Programme Structure

School of Engineering & Technology

M. Tech. (CSE)

Programme Code: M01

W.E.F. Session 2024-25

M. Tech.(CSE)

TITLE: Two Year Programme Structure for M. Tech (CSE)

DURATION OF THE COURSE: 2 Years

Total Credits- 80

Total credit of the 02 year PG Programme for year wise	01st Year	40
	02nd Year	40

Minimum credit required for multiple entry and exit:

Award on Exit after 2 Semesters: PG Diploma/ M.Voc(Engg.) 40 credits

Award on Exit after 4 Semesters: Post Graduate Degree M. Tech. 80 credits

Vision of the University

To be recognized as an Institution of excellence, facilitating learning, fostering creativity, knowledge creation, innovations, consultancy and leadership in multiple areas to build a conscious community that will positively impact living beings for a sustainable future.

Mission of the University

1. To Create conducive environment for an interactive and application oriented experiential learning making the Institute a preferred destination for work and study.
2. To Foster creativity, research and innovation orientation in students and faculty in basic and applied areas in all of its disciplines, provide cost effective solutions and nurture entrepreneurial capabilities to accelerate growth.
3. To act as a catalyst in social change by developing academic, social, political, technological, scientific, industrial and business leadership in the spirit “Think Globally and Act Locally”; by providing ample opportunities to develop team spirit, sportsmanship and love for culture and national heritage.

Core Values

1. Integrity
2. Honesty
3. Transparency
4. Empathy

School of Engineering & Technology

Vision of School

To be a globally recognized hub of excellence in engineering and technology education, renowned for nurturing creative problem solvers, fostering interdisciplinary collaboration, and driving impactful solutions for the

Mission of School

To empower future generations through transformative education and innovation, our mission is to:

1. Cultivate visionary leaders and creative problem solvers through interdisciplinary collaboration, driving impactful solutions that advance society's well-being and sustainable development.

2. Be a preeminent global center for engineering and technology.

Core Values

1. Excellence
2. Innovation
3. Sustainability
4. Global Perspective

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School of Engineering & Technology
W.E.F. Session: 2024-2025

Programme Educational Objectives (PEO's)

M. Tech. CSE

PEO-1 The Graduates will have advanced knowledge in their specialized field of study and will apply this knowledge to solve complex engineering or technological challenges in industry, academia, or research and development sectors.

PEO-2 The Graduates will demonstrate strong problem-solving abilities and innovative thinking, enabling them to design, develop, and implement solutions for real-world problems using modern engineering tools and technologies.

PEO-3 Graduates will exhibit leadership, teamwork, and communication skills in multidisciplinary environments, and will adhere to ethical, professional, and social responsibilities in their roles as engineers, researchers, or managers.

PEO-4 The Graduates will contribute to society by developing sustainable and environmentally responsible engineering solutions, applying their expertise to improve quality of life and address global challenges such as climate change, energy, and health.

Programme Outcomes (PO's):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO):

PSO1: Deep understanding of the theoretical foundations, contemporary techniques, and practical applications in advance areas of computer science.

PSO2: Strong research skills to formulate research problems, design experiments, analyze data, and interpret results and skilled in developing and deploying the solutions.

PSO3: Ability to continuously learn and adapt to emerging technologies, trends, and challenges in their field ensuring that their engineering solutions are socially responsible and environmentally sustainable.

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Semester-wise Evaluation Scheme
PG Program

M.Tech. (CSE)

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SDGI GLOBAL UNIVERSITY
School of Engineering & Technology
W.E.F. Session: 2024-2025

Programme: M. Tech. (CSE)

Semester: I w.e.f. Session: 2024-2025

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week				Hours	Credits	CIE	ESE	Total	Pass Marks
					L	T	P						
1	CC-1	M010124101	Mathematical Foundations of Computer Science		4	0	0	4	4	50	50	100	40
2	CC-2	M010124102	Advanced Data Structures		3	0	0	3	3	50	50	100	40
3	CC-3	M010124PE1-1 TO M010124PE1-4	Program Elective-1		3	0	0	3	3	50	50	100	40
4	CC-4	M010124PE2-1 TO M010124PE2-4	Program Elective-2		3	0	0	3	3	50	50	100	40
5	CC-5	M010124105	Soft Computing Techniques		3	0	0	3	3	50	50	100	40
6	CC-6	M010124152	Advanced Data Structures Lab		0	0	4	4	2	60	40	100	40
7	CC-7	M010124155	Advanced Computing Lab-1		0	0	4	4	2	60	40	100	40
				Total	16	0	8	24	20	370	330	700	280

