Learning Outcomes based Curriculum Framework (LOCF)

For

M. Tech. (Computer Science & Engineering)
2 Year Regular
Full-Time
Postgraduate Programme

Department of Computer Science & Engineering
Chaudhary Devi Lal University
Sirsa-125055
2021

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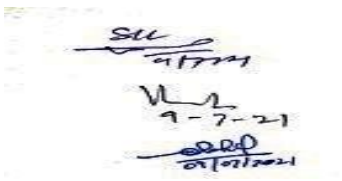
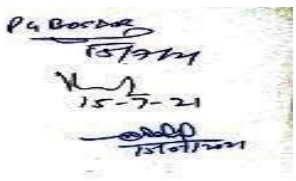




1. About the Department

There are two major streams in computer education. One of them is the Engineering stream leading to the B.E./B.Tech degree and the other an Applications stream leading to the MCA degree. The primary emphasis in the MCA programme is on designing information systems for various organizations such as government departments, banks, insurance companies, hotels, hospitals, etc. Development of application software in diverse areas where computers are used will be the main function of MCA graduates. The major thrust in the MCA programme is on giving the graduates a sound background in computing, business functioning, and mathematics relevant to information technology systems. The curriculum has the courses relevant to achieving the programme outcomes. A strong laboratory component is a part of the MCA curriculum, for computer application students learn best by doing. The laboratories, besides supplementing the theory course should also expose the student to the use of the latest software tools. Every MCA student is required to spend 6-8 weeks summer training in a relevant software development house or related industry after taking their second-semester terminal examinations. Further, in their fourth semester, every MCA student shall have to work on a real-life software development project worth 8 credits. For carrying out the project work, MCA students shall be taught and trained in various software development platforms for desktop, web-based, and mobile-based applications.

Further, every MCA student shall have to earn 116 credits in total – 76 Core Courses credits, 28 discipline elective courses Credits, and 12 Open Elective Courses Credits offered by other teaching departments of the University. The students with non-computer background at graduation level are required to earn 12 credits through two Bridge Courses. Moreover, so as to enhance the life skills, the student may opt for upto two Add-On Courses- 2 credits each.The postgraduate programme in engineering stream of computer science leading to the M. Tech. CSE degree has its primary emphasis on designing systems in computer hardware and systems software. Designing embedded systems, designing peripherals and interfacing them to a computer and use of computers in signal processing are some other areas of interest to engineering students. In computing science and engineering, students are provided a practical exposure to tools and technologies required in professional and academic arena. Curriculum of M. Tech. CSE programme comprises of an ample laboratory component, wherein the students get to know of current processes and technologies of this field.

The M. Tech. CSE programme regular (Full Time and Part Time) is dedicated to conducting and reporting on a research problem culminating in a dissertation worth 14 credits. Further, every M. Tech. CSE Regular Full Time student shall have to earn 88 credits in total – 44 Core Courses credits, 36 Discipline Specific Elective Courses Credits and 8 Open Elective Courses Credits offered by other teaching departments of the University. Every M. Tech. CSE Regular Part Time student shall have to earn 70 credits in total – 40 Core Courses credits, 30 Discipline Specific Elective Courses Credits. Mid-term examination shall cover the first two units of the course content. The question paper will be set by the internal teacher. This helps them blend their skills and orientation towards life in general and profession in particular. All in all, M. Tech. CSE graduates shall possess sound theoretical and research background apart from knowing modern principles and practices in computer science and engineering.

2. Learning Outcome based Curriculum Framework

The CBCS evolved into learning outcome based curriculum framework and provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system,

which is considered to be better than the conventional marks system. Grading system provides uniformity in the evaluation and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations which enables the student to move across institutions of higher learning. The uniformity in evaluation system also enables the potential employers in assessing the performance of the candidates.

