

1. Understand the basic notions of discrete and continuous probability.
2. Understand the methods of statistical inference and the role that sampling distributions paly in those methods.
3. Perform correct and meaningful statistical analysis, of simple to moderate complexity.
4. Learning various engineering applications in computers.
5. Understand the methodology of soft computing and bioinformatics.

UNIT- I

Probability Mass – Density and cumulative distribution functions - Parametric families of distributions- Expected value – Variance - Conditional expectation - Applications of the univariate and multivariate Central Limit Theorem - Probabilistic inequalities - Markov chains.

UNIT- II

Random samples - Sampling distributions of estimators - Methods of Moments and Maximum Likelihood.

UNIT- III

Graph Theory: Isomorphism - Planar graphs - Graph Coloring - Hamilton circuits and Euler cycles - Permutations and Combinations with and without repetition - Specialized techniques to solve combinatorial enumeration problems.

UNIT- IV

Computer science and engineering applications: Data mining - Network protocols - Analysis of Web traffic - Computer security - Software engineering - Computer architecture - Operating systems - Distributed systems - Bioinformatics - Machine learning.

UNIT- V

Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bio informatics - Soft computing and Computer vision.

TEXT BOOKS:

1. John Vince , Foundation Mathematics for Computer Science, Springer.
2. K.Trivedi, K.Wiley, Probability and Statistics with Reliability, Queuing, and Computer Science Applications.

REFERENCES:

1. Alan Tucker, Wiley, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Applied Combinatorics.
2. M. Mitzenmacher and E. Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge, 2005.
3. Swapna Kumar Sarkar, A Textbook of Discrete Mathematics, S.Chand Publications, 9e, 2016

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(19CS5001) ADVANCED DATA STRUCTURES

COURSE OBJECTIVES:

The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.

1. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
2. Student should be able to come up with analysis of efficiency and proofs of correctness.

COURSE OUTCOMES:

Understand the implementation of symbol table using hashing techniques.

1. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
2. Develop algorithms for text processing applications.
3. Understand the recent trends in Hashing Technique.
4. Understand how to Applying Dynamic Programming to the LCS Problem
5. Identify suitable data structures and develop algorithms for computational geometry Problems.

UNIT-I

Dictionaries: Definition - Dictionary Abstract Data Type - Implementation of Dictionaries.
Hashing: Review of Hashing - Hash Function - Collision Resolution Techniques in Hashing - Separate Chaining - Open Addressing - Linear Probing - Quadratic Probing - Double Hashing – Rehashing - Extendible Hashing.

UNIT-II

Skip Lists: Need for Randomizing - Data Structures and Algorithms - Search and Update Operations on Skip Lists - Probabilistic Analysis of Skip Lists - Deterministic Skip Lists
Trees: Binary Search Trees - AVL Trees - Red Black Trees - 2-3 Trees - B-Trees – Splay Trees

UNIT-III

Text Processing: Sting Operations - Brute-Force Pattern Matching - The Boyer-Moore Algorithm - The Knuth-Morris-Pratt Algorithm - Standard Tries - Compressed Tries - Suffix Tries - The Huffman Coding Algorithm - The Longest Common Subsequence Problem (LCS) - Applying Dynamic Programming to the LCS Problem.

UNIT-IV

Computational Geometry: One Dimensional Range Searching - Two Dimensional Range Searching - Constructing a Priority Search Tree - Searching a Priority Search Tree - Priority Range Trees - Quad trees - k-D Trees.

UNIT-V

Recent Trends in Hashing: Trees and various computational geometry methods for efficiently solving the new evolving problem.

TEXT BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

REFERENCES:

1. Peter Brass, Advanced Data Structures, Cambridge University Press, ISBN: 9781107439825, 9781107439825.
2. G A V Pai, Seymour Lipschutz, Data Structures, Schaums Outlines, Tata McGraw Hill, ISBN: 9780070601680, 0070601682
3. Steven S Skiena, The Algorithm Design Manual, Kindle 2nd Edition.

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Programme Elective I
(19CS5010) MACHINE LEARNING

COURSE OBJECTIVES:

To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.

1. To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
2. Explore supervised and unsupervised learning paradigms of machine learning.
3. To explore Deep learning technique and various feature extraction strategies.

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Extract features that can be used for a particular machine learning approach in various IOT Applications.
2. Compare and contrast pros and cons of various machine learning techniques and to get an Insight of when to apply a particular machine learning approach.
3. Mathematically analyze various machine learning approaches and paradigms.
4. Understand the classification methods for IOT applications.
5. Understand trends in various learning techniques of machine learning

UNIT-I

Supervised Learning (Regression/Classification): Basic methods - Distance-based methods- Nearest-Neighbors - Decision-Trees - Naive Bayes - Linear models - Linear Regression - Logistic Regression - Generalized Linear Models - Support Vector Machines - Nonlinearity and Kernel Methods - Beyond Binary Classification - Multi-class/Structured Outputs - Ranking

UNIT-II

Unsupervised Learning: Clustering - K-means/Kernel K-means - Dimensionality Reduction- PCA and kernel PCA - Matrix Factorization and Matrix Completion - Generative Models (mixture models and latent factor models)

UNIT-III

Evaluating Machine Learning algorithms and Model Selection - Introduction to Statistical Learning Theory - Ensemble Methods (Boosting, Bagging- Random Forests)

UNIT-IV

Sparse Modeling and Estimation - Modeling Sequence/Time-Series Data - Deep Learning and Feature Representation Learning Scalable Machine Learning (Online and Distributed Learning) a selection from some other advanced topics - e.g.- Semi-supervised Learning - Active Learning - Reinforcement Learning - Inference in Graphical Models - Introduction to Bayesian Learning and Inference.

UNIT-V

Recent trends in various learning techniques of machine learning and classification methods for IOT applications - Various models for IOT applications.

TEXT BOOKS:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online).

REFERENCES:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007. Tomm. Mitchell , Machine Learning, Tata McGraw Hill, 2017
2. Shai Shalev - Scwartz, Sai Ben David, Understanding Machine Learning: From Theoryto Algorithms, Kindle Edition, 2015

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Programme Elective I
(19CS501) WIRELESS SENSOR NETWORKS
(Common to all Branches)

COURSE OBJECTIVES:

1. Architect sensor networks for various application setups.
2. Devise appropriate data dissemination protocols and model links cost.
3. Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
4. Evaluate the performance of sensor networks and identify bottlenecks.

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Describe and explain radio standards and communication protocols for wireless sensor networks.
2. Explain the function of the node architecture and use of sensors for various applications.
3. Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.
4. Be familiar with MAC Protocol Analysis.
5. Describe the security system in wireless sensor networks.

UNIT-I

Introduction to Wireless Sensor Networks: Course Information - Introduction to Wireless Sensor Networks – Motivations – Applications - Performance metrics - History and Design factors.

Network Architecture: Traditional layered stack - Cross-Layer designs - Sensor Network Architecture.

Hardware Platforms: Motes - Hardware parameters.

UNIT-II

Introduction to NS-3: Introduction to Network Simulator 3 (NS-3) - Description of the NS -3 core module and simulation example.

UNIT-III

Medium Access Control Protocol design: Fixed Access-Random-access-WSN protocols: Synchronized Duty-cycled

Introduction to Markov Chain: Discrete time Markov Chain definition–Properties Classification and analysis.

MAC Protocol Analysis - Asynchronous duty-cycled - X-MAC Analysis (Markov Chain)

UNIT-IV

Security - Possible attacks – Countermeasures – SPINS - Static and Dynamic key

Routing protocols: Introduction - MANET protocols

Routing protocols for WSN: Resource-aware routing - Data-Centric–Geographic Routing - Broadcast - Multicast

UNIT-V

Opportunistic Routing Analysis: Analysis of opportunistic routing (MarkovChain) - Advanced topics in wireless sensor networks - Recent development in WSN standards - Software applications.

