**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**(Established by Govt. of A.P., ACT No.30 of 2008)**
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

## COURSE STRUCTURE & SYLLABI

### SEMESTER – I

| S. No. | Course codes | Course Name | Category | Hours per | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | 21D58101 | Advanced Data Structures and Algorithms | PC | 3 | 0 | 0 | 3 |
| 2. | 21D58102 | Advanced Computer Networks | PC | 3 | 0 | 0 | 3 |
| 3. | 21D58103a<br>21D58103b<br>21D5813c | **Program Elective Course - I**<br>Machine Learning<br>Object Oriented Software Engineering<br>Digital Image &Video Processing | PE | 3 | 0 | 0 | 3 |
| 4. | 21D58104a<br>21D58104b<br>21D58104c | **Program Elective Course - II**<br>Data Science<br>Design Patterns<br>Information Security | PE | 3 | 0 | 0 | 3 |
| 5. | 21D58105 | Advanced Data Structures and Algorithms Lab | PC | 0 | 0 | 4 | 2 |
| 6. | 21D58106 | Advanced Computer Networks Lab | PC | 0 | 0 | 4 | 2 |
| 7. | 21DRM101 | Research Methodology and IPR | MC | 2 | 0 | 0 | 2 |
| 8. | 21DAC101a<br>21DAC101b<br>21DAC101c | **Audit Course – I**<br>English for Research paper writing<br>Disaster Management<br>Sanskrit for Technical Knowledge | AC | 2 | 0 | 0 | 0 |
| **Total** | | | | | | | **18** |

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## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

### COURSE STRUCTURE & SYLLABI
### SEMESTER – II

| S.No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| **1.** | 21D58201 | Advanced Operating Systems | PC | 3 | 0 | 0 | 3 |
| **2.** | 21D58202 | Internet of Things | PC | 3 | 0 | 0 | 3 |
| **3.** | 21D58203a<br>21D58203b<br>21D58203c | **Program Elective Course – III**<br>Deep Learning<br>Service Oriented Architecture<br>Computer Vision | PE | 3 | 0 | 0 | 3 |
| **4.** | 21D58204a<br>21D58204b<br>21D58204c | **Program Elective Course - IV**<br>Data Visualization Techniques<br>Distributed Systems<br>Privacy Preserving Data Publishing | PE | 3 | 0 | 0 | 3 |
| **5.** | 21D58205 | Advanced Operating Systems Lab | PC | 0 | 0 | 4 | 2 |
| **6.** | 21D58206 | Internet of Things Lab | PC | 0 | 0 | 4 | 2 |
| **7.** | 21D35207 | Technical seminar | PR | 0 | 0 | 4 | 2 |
| **8.** | 21DAC201a<br>21DAC201b<br>21DAC201c | **Audit Course – II**<br>Pedagogy Studies<br>Stress Management for Yoga<br>Personality Development through Life Enlightenment Skills | AC | 2 | 0 | 0 | 0 |
| **Total** | | | | | | | **18** |

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## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

## COURSE STRUCTURE & SYLLABI

### SEMSTER - III

| S.No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | 21D58301a<br>21D58301b<br>21D58301c | **Program Elective Course – V**<br>Software Defined Networks<br>Reinforcement Learning<br>Data Analytics | PE | 3 | 0 | 0 | 3 |
| 2. | 21DOE301b<br>21DOE301c<br>21DOE301f | **Open Elective**<br>Industrial Safety<br>Business Analytics<br>Optimization Techniques | OE | 3 | 0 | 0 | 3 |
| 3. | 21D58302 | Dissertation Phase – I | PR | 0 | 0 | 20 | 10 |
| 4. | 21D58303 | Co-curricular Activities | | | | | 2 |
| | | **Total** | | | | | **18** |

### SEMESTER - IV

| S.No. | Course codes | Course Name | Category | Hours per | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | 21D58401 | Dissertation Phase – II | PR | 0 | 0 | 32 | 16 |
| **Total** | | | | | | | **16** |

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ADVANCED DATA STRUCTURES AND ALGORITHMS (Common to M.Tech CSE, CN, SE,AI & ML) | L | T | P | C |
|---|---|---|---|---|---|
| 21D58101 | | 3 | 0 | 0 | 3 |
| | Semester | I | | | |

**Course Objectives:**

- To understand concepts of dictionaries and hash tables.
- To implement lists and trees.
- To analyze usage of B trees, Splay trees and 2-3 trees.
- To understand the importance of text processing and computational Geometry.

**Course Outcomes (CO):** Student will be able to

- Understand the implementation of symbol table using hashing techniques
- Apply advanced abstract data type (ADT) and data structures in solving real world
- problem
- Effectively combine the fundamental data structures and algorithmic techniques in
- building a solution to a given problem
- Develop algorithms for text processing applications

| UNIT - I | | Lecture Hrs: |
|---|---|---|

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 | | Lecture Hrs: |
|---|---|---|

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 (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.

| UNIT - III | | Lecture Hrs: |
|---|---|---|

2-3 Trees , Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, B-Trees: Advantage of B- trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3 Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

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

| UNIT - V | | Lecture Hrs: |
|---|---|---|

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

**Textbooks:**

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004.
2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009

**Reference books:**

1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, First Edition, Wiley, 2006.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ADVANCED COMPUTER NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| 21D58102 | | 3 | 0 | 0 | 3 |
| | Semester | I | | | |

**Course Objectives:**

The objective of this course is to build a solid foundation in computer networks concepts and design

- To understand computer network architectures, protocols, and interfaces.
- The OSI reference model and the Internet architecture network applications.
- The course will expose students to the concepts of traditional as well as modern day
- computer networks - wireless and mobile, multimedia-based.
- Students completing this course will understand the key concepts and practices employed
- in modern computer networking

**Course Outcomes (CO):** Student will be able to

- Analyse computer network architectures and estimate quality of service
- Design application-level protocols for emerging networks
- Analyse TCP and UDP traffic in data networks
- Design and analyse medium access methods, routing algorithms and IPv6 protocol for data networks
- Analyze Data Center Networks and Optical Networks

