

MASTER OF TECHNOLOGY
COMPUTER ENGINEERING

SYLLABI BOOK
(2021 – 2022)



Department of Computer Engineering
Faculty of Technology
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SEM.	Sr. No.	SUBJECT	WORK LOAD			TOTAL	Credit	MARKS				
			Th	T	P			Th	Sess	TW	Pract	Total
Sem-I	1	Advance Compiler Techniques	3	1	2	6	5	60	40	25	25	150
	2	Advance Computer Network	3	1	2	6	5	60	40	25	25	150
	3	Machine Learning	4	0	2	6	5	60	40	25	25	150
	4	Elective – I	3	1	2	6	5	60	40	25	25	150
		Digital Image Processing										
		Advanced Software Engineering										
	5	Elective – II	3	1	2	6	5	60	40	25	25	150
		Operating System Design and Implementation										
		Advanced Programming in Unix										
		Advanced Data Structure										
	6	Research Methodology for Computer Science	2	0	0	2	2	40	-	-	-	40
TOTAL			18	4	10	32	27	340	200	125	125	790
Sem-II	1	Mathematical Foundation of Computer Science	4	0	0	4	4	60	40	-	-	100
	2	Distributed Computing	3	1	2	6	5	60	40	25	25	150
	3	Design and Analysis of Algorithms	3	1	2	6	5	60	40	25	25	150
	4	Soft Computing	3	1	2	6	5	60	40	25	25	150
	5	Big Data Analytics	4	0	2	6	5	60	40	25	25	150
	6	Pedagogy Studies	2	0	0	2	0	-	-	-	-	-
TOTAL			19	3	8	30	24	300	200	100	100	700



M. TECH. SEMESTER – I (CE)
SUBJECT: ADVANCED COMPILER TECHNIQUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION TO ADVANCED TOPICS

Review of Compiler Structure, Advanced Issues in Elementary Topics, The Importance of Code Optimization, Structure of Optimizing Compilers, Informal Compiler Algorithm Notation (ICAN)

2 CONTROL FLOW ANALYSIS

Approaches to Control-Flow Analysis, Depth-First Search, Preorder Traversal, Postorder Traversal, and Breadth-First Search, Dominators, Loops and Strongly Connected Components, Reducibility, Interval Analysis and Control Trees, Structural Analysis

3 DATA FLOW ANALYSIS

Basic Concepts: Lattices, Flow Functions, and Fixed Points, Taxonomy of Data-Flow Problems and Solution Methods, Iterative Data-Flow Analysis, Lattices of Flow Functions, Control-Tree-Based Data-Flow Analysis, Structural Analysis, Interval Analysis, Static Single-Assignment (SSA) Form, Dealing with Arrays, Structures, and Pointers

4 DEPENDENCE ANALYSIS AND DEPENDENCE GRAPHS

Dependence Relations, Basic-Block Dependence DAGs, Dependences in Loops, Dependence Testing, Program-Dependence Graphs

5 EARLY OPTIMIZATION

Constant-Expression Evaluation (Constant Folding), Scalar Replacement of Aggregates, Algebraic Simplifications and Re-association, Value Numbering, Copy Propagation, Sparse Conditional Constant Propagation

6 REDUNDANCY ELIMINATION

Common-Sub-expression Elimination, Loop-Invariant Code Motion, Partial-Redundancy Elimination, Redundancy Elimination and Reassociation, Code Hoisting

7 LOOP OPTIMIZATION

Induction-Variable Optimizations, Unnecessary Bounds-Checking Elimination

8 REGISTRATION ALLOCATION

Register Allocation and Assignment, Local Methods, Graph Coloring, Priority-Based Graph Coloring



9 INSTRUCTION SCHEDULING

branch scheduling, list scheduling

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Advanced Compiler Design and Implementation, by Steven Muchnick, Publisher: Morgan Kaufmann
2. Engineering a Compiler, by Keith Cooper and Linda Torczon, Publisher: Morgan Kaufmann
3. Optimizing Compilers for Modern Architectures, by Randy Allen & Ken Kennedy, Publisher: Morgan Kaufmann.



