Syllabus for M. Tech I Year I Semester
Computer Science Engineering
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (Professional Core -I)

M.Tech CSE I Year I Sem. **L T P C**
2 1 0 3

Subject Code: 8P101

Pre-requisites: An understanding of Math in general is sufficient.

Course Objectives: To learn

1. Introduces the elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generatingfunctions.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Ability to understand and construct precise mathematical proofs.
2. Ability to use logic and set theory to formulate precise statements.
3. Ability to analyze and solve counting problems on finite and discrete structures.
4. Ability to describe and manipulate sequences.
5. Ability to apply graph theory in solving computing problems.

UNIT-I:

The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II:

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT-III:

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, RecursiveDefinitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT-IV:

Discrete Probability and Advanced Counting Techniques:
An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value andVariance.
Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms andRecurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT-V:

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

UNIT-VI:

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.
Cantor's Diagonalization theorem: Complexity classes - NP-Hard and NP-complete Problems - Cook's theorem NP completeness reductions. Approximation algorithms.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

3. Joe L. Mott, Abraham Kandel, Theodore P. Baker, *Discrete Mathematics for Computer Scientists & Mathematicians*, Second Edition, PHI, 2005.
4. Discrete Mathematical Structures with Applications to Computer Science-J.P.Tremblay and R. Manohar, TMH
5. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, *Discrete Mathematical Structures*, Fourth Edition, PHI, 2002.

Reference

1. Discrete Mathematical Structures with Applications to Computer Science-J.P.Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed. , Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7Th Edtn., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.
6. Dr. D. S. Chandrasekharaiah, *Mathematical Foundations of Computer Science (Discrete Structures)*, Prism, 2006.
7. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearsoneducation, 5th edition.
8. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
ADVANCED DATA STRUCTURES (Professional Core -II)

M.Tech CSE I Year I Sem.

L	T	P	C
2	1	0	3

Subject Code: 8P102

Prerequisites: A course on "Data Structures"

COURSE OBJECTIVE

1. The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2. Students should be able to understand the necessary mathematical abstraction to solve problems.
3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Student should be able to come up with analysis of efficiency and proofs of correctness.

COURSE OUTCOMES

After completion of course, students would be able to:

1. Understand the implementation of symbol table using hashing techniques.
2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. Develop algorithms for text processing applications.
4. Identify suitable data structures and develop algorithms for digital search structures and heap structures, skip lists.

UNIT - I

Heap Structures: Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT - II

Hashing and Collision Resolution Techniques, Introduction, Hash Tables, Hash Function, Types of Hash Functions: Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collision Resolution Techniques in Hashing: Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing and Extendible Hashing.

Unit - III

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

UNIT - IV

Search Trees: Binary Search Trees, AVL trees, Red-Black trees, Splay trees. Multiway Search Trees: B- trees, 2-3 trees.

UNIT - V

Digital Search Structures: Digital Search trees, Binary tries, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries.

UNIT - VI

Pattern matching: Introduction, Algorithms: Brute-Force, Boyer –Moore, Knuth-Morris-Pratt, Naïve, Horspool, Rabin-Karp.

Textbooks

1. Data Structures & Algorithms in JAVA, Michael T. Goodrich, Roberto Tamassia, John Wiley & Sons
2. Fundamentals of data structures, Sahni, Horowitz, Mehatha, Universities Press.
3. Introduction to Algorithms, TH Cormen, PHI

References

1. Design methods and analysis of Algorithms, SK Basu and PHI.
2. Data Structures & Algorithm Analysis, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
DATABASE PROGRAMMING WITH PL/SQL (Professional Elective-I)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P103

Course Objectives:

1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

Course Outcomes:

1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

UNIT - I

PL/SQL Basics: Block Structure, Behavior of Variables in Blocks, Basic Scalar and Composite Data Types, Control Structures, Exceptions, Bulk Operations, Functions, Procedures, and Packages, Transaction Scope.

UNIT - II

Language Fundamentals & Control Structures: Lexical Units, Variables and Data Types, Conditional Statements, Iterative Statements, Cursor Structures, Bulk Statements, Introduction to Collections, Object Types: Varray and Table Collections, Associative Arrays, Oracle Collection API.

UNIT - III

Functions and Procedures: Function and Procedure Architecture, Transaction Scope, Calling Subroutines, Positional Notation, Named Notation, Mixed Notation, Exclusionary Notation, SQL Call Notation, Functions, Function Model Choices, Creation Options, Pass-by-Value Functions, Pass-by- Reference Functions, Procedures, Pass-by-Value Procedures, Pass-by-Reference Procedures, Supporting Scripts.