TEXT BOOKS:

1. W. Dargie and C. Poellabauer, Fundamentals of Wireless Sensor Networks–Theory and Practice, Wiley Publications, 2010
2. Kazem Sohraby, Daniel Minoli and TaiebZnati, Wiley Wireless sensor networks - Technology, Protocols, and Applications, Interscience 2007

REFERENCES:

1. Takahiro Hara, Vladimir I. Zadorozhny, and Erik Buchmann, Wireless Sensor Network Technologies for the Information Explosion Era, springer 2010.
2. Ananthram Swami, Qing Zhao, Yao-Win Hang, Lang Tong, Wireless Sensor Networks, Hardcover Edition, 2009
3. C.Siva Ram Murthy and B.S.Murthy, Adhoc Wireless Networks, Pearson Education, 2006

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Programme Elective I
(19CS5012) INTRODUCTION TO INTELLIGENT SYSTEMS

COURSE OBJECTIVES:

1. The aim of the course is to introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach.
2. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

COURSE OUTCOMES:

1. Able to demonstrate knowledge of the fundamental principles of intelligent systems and would be able to analyses and compare the relative merits of a variety of AI problem solving techniques.
2. Able to understand Biological foundations to intelligent systems.
3. Able to demonstrate Knowledge of genetic algorithm.
4. Understand Learning Techniques on uncertainty reasoning.
5. A study of different learning and evolutionary algorithms.

UNIT-I

Biological foundations to intelligent systems I - Artificial neural networks – Back propagation networks - Radial basis function networks - Recurrent networks.

UNIT-II

Biological foundations to intelligent systems II-Fuzzy logic - Knowledge Representation and inference mechanism - Genetic algorithm - Fuzzy neural networks.

UNIT-III

Search Methods: Basic concepts of graph and tree search - Three simple search methods Breadth-First search - Depth-first search - Iterative deepening search.

Heuristic search methods - Best-first search - Admissible evaluation functions - Hill-climbing search - Optimization and search such as Stochastic annealing and Genetic algorithm.

UNIT-IV

Knowledge representation and logical inference Issues in knowledge representation - Structured representation such as Frames – Scripts - Semantic networks and Conceptual graphs - Formal logic and Logical inference.

Knowledge based systems structures - Its basic components-Ideas of Blackboard architectures.

UNIT-V

Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning - Certainty factors and Dempster - Shafer Theory of Evidential reasoning- A study of different learning and evolutionary algorithms such as Statistical learning and Induction learning.

TEXT BOOKS:

1. Luger G.F. and Stubblefield W.A Artificial Intelligence: Structures and strategies for Complex Problem Solving,. (2008). Addison Wesley, 6th edition.
2. Russell S. and Norvig P, Artificial Intelligence: A Modern Approach, Prentice-Hall, 3rd edition, 2009.

REFERENCES:

1. Crina Grosan, Ajith Abraham, Intelligent Systems: A Modern Approach, Springer, 2011.
2. Danis Rothman, Artificial Intelligence by Example, Packt Publishing Pvt Ltd, ISBN: 9781788990547, 1788990544
3. Gabor Szederkenyi, R.Lakner, M.Gerzson, Intelligent Control Systems: An Introduction with Examples, Kindle Edition, 2013

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Programme Elective
(19CS5013) DATA SCIEN CE II

COURSE OBJECTIVES:

1. Provide you with the knowledge and expertise to become a proficient data scientist.
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
3. Produce Python code to statistically analyze a dataset;
4. Critically evaluate data visualizations based on their design and use for communicating stories from data

COURSE OUTCOMES:

1. Explain how data is collected, managed and stored for data science;
2. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;
3. Implement data collection and management scripts using Mongo DB
4. Understand the different type of Data visualization tools.
5. Understand the different application of Data Science.

UNIT-I

Introduction to core concepts and technologies- Introduction- Terminology- Data science process-Data science toolkit- Types of data - Example applications.

UNIT-II

Data collection and management – Introduction - Sources of data - Data collection and APIs - Exploring and fixing data - Data storage and management - Using multiple data sources

UNIT–III

Data analysis - Introduction-Terminology and concepts - Introduction to statistics - Central tendencies and distributions – Variance - Distribution properties and arithmetic - Samples/CLT - Basic machine learning algorithms - Linear regression – SVM - Naive Bayes.

UNIT-IV

Data visualization: Introduction - Types of data visualization - **Data for visualization**: Data types - Data encodings - Retinal variables - Mapping variables to encodings - Visual encodings.

UNIT-V

Applications of Data Science - Recent trends in various data collection and analysis techniques - Various visualization techniques - Application development methods of used in data science.

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt, *Doing Data Science,* Straight Talk from The Frontline, O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman , *Mining of Massive Datasets*. v2.1, Cambridge University Press.

REFERENCES:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishing pvt. Ltd, 2016.
2. Joel Grus, Data Science from Scratch, O'Reilly, Second Edition, 2019
3. Sinan Ozdemir, Principles of Data Science, Packt Publications Pvt. Ltd, 2016.

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Programme Elective II
(19CS5014) DISTRIBUTED SYSTEMS

COURSE OBJECTIVES:

1. To explain what a distributed system is, why you would design a system as a distributed system, and what the desired properties of such systems are;
2. To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions;
3. To recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems;
4. To design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognize when this is not possible, and explain why;
5. To build distributed system software using basic OS mechanisms as well as higher-level middleware and languages.

COURSE OUTCOMES:

1. Able to demonstrate knowledge of the basic elements and concepts related to distributed system technologies;
2. Able to demonstrate knowledge of the core architectural aspects of distributed systems;
3. Able to design and implement distributed applications;
4. Able to demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems);
5. Able to use and apply important methods in distributed systems to support scalability and fault tolerance;
6. Able to demonstrate experience in building large-scale distributed applications.

UNIT- I

Characterization of Distributed Systems: Introduction - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural – Fundamental - Inter process Communication - Introduction - API for Internet protocols - External data representation and marshaling - Client -server communication - Group communication - Case study-Inter-process Communication in UNIX.

UNIT- II

Distributed Objects and Remote Invocation: Introduction - Communication between distributed objects - Remote procedure calls - Events and notifications - Case study- Java RMI. Operating System Support - Introduction - OS layer - Protection - Processes and threads - Communication and invocation OS architecture.

UNIT- III

Distributed File Systems: Introduction - File service architecture - Case Study: Sun Network File System - Enhancements and further developments. Name Services - Introduction - Name Services and the Domain Name System - Directory Services - **Case Study**: Global Name Service.

UNIT- IV

Time and Global States: Introduction - Clocks, events and process states – Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging. Coordination and Agreement - Introduction - Distributed mutual exclusion - Elections - Multicast communication - Consensus and related problems.

UNIT- V

Distributed Shared Memory: Introduction - Design and implementation issues – Sequential consistency and Ivy case study Release consistency and Minim case study - Other consistency models. CORBA Case Study - Introduction - CORBA RMI - CORBA services.

TEXT BOOKS:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Distributed Systems: Concepts and Design, 4th Edition, Pearson Education.
2. S.Ghosh, Chapman & Hall/CRC, Distributed Systems, Taylor & Francis Group, 2010.

REFERENCES:

1. A.S. Tanenbaum and M. V. Steen, Distributed Systems: Principles and Paradigms, Second Edition, Prentice Hall, 2006.
2. M.L.Liu Distributed Computing Principles and Applications, Pearson Addison Wesley, 2004.
3. Mukesh Singhal, Advanced Concepts In Operating Systems, Mc GrawHill Series in Computer Science, 1994.
4. Nancy A. Lynch, Distributed Algorithms, the Morgan Kaufmann Series in Data Management System, Morgan Kaufmann Publishers, 2000.

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Programme Elective II
(19CS5015) ADVANCED WIRELESS AND MOBILE NETWORKS

COURSE OBJECTIVES:
The students should get familiar with the wireless/mobile market and the future needs and challenges.

1. To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
2. To learn how to design and analyses various medium access
3. To learn how to evaluate MAC and network protocols using network simulation software tools.
4. The students should get familiar with the wireless/mobile market and the future needs and challenges.

COURSE OUTCOMES:
After completion of course, students would be:

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Design wireless networks exploring trade-offs between wire line and wireless links. Develop mobile applications to solve some of the real world problems.
5. Able to understand Security in wireless Networks.

UNIT- I
INTRODUCTION: Wireless Networking Trends - Key Wireless Physical Layer Concepts - Multiple Access Technologies – CDMA – FDMA – TDMA - Spread Spectrum technologies- Frequency reuse - Radio Propagation and Modeling - Challenges in Mobile Computing: Resource poorness – Bandwidth - Energy etc.
WIRELESS LOCAL AREA NETWORKS: IEEE 802.11 Wireless LANs Physical &MAC layer - 802.11 MAC Modes (DCF PCF) IEEE 802.11 standards - Architecture & protocols - Infrastructure vs. Adhoc Modes - Hidden Node & Exposed Terminal Problem – Problems - Fading Effects in Indoor and outdoor WLANs - WLAN Deployment issues.