M. TECH. SEMESTER – I (CE)
SUBJECT: ADVANCE COMPUTER NETWORKS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 OVERVIEW

Overview of TCP/IP protocol suite, Different TCP/IP Layers and their major Functionalities
Various addressing used in TCP/IP

2 IP ADDRESSING & DELIVERY OF IP PACKETS

IPv4 addressing scheme and notations, Subnetting and Supernetting, Different Routing Methods

3 PROTOCOLS

ARP, RARP, IP, ICMP, IGMP, TCP and UDP

4 WIRELESS NETWORKS

Introduction & Applications, Types of Wireless Networks

5 AD HOC WIRELESS NETWORKS

Introduction & Issues in Ad-hoc wireless networks, Ad Hoc wireless Internet, Issues of Routing Protocol, Various Routing Protocols, Energy Management in Ad Hoc Wireless Networks

6 TRANSPORT LAYER AND SECURITY PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Issues in Designing a Transport Layer Protocol for Wireless Networks, Design Goals of a Transport Layer Protocol for Wireless Networks, Classification of Transport Layer Solutions
TCP over Wireless Networks, Other Transport Layer Protocols for Wireless Networks

7 DELAY TOLERANT NETWORKS

Application and issues, Architecture and routing algorithms



B. RECOMMENDED TEXTBOOK/ REFERENCE BOOKS

1. AdHoc Wireless Networks, Architectures and Protocols, 2nd Edition By: C. Siva Ram Murthy, B. S. Manoj. Publisher: Prentice Hall of India
2. Adhoc Mobile Wireless Networks: Principles, Protocols and Applications, 2nd Edition By:Subir Kumar Sarkar, T. G.Basavaraju, C. Puttamadappa Publisher: Auerbach Publications
3. Adhoc Networks: Technology & Protocols, 1st Edition By:Prasant Mohapatra, S.V. Krishnamurthy Publisher: Spriger
4. Principles of Wireless Networks, 4th Edition By: Kaveh Pahlavan, Prashant Krishnamurthy Publisher: Pearson Education
5. Wireless Networks, 1st Edition By: P. Nicopolitidis, M. S. Obaidat, G.I. Papadimitria, A.S. Pomportsis Publisher: John Wiley & Sons.
6. Wireless Communications & Networks, 2nd Edition By: W. Stallings Publisher: Prentice Hall



M.TECH. SEMESTER – I (CE)
SUBJECT: MACHINE LEARNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION

Well posed learning problem, Perspective and issues in machine learning

2 CONCEPT LEARNING

Concept learning tasks, Finding maximally specific hypothesis, version space and candidate elimination, Inductive bias

3 DECISION TREE CLASSIFICATION

Appropriate problem for Decision tree learning, decision tree algorithm, hypothesis space search, Inductive bias in decision tree, Issues in decision tree learning.

4 HYPOTHESIS EVALUATION

Estimating Hypothesis accuracy, Basics of sampling theory, Confidence interval, comparing learning algorithms

5 BAYESIAN LEARNING

Bayes theorem, Bayes theorem and concept learning, maximum likelihood and least square error hypothesis, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive bayes classifier, Bayesian Belief Network, The EM algorithm.

6 SUPPORT VECTOR MACHINE

Max margin motivation: low density, high stability, Margin geometry to primal SVM formulation for separable training data, Dual formulation and role of alpha in a form of sparse local regression, Inseparable data, slack variables, hinge loss, upper bound on 0/1 training loss, Handling non-linear regression by lifting data points to higher dimension, Polynomial, Gaussian, RBF kernels, Sequential minimal optimization (SMO) algorithm

7 COMPUTATIONAL LEARNING THEORY

Probably learning an approximately correct hypothesis, sample complexity of finite hypothesis space, sample complexity of infinite hypothesis test, The mistake bound model of learning

8 INSTANCE BASED LEARNING

K-Nearest neighbor learning, Locally weighted regression, Radial basis function, Case based



reasoning, Lazy and Eager learning

9 CLUSTERING

Mixture model and Expectation maximization, K-Means Clustering, Distance based clustering, Density based clustering techniques

10 LEARNING SET RULES

Sequential covering algorithm, Learning first order rules, FOIL, induction and inverted deduction, Inverting resolution

11 ENSAMBLE LEARNING

Bagging and Boosting, Random forest, Adaboost

12 DIMENSIONALITY REDUCTION

Curse of dimensionality, Principal Component Analysis, Latent Semantic Analysis

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Machine Learning. T. Mitchell. McGraw-Hill, 1997.
2. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017
3. Pattern recognition and machine learning by Christopher Bishop, Springer Verlag, 2006.