2.1 Objectives of the programme

After spending two years in their profession M.Tech. CSE Regular Full-Time graduates are expected to:

- apply knowledge and expertise - gained thus far - in problem-solving skills development and maintenance of software systems, tools, applications; academia and research in local and cross-border settings;
- be well adept in management of software development projects bearing techno-economical and social-behavioural delimitations; management of educational and research establishment; management of own start-up enterprise.
- exhibit support for peers and leadership by spearheading the projects teams; entrepreneurial skills by conceptualising new software projects; contributing to research and academia by way of undertaking research and academic assignments.
- engage in lifelong learning, career enhancement and adept to changing professional, societal, and environmental needs in a way conforming to his/her position in the profession/vocation;
- develop communication skills necessary to function productively in the given settings to achieve a successful professional/vocational career with academic and professional ethics and social obligations.

2.2 Programme Outcomes (POs)

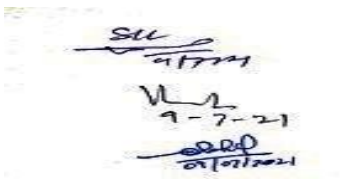
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems 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,

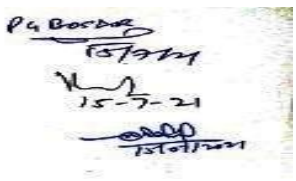
	and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**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.

2.3 Programme Specific Outcomes (PSOs)

The graduates of the M.TECH. C.S.E. Regular Full-Time programme will have/be:

PSO1	ample knowledge of principles and practices of computer science and engineering and capability of putting these principles to use in solving relevant problems.
PSO2	working knowledge of using modern computing tools and technologies like simulation & modelling and CASE tools in development and operations of various flavours of computer applications and in conduct of computing research.





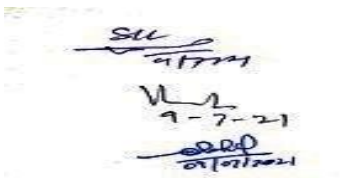
PSO3	well acquainted in adoption and application of skills gained during research and practice and exhibit a taste for adopting trending software processes to solve computing problems.
PSO4	working knowledge set for practicing their respective vocation/profession with ethics, integrity, leadership, and social responsibility.
PSO5	equipped to achieve their career goals in the academia/industry or pursue higher studies and enhance their professional knowledge.

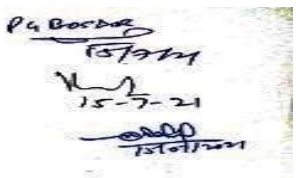
3. Programme Structure

M.TECH. C.S.E. Regular Full-Time programme a four-semesters postgraduate programme is 88 credits weitage consisting of Core Courses (CC), Discipline Specific Elective Courses (DSC), Skill Enhancement Courses (SEC), Open Elective Courses (OEC);

Table 1: MTech Credit Scheme

Semester	**Core Courses (CC)**		**Discipline Specific Elective Courses (DSC)**		**Skill Enhancement Courses**		**Open Elective Courses (OEC)**	**Grand Total Credits**
	No. of Courses	**Total Credits**	**No. of Courses**	**Total Credits**	**No. of Courses**	**Total Credits**	• A total of 12 credits are to be earned from other Departments or from MOOCs. • Students have to opt for open elective course(s) in consultation with Chairperson and Director, University Centre for Outreach Programmes and	
I	6	20			-	-		
II	4	12	02	08	-	-		
III	4	12	02	08	-	-		
IV	-	-	-	-	1(Dissertation)	20		





							Extension	
Total Credits	44		16		20		12	92
%age	47.82		17.39		21.73		13.04	-

Open Elective Courses offered for Students of other Departments		
Semester	**No. of Papers**	**Total Credits**
Even and Odd	4	16

Add-On Courses(Optional)	
No. of Courses	Total Credits
02(AOC1 &AOC2)	04

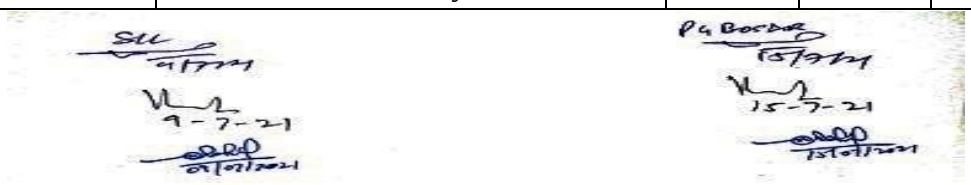
Note: Please mention L+P+T if practical is a part above.