**UNIT - I** Lecture Hrs:

Network Architecture, Performance: Bandwidth and Latency, High Speed Networks, Network-Centric View, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks, Overlay Networks: Routing Overlays, Peer-to-Peer Networks and Content Distribution Networks, Client-Server Networks, Delay-Tolerant Networks,

**UNIT - II** Lecture Hrs:

Switching: Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Message-Switched Networks, Asynchronous Transfer Mode: Evolution, Benefits, Concepts, Exploring Broadband Integrated Services Digital Network, Layer and Adaptation Layer, IPv4: Address Space, Notations, Classful, Classless, Network Address Translation, Datagram

**UNIT - III** Lecture Hrs:

Fragmentation and Checksum IPv6 Addresses: Structure, Address Space, Packet Format and Extension Headers, ICMP, IGMP, ARP, RARP, Congestion Control and Resource Allocation: Problem, Issues, Queuing, TCP Congestion Control, Congestion-Avoidance Mechanisms and Quality of Service,

UNIT - IV Lecture Hrs:

Internetworking: Intra-Domain and Inter-Domain Routings, Unicast Routing Protocols: RIP, OSPF and BGP, Multicast Routing Protocols: DVMRP, PIM-DM, PIM-SM, CBT, MSDP and MOSPF, Spanning Tree Algorithm, Optical Networking: SONET/SDH Standards, Traffic Engineering: Requirement, Traffic Sizing, Characteristics, Protocols, Time and Delay Considerations, Connectivity, Availability, Reliability and Maintainability and Throughput.

**UNIT - V** Lecture Hrs:

Multimedia Over Internet: Transmission, IP Multicasting and VoIP, Domain Name System: Name Space, Domain Name Space, Distribution, Domains, Resolutions and Dynamic Domain Name System, SNMP, Security: IPSec, SSL/TLS, PGP and Firewalls, Datacenter Design and Interconnection Networks.

**Textbooks:**

1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, Fifth Edition, Morgan Kaufmann, Elsevier, 2012.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, Fifth Edition, 2017.

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3. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber Security, CRC press, Taylor & Francis Group,2014
4. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014.


**Reference Books:**


1. Satish Jain Advanced Computer Networking: Concepts and Applications

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **MACHINE LEARNING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58103a** | **(Common to M.Tech CSE, SE,AI & ML)** | **3** | **0** | **0** | **3** |
| | **Semester** | **I** | | | |

**Course Objectives:**

- To understand various key paradigms for machine learning approaches.
- To familiarize with the mathematical and statistical techniques used in machine learning.
- To understand and differentiate among various machine learning techniques.

**Course Outcomes (CO):** Student will be able to

- To formulate a machine learning problem
- Select an appropriate pattern analysis tool for analysing data in a given feature space.
- Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.

| **UNIT - I** | Lecture Hrs: |
|---|---|
| Introduction: Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression | |
| **UNIT - II** | Lecture Hrs: |
| Bayes Decision Theory: Bayes decision rule, Minimum error rate classification, Normal density and discriminant functions.<br>Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation | |
| **UNIT - III** | Lecture Hrs: |
| Discriminative Methods: Distance-based methods, Linear Discriminant Functions, Decision Tree, Random Decision Forest and Boosting<br>Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS, SBFS | |
| **UNIT - IV** | Lecture Hrs: |
| Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled data. | |
| UNIT - V | Lecture Hrs: |
| Kernel Machines: Kernel Tricks, SVMs (primal and dual forms), K-SVR, K-PCA (6 Lectures) Artificial Neural Networks: MLP, Backprop, and RBF-Net | |

**Textbooks:**

1. Shalev-Shwartz,S., Ben-David,S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.

**Reference Books:**

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | OBJECT ORIENTED SOFTWARE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| 21D58103b | | 3 | 0 | 0 | 3 |
| | Semester | I | | | |

**Course Objectives:**

- To learn and understand various O-O concepts along with their applicability contexts.
- Given a problem, identify domain objects, their properties, and relationships among them.
- How to identify and model/represent domain constraints on the objects and (or) on their relationships
- To learn various modelling techniques to model different perspectives of object-oriented software design (UML)

**Course Outcomes (CO):** Student will be able to

- Discuss about software development process models
- Identify the contemporary issues and discuss about coding standards
- Recognize the knowledge about testing methods and comparison of various testing techniques.
- Use the concept and standards of quality and getting knowledge about software quality assurance group.

| **UNIT - I** | Lecture Hrs: |
|---|---|

Introduction to Software Engineering - Software Development process models – Agile Development - Project & Process - Project management - Process& Project metrics - Object Oriented concepts, Principles & Methodologies.

| **UNIT - II** | Lecture Hrs: |
|---|---|

Software Requirements Specification, Software prototyping - Software project planning - Scope - Resources - Software Estimation - Empirical Estimation Models – Planning - Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.

| **UNIT - III** | Lecture Hrs: |
|---|---|

Analysis Modelling - Data Modelling - Functional Modelling& Information Flow - BehaviouralModelling- Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behaviour Model, Design modelling with UML.

| **UNIT - IV** | Lecture Hrs: |
|---|---|

Design Concepts & Principles - Design Process - Design Concepts - Modular Design - Design Effective Modularity - Introduction to Software Architecture - Data Design - Transform Mapping - Transaction Mapping - Object Oriented Design - System design process- Object design process - Design Patterns.

| **UNIT - V** | Lecture Hrs: |
|---|---|

Top - Down, Bottom-Up, object oriented product Implementation & Integration. Software Testing methods- White Box, Basis Path-Control Structure - Black Box - Unit Testing - Integration testing - Validation & System testing - Testing Tools – Software Maintenance &Reengineering.

**Textbooks:**

1. Fairley R, “Software Engineering Concepts”, second edition, Tata McGraw Hill,NewDelhi, 2003.
2. Jalote P, “An Integrated Approach to Software Engineering”, third edition, NarosaPublishers, New Delhi, 2013.