UNIT - IV

Packages: Package Architecture, Package Specification, Prototype Features, Serially Reusable Precompiler Directive, Variables, Types, Components: Functions and Procedures, Package Body, Prototype Features, Variables, Types, Components: Functions and Procedures, Definer vs. Invoker Rights Mechanics, Managing Packages in the Database Catalog, Finding, Validating, and Describing Packages, Checking Dependencies, Comparing Validation Methods: Timestamp vs. Signature.

UNIT - V

Triggers: Introduction to Triggers, Database Trigger Architecture, Data Definition Language Triggers, Event Attribute Functions, Building DDL Triggers, Data Manipulation Language Triggers, Statement- Level Triggers, Row-Level Triggers, Compound Triggers, INSTEAD OF Triggers, System and DatabaseEvent Triggers, Trigger Restrictions, Maximum Trigger Size, SQL Statements, LONG and LONG RAWData Types.

UNIT - VI

CURSORS: Implicit Cursors, Explicit Cursors, Declaring the Cursor, Opening the Cursor, Fetching the Cursor, Closing the Cursor, PL/SQL- RECORDS, Table-Based Records, Cursor-Based Records, User-Defined Records.

TEXT BOOKS:

1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGrawHill Education

REFERENCES:

1. Benjamin Rosenzweig, Elena Silvestrova Rakhimov, Oracle PL/SQL by example Fifth Edition
2. Dr. P. S. Deshpande, SQL & PL / SQL for Oracle 11g Black Book

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
DEEP LEARNING (Professional Elective-I)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P104

Course Objectives: students will be able

1. To understand complexity of Deep Learning algorithms and their limitations
2. To be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes:

1. Implement deep learning algorithms, understand neural networks and traverse the layers ofdata
2. Learn topics such as convolutional neural networks, recurrent neural networks, training deepnetworks and high-level interfaces
3. Understand applications of Deep Learning to Computer Vision
4. Understand and analyze Applications of Deep Learning to NLP

UNIT - I

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT – II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT - III

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

UNIT - IV

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text withLSTM models, Attention Models for computer vision tasks

UNIT - V

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Wordsmodel (CBOW), Glove, Evaluations and Applications in word similarity

UNIT - VI

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
APPLIED CRYPTOGRAPHY (Professional Elective-I)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P106

Course Objectives: Knowledge on significance of cryptographic protocols and symmetric and publickey algorithms

Course Outcomes:

1. Understand the various cryptographic protocols
2. Analyze key length and algorithm types and modes
3. Illustrate different public key algorithms in cryptosystems
4. Understand special algorithms for protocols and usage in the real world.

UNIT - I

Foundations: Terminology, Steganography, Substitution Ciphers and Transposition Ciphers, Simple XOR, One-Time Pads, Computer Algorithms, Large Numbers,

Cryptographic Protocols: Protocol Building Blocks: Introduction to Protocols, Communications Using Symmetric Cryptography, One-Way Functions, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation

UNIT - II

Cryptographic Techniques: Key length: Symmetric Key length, Public key length, comparing symmetric and public key length.

Algorithm types and modes: Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Cipher, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mod, Counter Mode, Other Block-Cipher Modes.

UNIT - III

Public-Key Algorithms: Background, Knapsack Algorithms, RSA, Pohlig-Hellman, Rabin, ElGamal, McEliece, Elliptic Curve Cryptosystems, LUC, Finite Automaton Public-Key Cryptosystems

UNIT - IV

Public-Key Digital Signature Algorithms: Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, ESIGN

UNIT -V

Special Algorithms for Protocols: Multiple-Key Public-Key Cryptography, Secret-Sharing Algorithms, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Computing with Encrypted Data, Fair Coin Flips, One-Way Accumulators, All-or-Nothing Disclosure of Secrets, Fair andFailsafe Cryptosystems, Zero-Knowledge Proofs of Knowledge, Blind Signatures, Oblivious Transfer, Secure Multiparty Computation, Probabilistic Encryption, Quantum Cryptography

UNIT - VI

Real World Approaches: IBM Secret key management protocol, ISDN, Kerberos, KryptoKnight, Privacy enhanced mail (PEM), Message security protocol (MSP), PGP, Public-Key Cryptography Standards (PKCS), Universal Electronic Payment System (UEPS).

TEXT BOOKS:

1. Bruce Schneier, Applied Cryptography, Second Edition: Protocols, Algorithms, and SourceCode in C (cloth)

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
NATURAL LANGUA GEPROCESSING (Professional Elective-II)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P105

Prerequisites:

1. Data structures, finite automata and probability theory.

Course Objectives:

1. Introduction to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

Course Outcomes:

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluatingempirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, andestimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms Able to design different language modeling Techniques.
5. Able to design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models. **Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing,Multilingual Issues.

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation,Language Model Adaptation,

UNIT – VI

Types of Language Models: Language-Specific Modeling Problems, Multilingual and Cross Lingual Language Modeling.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, PearsonPublications

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
SOFTWARE QUALITY ENGINEERING (Professional Elective-II)

M.Tech CSE I Year I Sem.	L	T	P	C
	3	0	0	3

Subject Code: 8P108

Course Objectives: Knowledge on significance of Quality, quality assurance, quality engineering.