Table 2: Detailed break-up of Courses' Type (Semester wise)

Semester	Core Courses	Discipline Specific Elective Courses	Skill Enhancement Courses	Open Elective Courses	Total Courses
I	CC1 CC2 CC3 CC4 CC5 CC6			• A total of 12 credits are to be earned from other Departments or from MOOCs. • Students have to opt open elective course in consultation with Chairperson and Director, University Centre for Outreach Programmes and Extension	**6**
II	CC7 CC8 CC9 CC10	DSC1 DSC2			**6**
III	CC11 CC12 CC13 CC14	DSC3 DSC4			**6**
IV			SEC1 (Dissertation)		**1**

Table 3: Courses' codes, titles, and credits

Course Code	Course Title	Credit		
	Semester I	Theory	Practical	Total
MTech/CSE/FT /1/CC1	Advanced Database Systems	4	0	4

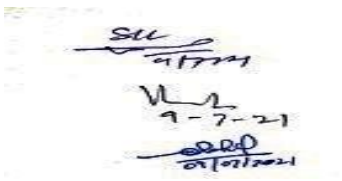


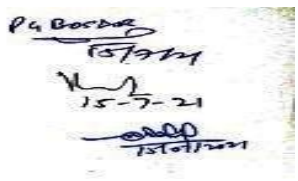
MTech/CSE/FT /1/CC2	Advanced Data Structures	4	0	4
MTech/CSE/FT /1/CC3	Advanced Operating Systems	4	0	4
MTech/CSE/FT /1/CC4	Advanced Computer Architectures	4	0	4
MTech/CSE/FT /1/CC5	Software Lab based on MTech/CSE/FT /1/CC1 (implementation in PL/SQL)	0	2	2
MTech/CSE/FT /1/CC6	Software Lab based on MTech/CSE/FT /1/CC2 (implementation in C/C++)	0	2	2
	Semester II			
MTech/CSE/FT /2/CC7	Advanced Web Technology	4	0	4
MTech/CSE/FT /2/CC8	MATLAB Programming	4	0	4
MTech/CSE/FT /2/DSC1	(a) Network Security, (b) Advanced Computer Networks, (c) Wireless Networks	4	0	4
MTech/CSE/FT /2/DSC2	(a) Soft Computing, (b) Machine Learning, (c) Artificial Intelligence	4	0	4
MTech/CSE/FT /2/CC9	Software Lab based on MTech/CSE/FT /2/CC7 (Advanced Web Technology)	0	2	2
MTech/CSE/FT /2/CC10	Software Lab based on MTech/CSE/FT /2/CC8 (MATLAB Programming)	0	2	2
	Semester III			
MTech/CSE/FT /3/CC11	Python Programming	4	0	4
MTech/CSE/FT /3/CC12	Research Methodology	4	0	4
MTech/CSE/FT /3/DSC3	(a) IoT and Cloud Computing, (b) Grid Computing, (c) Quantum Computing	4	0	4
MTech/CSE/FT /3/DSC4	(a) Data Warehousing and Data (b) Mining. Big Data Analytics, (c) Data Science	4	0	4
MTech/CSE/FT /3/CC13	Software Lab based on MTech/CSE/FT /3/CC11 (Python Programming)	0	2	2
MTech/CSE/FT /3/CC14	Software Lab based on MTech/CSE/FT /3/CC12 (implementation in MATLAB)	0	2	2
	Semester IV			
MTech/CSE/FT /4/SEC1	Dissertation			20

Table 4: MTech CSE Regular Full Time Courses' List

Course Code	Course Title	Credits
Core Courses		
MTech/CSE/FT /1/CC1	Advanced Database Systems	4