UNIT- II
WIRELESS CELLULAR NETWORKS: 1G and 2G - 2.5G - 3G and 4G - Mobile IPv4 - Mobile IPv6 - TCP over Wireless Networks - Cellular architecture - Frequency reuse -Channel assignment strategies - Handoff strategies - Interference and system capacity - Improving coverage and capacity in cellular systems Spread spectrum Technologies.

UNIT- III
WiMAX (Physical layer, Media access control, Mobility and Networking) - IEEE 802.22 Wireless Regional Area Networks - IEEE 802.21 Media Independent Handover Overview.

WIRELESS SENSOR NETWORKS: Introduction–Application–Physical - MAC layer and Network Layer - Power Management - Tiny OS Overview.

UNIT- IV

WIRELESS PANs: Bluetooth AND Zigbee - Introduction to Wireless Sensors. **SECURITY:** Security in wireless Networks Vulnerabilities - Security techniques – WiFi-Security - DoS in wireless communication.

UNIT- V

ADVANCED TOPICS: IEEE 802.11x and IEEE 802.11i standards - Introduction to Vehicular Adhoc Networks.

TEXT BOOKS:

1. Schiller J., Mobile Communications , Addison Wesley 2000
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005

REFERENCES:

1. Stojmenic Ivan, John Wiley and Sons Handbook of Wireless Networks and Mobile Computing, Inc 2002
2. Yi Bing Lin and Imrich Chlamtac, John Wiley and Sons Wireless and Mobile Network Architectures, Inc 2000
3. Pandya Raj, Mobile and Personal Communications Systems and Services PHI 200

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(19CS5002) ADVANCED DATA STRUCTURE S LAB

COURSE OBJECTIVES:

The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.

1. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
2. Student should be able to come up with analysis of efficiency and proofs of correctness.

COURSE OUTCOMES:

Understand the implementation of symbol table using hashing techniques.

1. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
2. Develop algorithms for text processing applications.
3. Develop the recent trends in Hashing Technique.
4. Identify suitable data structures and develop algorithms for computational geometry Problems.
5. Implement various sorting, and graph traversal techniques.

LIST OF EXPERIMENTS:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   a) Linear search b) Binary search
2. Write Java programs to implement the following using an array.
   a) Stack ADT b) Queue ADT
3. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
4. Write a Java program to implement circular queue ADT using an array.
5. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT b) Queue ADT
6. Write Java programs to implement the dequeue (double ended queue) ADT using
   a) Array b) Singly linked list c) Doubly linked list.
7. Write a Java program to implement priority queue ADT.
8. Write a Java program to perform the following operations:
   a) Construct a binary search tree of elements.
   b) Search for a key element in the above binary search tree.
   c) Delete an element from the above binary search tree.
9. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
10. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
11. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    a) Preorder b) In-order c) Post-order.

12. Write Java programs for the implementation of BFS and DFS for a given graph.
13. Write Java programs for implementing the following sorting methods:
    a) Bubble sort b) Merge sort c) Binary tree sort d) Insertion sort e) Heap sort
    f) Quick sort g) Radix sort
14. Write a Java program to perform the following operations:
    a) Insertion into a B-tree b) Searching in a B-tree
15. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
16. Write a Java program that implements KMP algorithm for pattern matching.

TEXT BOOKS:

1. S.Sahni, *Data structures, Algorithms and Applications in Java,* Universities Press.
2. Adam Drozdek, *Data structures and Algorithms in Java*,3rd edition, Cengage Learning.

REFERENCES:

1. M.A.Weiss, *Data structures and Algorithm Analysis in Java*, 2nd edition, Addison-
2. Peter Brass, *Advanced Data Structures, Cambridge University Press*, ISBN: 9781107439825, 9781107439825.
3. G A V Pai, Seymour Lipschutz, *Data Structures*, Schaums Outlines, Tata McGraw Hill, ISBN:9720070601680, 0070601682
4. Steven S Skiena**,***The Algorithm Design Manual,* Kindle 2nd Edition.

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I M. Tech – I Sem.

(19CS5016) MACHINE LEARNING LAB

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COURSE OBJECTIVES:

To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.

1. To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
2. Explore supervised and unsupervised learning paradigms of machine learning.
3. To explore Deep learning technique and various feature extraction strategies.

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Experiment the features that can be used for a particular machine learning approach in various IOT Applications.
2. Implement various machine learning approaches and paradigms.
3. Implement the classification methods for IOT applications.
4. Implement the trends in various learning techniques of machine learning

LIST OF EXPERIMENTS:

1. Decision Tree learning
2. Implement Logistic Regression
3. Implement classification using Multilayer perceptron
4. Implement classification using SVM
5. Implement Boosting and Bagging for Ensemble Learning
6. Implement K-means clustering to Find Natural Patterns in Data
7. Implement Principle Component Analysis for Dimensionality Reduction
8. Maximum Likelihood Estimation of Gaussian Mixtures Using the Expectation Maximization Algorithm
9. Estimate Hidden Markov Model Parameters
10. Implement Genetic algorithms
11. Implement K-nearest Neighbors

TEXT BOOKS:

1. Kevin Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, *The* Elements of Statistical Learning, Springer 2009 (freely available online).

REFERENCES:

1. Christopher Bishop , Pattern Recognition and Machine Learning, Springer, 2007.
2. Tomm. Mitchell, Machine Learning, Tata McGraw Hill, 2017
3. Shai Shalev - Scwartz, Sai Ben David, Kindle Edition, Understanding Machine Learning: From Theory to Algorithms, 2015

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I M. Tech – I Sem.

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AUDIT COURSE – I
(19HS0818) ENGLISH FOR RESEARCH PAPER WRITING

COURSE OBJECTIVES:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title.
4. Ensure the good quality of paper at very first-time submission.

COURSE OUTCOMES:

Students will be able to:

1. Apply improved writing skills and level of readability.
2. Understand what to write in each section.
3. Understand the skills needed when writing a Title.
4. Draft good quality of paper at very first-time submission.

UNIT-I

Planning and Preparation - Word Order - Breaking up long sentences - Structuring Paragraphs and Sentences - Being Concise and Removing Redundancy - Avoiding Ambiguity and Vagueness.

UNIT-II

Clarifying Who Did What - Highlighting Your Findings - Hedging and Criticizing - Paraphrasing and Plagiarism - Sections of a Paper - Abstracts and Introduction.

UNIT-III

Review of the Literature – Methods – Results – Discussion – Conclusions - The Final Check.

UNIT-IV

Key skills needed when writing a Title - Key skills needed when writing abstract - Key skills needed when writing an Introduction - Skills when writing a Review of the Literature.

UNIT-V

Skills needed when writing the Methods - Skills needed when writing the Results - Skills needed when writing the Discussion - Skills needed when writing the Conclusions.

TEXT BOOKS:

1. Goldbort R, *Writing for Science*, (2006), Yale University Press.
2. Day R , *How to Write and Publish a Scientific Paper*, Cambridge University Press,2006

REFERENCES:

1. High man N, Handbook of Writing for the Mathematical Sciences, (1998), SIAM. Highman's Books.
2. Adrian Wall work, English for Writing Research Papers, Springer New York Dordrecht. Heidelberg London, 2011.
3. M.P.Sinha, Research Methods in English, Atlantic Publishers, 2018

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I M. Tech – II Sem.

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(19CS5003) ADVANCED ALGORITHMS

COURSE OBJECTIVES:

1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

COURSE OUTCOMES:

1. After completion of course, students would be able to:
2. Analyze the complexity/performance of different algorithms.
3. Determine the appropriate data structure for solving a particular set of problems.
4. Categorize the different problems in various classes according to their complexity.
5. Students should have an insight of recent activities in the field of the advanced data structure.

UNIT-I

Sorting: Review of various sorting algorithms - Topological sorting

Graph: Definitions and Elementary Algorithms - Shortest path by BFS - Shortest path in edge - Weighted case (Dijkstra's) - Depth-first search and Computation of strongly connected components - Emphasis on correctness proof of the algorithm and time/space analysis - example of amortized analysis.

UNIT-II

Metroid's: Introduction to greedy paradigm - Algorithm to compute a maximum weight maximal independent set - Application to MST.

Graph Matching: Algorithm to compute maximum matching - Characterization of maximum matching by augmenting paths - Edmond's Blossom algorithm to compute augmenting path.