Course Outcomes:

1. Understand software quality and its perspectives
2. Analyze defect prevention and defect reduction in software quality assurance
3. Illustrate software quality engineering activities and its process

UNIT - I

Software Quality: Quality: perspectives and expectations, Quality frameworks and ISO-9126, correctness and defects: Definitions, properties and Measurements, A historical perspective of quality,software quality.

UNIT - II

Quality Assurance: Classification: QA as dealing with defects, Defect prevention- Education and training, Formal method, Other defect prevention techniques, Defect Reduction - Inspection: Direct fault detection and removal, Testing: Failure observation and fault removal, other techniques and risk identification, Defect Containment- software fault tolerance, safety assurance and failure containment

UNIT - III

Quality Engineering: Activities and process, Quality planning: Goal setting and Strategy formation, Quality assessment and Improvement, Quality engineering in software process.

UNIT - IV

Test Activities, Management and Automation: Test planning and preparation, Test execution, Result checking and measurement, Analysis and follow- up, Activities People and Management, Test Automation.

UNIT - V

Coverage and usage testing based on checklist and partitions: Checklist based testing and its limitations, Testing for partition Coverage, Usage based Statistical testing with Musa's operational profiles, Constructing operational profiles

UNIT – VI

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Case Study: OP for the cartridge Support Software

TEXT BOOKS:

1. Jeff Tia`n, Software Quality Engineering, Testing, Quality Assurance, and Quantifiable improvement
2. Richard N. Taylor, Software Architecture: Foundations, Theory, and Practice

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
MINING MASSIVE DATASETS (Professional Elective- II)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P109

Prerequisites:

1. Students should be familiar with Data mining, algorithms, basic probability theory andDiscrete math.

Course Objectives:

1. This course will cover practical algorithms for solving key problems in mining of massive datasets.
2. This course focuses on parallel algorithmic techniques that are used for large datasets.
3. This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied indetail.

Course Outcomes:

1. Handle massive data using MapReduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context ofdata mining.
3. Understand the algorithms for extracting models and information from large datasets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT - I:

Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,
MapReduce and the New Software Stack-Distributed File Systems, MapReduce, Algorithms Using MapReduce.

UNIT - II:

Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling ofDocuments, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, FilteringStreams.

UNIT - III:

Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, CountingFrequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams andParallelism.

UNIT - IV:

Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem,The Adwords Problem, Adwords Implementation.

UNIT - V

Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

UNIT - VI:

Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles.

TEXT BOOK:

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

REFERENCES:

1. Jiawei Han & Micheline Kamber , Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques,Morgan Kaufmann.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
Human and Computer Interaction (Professional Elective- II)

M.Tech CSE I Year I Sem.

L	T	P/D	C
3	0	**0**	**3**

Subject Code: 8P110

Course Objectives:

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

COURSE OUTCOMES

After completion of course, students would be able to:

- Understand the structure of models and theories of human computer interaction and vision.
- Design an interactive web interface on the basis of models studied.

Unit I

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Unit II

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Unit III

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit IV

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Unit V

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

Unit VI

Recent Trends: Speech Recognition and Translation, Multimodal System

References:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)

2. Brian Fling, “Mobile Design and Development”, First Edition , O□Reilly Media Inc., 2009

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O□Reilly, 2009.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
ADVANCED DATA STRUCTURES LAB (Lab-I)

M.Tech CSE I Year I Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P150

Prerequisites:

1. A course on Computer Programming & Data Structures

Course Objectives:

1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs,and B-trees.
4. Introduces sorting and pattern matching algorithms.

Course Outcomes:

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations orcombinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and generaltree structures, search trees, tries, heaps, graphs, and B-trees.

List of Programs

1. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
   a) Merge sort b) Heap sort c) Quick sort

3. Write a program to perform the following operations:
   a) Insert an element into a B- tree.
   b) Delete an element from a B- tree.
   c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
   a) Insert an element into a Min-Max heap
   b) Delete an element from a Min-Max heap
   c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
   a) Insert an element into a Lefiist tree
   b) Delete an element from a Leftist tree
   c) Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
   a) Insert an element into a binomial heap
   b) Delete an element from a binomial heap.
   c) Search for a key element in a binomial heap
7. Write a program to perform the following operations:
   a) Insert an element into a AVL tree.
   b) Delete an element from a AVL search tree.

c) Search for a key element in a AVL search tree.

8. Write a program to perform the following operations:
   a) Insert an element into a Red-Black tree.
   b) Delete an element from a Red-Black tree.
   c) Search for a key element in a Red-Black tree.