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W.E.F. Session: 2024-2025

Program Elective-1	
M010124PE1-1	Advanced Computer Architecture
M010124PE1-2	Advanced Operating System
M010124PE1-3	Web Search & Information Retrieval
M010124PE1-4	Software Engineering & Project Management

Program Elective-2 POOL - (AI & ML)	
M010124PE2-1	Applied AI
M010124PE2-2	Pattern Recognition
M010124PE2-3	Bio-Medical Signal and Image Processing
M010124PE2-4	Introduction to Cognitive Computing

Program Elective-2 POOL – Data Science	
M010124PE2-1	Data Warehousing
M010124PE2-2	Data Mining
M010124PE2-3	Big Data Analytics
M010124PE2-4	Big Data Modelling and Management

Program Elective-2 POOL – Cyber Security	
M010124PE2-1	Foundations of Cryptography
M010124PE2-2	Cryptology and Cryptanalysis
M010124PE2-3	Biometrics
M010124PE2-4	Information and System Security

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W.E.F. Session: 2024-2025

Programme: M. Tech. (CSE)

Semester: II **w.e.f. Session: 2024-2025**

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week				Hours	Credits	CIE	ESE	Total	Pass Marks
					L	T	P						
1	CC-1	M010124201	Analysis & Design Of Algorithm		4	0	0	4	4	50	50	100	40
2	CC-2	M010124202	Knowledge Based System Design		4	0	0	4	4	50	50	100	40
3	CC-3	M010124PE3-1 TO M010124PE3-3	Program Elective 3		3	0	0	3	3	50	50	100	40
4	CC-4	M010124PE4-1 TO M010124PE4-3	Program Elective 4		3	0	0	3	3	50	50	100	40
5	CC-5	M010124203	Seminar-1		0	0	4	4	2	50	50	100	40
6	CC-6	M010124251	Analysis & Design of Algorithm Lab		0	0	4	4	2	60	40	100	40
7	CC-7	M010124252	Knowledge Based System Design Lab		0	0	4	4	2	60	40	100	40
				Total	14	0	12	26	20	370	330	700	280

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Program Elective-3 POOL - (AI & ML)	
M010124PE3-1	Natural Language Processing
M010124PE3-2	Deep Learning
M010124PE3-3	Machine Learning

Program Elective-3 POOL – Data Science	
M010124PE3-1	Statistical Learning for Data Science
M010124PE3-2	Business Process Modelling & Analysis
M010124PE3-3	Time Series Analysis

Program Elective-3 POOL – Cyber Security	
M010124PE3-1	Secure Multiparty Computation
M010124PE3-2	Digital Forensics
M010124PE3-3	Cyber Security

Program Elective-4 POOL – Data Science	
M010124PE4-1	NOSQL Dtatabases
M010124PE4-2	Big Data Analytics using Hadoop
M010124PE4-3	Data Analytics using R

Program Elective-4 POOL – Cyber Security	
M010124PE4-1	Blockchain Technology and its Applications
M010124PE4-2	Information Theory for Cyber Security
M010124PE4-3	Web Application Security

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Program Elective-4 POOL – AI&ML	
M010124PE4-1	Deep Learning for Image Processing
M010124PE4-2	Information Retrieval
M010124PE4-3	Human Activity Recognition

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W.E.F. Session: 2024-2025

Programme: M. Tech. (CSE)

Semester: III w.e.f. Session: 2024-2025

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	CC-1	M010124301	Advanced Database Management System	4	0	0	4	4	50	50	100	40
2	CC-2	M010124PE5-1 TO M010124PE5-3	Program Elective-V	4	0	0	4	4	50	50	100	40
3	CC-3	M010124303	Seminar	0	0	0	0	6	100		100	40
4	CC-4	M010124304	Minor Dissertation	0	0	0	0	6	100		100	40
			Total	8		0	8	20	300	100	400	160

Program Elective-5	
M010124PE5-1	Advanced Information Retrieval
M010124PE5-2	Optimization Techniques
M010124PE5-3	Cloud Computing