**Reference Books:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson - "the Unified Modeling Language User Guide" - Addison Wesley, 1999.
2. Ali Bahrami, “Object Oriented Systems Development” 1st Edition, The McGraw-Hill Company, 1999

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **DIGITAL IMAGE AND VIDEO PROCESSING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58103c** | | **3** | **0** | **0** | **3** |
| | **Semester** | **I** | | | |

**Course Objectives:**

- To study the image fundamentals and mathematical transforms necessary for image Processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.

**Course Outcomes (CO):** Student will be able to

- Review the fundamental concepts of a digital image processing system.
- Analyse images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques

**UNIT - I** — Lecture Hrs:

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms

**UNIT - II** — Lecture Hrs:

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de-convolution.

**UNIT - III** — Lecture Hrs:

Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

**UNIT - IV** — Lecture Hrs:

Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

**UNIT - V** — Lecture Hrs:

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

**Textbooks:**

1. Digital Image Processing – Gonzaleze and Woods, 3rdEd., Pearson.
2. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PH Int.

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**COURSE STRUCTURE & SYLLABI**

| | |
|---|---|
| | **Reference Books:** |
| 1. | S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, TataMcGraw Hill publishers, 2009 |

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## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | DATA SCIENCE | L | T | P | C |
|---|---|---|---|---|---|
| 21D58104a | | 3 | 0 | 0 | 3 |
| | Semester | I | | | |

**Course Objectives:**

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

**Course Outcomes (CO):** Student will be able to

- Explain how data is collected, managed and stored for data science;
- Understand the key concepts in data science, including their real-world applications and the
- toolkit used by data scientists;
- Implement data collection and management scripts using MongoDB

| UNIT - I | | Lecture Hrs: |
|---|---|---|

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

| UNIT - II | | Lecture Hrs: |
|---|---|---|

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 | | Lecture Hrs: |
|---|---|---|

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 | | Lecture Hrs: |
|---|---|---|

Data visualization: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings

| UNIT - V | | Lecture Hrs: |
|---|---|---|

Applications of Data Science, Technologies for visualisation, Bokeh (Python) Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science

**Textbooks:**

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

**Reference Books:**

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O'Reilly, 2013.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer, 2009.
4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018.
5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014.
6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **DESIGN PATTERNS (Common to M.Tech CSE, CN, SE)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58104b** | | **3** | **0** | **0** | **3** |
| | **Semester** | **I** | | | |

**Course Objectives:**

- Understand the concept of Design patterns and its importance.
- Understand the behavioural knowledge of the problem and solutions.
- Relate the Creational, Structural ,behavioural Design patterns.
- Apply the suitable design patterns to refine the basic design for given context

**Course Outcomes (CO):** Student will be able to

- Identify the appropriate design patterns to solve objectoriented design problems.
- Develop design solutions using creational patterns.
- Apply structural patterns to solve design problems.
- Construct design solutions by using behavioral patterns.

| **UNIT - I** | Lecture Hrs: |
|---|---|
| Introduction : What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern. | |
| **UNIT - II** | Lecture Hrs: |
| A Case Study : Designing a Document Editor : Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary . | |
| **UNIT - III** | Lecture Hrs: |
| Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.Structural Pattern Part-I : Adapter, Bridge, Composite. | |
| **UNIT - IV** | Lecture Hrs: |
| Structural Pattern Part-II : Decorator, Façade, Flyweight, Proxy.Behavioural Patterns Part-I : Chain of Responsibility, Command, Interpreter, Iterator. | |
| **UNIT - V** | Lecture Hrs: |
| Behavioral Patterns Part-II : Mediator, Memento, Observer, State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns. | |

**Textbooks:**

1. Design Patterns By Erich Gamma, Pearson Education

**Reference Books:**

1. Erich Gamma , Richard Helm, Ralph Johnson, John Vlissides , Grady Booch
   Design Patterns: Elements of Reusable Object-Oriented Software

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **INFORMATION SECURITY** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58104c** | | **3** | **0** | **0** | **3** |
| | **Semester** | **I** | | | |

**Course Objectives:**

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a Data
- To understand various protocols for network security to protect against the threats in the networks.

**Course Outcomes (CO):** Student will be able to

- Provide security of the data over the network.
- Do research in the emerging areas of cryptography and network security.
- Implement various networking protocols.
- Protect any network from the threats in the world

**UNIT - I** — Lecture Hrs:

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

**UNIT - II** — Lecture Hrs:

Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT - III** — Lecture Hrs:

Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**UNIT - IV** — Lecture Hrs:

Email privacy: Pretty Good Privacy (PGP) and S/MIME.IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT - V** — Lecture Hrs:

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats.

**Textbooks:**

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, wileyDreamtech,
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson

**Reference Books:**

1. Network Security and Cryptography‖, Bernard Menezes ,Cengage Learning.
2. Cryptography and Security‖, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India.
3. Applied Cryptography, Bruce Schiener, 2nd edition, John Wiley & Sons.
4. Cryptography and Network Security‖, AtulKahate, TMH.
5. ‗Introduction to Cryptography‖, Buchmann, Springer.
6. ‗Number Theory in the Spirit of Ramanujan‖, Bruce C.Berndt, University Press
7. Introduction to Analytic Number Theory‖, Tom M.Apostol, University Press

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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ADVANCED DATA STRUCTURES AND ALGORITHMS LAB (Common to M.Tech CSE, CN, SE,AI & ML) | L | T | P | C |
|---|---|---|---|---|---|
| 21D58105 | | 0 | 0 | 4 | 2 |
| | Semester | I | | | |

**Course Objectives:**

- Implement linear and non linear data structures.
- Analyze various algorithms based on their time complexity.
- Choose appropriate data structure and algorithm design method for a specific application.
- Identify suitable data structure to solve various computing problems.

**Course Outcomes (CO):**

- Implement divide and conquer techniques to solve a given problem.
- Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing.
- Perform Stack operations to convert infix expression into post fix expression and evaluate the post fix expression.
- Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms.