9. Write a program to implement all the functions of a dictionary using hashing.

10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.

11. Write a program for implementing Brute Force pattern matching algorithm.

12. Write a program for implementing Boyer pattern matching algorithm.

TEXT BOOKS:

1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
3. Introduction to Data Structures in C, Ashok Kamthane, 1st Edition, Pearson.

REFERENCES:

1. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Data structures: A Pseudocode Approach with C, R.F. Gilberg And B.A. Forouzan, 2nd Edition,Cengage Learning

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
DATABASE PROGRAMMING WITH PL/SQL LAB (Lab -II)

M.Tech CSE I Year I Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P151

Course Objectives:

1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

Course Outcomes:

1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

List of Experiments:

1. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
2. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID), write a cursor toselect the five highest paid employees from the table.
3. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.
4. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.
5. Write a PL/SQL program to demonstrate Exceptions.
6. Write a PL/SQL program to demonstrate Cursors.
7. Write a PL/SQL program to demonstrate Functions.
8. Write a PL/SQL program to demonstrate Packages.
9. Write PL/SQL queries to create Procedures.
10. Write PL/SQL queries to create Triggers.

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
DEEP LEARNING LAB (Lab-II)

M.Tech CSE I Year I Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P152

Course Objectives:

1. To Build The Foundation Of Deep Learning.
2. To Understand How To Build The Neural Network.
3. To enable students to develop successful machine learning concepts.

Course Outcomes:

1. Upon the Successful Completion of the Course, the Students would be able to:
2. Learn The Fundamental Principles Of Deep Learning.
3. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms And Solve Real-world problems.

LIST OF EXPERIMENTS:

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Extensive Reading:

- http://www.deeplearning.net
- https://www.deeplearningbook.org/
- https://developers.google.com/machine-learning/crash-course/ml-intro
- www.cs.toronto.edu/~fritz/absps/imagenet.pdf
- http://neuralnetworksanddeeplearning.com/

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
Cryptography Lab (Lab - II)

M.Tech CSE I Year I Sem.

L	T	P	C
-	-	4	2

Subject Code: 8P153

Objective:

The student can able to attain knowledge in advance algorithms.

Outcomes

The student can able to analyze the performance of algorithms

1 Implement RSA algorithm
   (A) Generate Public key and Private key pair
   (B) Generate Ciphertext for the Plaintext
   (C) Obtain the Plaintext from the Ciphertext
2 Implement DES
   (A) Generate Cipher text for the given Plaintext
   (B) Retrieve the Plaintext from the given Ciphertext
3 Implement Diffie Hell man Algorithm and generate Secret Key
4 Implement Hash Algorithm
5 Generate Digital Signature
6 Gital Envelope

Syllabus for M. Tech I Year I Semester
Computer Science Engineering

RESEARCH METHODOLOGY & IPR

M.Tech CSE I Year I Sem.

L	T	P	C
2	0	0	2

Subject Code: 8P155
Prerequisite: None

Course Objectives:

1. To understand the research problem
2. To know the literature studies, plagiarism and ethics
3. To get the knowledge about technical writing
4. To analyze the nature of intellectual property rights and new developments
5. To know the patent rights

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

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrowworld will be ruled by ideas, concept, and creativity.
5. 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.
6. 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:
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:
Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III:
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

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

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

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

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. C.R. Kothari, Research Methodology, methods & techniques, 2nd edition, New ageInternational publishers

REFERENCES:

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.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New TechnologicalAge", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Syllabus for M. Tech I Year I Semester
Computer Science Engineering
English for Research Paper Writing (Audit Course - 1)

M.Tech CSE I Year I Sem.

L	T	P/D	C
2	0	**0**	**0**

Subject Code: 8HC18

Course objectives: Students will be able to:
1. Understand how to improve writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission Syllabus

CONTENTS

Unit I Planning and Preparation
a. Word Order and Breaking up long sentences
b. Structuring Paragraphs and Sentences
c. Being Concise and Removing Redundancy
d. Avoiding Ambiguity and Vaguencess

Unit II Clarifying Who did What
a. Highlighting your Findings
b. Hedging and Criticizing
c. Paraphrasing and Plagiarism
d. Sections of a Paper
e. Abstracts Introduction

Unit III Review of Literature
a. Methods
b. Results
c. Discussion
d. Conclusions
e. The Final Check

Unit IV Key skills needed when writing a Title
a. Key skills needed when writing an Abstract
b. Key skills needed when writing an Introduction
c. Skills needed when writing a Review of Literature

Unit V Skills needed when writing the Methods
a. Skills needed when writing the Results
b. Skills needed when writing the Discussion
c. Skills needed when writing the Conclusion

Unit VI Useful phrases
a. How to ensure paper as good as it could possibly be for the first – time submission

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

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ADVANCED ALGORITHMS (Professional Core -III)

M.Tech CSE I Year II Sem.