MTech/CSE/FT /1/CC2	Advanced Data Structures	4
MTech/CSE/FT /1/CC3	Advanced Operating Systems	4
MTech/CSE/FT /1/CC4	Advanced Computer Architectures	4
MTech/CSE/FT /1/CC5	Software Lab based on MTech/CSE/FT /1/CC1 (implementation in PL/SQL)	2
MTech/CSE/FT /1/CC6	Software Lab based on MTech/CSE/FT /1/CC2 (implementation in C/C++)	2
MTech/CSE/FT /2/CC7	Advanced Web Technology	4
MTech/CSE/FT /2/CC8	MATLAB Programming	4
MTech/CSE/FT /2/CC9	Software Lab based on MTech/CSE/FT /2/CC7 (Advanced Web Technology)	2
MTech/CSE/FT /2/CC10	Software Lab based on MTech/CSE/FT /2/CC8 (MATLAB Programming)	2
MTech/CSE/FT /3/CC11	Python Programming	4
MTech/CSE/FT /3/CC12	Research Methodology	4
MTech/CSE/FT /3/CC13	Software Lab based on MTech/CSE/FT /3/CC11 (Python Programming)	2
MTech/CSE/FT /3/CC14	Software Lab based on MTech/CSE/FT /3/CC12 (implementation in MATLAB)	2
Discipline Specific Elective Courses		
MTech/CSE/FT /2/DSC1	(a) Network Security , (b) Advanced Computer Networks , (c) Wireless Networks	4
MTech/CSE/FT /2/DSC2	(a) Soft Computing, (b) Machine Learning, (c) Artificial Intelligence	4
MTech/CSE/FT /3/DSC3	(a) IoT and Cloud Computing, (b) Grid Computing, (c) Quantum Computing	4
MTech/CSE/FT /3/DSC4	(a) Data Warehousing and Data Mining. (b) Big Data Analytics, (c) Data Science	4
Skill Enhancement Courses		
MTech/CSE/FT /4/SEC1	Dissertation	20
Add-On Courses		
MTech/CSE/FT/1/SEC1	Green Computing	2
MTech/CSE/FT/2/SEC2	Cyber Laws and Ethics in Computing	2
Open Electives Courses offered to other departments ODD Semester and Even Semester		
CSE//9/OEC1	Fundamentals of Information Technology	4
CSE/9/OEC2	Windows and Office Automation Tools	4
CSE/9/OEC3	Introduction to Cyber Space	4
CSE/9/OEC4	Information Technology for Lifelong Learning	4





Note: During the dissertation work Students be encouraged to publish their research work in Scopus/Web of Science(SCI, SCIE, ESCI)/UGC CARE journals.

MTech/CSE/FT/1/CC1: Advanced Database Systems							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with different concepts related to database.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: 3-schema architecture, ER diagrams, EER model, functional dependencies, normal forms, data types, views in SQL, concurrency control techniques, database security issues, semantic data models, and client server architecture.
CO2	discuss: ER diagram, relational model, EER model, functional dependencies, normal forms, SQL constraints and views, recovery techniques, data warehouse, and distributed databases.
CO3	apply: inheritance, SQL statements, normal forms, SQL constraints, dependencies, data security, concurrency control and recovery techniques on database.
CO4	categorized: subclass, super class, inheritance, SQL statements, normal forms, SQL constraints, dependencies, data security, concurrency control and recovery techniques.
CO5	justify: subclass, super class, inheritance, SQL queries, normal forms, SQL constraints, functional dependencies, security, concurrency control and recovery techniques.
CO 6	design: database for a particular application.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC1

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO 6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC1

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	1	-	-	-	-	1	3
CO2	2	1	1	3	1	1	-	-	-	-	2	3
CO3	3	1	1	3	3	1	-	-	-	-	3	3
CO4	3	3	1	3	1	1	-	-	-	-	3	3
CO5	3	1	1	1	3	1	-	-	-	-	3	3

CO 6	3	3	3	3	3	1	-	-	-	-	3	3
Average	2.5	2	1.33	2.33	2	1	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course: MTech/CSE/FT/1/CC1