M. TECH. SEMESTER – I (CE)
SUBJECT: DIGITAL IMAGE PROCESSING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION

Introduction, components of Digital Image Processing, examples, steps in DIP.

2 DIGITAL IMAGE FUNDAMENTALS

Elements of Visual perception, Light and Electromagnetic spectrum, Image Sensing and application, image sampling and quantization, Basic relationships between pixels, mathematical tools.

3 IMAGE TRANSFORMATION AND SPATIAL FILTERING

Basic intensity transformation, Histogram processing, Spatial filtering, smoothing and sharpening, combining spatial enhancement methods

4 IMAGE TRANSFORMATION IN FREQUENCY DOMAIN

Concepts, Sampling and Fourier transform, 1D and 2D Discrete Fourier Transform, properties of DFT, Basics of filtering, Image smoothing and sharpening, selective filtering, implementation.

5 IMAGE RESTORATION AND RECONSTRUCTION

Model of image degradation/restoration, noise models, restoration in spatial and frequency domain, estimating degradation function, inverse filtering, Wiener filtering, constrained least square filtering, geometric mean filter, image reconstruction from projections

6 COLOR IMAGE PROCESSING

Fundamentals, color models, pseudocolor image processing, full-color image processing, color transformation, smoothing and sharpening, segmentation based on color, noise in color images

7 WAVELETS AND MULTI-RESOLUTION PROCESSING

Background, multi-resolution expansion, wavelet transformation in one dimension, fast wavelet transform.

8 IMAGE COMPRESSION

Fundamentals, Huffman coding, golomb coding, arithmetic coding, LZW coding, run-length coding, symbol-based coding, bit-plane coding, block transform coding, predictive coding,



wavelet coding.

9 MORPHOLOGICAL IMAGE PROCESSING

Erosion and dilation, opening and closing, hit-or-miss transformation, basic morphological algorithms.

10 IMAGE SEGMENTATION

Fundamentals, point-line-edge detection, thresholding, region-based segmentation.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Digital Image Processing (3 rd Edition) By: Rafael C. Gonzalez and Richard E. Woods Publisher: Pearson
2. Fundamental of Digital Image Processing, 1 st Edition By: Anil K. Jain, Publisher: Pearson Education
3. Introduction to Data Compression, 3rd Edition By: Khalid Sayood, Publisher: Morgan kaufmann.



M. TECH. SEMESTER – I (CE)
SUBJECT: ADVANCED SOFTWARE ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION

Software Product and Process, Phases in Software Development, Software Development Process Models.

2 SOFTWARE ANALYSIS AND DESIGN

Analysis Methods, Software Requirement Specifications, System Design Methods, Detailed Design, Architectural Design and Component Level Design, User Interface Design.

3 IMPLEMENTATION AND TESTING

Coding, Verification and Testing. Testing Techniques

4 SOFTWARE QUALITY

Quality Standards, Quality Assurance, Measuring Aspect of Software Quality, Software Reliability and Maintenance.

5 SOFTWARE METRICS

Software Measurement and Metrics, Software Quality, Metrics for Software Product, Process and Project.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Software Engineering, Pressman, McGraw-Hill, 1992
2. Software Metrics , Fenton & Pfleeger, PWS Publication
3. Watts S. Humphrey, Managing The Software Process, Addison Wesley, 1989
4. Encyclopedia Of Software Engineering , J.J. Marciniak, Ed., Vols. 1 And 2 John Wiley,1994



M. TECH. SEMESTER I (CE)
SUBJECT: OPERATING SYSTEM DESIGN AND IMPLEMENTATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

- 1 Booting and system calls
- 2 Devices And Device Drivers
- 3 Processes Description And Control
- 4 Signals
- 5 Memory Management And Virtual Memory
- 6 Threads, SMP, Microkernel, Exo-Kernel
- 7 Inter-process Communication (shared Memory, Semaphores, And Synchronization)
- 8 Kernel Interaction With Runtime Support Systems
- 9 Multiprocessor & Real-time Scheduling
- 10 Memory Management In UNIX/Linux
- 11 Fundamentals Of Real Time Operating Systems & Study Of Various RTOS – Real Time Operating
- 12 System : RTAI, WinCE, VxWorks