L	T	P	C
2	1	0	3

Subject Code: 8P201

Pre-Requisites: UG level course in Algorithm Design and Analysis

Course Objectives:

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

Course Outcomes: After completion of course, students would be able to:

1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.

UNIT – I

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT – II

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

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

UNIT - III

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

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP- decomposition.

UNIT - IV

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

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

UNIT - V

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm.

UNIT - VI

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applyingrecently proposed data structures.

REFERENCES:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms".
2. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms".
3. Kleinberg and Tardos."Algorithm Design".

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ADVANCED COMPUTERAR CHITECTURE (Professional Core-IV)

M.Tech CSE I Year II Sem.

L	T	P	C
2	1	0	3

Subject Code: 8P202

Prerequisites: Computer Organization

Course Objectives:

1. To impart the concepts and principles of parallel and advanced computer architectures.
2. To develop the design techniques of Scalable and multithreaded Architectures.
3. To Apply the concepts and techniques of parallel and advanced computer architectures todesign modern computer systems

Course Outcomes: Gain knowledge of

1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors

UNIT - I

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors andMulticomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT - II

Principles of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors

UNIT - III

Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT - IV

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers.

UNIT -V

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

UNIT - VI

Vector Processing Principles, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

TEXT BOOK:

1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

REFERENCES:

1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition, ELSEVIER.
2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G.Wellein,

CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ENTERPRISE CLOUD CONCEPTS (Professional Elective- III)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P203

Course Objectives: Knowledge on significance of cloud computing and its fundamental conceptsand models.

Course Outcomes:

1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

UNIT - I

Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goalsand Benefits, Risks and Challenges.

Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud DeliveryModels, Cloud Deployment Models.

UNIT - II

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data CenterTechnology, Virtualization Technology.

Cloud Computing Mechanisms:

Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device,Cloud Usage Monitor, Resource Replication.

UNIT - III

Cloud Management Mechanisms: Remote Administration System, Resource Management System,SLA Management System, Billing Management System, Case Study Example

Cloud Computing Architecture

Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example

UNIT - IV

Cloud-Enabled Smart Enterprises: Introduction, Revisiting the Enterprise Journey, Service-Oriented Enterprises, Cloud Enterprises, Smart Enterprises, The Enabling Mechanisms of Smart Enterprises

UNIT - V

Cloud-Inspired Enterprise Transformations: Introduction, The Cloud Scheme for EnterpriseSuccess, Elucidating the Evolving Cloud Idea, Implications of the Cloud on Enterprise Strategy,Establishing a Cloud-Incorporated Business Strategy

Transitioning to Cloud-Centric Enterprises: The Tuning Methodology, Contract Management in theCloud

UNIT - VI

Cloud-Instigated IT Transformations

Introduction, Explaining Cloud Infrastructures, A Briefing on Next-Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure Solutions, Clouds for Business Continuity, The Relevance of Private Clouds, The Emergence of Enterprise Clouds

TEXT BOOKS:

1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press

REFERENCES:

1. James Bond,The Enterprise Cloud, O'Reilly Media, Inc.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ADVANCED COMPUTER NETWORKS (Professional Elective-III)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P204

Prerequisites: Data Communication, Basic Networking Principles, Computer Networks

Course Objective: This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

Course Outcomes:

1. Understanding of holistic approach to computer networking
2. Ability to understand the computer network protocols and their applications
3. Ability to design simulation concepts related to packet forwarding in networks.

UNIT - I

Data-link protocols: Ethernet, Token Ring and Wireless (802.11). Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs), Multiple access schemes Routing andInternetworking.

UNIT - II

Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer.

UNIT - III

Transport and Application Layer Protocols: Client-Server and Peer-To-Peer Application Communication, Protocols on the transport layer, reliable communication. Routing packets through a LAN and WAN. Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP),Mobile Transport Protocols, TCP Congestion Control. Principles of Network Applications,

UNIT- IV

The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, building a Simple Web Server Creating simulated networks and passing packets through them using different routing techniques. Installing and using network monitoring tools.

UNIT - V

Wireless and Mobile Networks: Introduction, Wireless links and Network Characteristics - CDMA, Wifi: 802.11 Wireless LANS, Cellular internet access, Mobility management: Principles

UNIT - VI

Multimedia networking: Multimedia networking applications, streaming stored video, Voice-over-IP, Protocols for real-time conversational applications.

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson,6th Edition, 2012.
2. Computer Networks and Internets, Duglas E. Comer, 6th Edition, Pearson.

REFERENCES:

1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and Piyasat Nilkaew, Pearson,3rd Edition, 2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Prentice Hall.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
EDGE ANALYTICS (Professional Elective-III)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P205

Prerequisites

- A basic knowledge of "Python Programming"

Course Objectives

1. The aim of the course is to introduce the fundamentals of Edge Analytics.
2. The course gives an overview of – Architectures, Components, Communication Protocols andtools used for Edge Analytics.