UNIT-III

Flow-Networks: Maxflow - Mincut theorem - Ford-Fulkerson Method to compute maximum flow - Edmond-Karp maximum-Flow algorithm.

Matrix Computations: Stassen's algorithm and Introduction to divide and conquer paradigm Inverse of a triangular matrix - Relation between the time complexities of basic matrix operations - LUP-Decomposition.

UNIT-IV

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm - More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem -Conversion between base-representation and modulo-representation - Extension to polynomials – Application - Interpolation problem.
Discrete Fourier Transform (DFT): In complex field - DFT in modulo ring - Fast Fourier Transform algorithm - Schonhage- Strassen Integer Multiplication algorithm.

UNIT-V
Linear Programming: Geometry of the feasibility region and Simplex algorithm
NP-completeness: Examples - Proof of NP-hardness and NP-Completeness.
One or more of the following topics based on time and interest: Approximation algorithms - Randomized Algorithms - Interior Point Method - Advanced Number Theoretic Algorithm

TEXT BOOKS:
1. Cormen, Leiserson, Rivest, Stein, Introduction to Algorithms, Second Edition, MIT Press.
2. Aho, Hopcroft, Ullman, The Design and Analysis of Computer Algorithm, Pearson Education, 2009

REFERENCES:
1. Kleinberg and Tardo, Algorithm Design, Pearson Education India.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 2001.
3. Steiven S .S Skiena, The Algorithm Design Manual, Springer Publications, 2nd Edition, 2008.

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(19CS5004) SOFT COMPUTING

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem
5. Apply Machine Learning Approach to Knowledge Acquisition

UNIT-I

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents - From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Mat lab/Python Lib: Introduction to Matlab/Python - Arrays and array operations -Functions and Files - Study of neural network toolbox and fuzzy logic toolbox - Simple implementation of Artificial Neural Network and Fuzzy Logic - Recent Trends in deep learning - various classifiers-neural networks and genetic algorithm - Implementation of recently proposed soft computing techniques.

TEXT BOOKS

1. JyhShing Roger Jang, Chuen, Tsai Sun, EijiMizutani, Neuro: Fuzzy and Soft Computing, Prentice: Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.

REFERENCES

1. N P Padhy, S.P.Simon, Soft Computing with MATLAB Programming, Oxford Publications, 2015
2. S.N.Sivanandam, S.N.Deepa, Principles of Soft Computing, Wiley Publications, Second Edition, 2011
3. MATLAB Toolkit Manual

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Programme Elective III
(19CS5017) DATA PREPARATION AND ANALYSIS

COURSE OBJECTIVES:
1. To prepare the data for analysis and develop meaningful Exploratory Analysis
2. To prepare the data for analysis and develop meaningful Data Visualizations

COURSE OUTCOMES:
After completion of course, *students would be:*
1. Able to extract the data for performing the Analysis.
2. Able to understand different technique used in data cleaning
3. Able to understand design visualization.
4. Learning various interactive methods.
5. Learning Ethics in Profession

UNIT-I
Data Gathering and Preparation: Data formats - Parsing and transformation – Scalability and real-time issues

UNIT-II
Data Cleaning: Consistency checking - Heterogeneous and missing data – Data Transformation and Segmentation

UNIT-III
Exploratory Analysis: Descriptive and comparative statistics - Clustering and association - Hypothesis Generation

UNIT-IV
Visualization: Designing visualizations - Time series - Geolocated data - Correlations and connections - Hierarchies and networks – Interactivity

UNIT-V
Ethics in Profession: Cases in Computing - Statistics and Communication–Professional Ethics Codes: ACM - IEEE - Am Stat. Assoc.

TEXT BOOKS:
1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining.
2. Linda B.Bourque, Virginia A.Clark, Data Preparation for Analysis, Little Green Book, 1992

REFERENCES:
1. Anil Maheswari, Data Analytics, Tata Mc Graw Hill Publications, 2017.
2. Edward R.Turte, The Visual Display of Quantitative Information, Copyrighted Material, 2001
3. Ben Fry, Visualizing Data: Exploring and Explaining data with the processing environment, O'Reilly Publications.

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Programme Elective III
(19CS5018) SECURE SOFTWARE DESIGN & ENTERPRISE COMPUTING

COURSE OBJECTIVES:

1. To learn parallel programming with Graphics Processing Units (GPUs).

COURSE OUTCOMES:

After completion of course, students would be:

1. Learning the concepts in parallel programming, implementation of programs on GPUs, debugging and profiling parallel programs.
2. Understand the different memory hierarchy of the system.
3. Understand the concept of synchronization across CPU and GPU
4. Learning various performance aspects and profiling tools.
5. Case study on Image Processing, Graph algorithms, Simulations, Deep Learning & advance topic.

UNIT-I

Introduction: History - Graphics Processors - Graphics Processing Units–GPGPUs - Clockspeeds - CPU / GPU comparisons – Heterogeneity – Accelerators - Parallel programming - CUDA OpenCL / OpenACC - Hello World Computation Kernels - Launch parameters - Thread hierarchy - Warps / Wave-fronts - Thread blocks / Workgroups - Streaming multiprocessors - 1D / 2D / 3D thread mapping - Device properties - Simple Programs.

UNIT-II

Memory: Memory hierarchy - DRAM / global - Local / shared - Private / local–Textures - Constant Memory – Pointers - Parameter Passing - Arrays and dynamic Memory - Multi-dimensional Arrays - Memory Allocation - Memory copying across devices - Programs with matrices - Performance evaluation with different memories.

UNIT-III

Synchronization: Memory Consistency - Barriers (local versus global)–Atomics - Memory fence - Prefix sum – Reduction - Programs for concurrent Data Structures such as Work lists - Linked-lists - Synchronization across CPU and GPU.

Functions: Device functions - Host functions - Kernels functions - Using libraries (such as Thrust) and developing libraries.

UNIT-IV

Support: Debugging GPU Programs–Profiling - Profile tools - Performance aspects **Streams:** Asynchronous processing–Tasks - Task-dependence - Overlapped data transfers -Default Stream - Synchronization with streams - Events - Event-based - Synchronization - Overlapping data transfer and kernel execution - Pitfalls.

UNIT-V

Case Studies: Image Processing - Graph algorithms–Simulations - Deep Learning.

Advanced topics: Dynamic parallelism - Unified Virtual Memory - Multi-GPU processing - Peer access - Heterogeneous processing.

TEXT BOOKS:

1. David Kirk, Wen-meiHwu; Morgan Kaufman Programming Massively Parallel, AHands-on Approach Processors ; 2010 (ISBN: 978-0123814722)
2. Shane Cook; Morgan Kaufman, Programming: A Developer's Guide to Parallel
3. Computing with GPUs CUDA Programming, 2012 (ISBN: 978-0124159334)

REFERENCES:

1. Sushil jajodia,Krishna kant, Pierangela Samarati, Pierangela Smarati, Anoop Singhal, Vipin Swaroop, Cliff Wang, Secure Cloud Computing , Springer Publications.
2. Judith M.Myerson, Systems Integration, Enterprise Hardcover Publications, Second Edition.
3. Gautam Shroff, Enterprise Cloud Computing, Cambridge Publications, 2011.

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Programme Elective III
(19CS5019) COMPUTER VISION

COURSE OBJECTIVES:

1. Be familiar with both the theoretical and practical aspects of computing with images.
2. Have described the foundation of image formation, measurement, and analysis.
3. Understand the geometric relationships between 2D images and the 3D world.
4. Grasp the principles of state-of-the-art deep neural networks.

COURSE OUTCOMES:

After completion of course, students would be able to*:*

1. Developed the practical skills necessary to build computer vision applications.
2. To have gained exposure to object and scene recognition and categorization from images.
3. Understand different techniques used for edge detections and corner detection.
4. Understanding the concept of pattern analysis and data processing.
5. Develop and learning the classifiers and distinct models.

UNIT-I

Overview - Computer imaging systems – Lenses - Image formation and Sensing - Image analysis - Pre-processing and Binary image analysis.

UNIT-II

Edge detection - Edge detection performance - Hough transform - Corner detection.

UNIT-III

Segmentation - Morphological filtering - Fourier transforms.

UNIT-IV

Feature extraction – Shape – Histogram – Color – Spectral – Texture - Using CVIP tools - Feature analysis - Feature vectors - Distance /similarity measures - Data preprocessing. **Pattern Analysis:** Clustering - K-Means - K-Medoids - Mixture of Gaussians Classification - Discriminant Function – Supervised - Un-supervised - Semi supervised

UNIT-V

Classifiers – Bayes – KNN - ANN models - Dimensionality Reduction – PCA – LDA - ICA and Non-parametric methods.