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3
CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
CO 6	3	2	3	-	3
Average	3	2	2.5	-	3

Course Content
MTech/CSE/FT/1/CC1: Advanced Database Systems

Unit I	**Database System Concepts and Architecture:** Three - Schema Architecture and Data Independence, ER Diagrams, Naming conventions and Design Issues. Relational Model Constraints and Relational Database Schemas, EER model: Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization. Relational Model: Relational Model Concepts, Relational model Constraints and Relational Database Schemas
Unit - II	**Informal design guidelines for Relational schemas**: Functional Dependencies, Normal forms based on Primary keys: 1NF, 2NF, 3NF and BCNF, Properties of Relational Decomposition, Multivalued dependencies and 4NF, JOIN dependencies and 5NF. SQL Data Definition and Data types, Specifying Basic Constraints and Queries in SQL, Views in SQL.
Unit - III	**Introduction to Transaction processing:** Concepts, Concurrency control techniques, Database recovery techniques: Deferred update and Immediate update, ARIES Recovery algorithm, Shadow paging, Database security issues
Unit - IV	**Data Warehousing**: Components, Building a data warehouse, Data extraction, cleanup and transformation, OLAP **Future Trends in data models:** Semantic data models, Active and Spatial databases, Temporal databases, Multimedia databases, Distributed Database concepts and Client Server Architecture
Text/Reference Books	
Text Books	1. Elmasri&Navathe: Fundamentals of Database System, 3e, Addison Wesley, New Delhi. 2. Korth&Silberschatz: Database System Concept, 4e, McGraw Hill International Edition.
Reference Books	1. C.J. Date: An Introduction to Database System, 7e, Addison Western New Delhi. 2. Abbey Abramson & Cory: ORACLE SI-A Beginner's Guide Tata McGraw Hill Publishing Company Ltd. 3. Hector G.M., Ullman J.D., Widom J., "Database Systems: The Complete Book", Pearson Education.

MTech/CSE/FT/1/CC2: Advanced Data Structures								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Compulsory Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective is to make students to learn different algorithms analysis techniques, analyse the efficiency of algorithm, apply data structures and algorithms in real time applications.

Course Outcomes	At the end of this course, the student will be able to:
CO1	identify: data type, time and space complexity, stack, queue, linked list, trees, graph, searching, sorting and hashing.
CO2	understand and explain: abstract data types, stack, queue, linked list, tree, and graph, searching, sorting, and traversing algorithms and hashing function.
CO 3	apply and use: various data types, algorithms, stack, queue and link list operations, tree traversal operation, graph representation and traversals algorithms, and searching sorting techniques on data.
CO 4	distinguish: time and space complexity, stack and queue, single, double and circular linked list, binary, AVL, B tree and multiway search tree, depth and breadth first search, Dijkstra's and Kruskal's algorithm, various searching and sorting techniques.
CO5	select: algorithm, data representation technique , searching and sorting technique suitable in a given situation.
CO 6	design: algorithm, stack, queue, linked list, trees, graph, searching, sorting and hashing.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC2

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO 6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC2

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3

CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	1	3	-	-	-	-	-	3	3
CO 6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.33	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/1/CC2

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO 6	3	3	3	-	3
Average	3	3	2.5	-	3

Course Content
MTech/CSE/FT/1/CC2: Advanced Data Structures

Unit I	**Introduction to algorithms**: abstract data types, role of algorithms in computing, performance analyzing algorithms, designing algorithms, time-Space trade offs growth of functions, asymptotic notations, Recurrences: master, substitution, recurrence tree method.
Unit - II	**ADT**: stack, operations on stacks, queue &its variations, operations, types of linked list operations performed on linked list. Trees: representation, traversals, operations, applications, binary search trees, AVL trees, Splay trees, B-trees, m-way search tree, implementation of threading on binary trees.
Unit - III	**Graphs**: : representation, traversals(BFS, DFS, Topological sort), operations, applications, shortest path algorithms (Dijkstra's), minimum spanning trees, algorithms for finding minimum spanning tree (Kruskal , Prim's), Graph coloring.
Unit - IV	**Sorting and Searching**: linear search, binary search, insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Bubble sort, Bin sort, Radix sort. **Hashing**: hash Function, collision resolution, deletion, perfect hash functions, hash functions for Extendible files.