Course Outcomes

1. Understand the concepts of Edge Analytics, both in theory and in practical application.
2. Demonstrate a comprehensive understanding of different tools used at edge analytics.
3. Formulate, Design and Implement the solutions for real world edge analytics .

UNIT - I

Introduction to Edge Analytics

What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

UNIT - II

Introduction Edge analytics, Basic edge analytics components, Connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics,

UNIT - III

Introduction Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long-distance communication using LoRa and Signfox for edge analytics.

UNIT - IV

Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure ioT Hub, Using the Raspberry Pi with Azure IoT edge, Connecting our Raspberry Pi edgedevice, adding a simulated temperature sensor to our edge device.

UNIT - V

Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

UNIT - VI

Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code,creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protectingour edge analytics applications

TEXT BOOK:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edgeanalytical solutions including Azure IoT Edge by Colin Dow

REFERENCES:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source usingMicrosoft Azure by Ashish Mahajan

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
BIOINFORMATICS (Professional Elective-IV)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P207

Course Objectives: Knowledge on concepts of bioinformatics and biological motivations of sequenceanalysis

Course Outcomes:

1. Understand the Central Dogma & XML (Bio XML) for Bioinformatics
2. Analyze Perl (Bioperl) for Bioinformatics
3. Illustrate Databases technology, architecture and its interfaces
4. Understand Sequence Alignment Algorithms, Phylogenetic Analysis

UNIT -I:

The Central Dogma & XML (Bio XML) for Bioinformatics: Watson's definition, information flow, fromdata to knowledge, Convergence, the organization of DNA, the organization of Proteins, Introduction, Differences between HTML and XML, fundamentals of XML, fundamentals of XML namespaces.

UNIT - II

Introduction to DTDs, Document type Declarations, Declaring elements, declaring attributes, working with entities XML Schemas, Essential Concepts, working with simple types, working with complex types, Basic namespaces issues.

UNIT -III:

Perl (Bioperl) for Bioinformatics: Representing sequence data, program to store a DNA sequence, concatenating DNA fragments, Transcription, Calculating the reverse complement in Perl, Proteins, files, reading proteins in files, Arrays, Flow control, finding motifs, counting Nucleotides, exploding strings into arrays, operating on strings, writing to files, subroutines and bugs.

UNIT -IV:

Databases: Flat file, Relational, object-oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.

UNIT -V:

Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models for sequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.

UNIT -VI:

Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor-Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Othermethods, Tree evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

TEXT BOOKS:

1. S.C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications,2004
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001

REFERENCE BOOKS:

1. D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003)
2. Att Wood, "Bioinformatics" Pearson Education, 2004
3. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education, 2003

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
NATURE INSPIRED COMPUTING (Professional Elective-IV)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P208

Course Objectives: Knowledge on significance of intelligence, genetic algorithms Ant Colony algorithms

Course Outcomes:

1. Familiar with Genetic algorithm and its applications.
2. Compare different Ant Colony Optimization algorithmic models.
3. Compare different Artificial Bee Colony Optimization algorithmic models.
4. Illustrate Particle swam optimization algorithm with an example.

UNIT - I:

Models of Life and Intelligence - Fundamentals of bio-inspired models and bio-inspired computing. Evolutionary models and techniques, Swarm models and its self-organization, swarm and evolutionary algorithms. Optimisation problems – single and multi-objective optimisation, heuristic, meta-heuristic and hyper heuristic functions.

UNIT - II:

Genetic algorithms - Mathematical foundation, Genetic problem solving, crossover and mutation. genetic algorithms and Markov process, applications of genetic algorithms

UNIT - III:

Ant Colony Algorithms - Ant colony basics, hybrid ant system, ACO in combinatorial optimisation, variations of ACO, case studies.

UNIT - IV:

Particle Swarm algorithms - particles moves, particle swarm optimisation, variable length PSO, applications of PSO, case studies. Artificial Bee Colony algorithms - ABC basics, ABC in optimisation,multi-dimensional bee colony algorithms, applications of bee algorithms, case studies.

UNIT - V:

Selected nature inspired techniques - Hill climbing, simulated annealing, Gaussian adaptation, Cuckoo search, Firey algorithm, SDA algorithm, bat algorithm, case studies.

UNIT - VI

Nature inspired techniques -Social spider algorithm, Cultural algorithms, Harmony search algorithm, Intelligent water drops algorithm, Artificial immune system, Flower pollination algorithm, case studies.