Recent trends in Activity Recognition - Computational photography - Biometrics.

TEXT BOOKS

1. Richard Szeliski, Computer Vision: Algorithms and Applications, HardCover Publications, 2010
2. Goodfellow, Bengio and Courville , Deep Learning, HardCover Publications, 2017
3. Fisher et al , Dictionary of Computer Vision and Image Processing, Wiley Publications

REFERENCES

1. Forsyth, Ponce, Computer Vision: A Modern Approach, Second Edition,2015
2. Ahmadi Tazehkandi, Amin, Hands-On Algorithms for Computer Vision, packt Publications Pvt Ltd, 2018.
3. E R Davies, Computer and Machine Vision, AP Publications, 2012
4. Ian Good Fellow, Yoshua Bengio, Aaron Courville, Francis Bach, Deep Learning, Hard Cover Publications, 2017

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Programme Elective IV
(19CS5020) HUMAN AND COMPUTER INTERACTION

COURSE OBJECTIVES:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Be aware of mobile Human Computer interaction.
4. Learn the guidelines for user interface.

COURSE OUTCOMES:

After completion of course, students would be

1. Understand the structure of models and theories of human computer interaction and vision.
2. Design an interactive web interface on the basis of models studied.
3. Understand various social Organizational issues.
4. Learning and understanding various frameworks and develop the mobile applications.
5. Understanding the web interfaced and learning the recent trends.

UNIT-I

Human: I/O channels–Memory–Reasoning and problem solving

The computer: Devices – Memory – Processing and Networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity - Paradigms.

UNIT-II

Interactive Design basics – Process – Scenarios – Navigation – Screen design – Iteration and prototyping - HCI in software process – Software life cycle – Usability engineering – Prototyping in practice – Design rationale - Design rules – Principles – Standards – Guidelines – Rules - Evaluation Techniques – Universal Design.

UNIT-III

Cognitive models – Socio - Organizational issues and Stake holder requirements – Communication and Collaboration models – Hypertext - Multimedia and WWW.

UNIT-IV

Mobile Ecosystem – Platforms - Application frameworks

Types of Mobile Applications: Widgets – Application – Games - Mobile Information Architecture - Mobile 2.0 - Mobile Design: Elements of Mobile Design - Tools.

UNIT-V

Designing Web Interfaces – Drag & Drop - Direct Selection - Contextual Tools – Overlays - Inlays and Virtual Pages - Process Flow - Case Studies.

Recent Trends - Speech Recognition and Translation - Multimodal System

TEXT BOOK:

1. Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, Alan Dix, 3rd Edition, Pearson Education, 2004 .
2. Brian Fling, Mobile Design and Development, First Edition , O Reilly Media Inc., 2009
3. Bill Scott and Theresa Neil, Designing Web Interfaces, First Edition, OReilly, 2009.

REFERENCES:

1. Ben Shneiderman, Maxine Cohen, Catherine Plaisant, Steven M. Jacobs, Designing the User Interface, Pearson Education.
2. Julie A Jacko, Human Computer Interaction Handbook, Hardcover Publications, Third edition.
3. Serendual Smith-Atakan, Human-Computer Interaction, Cengage Learning Publications, India Edition.

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Programme Elective IV
(19CS5021) GPU COMPUTING

COURSE OBJECTIVES:

1. GPU many-core hardware architecture, shading and GPU programming languages and APIs
2. Approaches to massively parallel computations, memory subsystems and caches, texture mapping

COURSE OUTCOMES:

After completion of course, students would be:

1. Understanding of GPU architecture and APIs (OpenGL, GLSL, CUDA) with important practical applications.
2. Understanding of both the traditional use of GPUs for rendering graphics, as well as the use of GPUs for general purpose computations (GPGPU), or GPU Computing.
3. Understanding of parallel computations, memory subsystems and caches, texture mapping
4. Understanding of System Issues in GPU
5. Understanding of 3D computer graphics and mathematics related to GPU

UNIT-I

Basics of computer graphics: Concepts–Pipeline–Transformation - Lighting
Overview of GPUs: Architecture–Features - Programming model

UNIT-II

GPU Architecture: Types of GPU Architecture - Alternative GPU Architectures – Shading and Compute APIs - Types of GPU Texturing.

UNIT-III

Stream Computing and GPGPU - CUDA Memory Access 1, 2, 3 and 4 - GPU Reduction - GPU Parallel Scan / Prefix Sum.

UNIT-IV

System issues: Cache and data management - Languages and Compilers - Stream processing- GPU-CPU load balancing

UNIT-V

GPU-Specific implementation - 3D computer graphics topics - Sorting and Searching - Linear algebra - Signal processing - Differential equations - Numerical Solvers

TEXT BOOKS:

1. Fernando and M. Kilgard, the CG Tutorial: The Definitive Guide to Programmable Real-Time Graphics, Addison-Wesley, 2003.
2. David Wolf, Open GL 4 Shading Language Cook Book, Packt Publishing Pvt. Ltd, 2013.

REFERENCES:

1. David B.Kirk, Wen-mei W Hue, Programming Massively Parallel Processors, MK Publications, 3rd Edition
2. Peter S. Pacheco, an Introduction to Parallel Programming, Morgan Kaufmann Publishers 1st Edition, 2011.
3. Jason Sanders and Edward Kandrot, CUDA by Example: An Introduction to General-Purpose GPU Programming, Addison Wesley Professional, 1st Edition, 2011.
4. Wolfgang Engel, GPU Pro 360 Guide to Shadows, CRC Press, 2018

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Programme Elective IV
(19CS5022) DIGITAL FORENSICS

COURSE OBJECTIVES:

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Understand relevant legislation and codes of ethics.
2. Computer forensics and digital detective and various processes, policies and procedures.
3. E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Email and web forensics and network forensics
5. Understand the awareness of legal aspects of forensics

UNIT-I

Digital Forensics Science: Forensics science - Computer forensics - Digital forensics. **Computer Crime:** Criminalistics as it relates to the investigative process - Analysis of cyber-Criminalistics area - Holistic approach to cyber forensics

UNIT-II

Cyber Crime Scene Analysis: seizure electronic evidence -importance of understanding investigation. Discuss the various court orders etc.- Methods to search and Retrieved and Un-retrieved communications - Discuss the what court documents would be required for a criminal

UNIT-III

Evidence Management & Presentation: Create and manage shared folders using operating system - Importance of the forensic mindset - Define the workload of law enforcement - Explain what the normal case would look like - Define who should be notified of a crime - Parts of gathering evidence - Define and apply probable cause.

UNIT-IV

Computer Forensics: Prepare a case - Begin an investigation - Understand computer forensics workstations and software - Conduct an investigation - Complete a case - Critique a case.

Network Forensics: Open-source security tools for network forensic analysis - Requirements for preservation of network data.

UNIT-V

Mobile Forensics: Mobile forensics techniques - Mobile forensics tools.

Legal Aspects of Digital Forensics: IT Act 2000 - Amendment of IT Act 2008 – Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.

TEXT BOOKS:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

REFERENCES:

1. Dr. Mrs Rukmani Krishnamurthy, Introduction to Forensic Science in Criminal Investigation, Paper back Publications, 2015
2. Dejey (Author), Murugan (Author), Cyber Forensics, Oxford Publications, 2018.
3. Nilakshi Jain, Dhananjay R. Kalbande, Digital Forensics, Wiley Publications, For Mumbai University, 2019.

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(19CS5005) ADVANCED ALGORITHMS LAB

COURSE OBJECTIVES:

1. This course aims to make learning about Different sorting techniques, Graphs and its traversals, dynamic programming, travelling sales person problem, back tracking.

COURSE OUTCOMES:

At the end of the course, Students are able to implement

1. Different Sorting Techniques.
2. Graphs and its traversals.
3. Dynamic programming, Travelling sales person problem
4. Back tracking.

List of Experiments:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

2. Using Open, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

3. a) Obtain the Topological ordering of vertices in a given digraph.
   b) Compute the transitive closure of a given directed graph using Warshall's algorithm.

4. Implement 0/1 Knapsack problem using Dynamic Programming.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra‟s algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kristal‟s algorithm.

7. a) Print all the nodes reachable from a given starting node in a digraph using BFS method.
   b) Check whether a given graph is connected or not using DFS method.

8. Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim‟s algorithm.

11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using Open and determine the speed-up achieved.

12. Implement N Queen's problem using Back Tracking.

TEXT BOOKS:

1. Cormen, Leiserson, Rivest, Stein, *Introduction to Algorithms*, Second Edition, MIT Press.
2. Aho, Hopcroft, Ullman, *The Design and Analysis of Computer Algorithm*, Pearson Education, 2009

REFERENCES:

1. Kleinberg and Tardo, Algorithm Design, Pearson Education India.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 2001.
3. Steiven S .S Skiena, The Algorithm Design Manual, Springer Publications, 2nd Edition, 2008.

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(19CS5006) SOFT COMPUTING LAB

COURSE OBJECTIVES:

This course makes to learn the concepts such as

1. To implement soft computing based solutions for real-world problems.
2. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.

COURSE OUTCOMES:

At the end of the course, the students able to do the following:

1. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
2. Apply genetic algorithms to combinatorial optimization problems.
3. Evaluate and compare solutions by various soft computing approaches for a given problem

LIST OF PROGRAMS:

1. Write a Program For Implementing Linear Saturating Function.
2. Study and Analysis of Art Model.
3. Write a Program For Error Back Propagation Algorithm (Ebpa) Learning.
4. Study and Analysis of CPN
5. Study and Analysis of Genetic Algorithm Life Cycle.
6. Study and Analysis of Fuzzy Vs Crisp Logic.
7. Write a Program Of Perceptron Training Algorithm.
8. Write a Program To Implement Hebb's Rule
9. Write a Program To Implement Of Delta Rule
10. Write a Program For Back Propagation Algorithm
11. Write a Program To Implement Logic Gates

TEXT BOOKS:

1. S.N. Shivnandam, Principle of soft computing, Wiley.
2. S.Rajshekaran and G.A.V. Pai, Fuzzy logic And Genetic Algorithm, Neural Network, PHI.

REFERENCES:

1. Jack M. Zurada, Introduction to Artificial Neural Network System, JAico Publication.
2. Simon Haykins, Neural Network- A Comprehensive Foudation.
3. N P Padhy, S.P.Simon Soft Computing with MATLAB Programming, Oxford Publications, 2015
4. S.N.Sivanandam, S.N.Deepa, Principles of Soft Computing, Wiley Publications, Second Edition, 2011
5. MATLAB Toolkit Manual

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(19CS5007) MINI PROJECT

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AUDIT COURSE-II
(19HS0816) CONSTITUTION OF INDIA

COURSE OBJECTIVES:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. 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. 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.

COURSE OUTCOMES:

Students will be able to:

1. Explain the key concepts of political economy.
2. Analyse the significant developments in the political ideologies.
3. Describe the salient features of the constitution of India interpret, integrate and critically.
4. Analyse the political economy of Indian international relations and gain knowledge in Judiciary system.
5. Apply their knowledge and skills acquired to write civil service examinations.

UNIT-I

Meaning of the Constitution Law

UNIT-II

Historical Perspective of the Constitution of India - Salient features and characteristics of the Constitution of India

UNIT-III

Scheme of the fundamental rights - The scheme of the Fundamental Duties and its legal status The Directive Principles of State Policy – Its importance and implementation - Federal structure and distribution of legislative and financial powers between the Union and the States

UNIT-IV

Parliamentary Form of Government in India – The constitution powers and status of the President of India - Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India.

Emergency Provisions: National Emergency - President Rule - Financial Emergency.

UNIT-V

Local Self Government – Constitutional Scheme in India - Scheme of the Fundamental Right to Equality - Scheme of the Fundamental Right to certain Freedom under Article 19 - Scope of the Right to Life and Personal Liberty under Article 21

TEXT BOOKS:

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

REFERENCES:

1. M. P. Jain , Lexis Nexis, Indian Constitution Law ,7th Edition., 2014.
2. D.D. Basu, Lexis Nexis , Introduction to the Constitution of India 2015.
3. Dr.P.K.Agarwal, Dr.K.N.Chathurvedi, Constitution of India, Kindle Edition, 2017.

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PROGRAM ELECTIVE – V
(19CS5023) BIG DATA ANALYTICS

COURSE OBJECTIVES:
The Objectives of this course
1. To understand the competitive advantages of big data analytics
2. To understand the big data frameworks
3. To learn data analysis methods
4. To learn stream computing
5. To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

COURSE OUTCOMES:
On successful completion of the course students will be able to
1. Understand how to leverage the insights from big data analytics
2. Analyze data by utilizing various statistical and data mining approaches
3. Perform analytics on real-time streaming data
4. Develop Real Time Analytics Platform (RTAP) Applications
5. Understand the various No Sql alternative database models
6. Able to gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

UNIT I
INTRODUCTION TO BIG DATA: Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - analysis vs Reporting - Modern Data Analytic Tools.

UNIT II
HADOOP FRAMEWORK:
Distributed File Systems - Large-Scale File System Organization – HDFS concepts – Map Reduce Execution, Algorithms using Map Reduce, Matrix-Vector multiplication – Hadoop YARN

UNIT III
DATA ANALYSIS
Statistical Methods: Regression modeling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data – Predictive Analytics – Data analysis using R.

UNIT IV
MINING DATA STREAMS
Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT V
BIG DATA FRAMEWORKS
Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts. Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQLQueries

TEXT BOOKS:
1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.
2. David Loshin, Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, Morgan Kaufmann, 2013.

REFERENCES:
1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, Second Edition, 2007.
2. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley, 2013.
3. P. J. Sadalage and M. Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley Professional, 2012.
4. Richard Cotton, Learning R – A Step-by-step Function Guide to Data Analysis, O'Reilly Media, 2013.

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PROGRAM ELECTIVE – V
(19CS5024) DISTRIBUTED DATABASES

COURSE OBJECTIVES:

The Objectives of this course

1. To understand the Concepts of distributed database and centralized databases
2. To learn Transformations for Queries
3. To learn Distributed Concurrency Control – Distributed Deadlocks
4. To gain knowledge on Distributed object database management systems

COURSE OUTCOMES:

On successful completion of the course students will be able to

1. Understand the Features of Distributed versus Centralized Databases
2. Gain knowledge on Equivalence Transformations for Queries
3. Understand Foundations of Distributed Concurrency Control and Distributed Deadlocks
4. Understand Distributed object database management systems and Distributed Object Storage
5. Understand Parallel Database Systems
6. Performance Evaluation over the types of database available

UNIT - I

Features of Distributed versus Centralized Databases – Why Distributed Databases – Distributed Database Management Systems (DDBMSs)- Review of Databases – Review of Computer Networks-Levels of Distribution Transparency- Reference Architecture for Distributed Databases – Types of Data Fragmentation – Distribution Transparency for read-only Applications – Distribution transparency for Update Applications – Distributed Database Access Primitives – Integrity Constraints in Distributed Databases - A Framework for Distributed Database Design – The Design of Database Fragmentation – The Allocation of Fragments.

UNIT - II

Equivalence Transformations for Queries – Transforming Global Queries into Fragment Queries – Distributed Grouping and Aggregate Function Evaluation – Parametric Queries - Optimization of Access Strategies - A Framework for Query Optimization – Join Queries – General Queries. A Framework for Transaction Management – Supporting Atomicity of Distributed Transactions – Concurrency Control for Distributed Transactions – Architectural Aspects of Distributed Transactions

UNIT- III

Foundations of Distributed Concurrency Control – Distributed Deadlocks – Concurrency Control Based on Timestamps – Optimistic Methods for Distributed Concurrency Control - Reliability – Basic Concepts Nonblocking Commitment Protocols – Reliability and Concurrency Control – Determining a Consistent View of the Network – Detection and Resolution of Inconsistency – Checkpoints and Cold Restart - Distributed Database Administration – Catalog Management in Distributed Databases – Authorization and Protection.

UNIT - IV

Distributed object database management systems – Fundamental object concepts and Models – Object – Abstract Data Types – Composition (Aggregation) – Class – Collection – Subtyping and Inheritance. – Object Distribution Design – Horizontal Class Partitioning – Vertical Class Partitioning – Path Partitioning – Class Partitioning Algorithms – Allocation – Replication – Alternative Client / Server Architectures – Cache Consistency – Object Identifier Management – Pointer Switching Object Migration – Distributed Object Storage – Object Query Processor Architectures – Query Processing Issues – Query Execution – Correctness Criteria – Transaction Models and Object Structures – Transactions Management in Object DBMSs – Transactions as Objects – Conclusion – Bibliographic Notes – Exercises.