**List of Experiments**:

- To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing).
- To perform various operations i.e., insertions and deletions on AVL trees.
- To perform various operations i.e., insertions and deletions on 2-3 trees.
- To implement operations on binary heap.
- To implement operations on graphs
- To implement Depth First Search for a graph non-recursively.
- To implement Breadth First Search for a graph non-recursively.
- To implement Prim's algorithm to generate a min-cost spanning tree.
- To implement Krushkal's algorithm to generate a min-cost spanning tree.
- To implement Dijkstra's algorithm to find shortest path in the graph.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ADVANCED COMPUTER NETWORKS LAB | L | T | P | C |
|---|---|---|---|---|---|
| 21D58106 | | 0 | 0 | 4 | 2 |
| | Semester | I | | | |

**Course Objectives:**

- Aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks

**Course Outcomes (CO):**

Develop programs for client-server applications
Perform packet sniffing and analyze packets in network traffic.
Implement error detecting and correcting codes
Implement network security algorithms

**List of Experiments**:

1. Implementation of client server programs for different network applications
2. Study and analysis of the network using Wireshark network protocol analyser
3. Implementation of topology generation for network simulation
4. Implementation of queuing management
5. Implementation of MAC-layer protocols
6. Implementation of routing protocols
7. Implementation of transport-layer protocols
8. Implementation of network security mechanisms

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | RESEARCH METHODOLOGY AND IPR | L | T | P | C |
|---|---|---|---|---|---|
| 21DRM101 | (Common to M.Tech CSE, CN, SE,AI & ML) | 2 | 0 | 0 | 2 |
| | Semester | I | | | |

**Course Objectives:**

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

**Course Outcomes (CO):** Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

| **UNIT - I** | | Lecture Hrs: |
|---|---|---|

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

| **UNIT - II** | | Lecture Hrs: |
|---|---|---|

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

| **UNIT - III** | | Lecture Hrs: |
|---|---|---|

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 - IV** | | Lecture Hrs: |
|---|---|---|

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

| **UNIT - V** | | |
|---|---|---|

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.

**Textbooks:**

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

**Reference Books:**

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.

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5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **ADVANCED OPERATING SYSTEMS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58201** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

- To be able to read and understand sample open source programs and header files.
- System calls which explore networking and security Applications..
- To acquire the knowledge in the implementation of interprocess communication.

**Course Outcomes (CO):** Student will be able to

- To explain the functionality of a large software system by reading its source.
- To revise any algorithm present in a system.
- Inter process communication mechanism
- Android mobiles inner process system

| **UNIT - I** | | Lecture Hrs: |
|---|---|---|

Basic Operating System Concepts - Overview of Unix File System - Files - Links - Types - Inodes -Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization - Interprocess Communication - Process Management - Memory Management - Device Drivers.

| **UNIT - II** | | Lecture Hrs: |
|---|---|---|

Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - System Calls - Kernel Threads - Destroying Processes -Termination - Removal.

| **UNIT - III** | | Lecture Hrs: |
|---|---|---|

The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Files systems – Filesystem Type Registration – Filesystem Handling - Namespaces - Mounting – Unmounting - Implementation of VFS System Calls.

| **UNIT - IV** | | Lecture Hrs: |
|---|---|---|

Windows Operating system - versions, Concepts and tools, Windows internals, System Architecture, Requirements and design goals, Operating system model, Architecture overview. Key system components. System mechanisms - Trap dispatching, object manager, Synchronization, System worker threads, Windows global flags, Local procedural calls, Kernelevent tracing.

| **UNIT - V** | | Lecture Hrs: |
|---|---|---|

what is android, basic building blocks – activities, services, broadcast receivers & content, ui components-views & notifications, components for communication -intents & intent filters, android api levels launching emulator editing emulator settings emulator shortcuts log cat usage, Applications of Android.

**Textbooks:**

1. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005.
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, ―Structure and Interpretation of Computer Programs‖, Second Edition, Universities Press, 2013.

**Reference Books:**

1. Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, 4th Edition, Microsoft Press, 2004.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **INTERNET OF THINGS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58202** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.
- Familiarize the student with application program interfaces for IoT.
- Enable students to create simple IoT applications.

**Course Outcomes (CO):** Student will be able to
- Choose the sensors and actuators for an IoT application
- Select protocols for a specific IoT application
- Utilize the cloud platform and APIs for IoT applications
- Experiment with embedded boards for creating IoT prototypes
- Design a solution for a given IoT application
- Establish a startup

**UNIT - I** — Lecture Hrs:

Overview of IoT:
The Internet of Things: An Overview, The Flavor of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?
Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.
Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

**UNIT - II** — Lecture Hrs:

Embedded Devices:
Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

**UNIT - III** — Lecture Hrs:

Communication in the IoT:
Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols
Prototyping Online Components:
Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

**UNIT - IV** — Lecture Hrs:

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups.
Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

**UNIT - V** — Lecture Hrs:

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software.
Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions

**Textbooks:**

1.Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

**Reference Books:**

1. HaiderRaad Fundamentals of IoT and Wearable Technology Design, Wiley Publications2020.
2. KashishAraShakil,Samiya Khan, Internet of Things (IoT) Concepts and Applications,Springer Publications 2020.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **DEEP LEARNING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58203a** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

- To present the mathematical, statistical and computational challenges of building neural networks.
- To teach the concepts of deep learning.
- To introduce dimensionality reduction techniques.
- To enable the students to know deep learning techniques to support real-time applications.
- To explain the case studies of deep learning techniques.

**Course Outcomes (CO):** Student will be able to

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

| **UNIT - I** | Lecture Hrs: |
|---|---|

Introduction: Introduction to machine learning- Linear models (SVMs and Perceptron's, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

| **UNIT - II** | Lecture Hrs: |
|---|---|

Deep Networks: History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning .

| **UNIT - III** | Lecture Hrs: |
|---|---|

Dimensionality Reduction: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

| **UNIT - IV** | Lecture Hrs: |
|---|---|

Optimization and Generalization: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

| **UNIT - V** | Lecture Hrs: |
|---|---|

Case Study and Applications: Image net- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

**Textbooks:**

1. Deep Learning", Ian Goodfellow, YoshuaBengio , Aaron Courville, MIT Press 2016.

**Reference Books:**

1. "Neural Networks and Deep Learning A Text Book", Charu C Aggarwal, Springer International
Publishing AG, Part of Springer Nature 2018.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | SERVICE ORIENTED ARCHITECTURE | L | T | P | C |
|---|---|---|---|---|---|
| 21D58203b | | 3 | 0 | 0 | 3 |
| | Semester | II | | | |

**Course Objectives:**

- Understand SOA and evolution of SOA.
- Understand web services and primitive, contemporary SOA.
- Understand various service layers.
- Understand service-oriented analysis and design based on guidelines.