Text/Reference Books

Text Books	1. Seymour lipschutz, Data structures with C, MacGraw Hill. 2. Adam Drozdek, Data Structures and Algorithm in C++, India Edition. 3. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley.
Reference Books	1. Alfred V. Aho, John E.Hopcroft, Jeffrey D.Ullman, Data Structures and Algorithms, Pearson Education. 2. Ellis Horowitz,SartajSahni,SanguthevarRajasekaran, Fundamental of Computer Algorithms, 2e,Universities Press. 3. YedidyahLangsam, Moshe J.Augenstein, A. M.Tenebaum, Data Structures using C and C++, 2e, Pearson Education

MTech/CSE/FT/1/CC3: Advanced Operating Systems							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Compulsory Theory	04	04	Lecture	70	30 (20 / 5 / 5)	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to study, learn, and understand the major concepts of advanced operating systems, namely, multimedia operating systems, distributed and real time operating systems, threads, security and design issues in operating systems.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: kernel, threads, concept of multimedia, distributed and real time operating system, issues in design, security and performance of operating system.
CO2	understand and describe: kernel, threads, deadlock, virtualization, concept of multimedia, distributed and real time operating system, issues in design, security and performance of operating system.
CO3	demonstrate/illustrate: process scheduling, disk scheduling ,real time scheduling, mutual exclusion, deadlock, security and protection mechanism in operating system.
CO4	classify algorithm for: process scheduling and disk scheduling, mutual exclusion, deadlock, security and protection.
CO5	compare algorithm for: process scheduling and disk scheduling, mutual exclusion, deadlock, security and protection.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC3

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC3

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	1	-	-	-	-	1	3
CO2	2	1	1	3	1	1	-	-	-	-	2	3
CO3	3	1	1	3	3	1	-	-	-	-	3	3
CO4	3	3	1	3	1	1	-	-	-	-	3	3
CO5	3	1	1	3	3	1	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	1	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/1/CC3

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3

CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
Average	3	2	2.4	-	3

Course Content **MTech/CSE/FT/1/CC3: Advanced Operating Systems**	
Unit I	Multimedia operating systems: Introduction to multimedia; multimedia files and video compression standards; process scheduling, file system, file placement, caching and disk scheduling for multimedia.
Unit - II	Distributed operating systems: Multiprocessor hardware and scheduling; multicomputer hardware and scheduling; distributed computing architecture; distributed system models; distributed shared memory and distributed file system; mutual exclusion and deadlocks in distributed systems; network operating system vs. distributed operating system.
Unit - III	Real-time operating systems: Characteristics and classification of real-time systems; scheduling in real-time operating systems; trends in kernel design, exo-kernel and micro-kernel; virtualization; threads – concept, advantages, implementation.
Unit - IV	Design issues in operating systems: Goals and nature of design problem; guiding principles and paradigms of interface design; issues in implementation of operating system; performance of operating system; security – cryptography, user authentication, inside and outside attacks, protection mechanism.
Text/Reference Books	
Text Books.	1. Andrew S. Tanenbaum, Modern Operating Systems, 2e, Pearson – Prentice Hall. 2. Pramod Chandra P. Bhatt, An Introduction to Operating Systems – Concepts and Practice, 3e, Prentice Hall, India. 3. Charles Crowley, Operating Systems – A Design Oriented Approach, Tata McGraw Hill.
Reference Books	1. Deitel H.M., Operating Systems, Pearson Education. 2. Stallings William, Operating System, PHI Learning. 3. Godbole A.S., Operating Systems, Tata McGraw-Hill, New Delhi. 4. Tanenbaum A.S., Operating System- Design and Implementation, PHI Learning.