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School of Engineering & Technology
W.E.F. Session: 2024-2025

Programme: M. Tech. (CSE)

Semester: IV w.e.f. Session: 2024-2025

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	CC-1	M010124401	Major Dissertation	0	0	0	0	20	200	400	600	240
			Total	0	0	0	0	20	200	400	600	240

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DETAILED SYLLABUS
Programme: M. Tech. (CSE)

Mathematical Foundations of Computer Science
(Course Code: M010124101)

Year: **I**st
Semester: **I**st

L	T	P	C
4	0	0	4

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO 1	Understand the Propositional Calculus and Predicate Calculus .	K_4, K_6
CO 2	To apply the Operations on Binary Sets, relations and matrix.	K_5, K_6
CO 3	Understand the mathematical concepts of Algebraic Structures and Number Theory	K_2, K_5
CO 4	Understand and apply the basics of combinatorics.	K_2, K_4
CO 5	Understand basic concepts of recurrence relations.	K_2, K_3

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Mathematical Logic:** Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. Predicate Calculus:Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.	**10**
II	**Set Theory:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion, Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, Functions: Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.	**10**
III	**Algebraic Structures and Number Theory:** Algebraic Structures: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism, Number Theory: Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)	**10**
IV	**Combinatorics:** Basic of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, The Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.	**10**
V	**Recurrence Relations:** Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	**10**

Text Books

1. Discrete Mathematical Structures with Applications to Computer Science,J. P.Tremblay and P. Manohar,Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata McGraw Hill.

Reference Books

4. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
5. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon m Cutler Ross, PHI.
6. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

ADVANCED DATA STRUCTURES
(Course Code: M010124102)

Year: **I**st
Semester: **I**st

L	T	P	C
3	**0**	**0**	**3**

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO 1	Understand the basic principles and operations of data structures.	K_2
CO 2	Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.	K5
CO 3	Apply the concepts of advanced Trees and Graphs for solving problems effectively.	K5
CO 4	Analyze the given scenario and choose appropriate Data Structure for solving problems.	K5
CO 5	Understand basic concepts of genetic algorithms.	K_2, K_3

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Hashing** General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.	**09**
II	**Priority Queues (Heaps)** Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations. Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queue, Priority Queues in the Standard Library.	**09**
III	**Trees** AVL: Single Rotation, Double Rotation, B-Trees. Multi-way Search Trees – 2-3 Trees: Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree. Red-Black Trees – Properties of red-black trees, Rotations, Insertion, Deletion.	**09**
IV	**Graphs Algorithms** Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.	**09**
V	**Disjoint Sets** Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm. String Matching – The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.	**09**

Text Books

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, 2009, The MIT Press.

Reference Books

3. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
4. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

Software Engineering & Project Management
(Course Code: M010124PE1-4)

Year: **I**st
Semester: Ist

L	T	P	C
3	**0**	**0**	**3**

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO1	**Understand Software Engineering concepts.**	K_2, K_3
CO2	**Know the fundamentals of system analysis & system design.**	K_2, K_3
CO3	**Explore CASE tools.**	K_3
CO4	**Understand the Software quality assurance parameters.**	K_2, K_3
CO5	**Do Software Cost and Time Estimation.**	K_4

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Software Engineering Fundamentals**: Definition of software product, software engineering paradigms, Software engineering, knowledge engineering, and End user development approach, software engineering life cycle, process modules (Waterfall model, Spiral model)	**09**
II	**System Analysis:** An abstraction, Partitioning and projection, system specification, software requirement specification (SRS) standards, formal specification methods, specification tools, flow based, data based and object oriented analysis (data flow diagram, data dictionary). **System Design:** Problem partitioning, abstraction, top down &bottom up strategies, modularity structure charts, idealized and constraint design (Warnier -Orr, E-R modeling), object oriented design (Booch approach), cohesion and coupling, design matrices, design documentation standard.	**09**
III	**Role of CASE tools:** relevance of CASE tools, high-end low end CASE tools, automated support for data dictionaries, DFDs, ERDs. **Coding and Programming:** choice of programming languages, mixed language programming and cell semantics, structured programming, information hiding, documentation, re-engineering legacy systems, coding standard.	**09**
IV	**Software quality and testing**: software quality assurance, types of software testing (White box and Black box testing, unit testing integration testing, verification and validation of software), debugging and softwa~e reliability analysis, software quality and matrices, software maturity model and extensions.	**09**
V	**Software Cost and Time Estimation:** functions points, issues in software cost estimation: Introduction to the Rayleigh curve, algorithmic cost models (CO COMO, PutnamSlim, Watson), other approaches to software cost and size estimation (software complexity, delphi, costing by analogy). **Software Project Management**: planning software, project, work breakdown structures, integrating software design and project planning, software project teams, projecting monitoring control.	**09**