**Course Outcomes (CO):** Student will be able to

- Comprehend the need for SOA and its systematic evolution
- Apply SOA technologies to enterprise domain
- Design and analyse various SOA patterns and techniques
- Compare and evaluate best strategies and practices of SOA

**UNIT - I** — Lecture Hrs:

Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA.
The Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.

**UNIT - II** — Lecture Hrs:

Web Services and Primitive SOA: The Web Services Frame Work, Services, Service Descriptions, Messaging.
Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration, and Choreography.
Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.

**UNIT - III** — Lecture Hrs:

Principles of Service-Orientation: Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service- Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Orientation.
Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

**UNIT - IV** — Lecture Hrs:

SOA Delivery Strategies: SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy.
Service Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services.
Service Oriented Analysis (Part-II-Service Modelling): Service Modelling, Service Modelling Guidelines, Classifying Service Model Logic, Contrasting Service Modelling Approaches.
Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WSDL Language Basics, Service Interface Design Tools.
Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.

UNIT - V — Lecture Hrs:

Service Oriented Design (Part III- Service Design): Service Design Overview, Entity- Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines.
Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS- Coordination Overview, Service Oriented Business Process Design.

**Textbooks:**

1.Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education, 2006.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

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|---|
| 2.Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education, 2005. |
| **Reference Books:** |
| 1. Thomas Erl; Service Oriented Architecture Concepts Technology & Design, Pearson Education Limited; 2015, ISBN-13: 9788131714904.<br>2 Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors; 2010, ISBN-13: 9789350231081 |

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **COMPUTER VISION** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58203c** | **(Common to M.Tech CSE, AI & ML)** | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

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

**Course Outcomes (CO):** Student will be able to

- Develop the practical skills necessary to build computer vision applications.
- To have gained exposure to object and scene recognition and categorization from images

| | | |
|---|---|---|
| **UNIT - I** | | Lecture Hrs: |
| Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis | | |
| **UNIT - II** | | Lecture Hrs: |
| Edge detection, Edge detection performance, Hough transform, corner detection | | |
| UNIT - III | | Lecture Hrs: |
| Segmentation, Morphological filtering, Fourier transform | | |
| **UNIT - IV** | | Lecture Hrs: |
| Feature extraction, shape, histogram, colour, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing | | |
| UNIT - V | | Lecture Hrs: |
| Pattern Analysis:<br>Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised<br>Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods | | |

**Textbooks:**

1. Computer Vision: Algorithms and Applications by Richard Szeliski.

**Reference Books:**

1. Deep Learning, by Goodfellow, Bengio, and Courville.
2. Dictionary of Computer Vision and Image Processing, by Fisher et al.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **DATA VISUALIZATION TECHNIQUES** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58204a** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

- To develop skills to both design and critique visualizations.
- To introduce visual perception and core skills for visual analysis.
- To understand visualization for time-series analysis.
- To understand visualization for ranking analysis.
- To understand visualization for deviation analysis..

**Course Outcomes (CO):** Student will be able to

- Explain principles of visual perception
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Design information dashboard

| **UNIT - I** | Lecture Hrs: |
|---|---|

Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples.

| **UNIT - II** | Lecture Hrs: |
|---|---|

Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.

| **UNIT - III** | Lecture Hrs: |
|---|---|

Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence.

| **UNIT - IV** | Lecture Hrs: |
|---|---|

Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.

| **UNIT - V** | Lecture Hrs: |
|---|---|

Plotting Geospatial Data: Introduction to Geoplotlib, Design Principles of Geoplotlib, Geospatial Visualizations, Plotting Geospatial Data on a Map Web-Based Visualizations: Concepts of Bokeh, Interfaces-Plotting and Model Interfaces, Output, Bokeh Server, Presentation, Integrating – HTML Document and Bokeh Applications

**Textbooks:**

1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2. Mario Dobler, Tim Grobmann, “Data Visualization with Python”, O’Reilly, First Edition, 2019

**Reference Books:**

1. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **DISTRIBUTED SYSTEMS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58204b** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems

**Course Outcomes (CO):** Student will be able to

- Design trends in distributed systems.
- Apply network virtualization.
- Apply remote method invocation and objects

| **UNIT - I** | Lecture Hrs: |
|---|---|

Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts
DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

| **UNIT - II** | Lecture Hrs: |
|---|---|

DISTRIBUTED DATABASE DESIGN
Alternative design strategies; Distributed design issues; Fragmentation; Data Allocation
SEMANTICS DATA CONTROL
View management; Data security; Semantic Integrity Control
QUERY PROCESSING ISSUES
Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data

| **UNIT - III** | Lecture Hrs: |
|---|---|

Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms
TRANSACTION MANAGEMENT
The transaction concept; Goals of transaction management; Characteristics oftransactions; Taxonomy of transaction models
CONCURRENCY CONTROL
Concurrency control in centralized database systems; Concurrency control in DDBSs;Distributed concurrency control algorithms; Deadlock management

| **UNIT - IV** | Lecture Hrs: |
|---|---|

Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

| **UNIT - V** | Lecture Hrs: |
|---|---|

PARALLEL DATABASE SYSTEMS
Parallel architectures; parallel query processing and optimization; load balancing
ADVANCED TOPICS
Mobile Databases, Distributed Object Management, Multi-databases

**Textbooks:**

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.

**Reference Books:**

1. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **PRIVACY PRESERVING DATA PUBLISHING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58204c** | | **3** | **0** | **0** | **3** |
| | **Semester** | **II** | | | |

**Course Objectives:**

- Will be able to decide, given an application, if it should be formulated as a data privacy problem. If yes, the students will be able to formally define the problem and state what properties can be guaranteed by applying differential privacy.
- Will have understanding of how (and why) randomness (or uncertainty) provides privacy protection.
- Will be able to analyse real-world privacy problems, identify which privacy-preserving methods are appropriate, and implement the private algorithms in code.
- Will be able to evaluate and compare privacy-preserving algorithms.