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Operating System By William Stallings, PHI Publication
2. "The Design Of The UNIX O/S", Maurice J.Bach, PHI
3. "Modern Operating Systems", Tannenbaum, PHI
4. "O/S:A Design-Oriented Approach", Charles Crowley, TMH
5. Research Papers Related To RTOS, Linux Kernel Internals, Exo-Kernel



M. TECH. SEMESTER – I (CE)
SUBJECT: ADVANCED PROGRAMMING IN UNIX

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

- 1 UNIX system overview
- 2 File I/O & Files and directories
- 3 System data files and information
- 4 Process environment
- 5 Process control & Process relationships
- 6 Signals
- 7 Threads
- 8 Daemon processes
- 9 Inter-process communication

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. “Advanced Programming in the UNIX Environment” by W. Richard Stevens and Stephen A. Rago, 3rd edition, Addison Wesley Professional
2. “Advanced Linux Programming” by Mark Mitchell, Jeffrey Oldham, Alex Samuel, 1st edition, Pearson Education
3. “Beginning Linux Programming” by Neil Matthew and Richard Stones, 4th edition, Wiley Publishing Inc.
4. “Linux System Programming” by Robert Love, O’reilly



M. TECH. SEMESTER I (CE)
SUBJECT: ADVANCED DATA STRUCTURES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 Dictionaries

Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

2 Hashing

Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

3 Skip List

Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

4 Trees

Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

5 Text Processing

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

6 Computational Geometry

One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadrees, k-D Trees.

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

B. RECOMMENDED TEXT / REFERENCE BOOKS

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



M. TECH. SEMESTER I (CE)

SUBJECT: RESEARCH METHODOLOGY FOR COMPUTER SCIENCE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	2	40	-	-	-	40

A. DETAILED SYLLABUS

1 INTRODUCTION TO RESEARCH METHODOLOGY

Motivation and Objectives in Research, Distinct Approaches and Significance of research- Descriptive vs Analytical, Applied vs Fundamental, Quantitative vs Qualitative, Conceptual vs Empirical, The Significance of Research. Research Methods vs Methodology. Significance of research.

2 LITERATURE SURVEY

Finding Research Papers, Critical Reading, Developing a Literature, Authors, Editors, and Referees.

3 HYPOTHESIS, QUESTIONS AND EVIDENCE IN COMPUTER SCIENCE AND ENGINEERING

Hypotheses, Defending Hypotheses, Forms of Evidence, Use of Evidence, Approaches to Measurement

4 QUANTITATIVE AND QUALITATIVE STUDY DESIGNS, DATA COLLECTION

Concept of Quantitative and Qualitative Study Designs, Data collection in Quantitative and Qualitative research, Major approaches of Information gathering.

5 EXPERIMENTATION IN COMPUTER SCIENCE AND ENGINEERING

Persuasive Data, Interpretation, Robustness, Performance of Algorithms, Human Studies, Coding for Experimentation, Describing Experiments

6 PUBLICATION

Writing research papers, purpose, nature and evaluation, content and format, Presentation of Algorithms and graphs, Research Presentations.

7 ETHICS

Intellectual Creations, Plagiarism, Misrepresentation, Authorship

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. "Writing for Computer Science", by Justin Zobel, Springer, 2014
2. "Guide to Advanced Empirical Software Engineering", by Forrest Shull, Springer, 2008



3. "Research Methodology: A Step by Step Guide for Beginners", by Ranjit Kumar, Pearson India, 2005
4. Easterbrook, Steve, et al. "Selecting empirical methods for software engineering research." Guide to advanced empirical software engineering. Springer, London, 2008. 285-311.
5. S. Demeyer, "Research methods in computer science," 2011 27th IEEE International Conference on Software Maintenance (ICSM), Williamsburg, VI, 2011, pp. 600-600.
6. Nallaperumal, Krishnan & Krishnan, Annam. (2013). Engineering Research Methodology A Computer Science and Engineering and Information and Communication Technologies Perspective.
7. Research Design. Qualitative, Quantitative, and Mixed Methods Approaches. By John W. Creswell, Fourth Edition. SAGE Publication, 2014