Text Books

1. Software Engineering, Rogers G. Pressman, MH
2. Fundamentals of Software Engineering,2nd Ed. ,Ghezzi,PHI
3. Software Engineering, Pankaj Jalote, PHI

Reference Books

1. Classical and Object Oriented Software Engineering, Schach, TMH
2. Software Engineering: Principles & Practice,Van Vliet,SPD/JOHN WILEY
3. Software Engineering, K.K.Aggarwal & Yogesh Singh, New Age International
4. Software Engineering, Leon, VIKAS
5. Software Testing Fundamentals: Methods& Metrices, Marmie Hutcheson, And Wiley Dreamtech
6. Managing for Total Quality,Logothetis,PHI

BigData Analytics
(Course Code: M010124PE2-3)

Year: **I**st
Semester: Ist

L	T	P	C
3	**0**	**0**	**3**

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO1	**Understand big data analytics as the next wave for businesseslooking for competitive advantage.**	K_2, K_3
CO2	**Understand the financial value of big data analytics.**	K_2, K_3
CO3	**Explore tools and practices for working with big data**	K_2, K_3
CO4	**Understand how big data analytics can leverage into a keycomponent.**	K_2, K_3
CO5	**Learn about stream computing.**	K_2, K_3

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**INTRODUCTION:** Dawn of the Big Data Era, Definition and Features of Big Data, Big Data Value, The Development of Big Data, Challenges of Big Data. RELATED TECHNOLOGIES: Cloud Computing - Cloud Computing Preliminaries, Relationship Between Cloud Computing and Big Data, IoT - IoT Preliminaries, Relationship Between IoT and Big Data, Data Center, Hadoop - Hadoop Preliminaries, Relationship between Hadoop and Big Data.	**09**
II	**BIG DATA GENERATION AND ACQUISITION:** Big Data Generation-Enterprise Data,IoT Data, Internet Data, Bio- medical Data, Data Generation from Other Fields, Big Data Acquisition - Data Collection, Data Transportation, Data Pre-processing.	**09**
III	**BIG DATA STORAGE** Storage System for Massive Data,Distributed Storage System,Storage Mechanism for Big Data - Database Technology, Design Factors, Database Programming Model. **HADOOP & MAP REDUCE:** Data Storage and Analysis, Comparison with Other Systems, A Brief History of Hadoop , Apache Hadoop and the Hadoop Ecosystem, A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop(Map and Reduce, Java MapReduce), Scaling Out, Hadoop Streaming, Hadoop Pipes.	**09**
IV	**BIG DATA ANALYSIS:** Traditional Data Analysis, Big Data Analytic Methods, Architecture for Big Data Analysis - Real-Time vs. Offline Analysis, Analysis at Different Levels, Analysis with Different Complexity, Tools for Big Data Mining and Analysis.	**09**
V	**BIG DATA APPLICATIONS:** Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis,Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network-Oriented Big Data, Applications of Healthcare and Medical Big Data, CollectiveIntelligence, Smart Grid.	**09**

Text Books

1. Min Chen, Shiwen Mao, Yin Zhang,Victor C.M. Leung, "Big Data: Related Technologies, Challenges and Future Prospects", Springer; 2014 edition.S Ceri and G Pelagatti, "Distributed databases principles andsystems", 1st Edition, TMH, 2008.

Reference Books

1. Tom White, "Hadoop- The Definitive Guide", O'reilly, 2nd Edition.
2. VigneshPrajapati,"Big Data Analytics with R and Hadoop", PACKT Publishing,November 2013.