**Course Outcomes (CO):** Student will be able to

- Apply anonymization methods for sensitive data protection
- Apply state-of-art techniques for data privacy protection
- Design privacy preserving algorithms for real-world applications
- Identify security and privacy issues in OLAP systems
- Apply information metrics for Maximizing the preservation of information in the anonymization process

| **UNIT - I** | Lecture Hrs: |
|---|---|
| Fundamentals of defining privacy and developing efficient algorithms for enforcing privacy, challenges in developing privacy preserving algorithms in real-world applications, privacy issues, privacy models, | |
| **UNIT - II** | Lecture Hrs: |
| Anonymization operations, information metrics, Anonymization methods for the transaction data, trajectory data, social networks data, and textual data, Collaborative Anonymization, | |
| **UNIT - III** | Lecture Hrs: |
| Access control of outsourced data, Use of Fragmentation and Encryption to Protect Data Privacy, Security and Privacy in OLAP systems. | |
| **UNIT - IV** | Lecture Hrs: |
| Extended Data publishing Scenarios, Anonymization for Data Mining, publishing social science data, | |
| **UNIT - V** | Lecture Hrs: |
| Continuous user activity monitoring (like in search logs, location traces, energy monitoring), social networks, recommendation engines and targeted advertising. | |

**Textbooks:**

1. Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu and Philip S. Yu, Introduction to PrivacyPreserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010.

**Reference Books:**

1. Bee-Chung Chen, Daniel Kifer, AshwinMachanavajjhala, Kristen LeFevre Privacy-Preserving Data Publishing ,Now Publishers Inc, 2009.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ADVANCED OPERATING SYSTEMS LAB | L | T | P | C |
|---|---|---|---|---|---|
| 21D58205 | | 0 | 0 | 4 | 2 |
| | Semester | II | | | |

**Course Objectives:**

- To study Linux memory management data structures and algorithms.
- To acquire the knowledge in the implementation of interprocess communication.
- To understand how program execution happens in Linux.

**Course Outcomes (CO):**

- To revise any algorithm present in a system.
- To design a new algorithm to replace an existing one.
- To appropriately modify and use the data structures of the linux kernel for a different software system

**List of Experiments**:

1. Write programs using the following system calls of UNIX operating system: 40 fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, etc.
4. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)
5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)
6. Developing Application using Inter Process communication (using shared memory, pipes or message queues)
7. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | INTERNET OF THINGS LAB | L | T | P | C |
|---|---|---|---|---|---|
| 21D58206 | | 0 | 0 | 4 | 2 |
| | Semester | II | | | |

**Course Objectives:**

- The main objective IOT applications is to know the different real time sensors used to measure the different electrical parameters and to control the different devices from anywhere through IOT.

**Course Outcomes (CO):**

- The students will be thorough about the technology behind the IoT and associated technologies
- The students will be able to use the IoT technologies in practical domains of society
- The students will be able to gain knowledge about the state of the art methodologies in IoT application domains.

**List of Experiments**:

1. Exercise on Eclipse IoT Project.
2. Experiments on few Eclipse IoT Projects.
3. Any Experiment on architecture of Iot Toolkit.
4. Exercise on smart object API Gateway service reference implementation in IoTToolkit.
5. Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.
6. Experiment on Gate way as a service deployment in IoT Toolkit.
7. Experiment on application framework and embedded software agents for IoT Toolkit

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| **Course Code** | **SOFTWARE DEFINED NETWORKS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **21D58301a** | | **3** | **0** | **0** | **3** |
| | **Semester** | **III** | | | |

**Course Objectives:**

- This course introduces about software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network.

**Course Outcomes (CO):** Student will be able to

- Differentiate between traditional networks and software defined networks and understand the key benefits and use cases of SDN.
- Interpret the SDN data plane devices and OpenFlow Protocols
- Implement the operation of SDN control plane with different controllers
- Apply techniques that enable applications to control the underlying network using SDN
- Evaluate Network Functions Virtualization components and their roles in SDN

| **UNIT - I** | | Lecture Hrs: |
|---|---|---|

Evolving network requirements-The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.

| **UNIT - II** | | Lecture Hrs: |
|---|---|---|

SDN data plane: Data plane Functions, Data plane protocols, Open flow logical network Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- Open Flow Protocol.

| **UNIT - III** | | Lecture Hrs: |
|---|---|---|

SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- OpenDaylight-REST- Cooperation and Coordination Among Controllers

| **UNIT - IV** | | Lecture Hrs: |
|---|---|---|

SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic- Traffic Engineering Measurement and Monitoring Security- Data CentreNetworking- Mobility and Wireless.

| **UNIT - V** | | Lecture Hrs: |
|---|---|---|

Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements- NFV Reference Architecture: NFV Management and Orchestration

**Textbooks:**

1. Paul Goransson Chuck Black Timothy Culver: Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, 2016.
2. Ken Gray Thomas Nadeau: Network Function Virtualization, Morgan Kaufmann, 2016.

**Reference Books:**

1. Larry Peterson , Carmelo Cascone , Bruce Davie: Software-Defined Networks: A Systems Approach, Systems Approach, 2021

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**COURSE STRUCTURE & SYLLABI**

| Course Code | REINFORCEMENT LEARNING | L | T | P | C |
|---|---|---|---|---|---|
| 21D58301b | (Common for MTech CSE, AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | III | | | |

**Course Objectives:**

- Reinforcement Learning is a subfield of Machine Learning, but is also a general-purpose formalism for automated decision-making and AI. This course introduces you to statistical learning techniques where an agent explicitly takes actions and interacts with the world.

**Course Outcomes (CO):** Student will be able to

- Formulate Reinforcement Learning problems
- Apply various Tabular Solution Methods to Markov Reward Process Problems
- Apply various Iterative Solution methods to Markov Decision Process Problems
- Comprehend Function approximation methods

**UNIT - I** — Lecture Hrs:

Introduction: Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).