M. TECH. SEMESTER – II (CE)
SUBJECT: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	0	4	4	60	40	-	-	100

A. DETAILED SYLLABUS

- 1 Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains
- 2 Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood
- 3 Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting model assessment.
- 4 Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems
- 5 Computer science and engineering applications in Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
- 6 Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatic, soft computing, and computer vision

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. John Vince, Foundation Mathematics for Computer Science, Springer.
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatorics, Wiley



M. TECH. SEMESTER – II (CE)
SUBJECT: DISTRIBUTED COMPUTING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

- 1 Distributed System Architecture
- 2 Logical Time and Global States
- 3 Distributed Mutual Exclusion
- 4 Distributed Deadlock
- 5 Distributed File Systems
- 6 Distributed Shared Memory
- 7 Distributed Scheduling (job scheduling, load balancing, load sharing)
- 8 Consistency and Replication
- 9 Failure Recovery and Fault Tolerance
- 10 Security in Distributed Systems
- 11 Peer to Peer Systems

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Advanced Concepts in Operating Systems by Mukesh Singhal and Niranjan Shivaratri, MGH
2. Distributed Systems: Principles and Paradigms by Andrew Tanenbaum and Maarten Steen, Pearson
3. Distributed Operating Systems: Concepts And Design by Pradip K. Sinha, Pearson
4. Distributed Systems : Concepts & Design by Colouris and Dollimore, Addison Wesley



M. TECH. SEMESTER – II (CE)
SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

- 1 Notion Of Algorithms. Big-Oh, Small-OS, Theta & Omega Notations
- 2 Review Of Data Structures And Models Of Computation
- 3 Basic Paradigms, E.g. Greedy Algorithms, Divide And Conquer Strategies, Dynamic Programming
- 4 Graph Algorithms
- 5 Algorithms For Sorting & Searching
- 6 Order Statistics
- 7 String Matching & Sequence Comparison
- 8 Geometric Algorithms
- 9 Probabilistic Algorithms
- 10 The Classes P and NP And The Notation Of NP-completeness.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Aho, A. V. , Hopcroft J. E. , Ullman J.D., Design And Analysis Of Algorithms, Addison-wesly, 1974
2. Brassard G, And Bratley P., Algorithms, Theory And Practices, Prentice-Hall International-1988
3. Cormen T. H. , Leiserson C.E. And Rivest R. L., Introduction To Algorithms, MIT Press, 1990



M. TECH. SEMESTER II (CE)
SUBJECT: SOFT COMPUTING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION

Introduction to soft computing, Intelligent System, neural network, fuzzy logic and genetic algorithm

2 NEURAL NETWORK

Introduction, architecture, supervised and unsupervised learning, multilayer feed forward network and back propagation algorithm, Error-correction learning, Memory based learning, Hebbian learning, competitive learning, Boltzmann learning, Single layer perceptron, Multilayer perceptron.

3 CONVOLUTIONAL NEURAL NETWORK

Basics of convolutional neural networks, activation functions (soft-max, Relu), initialization, dropout, batch normalization, Update rules, ensembles, data augmentation, transfer learning, applications of CNN.

4 FUZZY LOGIC

Introduction, fuzzy sets and rules, fuzzy membership function, fuzzy controllers, application of fuzzy logic.

5 GENETIC ALGORITHM

Introduction, operators, selection, crossover mutations, different genetic algorithms and its applications.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Neural Networks: A Comprehensive Foundation, S. Haykin, PHI
2. Introduction To Applied Fuzzy Electronics, Ahmad Ibrahim, PHI
3. Genetic Algorithms In Search, Optimization, And Machine Learning, D. E. Goldberg, Addison-Wesley
4. Fundamental of deep learning” by Nikhil Buduma



M. TECH. SEMESTER II (CE)
SUBJECT: BIG DATA ANALYTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. DETAILED SYLLABUS

1 INTRODUCTION

An overview of Data Warehousing and data mining.