SOFT COMPUTING TECHNIQUES
(Course Code: M010124105)

Year: Ist
Semester: Ist

L	T	P	C
3	0	0	3

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO 1	Understand the architectural concept of neural networks and different learning techniques.	K_2, K_3
CO 2	Understand the backpropagation algorithm and multilayer perception model.	K_2, K_3
CO 3	Understand the mathematical concepts of fuzzy logic systems.	K_2, K_3
CO 4	Understand and apply Fuzzy fications & Defuzzificataions.	K_5, K_6
CO 5	Understand basic concepts of genetic algorithms.	K_2, K_3

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Neural Networks-1(Introduction & Architecture)** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	09
II	**Neural Networks-II (Back propogation networks)** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;backpropagation algorithm, factors affecting backpropagation training, applications.	09
III	**Fuzzy Logic-I (Introduction)** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	09
IV	**Fuzzy Logic –II (Fuzzy Membership, Rules)** Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzy fications & Defuzzificataions, Fuzzy Controller, Industrial applications.	09
V	**Genetic Algorithm(GA)** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	09

Text Books

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and GeneticAlgorithm:Synthesis and Applications" Prentice Hall of India.

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

Reference Books

3. Siman Haykin,"Neural Netowrks"Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata Mc Graw Hill

Advanced Data Structures Lab

(Course Code: M010124152)

	L	T	P	C
Year: **I**st				
Semester: **I**st	0	0	4	2

List of Experiments (Indicative & not limited to)

1 Write a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

2. Write a C program to perform the following: i) Creating a AVL Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

3. Write a C program to perform the following: i) Creating a B-Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

4.Write a program that implements Kruskals algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line representing the starting vertex, the second the ending vertex, and the third the weigh of the edge. Use this file to construct, line by line, the graph upon which Kruskal's algorithm will be run (do NOT hardcode this graph!).

5. Write a program to simulate various graph traversing algorithms.

6. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm. The program should be able to read in the weight matrix of a graph and produce the minimal spanning tree Generate weight matrices (using a random number generator) with a large number of nodes and estimate the time complexity of the algorithm.

Advanced Computing Lab
(Course Code: M010124155)

	L	T	P	C
Year: **I**st				
Semester: **I**st	0	0	4	2

List of Experiments (Indicative & not limited to)

1. Programs using Functions and Pointers in C

2. Programs using Files in C

3. Programs using Classes and Objects

4. Programs using Operator Overloading

5. Programs using Inheritance, Polymorphism and its types

6. Programs using Arrays and Pointers

7. Programs using Dynamic memory allocation

8. Programs using Templates and Exceptions.

9. Programs using Sequential and Random access files.

DESIGN AND ANALYSIS OF ALGORITHMS
(Course Code: M010124201)

Year: **I**st
Semester: I**I**nd

L	T	P	C
4	**0**	**0**	**4**

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able :		
CO 1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.	K_4, K_6
CO 2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).	K_5, K_6
CO 3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.	K_2, K_5
CO 4	Apply classical sorting, searching, optimization and graph algorithms.	K_2, K_4
CO 5	Understand basic techniques for designing randomized algorithms.	K_2, K_3

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Introduction** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**10**
II	**Advanced Structures:** Binary search trees, B trees, AVL trees, Red black trees, splay trees. Van Emde Boas trees. Randomly built binary search trees. Heaps, Binomial heaps, Fibonacci heaps. Minimum spanning trees, BFS, DFS, Strongly connected components, Biconnected components.	**10**
III	**Network Flow:** Flow networks, The Ford-Fulkerson method, Maximum bipartite matching. String Matching: Naive string-matching algorithm, Rabin-Karp algorithm, String matching with finite automata, Knuth-Morris-Pratt algorithm.	**10**
IV	**Approximation algorithms:** NP completeness, Reductions, coping with NP completeness, Approximation algorithms: The vertex cover problem, The travelling salesman problem, The set covering problem, The Subset-sum problem. Graph colouring.	**10**
V	**Randomized algorithms:** Las Vegas and Monte Carlo algorithm, Random variables and their expectations. probabilistic analysis and uses of indicator random variables: Birthday paradox, coupon collector's problem, The online hiring problem. Randomized version of quick sort, Miller Rabin randomized primality Test.	**10**

Text Books

6. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein. "Introduction to Algorithms," Third edition ,Prentice Hall India, 2011

Reference Books

7. Sara. Basse, Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson, 2000.
8. R. Motwani and P. Raghavan, "Randomized Algorithms," Cambridge University Press, 1995.
9. Dexter C. Kozen, "The Design and Analysis of Algorithms," Springer, 1992
10. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," Third edition, Pearson, 2007.