UNIT-V

Parallel Database Systems – Database Server Approach – Database Servers and Distributed Databases – Parallel System Architectures – Objectives – Functional Aspects – Parallel Data Processing – Parallel Query Optimization – Data Placement – Query Parallelism – Parallel Execution Problems – Initialization – Interferences and Convoy Effect – Load Balancing – Parallel Execution for Hierarchical Architecture – Problem Formulation – Basic Concepts – Load Balancing Strategy – Performance Evaluation – Conclusion – Bibliographic Notes – Exercises.

TEXT BOOKS:

1. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill.
2. M.TamerOzsu, Patrick Valduriez, Distributed database systems, 2nd Edition, Prentice Hall of India, New Delhi.

REFERENCES:

1. M.TamerOzsu, Patrick Valduriez, Principles of Distributed Database Systems, Pearson Education.
2. Bell D. and Grimson J., Distributed Database Systems, Addison-Wesley, 1992.

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PROGRAM ELECTIVE – V
(19CS5025) ADVANCED OPERATING SYSTEMS

COURSE OBJECTIVES:
The Objectives of this course
1. To learn the fundamentals of Operating Systems
2. To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
3. To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
4. To know the components and management aspects of Real time, Mobile operating systems

COURSE OUTCOMES:
On successful completion of the course students will be able to
1. Discuss the various synchronization, scheduling and memory management issues
2. Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
3. Discuss the various resource management techniques for distributed systems
4. Identify the different features of real time and mobile operating systems
5. Install and use available open source kernel
6. Modify existing open source kernels in terms of functionality or features used

UNIT-I
FUNDAMENTALS OF OPERATING SYSTEMS: Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling –Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT-II
DISTRIBUTED OPERATING SYSTEMS: Issues in Distributed Operating System – Architecture – Communication Primitives –Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III
DISTRIBUTED RESOURCE MANAGEMENT: Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non blocking Commit Protocol – Security and Protection.

UNIT IV

REAL TIME AND MOBILE OPERATING SYSTEMS: Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT V

CASE STUDIES: Linux System: Design Principles - Kernel Modules - Process Management Scheduling-Memory Management - Input-Output Management - File System - Inter process Communication. IOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TEXT BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor
2. Operating Systems, Tata McGraw-Hill, 2001.
3. Abraham Silberschatz, Peter Baer Galvin; Greg Gagne, Operating System Concepts, Seventh Edition, John Wiley & Sons, 2004.

REFERENCES:

1. Daniel P Bovet and Marco Cesati, Understanding the Linux kernel, 3rd edition, O'Reilly, 2005.
2. Rajib Mall, Real-Time Systems: Theory and Practice, Pearson Education India, 2006.
3. Neil Smyth, iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

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OPEN ELECTIVE
(19HS0824) BUSINESS ANALYTICS

COURSE OBJECTIVES:

1. Understand the concepts and methods of business analytics.
2. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
3. Identify the management related issues and processes to resolve
4. Understand the significance of forecasting models helpful in decision making
5. To become familiar with processes needed to develop, report, and analyze business data.

COURSE OUTCOMES:

After the completion of the course, student would be able to:

1. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2. Design alternatives to solve business problems utilizing quantitative analysis, critical thinking and sound ethical decision making.
3. Summarize, process and transform data for obtaining meaningful conclusions
4. Interpret data using latest data analytics tools to address organisational problems
5. Organize and critically apply the concepts and methods of business analytics
6. Assess decision problems and build models for creating solutions using business analytical tools.

UNIT I

Business analytics: Overview of Business analytics - Scope of Business analytics - Business Analytics Process - Relationship of Business Analytics Process and organisation - competitive advantages of Business Analytics - Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data - simple Linear Regression - Important Resources - Business Analytics Personnel - Data and models for Business analytics - problem solving - Visualizing and Exploring Data, Business Analytics Technology

UNIT III

Organization Structures of Business analytics: Team management - Management Issues - Designing Information Policy – Outsourcing - Ensuring Data Quality - Measuring contribution of Business analytics - Managing Changes - Descriptive Analytics - predictive analytics - predicative Modelling - Predictive analytics analysis - Data Mining - Data Mining Methodologies - Prescriptive analytics and its step in the business analytics Process - Prescriptive Modelling - nonlinear Optimization.

UNIT IV

Forecasting Techniques: Qualitative and Judgmental Forecasting - Statistical Forecasting Models - Forecasting Models for Stationary Time Series - Forecasting Models for Time Series with a Linear Trend - Forecasting Time Series with Seasonality - Regression Forecasting with Casual Variables - Selecting Appropriate Forecasting Models - Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform - New-Product Development Model - Newsvendor Model - Overbooking Model - Cash Budget Model.

UNIT V

Decision Analysis: Formulating Decision Problems - Decision Strategies with the Outcome Probabilities - Decision Trees - The Value of Information - Utility and Decision Making - Recent Trends in Embedded and collaborative business intelligence - Visual data recovery - Data Storytelling and Data journalism.

TEXT BOOKS:

1. S. Christian Albright, *Business Analytics: Data analysis & Decision making*, Cengage Learning
2. Jeffery Camm, & others, *Essentials of Business Analytics*, Cengage Learning

REFERENCES:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey,*Business analytics Principles, Concepts, and Applications*, Pearson FT Press
2. James Evans, *Business Analytics*, Pearsons Education.
3. Galit Shmueli, Peter C. Bruce, Inbal Yahav, Nitin R. Patel, Kenneth C. Lichtendahl Jr., *Data mining for business analytics: Concepts, Techniques and Applications*, WILEY.

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OPEN ELECTIVE
(19ME3121) INDUSTRIAL SAFETY

COURSE OBJECTIVES:

1. To learn about mechanical and electrical hazards.
2. To learn about Fundamentals of Maintenance Engineering.
3. To learn about Wear and Corrosion and their prevention.
4. To know about Fault Tracking
5. To learn about Periodic and preventive maintenance.

COURSE OUTCOMES:

Students undergoing this course are able *to*

1. Understand the points of factories act 1948 for health and safety.
2. Understand the cost & its relation with replacement economy.
3. Understand the concepts of Wear and Corrosion Prevention
4. Understand the concepts of sequence of fault finding activities
5. Understand the Program and schedule of preventive maintenance of mechanical and electrical equipment.
6. Understand the Periodic Maintenance of Equipment's

UNIT-I:

Industrial Safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II:

Fundamentals of Maintenance Engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III:

Wear and Corrosion and their Prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV:

Fault Tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical

equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V:

Periodic and Preventive Maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS:

1. Higgins & Morrow, Maintenance Engineering Handbook, Da Information Services.
2. H. P. Garg, Maintenance Engineering, S. Chand and Company.

REFERENCE BOOKS:

1. Audels, Pump-hydraulic Compressors, Mcgrew Hill Publication.
2. Winterkorn, Foundation Engineering Handbook, Chapman & Hall London.

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OPEN ELECTIVE
(19ME3021) ADVANCES IN OPERATIONS RESARCH

COURSE OBJECTIVES:

On successful Completion of this course the student will be able to

1. Enumerate the fundamentals of Linear Programming
2. Learn classical optimization techniques
3. Develop the best strategy of Game and identifying the Queuing theory.
4. Understand about sequence and optimum Duration of the Project
5. Develop the importance of Replacement models and Inventory control

COURSE OUTCOMES:

On successful Completion of this course the student will be able to

1. Create mathematical models of the real time situations.
2. Implement Transportation and Assignment problems to solve in real time industry
3. choose the best strategy of Game and capable of identifying the suitable queuing theory
4. Enumerate fundamental techniques and apply it to solve various optimization areas
5. Investigate, study, Apply knowledge in Replacement models and
6. Understand the Inventory control Models

UNIT-I

Introduction to OR and Linear Programming-OR definition–Types of Operations Research models; Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Degeneracy - Problems

UNIT-II

Transportation Problem – Formulation; Initial Basic Feasible Solution-North-West Corner Rule, Least Cost Method, Vogel‘s Approximation Method, Modified Distribution (MODI) Method, Unbalanced Transportation - Problems

Assignment Problem – Formulation, Optimal Solution -Traveling Salesman problem.

UNIT-III

Game Theory - Introduction – Minimax (Maxi mini) Criterion and Optimal Strategy, Saddle Point, Solution of Games with Pure Strategy and Mixed Strategies – 2 X 2 Games – Dominance Principle.