**UNIT - II** — Lecture Hrs:

Evaluative Feedback - Multi-Arm Bandit Problem: An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs

**UNIT - III** — Lecture Hrs:

Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations. Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP , Generalized Policy Iteration.

**UNIT - IV** — Lecture Hrs:

Monte Carlo Methods for Prediction and Control: Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monto Carlo Control, On policy and off policy learning, Importance sampling. Temporal Difference Methods: TD Prediction, Optimality of TD(0), TD Control methods - SARSA, Q-Learning and their variants.

**UNIT - V** — Lecture Hrs:

Eligibility traces: n-Step TD Prediction, Forward and Backward view of TD(λ), Equivalence of forward and backward view, Sarsa(λ),, Watkins's Q(λ), Off policy eligibility traces using importance of sampling. Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods, control with function approximation.

**Textbooks:**

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press.
2. CsabaSzepesvari – Algorithms for Reinforcement Learning – Morgan & Claypool, 2010.

**Reference Books:**

1. Reinforcement Learning By Richard S. (University Of Alberta) Sutton,Andrew G. (Co-Director Autonomous Learning Laboratory) Barto

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## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | DATA ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| 21D58301c | (Common to M.Tech CSE, SE) | 3 | 0 | 0 | 3 |
| | Semester | III | | | |

**Course Objectives:**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

**Course Outcomes (CO):** Student will be able to

- Understand the ideas of statistical approaches to learning
- Understand the significance of exploratory data analysis (EDA) in data science and apply basic tools (plots, graphs, summary statistics) to perform EDA
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling. Explore the merits of Naive Bayes technique
- Recognize the characteristics of machine learning techniques that are useful to solve real-world problems

| **UNIT - I** | Lecture Hrs: |
|---|---|

Introduction: What is Data Science? Big Data and Data Science hype and getting past the hype, Why now?, Datafication, Current landscape of perspectives, Skill sets, Life cycle of Data Science, Different phases.

| **UNIT - II** | Lecture Hrs: |
|---|---|

Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm), Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k-NN), k-means.

| **UNIT - III** | Lecture Hrs: |
|---|---|

One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web, Feature Generation and Feature Selection (Extracting Meaning From Data), Motivating application: user (customer) retention,

| **UNIT - IV** | Lecture Hrs: |
|---|---|

Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests, Recommendation Systems: Building a User-Facing Data Product: Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.

| **UNIT - V** | Lecture Hrs: |
|---|---|

Data Visualization: Basic principles, ideas and tools for data visualization, Case study on industry projects, Exercise: create your own visualization of a complex dataset, Data Science and Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.

**Textbooks:**

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly, 2014.
2. Jure Leskovek, AnandRajaraman and Jerey Ullman. Mining of Massive Datasets, Cambridge University Press, 2014.

**Reference Books:**

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O'Reilly, 2013.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer, 2009.

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**COURSE STRUCTURE & SYLLABI**


4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018.
5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014.
6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011.

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**COURSE STRUCTURE & SYLLABI**

# AUDIT COURSE-I

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | ENGLISH FOR RESEARCH PAPER WRITING | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC101a | | 2 | 0 | 0 | 0 |
| | Semester | I | | | |

**Course Objectives:** This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

**Course Outcomes (CO):** Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

| UNIT - I | Lecture Hrs:10 |
|---|---|

**1**Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

| UNIT - II | Lecture Hrs:10 |
|---|---|

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

| UNIT - III | Lecture Hrs:10 |
|---|---|

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

| UNIT - IV | Lecture Hrs:9 |
|---|---|

Key skills needed for writing a Title, Abstract, and Introduction

| UNIT - V | Lecture Hrs:9 |
|---|---|

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

**Suggested Reading**


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

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**COURSE STRUCTURE & SYLLABI**

| Course Code | DISASTER MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC101b | | 2 | 0 | 0 | 0 |
| | **Semester** | I | | | |

**Course Objectives:** This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

**UNIT - I**

**Introduction:**
Disaster:Definition,FactorsandSignificance;DifferenceBetweenHazardandDisaster;Naturaland Manmade Disasters: Difference, Nature, Types and Magnitude.

**Disaster Prone Areas in India:**
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

**UNIT - II**

**Repercussions of Disasters and Hazards**:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsandFamines,Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

**UNIT - III**

**Disaster Preparedness and Management:**
Preparedness: Monitoring of Phenomena Triggering ADisasteror Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

**UNIT - IV**

**Risk Assessment Disaster Risk:**
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

**UNIT - V**

**Disaster Mitigation:**
Meaning,ConceptandStrategiesofDisasterMitigation,EmergingTrendsInMitigation.Structural Mitigationand Non-Structural Mitigation, Programs of Disaster Mitigation in India.

**Suggested Reading**

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**COURSE STRUCTURE & SYLLABI**


1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies
2. "'New Royal book Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi.
3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | SANSKRITFOR TECHNICAL KNOWLEDGE | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC101c | | 2 | 0 | 0 | 0 |
| | **Semester** | **I** | | | |

**Course Objectives:** This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancientliterature

**Course Outcomes (CO):** Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

**UNIT - I**

Alphabets in Sanskrit,

**UNIT - II**

Past/Present/Future Tense, Simple Sentences

**UNIT - III**

Order, Introduction of roots

**UNIT - IV**

Technical information about Sanskrit Literature

**UNIT - V**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**Suggested Reading**

1.“Abhyaspustakam” –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2.“Teach Yourself Sanskrit” Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3.“India’s Glorious ScientificTradition” Suresh Soni, Ocean books (P) Ltd.,New Delhi

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**COURSE STRUCTURE & SYLLABI**

# AUDIT COURSE-II

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## M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | PEDAGOGY STUDIES | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC201a | | 2 | 0 | 0 | 0 |
| | **Semester** | **II** | | | |

**Course Objectives:** This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

**Course Outcomes (CO):** Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials best support effective pedagogy?

**UNIT - I**

**Introduction and Methodology:** Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories oflearning,Curriculum,Teachereducation.Conceptualframework,Research questions**.** Overview of methodology and Searching.