11. Michael Sipser, “Introduction to theory of computation”, Thomson Course technology, 2006.
12. Alfred V Aho, Jeffrey D Ullman, John E Hopcroft, “Data Structures and Algorithms”, Pearson, 1983
13. Sartaj Sahni, “Data Structures, algorithms & applications In C++,” university press, 2008.

Knowledge Based System Design
(Course Code: M010124202)

Year: **I**st
Semester: I**I**nd

L	**T**	**P**	**C**
4	**0**	**0**	**4**

Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	To understand the concepts of Knowledge Based System Design	K3
CO 2	To understand the components of Knowledge Based Systems	K3
CO 3	To understand the issues and approaches in Knowledge Based System Design	K_2
CO 4	Apply classical sorting, searching, optimization and graph algorithms.	K_2
CO 5	Understand basic techniques for designing randomized algorithms.	K_2, K_3

DETAILED SYLLABUS

Unit	**Topic**	**Proposed Lecture**
I	**Introduction To Knowledge Engineering:** Introduction To Knowledge Engineering : The Human Expert And An Artificial Expert – Knowledge Base And Inference Engine – Knowledge Acquisition And Knowledge Representation- Problem Solving Process	**10**
II	**Rule Based Systems** Heuristic Classifications – Constructive Problem Solving- Tools For Building Expert Systems	**10**
III	**Analysis:** Case Based Reasoning – Semantic Of Expert Systems – Modeling Of Uncertain Reasoning – Applications Of Semiotic Theory	**10**
IV	**Design:** Designing For Explanation- Expert System Architectures – High Level Programming Languages – Logic Programming For Expert Systems.	**10**
V	**Implementation Testing and Maintenance:** Machine Learning – Rule Generation And Refinement –Learning Evaluation – Testing And Tuning	**10**

Text Books

1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education 2007
2. Robert I. Levine, Diane E. Drang, Barry Edelson: " AI and Expert Systems: a comprehensive guide, C language", 2nd edition, McGraw-Hill 1990
3. Jean-Louis Ermine: "Expert Systems: Theory and Practice", 4th printing, Prentice-Hall of India , 2001

Reference Books

4. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach",2nd Edition, Pearson Education, 2007
5. N.P.Padhy: "Artificial Intelligence and Intelligent Systems",4th impression , Oxford University Press, 2007

Design and Analysis of Algorithm Lab

(Course Code: M010124251)

Year: **I**st	L	T	P	C
Semester: **II**nd	0	0	4	2

List of Experiments (Indicative & not limited to)

1. Write a program for Recursive Binary & Linear Search and compute its time complexity.
2. Write a program for Heap Sort and compute its time complexity.
3. Write a program for Merge Sort and compute its time complexity.
4. Write a program for Selection Sort and compute its time complexity.
5. Write a program for Insertion Sort and compute its time complexity.
6. Write a program for Quick Sort and compute its time complexity.
7. Write a program for Knapsack Problem using Greedy approach.
8. Write a program to perform Travelling Salesman Problem.
9. Write a program to find Minimum Spanning Tree using Kruskal's Algorithm.
10. Write a program to implement N Queen Problem using Backtracking.
11. Write a program to show how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
12. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
13. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
14. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
15. Write programs to implement All-Pairs Shortest Paths problem using Floyd's algorithm.

Knowledge Based System Design Lab

(Course Code: M010124252)

Year: **I**st	L	T	P	C
Semester: **I**Ind	0	0	4	2

List of Experiments (Indicative & not limited to)

1. Build a simple knowledge base with basic inference rules.
2. Implement a basic inference engine with a predefined knowledge base.
3. Acquire and represent knowledge using a chosen method.
4. Create a rule-based system for a specific domain (e.g., medical diagnosis).
5. Implement heuristic classification for problem-solving scenarios.
6. Solve problems using constructive methods.
7. Use a tool (e.g., CLIPS, JESS) to build a simple expert system.
8. Implement a CBR system and test it with sample cases.
9. Implement uncertain reasoning methods in a sample expert system.
10. Hands-on exercise: Implement explanation features in an expert system.
11. Design an expert system architecture for a given problem.
12. Implement expert system rules and queries using logic programming.
13. Hands-on exercise: Integrate machine learning models into an expert system.
14. Hands-on exercise: Conduct testing and tuning of a complete expert system, documenting issues and improvements.