2 A MULTI DIMENSIONAL DATA MODEL

Multi dimensional data cubes, Star, Starr Flakes & fact constellation Schema, concept Hierarchies, OLAP

3 DATA WAREHOUSE ARCHITECTURE

Steps for Design & Construction of Data Warehouse, A 3-Tier Data Warehouse Architecture, ROLAP, MOLAP, HOLAP

4 DATA PREPROCESSING

Overview, Need for Pre- Processing, Issues Related to Efficient Data Handling(Extacting, Tranformation And Handling of Large Databases)

5 DATA REDUCTION

Discretization & Concept Hierarchy Generation, Data Warehouse Implementation: Efficient Computation of Data Cubes, Indexing OLAP data, Efficient, Processing of OLAP Queries, Metadata, Data Warehouse Backend Tools & Utilities. Data Mining Primitives, Language & System Architecture: What defines a Data Mining Task ? A Data Mining Query Language, Architecture of a Data Mining System

6 CONCEPT DESCRIPTION

Characterization & Comparison: An Overview, Data generalization & Summarization-based Characterization, Analytical Characterization: Analysis & Attribute Relevance, Mining class Comparisons, Mining Descriptive Statistical Measures, Concept Description & Its Mining

7 MINING ASSOCIATION RULE

Basic Concepts, Market Basket Analysis, Mining Multi-Level, Association Rules From Transaction Rules from Trasactional Database, Mining Multi-Level Association Rules From Transaction Database, Mining Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining



8 CLASSIFICATION & PREDICTION

An Overview & Basic Concepts, Classification by Decision Tree Induction, Bayesian Classification, Classification by back Propagation, Classification Based on Concepts from Association Rules Mining, other Methods, such as Genetic Algorithm, Fuzzy set Approach, Case based Reasoning, etc., Prediction, classifier Accuracy

9 CLUSTER ANALYSIS

An Overview & Basic Concepts, Partitioning methods, hierarchical methods, density- based methods, grid-base clustering methods.

10 MINING COMPLEX TYPES OF DATA

An overview & basic concepts, mining spatial databases, mining multimedia databases, mining time series & sequence data, mining text databases, mining the world wide web.

11 APPLICATIONS & TRENDS IN DATA MINING

Data mining applications, data mining system procedures & research prototypes, additional themes on data mining, social impact of data mining, trends in data mining. Popular products, and a methodology to select a data mining tool

12 INTRODUCTION TO BIG DATA

Introduction of Big Data and Hadoop – Overview and Evolution of Big-Data Hadoop, Architecture/Framework, HDFS Architecture/Framework, Map reduce, Hadoop Environment Setup, Distributed File System – Big Data and its Importance, Drivers for Big data, Big Data Analytics, Big Data Applications, Optimization techniques, Dimensionality Reduction techniques, Time series Forecasting, Social networking and its Application, Big Data analysis using Hadoop, Pig, Hive, MongoDB, Spark and Mahout, Data analysis techniques like Discriminant Analysis and Cluster Analysis, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Introduction to NOSQL (Neo4j) and MongoDB, Hive Architecture, HBase concepts, PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

13 HADOOP

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Algorithms using Map Reduce, Understanding inputs and outputs of MapReduce ,Map and Reduce tasks, Job, Task trackers ,Cluster Setup, SSH and Hadoop Configuration, HDFS Administering ,Monitoring and Maintenance Moving Data in and out of Hadoop, Data Serialization



B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts & Techniques, Morgan Kaufmann Publishers (Academic Press)
2. W. B. Frakes & R. Baeza – Yates Eds., Information Retrieval: Data Structures & Algorithms, Prentice Hall, 1992
3. Michael J A Berry & Gordon Linoff, Data Mining Techniques: For Marketing, sales, customer support
4. Pieter Adriaans & Dolf Zantinge, Data Mining, Pearson Education Asia, 2001



M. TECH. SEMESTER II (CE)
SUBJECT: PEDAGOGY STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	2	0	-	-	-	-	-

A. DETAILED SYLLABUS

1 INTRODUCTION AND METHODOLOGY

Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

2 THEMATIC OVERVIEW

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

3 EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES

Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

4 PROFESSIONAL DEVELOPMENT

alignment with classroom practices and follow-up support Peer support, Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes

5 RESEARCH GAPS AND FUTURE DIRECTIONS

Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.



4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) *Read India: A mass scale, rapid, 'learning to read' campaign*.