**UNIT - II**

**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

**UNIT - III**

Evidence on theeffectivenessofpedagogicalpractices,Methodologyfortheindepthstage:quality assessmen t of included studies. How can teacher education (curriculumandpracticum) andthescho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of th body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

**UNIT - IV**

**Professional development:** alignment with classroom practices and follow-up support, Peer support, Support from the head teacherandthecommunity.Curriculumandassessment,Barrierstolearning:limitedresourcesand large class sizes

**UNIT - V**

**Researchgapsandfuturedirections:**Researchdesign**,**Contexts**,**Pedagogy**,**Teachereducation**,** Curriculum and assessment**,** Dissemination and research impact.

**Suggested Reading**

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof

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3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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**(Established by Govt. of A.P., ACT No.30 of 2008)**
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | STRESSMANAGEMENT BY YOGA | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC201b | | 2 | 0 | 0 | 0 |
| | **Semester** | **II** | | | |

**Course Objectives:** This course will enable students:

- To achieve overall health of body and mind
- To overcome stres

**Course Outcomes (CO):** Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

| | | |
|---|---|---|
| **UNIT - I** | | |
| Definitions of Eight parts of yog.(Ashtanga) | | |
| **UNIT - II** | | |
| Yam and Niyam. | | |
| **UNIT - III** | | |
| Do`sand Don't'sin life.<br>i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii)<br>Shaucha,santosh,tapa,swadhyay,ishwarpranidhan | | |
| **UNIT - IV** | | |
| Asan and Pranayam | | |
| **UNIT - V** | | |
| i)Variousyogposesand theirbenefitsformind &body<br>ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam | | |

**Suggested Reading**

1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur
2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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**COURSE STRUCTURE & SYLLABI**

| Course Code | PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENTSKILLS | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC201c | | 2 | 0 | 0 | 0 |
| | **Semester** | **II** | | | |

**Course Objectives:** This course will enable students:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Course Outcomes (CO):** Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geetawilllead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

**UNIT - I**

Neetisatakam- Holistic development of personality
Verses-19,20,21,22(wisdom)
Verses-29,31,32(pride &heroism)
Verses-26,28,63,65(virtue)

**UNIT - II**

Neetisatakam- Holistic development of personality
Verses-52,53,59(dont's)
Verses-71,73,75,78(do's)

**UNIT - III**

Approach to day to day work and duties.
ShrimadBhagwadGeeta:Chapter2-Verses41,47,48,
Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

**UNIT - IV**

Statements of basic knowledge.
ShrimadBhagwadGeeta:Chapter2-Verses 56,62,68
Chapter12 -Verses13,14,15,16,17,18
Personality of Rolemodel. Shrimad Bhagwad Geeta:

**UNIT - V**

Chapter2-Verses 17,Chapter3-Verses36,37,42,
Chapter4-Verses18,38,39
Chapter18– Verses37,38,63

**Suggested Reading**

1."SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata
2.Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, RashtriyaSanskrit Sansthanam, New Delhi.

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**COURSE STRUCTURE & SYLLABI**

# OPEN ELECTIVE

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**COURSE STRUCTURE & SYLLABI**

| Course Code | INDUSTRIAL SAFETY | L | T | P | C |
|---|---|---|---|---|---|
| 21DOE301b | (Common to M.Tech CSE, CN, SE,AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | III | | | |

**Course Objectives:**

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

**Course Outcomes (CO):** Student will be able to

- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

**UNIT - I** — Lecture Hrs:

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** — Lecture Hrs:

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** — Lecture Hrs:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications, 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** — Lecture Hrs:

Fault tracing: Fault tracing-concept and importance, decision treeconcept, 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** — Lecture Hrs:

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

**Textbooks:**

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

**Reference Books:**

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

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**COURSE STRUCTURE & SYLLABI**

| Course Code | BUSINESS ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| 21DOE301c | (Common to M.Tech CSE, CN, SE,AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | III | | | |

**Course Objectives:**

- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

**Course Outcomes (CO):** Student will be able to

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

| UNIT - I | Lecture Hrs: |
|---|---|

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

| UNIT - II | Lecture Hrs: |
|---|---|

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.

| UNIT - III | Lecture Hrs: |
|---|---|

Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

| UNIT - IV | Lecture Hrs: |
|---|---|

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

| UNIT - V | Lecture Hrs: |
|---|---|

Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

**Textbooks:**

1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

**Reference Books:**

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

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**M.TECH. IN COMPUTER SCIENCE AND ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | OPTIMIZATION TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| 21DOE301f | (Common to M.Tech CSE, CN, SE,AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | III | | | |

**Course Objectives:**

- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Know the basics of different evolutionary algorithms.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

**Course Outcomes (CO):** Student will be able to

- Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Use classical optimization techniques and numerical methods of optimization.
- Describe the basics of different evolutionary algorithms.
- Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas

**UNIT - I** Lecture Hrs:

LINER PROGRAMMING (L.P):
Revised Simplex Method, Duel simplex Method, Sensitivity Analysis
DYNAMIC PROGRAMMING (D.P):
Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.

**UNIT - II** Lecture Hrs:

CLASSICAL OPTIMIZATION TECHNIQUES:
Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.
NUMERICAL METHODS FOR OPTIMIZATION:
Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method

**UNIT - III** Lecture Hrs:

MODERN METHODS OF OPTIMIZATION:
GENETIC ALGORITHM (GA):
Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation
GENETIC PROGRAMMING (GP):
Principles of genetic programming, terminal sets, functional sets, differences between GA &GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems

**UNIT - IV** Lecture Hrs:

INTEGER PROGRAMMING:
Graphical Representation, Gomory's Cutting Plane Method,Balas' Algorithm for Zero–One Programming, Branch-and-Bound Method

**UNIT - V** Lecture Hrs:

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS:
Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

**Textbooks:**

1. Engineering Optimization (4th Edition) by S.S.Rao, New Age International,

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| **Reference Books:** |
|---|
| 1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers<br>2. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers<br>3. Operations Research by Hillar and Liberman, TMH Publishers<br>4. Optimal design – JasbirArora, McGraw Hill (International) Publisher |