TEXT BOOKS:

1. Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006
2. Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence: Theories, methods, and Technologies" IT Press, 2008

REFERENCES:

1. Leandro Nunes de Castro - " Fundamentals of Natural Computing, Basic Concepts, Algorithmsand Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Marco Dorrigo, Thomas Stutzle -” Ant Colony Optimization”, Prentice Hall of India, New Delhi,2005
3. Vinod Chandra S S, Anand H S - “Machine Learning: A Practitioner's Approach”, Prentice Hallof India, New Delhi, 2020

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ROBOTIC PROCESS AUTOMATION (Professional Elective-IV)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Subject Code: 8P209

Course Objectives: Aim of the course is to make learners familiar with the concepts of RoboticProcess Automation.

Course Outcomes:

1. Describe RPA, where it can be applied and how it's implemented.
2. Identify and understand Web Control Room and Client Introduction
3. Understand how to handle various devices and the workload
4. Understand Bot creators, Web recorders and task editors

UNIT - I

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots

UNIT - II

Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials)

UNIT - III

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

UNIT - IV

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command
- String Operation Command - XML Command

UNIT - V

Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - ObjectCloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer.

UNIT – VI

Web Scraping, Introduction Scraper tools and a simple web scraping exercise using UiPath, Studio, Introduction Document Understanding Process, Built to process various document types, Out-of-the-box AI solutions, Accuracy improving over time, End-to-end automation of complex processes, Extracting Data from receipts Invoices retrained, with one additional field Framework Component, ML Packages, Pipelines, Document Manager, OCR Services.

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPAtool – UiPath Kindle Edition.

REFERENCES:

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
Data Science (Professional Elective - IV)

M.Tech CSE I Year II Sem.	L	T	P/D	C
	3	0	0	3

Subject Code: 8P210

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 analyze a dataset;
- Critically evaluate data visualizations based on their design and use for communicating stories from data;

COURSE OUTCOMES

On completion of the course the student should 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

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

Unit II

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources

Unit III

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

Unit IV

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

Unit V

Applications of Data Science, Technologies for visualization, Bokeh (Python)

Unit VI

Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

References:

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.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ADVANCED ALGORITHMS LAB (Lab-III)

M.Tech CSE I Year II Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P250

Course Objective: The student can able to attain knowledge in advanced algorithms.

Course Outcomes: The student can able to analyze the performance of algorithms

List of Experiments

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement a solution for the knapsack problem using the Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement the Rabin Karp algorithm.
8. Implement the KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flow problem.

TEXT BOOK:

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

REFERENCES:

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam,Universities Press.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ENTERPRISE CLOUD CONCEPTS (Lab-IV)

M.Tech CSE I Year II Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P251

Course Objectives: Knowledge on significance of cloud computing and its fundamental conceptsand models.

Course Outcomes:

1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java..
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
6. Install Hadoop single node cluster and run simple applications like word count.

E-Resources:

1. https://www.iitk.ac.in/nt/faq/vbox.htm
2.https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjqrNG0za73AhXZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu%2F~sedwards%2Fclasses%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz
3. https://www.cloudsimtutorials.online/cloudsim/
4.https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/
5. https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
ADVANCED COMPUTER NETWORKS LAB (Lab- IV))

M.Tech CSE I Year II Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P252
Prerequisites: Data communication, Basic networking principles, Computer Networks

Course Objectives:
1. Understand and analyze the existing protocols
2. Understand the use of network packet capturing tools

Course Outcomes: Ability of acquiring the practical exposure to existing protocols

List of Experiments:
1. Implement the IP fragmentation and reassembly algorithm.
2. Implement the IP forwarding algorithm.
3. Implement the simplest sliding window protocol of TCP.
4. Connect two systems using a switch and configure private IP addresses to the systems and ping them from each other. Using Wireshark, capture packets and analyze all the header information in the packets captured.
5. Install Telnet on one of the systems connected by a switch and telnet to it from the other system. Using Wireshark, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.
6. Start packet capture in wireshark application and then open your web browser and type in an URL of the website of your choice. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received for the web page you visited in your web browser.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
EDGE ANALYTICS LAB (Lab- IV))

M.Tech CSE I Year II Sem.

L	T	P	C
0	0	4	2

Subject Code: 8P253

Course Objectives:

1. Understand the concept of edge computing
2. Understand the Edge computing Architecture
3. Implement the edge computing in IOT
4. Understand the concept of multi-access edge computing
5. Implement edge computing in MEC

Course Outcomes:

1. Identify the benefits of edge computing
2. Develop the microservices in iofog
3. Develop user defined services in the edge
4. Create use cases in IOT with edge computing
5. Develop services in MEC
6. Implement use cases in MEC

List of Experiments:

1. Set up the Arduino IDE for ESP8266-12 module and program it to blink a LED light.
2. Installation tools to create and manage ECN's
3. Deploy micro services and writing your own microservices
4. Setup the Communication Parameters
5. Implement any two Communications protocols
6. Deploy modules to a Windows IoT Edge device
7. Create an IoT hub.
8. Register an IoT Edge device to your IoT hub.
9. Install and start the IoT Edge for Linux on Windows runtime on your device.
10. Remotely deploy a module to an IoT Edge device and send telemetry.
11. Python based basic programs using Raspberry Pi.
12. Deploy a module Manage your Azure IoT Edge device from the cloud to deploy a module thatsends telemetry data to IoT Hub.
13. Publishing Data using HTTP.
14. Sensor Interfacing and Logging using MQTT.
15. File IO Example - # Example code to demonstrate writing and reading data to/from files
16. write code to turn on one of the LEDs on the board (Breadboard)

Additional Exercises on IOT Edge Analytics Applications

17. Temperature Logger
18. Home Automation

TEXT BOOKS:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edge analytical solutions including Azure IoT Edge by Colin Dow
2. MicroPython for the Internet of Things A Beginner's Guide to Programming with Python on Microcontroller, Charles Bell, A Press.

REFERENCE BOOKS:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source using Microsoft Azure by Ashish Mahajan
2. Peter Waher, “Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3”, First Edition, Packt Publishing, 2018
3. John C. Shovic, “Raspberry Pi IoT Projects: Prototyping Experiments for Makers”, Packt Publishing, 2016
4. Python for Microcontrollers: Getting Started with MicroPython Paperback – 16 December 2016,by Donald Norris, McGraw-Hill Education TAB
5. Programming with MicroPython: Embedded Programming with Microcontrollers and Python, by Nicholas H. Tollervey, OReilly
6. R. Buyya, S.N. Srirama (2019), Fog and Edge Computing: Principles and Paradigms, Wiley-Blackwell, 2019.

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
MACHINE LEARNING LAB (Lab- IV))

M.Tech CSE I Year II Sem.	L	T	P	C
	0	0	4	2

Subject Code: 8P254

Course Objective:

The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes:

After the completion of the course the student can able to:

1. understand complexity of Machine Learning algorithms and their limitations;

2. understand modern notions in data analysis-oriented computing;

3. be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;

4. Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python

3. Implement k-nearest neighbours classification using python

4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0

1.540 0.419 1

0.459 1.799 1

0.773 0.186 1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no -> highRisk

high golf trading married forties yes -> lowRisk

low speedway transport married thirties yes -> medRisk

medium football banking single thirties yes -> lowRisk

high flying media married fifties yes -> highRisk

low football security single twenties no -> medRisk

medium golf media single thirties yes -> medRisk

medium golf transport married forties yes -> lowRisk

high skiing banking single thirties yes -> highRisk

low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.

7. Implement Naïve Bayes theorem to classify the English text

8. Implement an algorithm to demonstrate the significance of genetic algorithm

9. Implement the finite words classification system using Back-propagation algorithm

Syllabus for M. Tech I Year II Semester
Computer Science Engineering
VALUE EDUCATION (Audit Course - II)

M.Tech CSE I Year II Sem.	L	T	P	C
	0	0	4	2

Subject Code:

Course Objectives:
To understand the meaning
To interpret Indian culture in a scientific manner
To assess the values of health, mind, aestheticism, spiritualism
To evaluate the impact of society
To appraise moral values in the society

Unit I:
Introduction to Value Education,
Value Education – Definition, Views on Education Swami Vivekananda, Sri Aurobindo, Human Values – Family Values

Unit II:
Character Formation Self-Discipline – Self-Confidence Forgiveness – Honesty and Courage Leadership qualities – Personality Development Unit:

Unit III:
Religious Values and Communal Harmony Introduction to Religious Values Brotherhood in Islam – Compassion in Buddhism Need for Religious Harmony

Unit IV:
The Power of Mind Controlling Mind – Physical Exercise Concept of Mind in the Upanishads Ways to Check Worry Habit and Eradication The Power of Mind – the Power of Positive Thinking.

Unit V:
Concept of Human Rights – Classifications – Human Rights of Women and Children – Violationand Redressal – Safeguards.

Unit VI:
Universal Values – Mutual respect for different cultures, people in India and across the globe,

References

1. Das, M.S. & Gupta, V.K. : *Social Values among Young adults: A changing Scenario*, M.D.Publications, New Delhi, 1995.
2. Jash, P. *Glimpses of Hindu Cults and Culture*, Sundeep Prakashan, Del i, 1997. NCERT,Education in Values, New Delhi, 1992.
3. R. C. Pradhan, "Language and Mind in the Upanishads", *Language and Mind: The Classical Indian Perspective*, ed. K. S. Prasad, Hyderabad Studies in Philosophy no. 5, Decent Books, New Delhi, 2008.
4. Vincent Peale, Norman. *Six Attitudes for Winners*, Jaico Publishing Ho se, Mumbai, 2009.
5. Vivekananda, Swami. "Personality Development", Advaita Ashrama, Kolkata, 2008.