Queuing Theory- Introduction to queuing system–Service Channel, Arrival Pattern, Size of Population, Service Pattern, Queue Discipline, Customer Behavior, Probability Distribution-Birth & Death Process, Simple Problems on Single Service channel only.

UNIT-IV

Sequencing –Terminology - Johnson’s Algorithm for n-jobs x 2 Machines and n-jobs x 3 machines models - Problems

PERT & CPM: Introduction, Difference between PERT and CPM, Terminology- Activities, Events, Predecessor, Early Start, Early Finish, Late Start & Late Finish Times, Earliest Occurrence and Latest Occurrence of the Event, Total Float, Free Float, Independent Float; CPM- Deterministic Model; PERT- Probabilistic Model, Critical Path, Optimal Project Duration, Least Possible Project Duration- Problems.

UNIT-V

Replacement – Failure Mechanism of Items**,** Types of Replacements- Individual Replacement policy, Group Replacement policy, Replacement of items fail suddenly – problems

Inventory - Necessity for maintaining inventory, inventory costs, classification of fixed order quantity inventory models, selective inventory management techniques.

TEXT BOOKS:

1. S D. SHARMA Operations Research KNRN Publications. 17th edition 2015
2. Hamdy A Taha , Operations Research Pearson Publications, 9 th edition 2015

REFERENCES BOOKS:

1. Manohar Mahajan Operations Research, Dhanpat Rai &Co 2016
2. Er. Prem kumar Guptha & Dr.D.S.Hira Operations Research, Schand publications 2012.
3. R Panneerselvam Operations Research PHI, 2nd edition, 2012.

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OPEN ELECTIVE
(19CE1028) COST MANAGEMENT OF ENGINEERING PROJECTS

COURSE OBJECTIVES:

To Understand

1. Establish systems to help streamline the transactions between corporate support departments and the operating units
2. Devise transfer pricing systems to coordinate the buyer-supplier interactions between decentralized organizational operating units
3. Use pseudo profit centers to create profit maximizing behavior in what were formerly cost centers

COURSE OUTCOMES (COs)

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

1. Summarize the concept of strategic cost management, strategic cost analysis – target costing, life cycle costing and Kaizen costing and the cost drive concept
2. Describe the decision-making; relevant cost, differential cost, incremental cost and opportunity cost, objectives of a costing system
3. Summarize the meaning and different types of project management and project execution, detailed engineering activities
4. Understand the project contracts
5. Describe the cost behavior and profit planning types and contents, Bar charts and Network diagram
6. Analyze by using quantitative techniques for cost management like PERT/CPM

UNIT – I

Introduction and Overview of the Strategic Cost Management Process

UNIT-II

Cost Concepts: Cost concepts in decision-making - Relevant cost - Differential cost - Incremental cost and Opportunity cost - Objectives of a Costing System - Inventory valuation - Creation of a Database for operational control - Provision of data for Decision Making

Unit – III

Project Management: Project meaning - Different types - why to manage - cost overruns centers - various stages of project execution: conception to commissioning - Project execution as conglomeration of technical and nontechnical activities - Detailed Engineering activities - Pre project execution main clearances and documents - Project team: Role of each member - Importance Project site: Data required with significance - Project contracts - Types and contents - Project execution Project cost control - Bar charts and Network diagram – Project commissioning: mechanical and process

UNIT – IV

Cost Behavior and Profit Planning: Cost Behavior and Profit Planning Marginal Costing - Distinction between Marginal Costing and Absorption Costing - Break-even Analysis - Cost-Volume-Profit Analysis - Various decision-making problems - Standard Costing and Variance Analysis - Pricing strategies: Pareto Analysis - Target costing - Life Cycle Costing - Costing of service sector - Just-in-time approach - Material Requirement – Planning - Enterprise Resource

Planning -Total Quality Management and Theory of constraints - Activity-Based Cost Management - Bench Marking - Balanced Score Card and Value-Chain Analysis - Budgetary Control - Flexible Budgets - Performance budgets - Zero-based budgets- Measurement of Divisional profitability pricing decisions including transfer pricing

UNIT-V

Quantitative Techniques: Quantitative techniques for cost management - Linear Programming, PERT/CPM - Transportation Problems - Assignment problems – Simulation - Learning Curve Theory

TEXT BOOKS:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd 2006

REFERENCES:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting, A. H. Wheeler publisher
4. https://nptel.ac.in/courses/110/101/110101132/
5. https://nptel.ac.in/courses/105104161/

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OPEN ELECTIVE
(19ME3022) COMPOSITE MATERIALS

COURSE OBJECTIVES:

1. To understand the mechanical behavior of composite materials
2. To get an overview of the methods of manufacturing composite materials.
3. To know the fundamentals of composite materials.
4. To understand the fabrication and process of composites.
5. To recognize the applications of composite materials.

COURSE OUTCOMES:

Upon completion of this course, the students will have an overview of

1. Fundamental concept of composite materials.
2. Different types of composite materials.
3. Fabrication and processing of composite materials.
4. MMC & CMC
5. Mechanical behavior of composite materials.
6. Application of composite materials.

UNIT-I

Introduction To Composites: Fundamentals of composites – need– enhancement of properties – classifications —Introduction to Reinforcement composites–types. Applications. Fiber production techniques for glass, carbon and ceramic fibers –Resin materials-Types.

UNIT-II

Polymer Matrix Composites: Fabrication of PMC's ,Fabrication of Fibers, Plastic Fiber Forms, Pre-pregs, Molding Compounds-Processes, Lay-Ups, Filament Winding, Pultrusion, and Recycling. Matrix – Reinforcement Interface, Wettability.

UNIT-III

MMC&CMC : Fabrication of MMC'S, Liquid Infiltration- Casting, Solid State Processes-Diffusion Bonding &In Situ Technique. Fabrication of CMC's, Hot-Pressing, Infiltration, In Situ Chemical reaction Techniques. CVD& CVI, Sol-gel.

UNIT-IV

Mechanics of Composites: Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria, Von - Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai-Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates

UNIT-V

Applications Of Composites: Applications of advanced composite materials. Environmental effects in Composites, Green composites, Synthesis and Properties of Nano composites. Surface Composites & Surface metal matrix composites: Need, Synthesis, Properties and applications.

TEXT BOOKS:

1. Mathews F. L. and Rawlings R. D., "Composite Materials: Engineering and Science", 1st Edition, Chapman and Hall, London, England, 1994.
2. Chawla K. K., "Composite materials", Second Edition, Springer – Verlag, 1998.

REFERENCES:

1. Clyne, T. W. and Withers, P. J., "Introduction to Metal Matrix Composites", Cambridge University Press, 1993.
2. Strong, A.B., "Fundamentals of Composite Manufacturing", SME, 1989.
3. Sharma, S.C., "Composite materials", Narosa Publications, 2000.

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II M. Tech – I Sem.

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OPEN ELECTIVE
(19EE2128) WASTE TO ENERGY

COURSE OBJECTIVES:

The Objectives of this course

1. To understand the importance of gaining energy from the waste
2. To Understand and analyze the pattern of renewable energy resources Suggest methodologies / technologies for its utilization Economics of the utilization and environmental aspects.
3. To undusted the need and production of for biogas.

COURSE OUTCOMES:

On successful completion of the course students will be able to

1. Identify the new methodologies / technologies for effective utilization of renewable energy sources.
2. Analyse over different types of waste for energy conception.
3. Understand different types of Bio mass utilizations.

UNIT-I
INTRODUCTION TO ENERGY FROM WASTE:

Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

UNIT-II
BIOMASS PYROLYSIS

Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods -Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III
BIOMASS GASIFICATION

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV
BIOMASS COMBUTION

Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V
PROPERTIES OF BIOGAS (CALORIFIC VALUE AND COMPOSITION)

Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications- Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. Desai, Ashok V., Non-Conventional Energy, Wiley Eastern Ltd.,1990.
2. Khandelwal, K. C. and Mahdi, S. S.,Biogas Technology - A Practical HandBook - Vol. I & II, Tata McGraw Hill Publishing Co. Ltd.,1983.
3. Challal, D. S., Food, Feed and Fuel from Biomass, IBH Publishing Co. Pvt. Ltd., 1991.

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(19CS5008) PHASE-I DISSERTATION-I /INDUSTRIAL PROJECT

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(19CS5009) PROJECT PHASE –II /DISSERTATION-II

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