MTech/CSE/FT/1/CC4:Advanced Computer Architectures						
Course Type	Course	Contact	Delivery	Maximum Marks	Exam	Assessment

	Credit	Hours/Week	Mode	External	Internal	Duration	Methods
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment(s)/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with different concepts related to computer architecture.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: concepts of parallel processing, computer architecture, principles of pipeline, collision free scheduling, ILP processors, branch handling, TLB, paging, segmentation, memory hierarchy technology, distributed and shared MIMD.
CO2	understand and explain: parallel processing, computer architecture, principles of pipeline, collision free scheduling, ILP processors, branch handling, TLB, paging, segmentation, memory hierarchy technology, switching and routing techniques, distributed and shared MIMD.
CO3	illustrate different types of: computational models, pipeline, scheduling, TLB, paging, segmentation, cache performance, network interconnection topologies, cache coherence problem and switching network.
CO4	categorize: level of parallelism, linear and non-linear pipeline, code scheduling, TLB, paging and segmentation, UMA, NUMA, CC-NUMA and COMA multiprocessors.
CO5	relate: concurrent and parallel execution, dependencies between instruction, synchronous and asynchronous pipeline, different code scheduling and hardware based cache coherence protocols.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC4

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	1	3	3	3
CO3	3	1	3	3	3
CO4	3	1	3	3	3
CO5	3	1	3	3	3
Average	2.4	1	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC4

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3

Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/1/CC4

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	-	3
CO2	3	1	2	-	3
CO3	3	1	3	-	3
CO4	3	1	3	-	3
CO5	3	1	3	-	3
Average	3	1	2.4	-	3

Course Content
MTech/CSE/FT/1/CC4:Advanced Computer Architectures

Unit I	Concurrent and Parallel Execution: Von-Neumann computational model, Basic concepts of parallel processing, Types and levels of parallelism, Classifications of parallel architectures. Instruction-Level-Parallel Processors: Dependencies between instructions, Principles of Pipelining. Pipelined instruction processing, Synchronous & Asynchronous pipeline, Linear Pipeline-clocking & timing control, speedup, efficiency & throughput, Non linear pipeline- reservation table, latency analysis, collision free scheduling, internal data forwarding.
Unit - II	Introduction to ILP processors – Evolution of ILP, Dependencies between instructions, Principles of pipelining, Performance measures, VLIW architecture, Branch handling-delayed branching, branch processing, multiway branching, guarded execution, Code scheduling- basic block scheduling, loop scheduling, global scheduling.
Unit - III	Memory Hierarchy Technology : inclusion, coherence and locality, virtual memory models, TLB, paging and segmentation, memory replacement policies, cache addressing models, cache performance issues, interleaved memory organization. Distributed MIMD architectures: Direct interconnection networks-interconnection topologies, switching techniques, routing
Unit - IV	Shared MIMD architectures: Dynamic interconnection networks- shared path, switching networks- crossbar & multistage networks. Cache coherence problem, Hardware based cache coherence protocol- Snoopy cache protocol, Directory scheme, hierarchical cache coherence protocol. UMA, NUMA, CC-NUMA and COMA multiprocessors.
Text/Reference Books	
Text Books	1. Hennessy J.D., Patterson D.A., "Computer Architecture A Quantitative Approach", Elsevier India. 2. Sima D., Fountain T., Kasuk P., "Advanced Computer Architecture-A Design Space Approach," Pearson Education.
Reference Books	1. Kai Hwang, "Advanced Computer Architecture – Parallelism, Scalability, Programmability", Tata McGraw Hill.

MTech/CSE/FT/1/CC5:Software Lab based on MTech/CSE/FT/1/CC1(Implementation in PL/SQL)							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		

Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to get the students hands on practice with advanced concepts of database (as covered in course MTech/CSE/FT/1/CC1) and their implementation in PL/SQL.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: 3-schema architecture, ER diagrams, EER model, functional dependencies, normal forms, data types, views in SQL, concurrency control techniques, database security issues, semantic data models, and client server architecture.
CO2	discuss: ER diagram, relational model, EER model, functional dependencies, normal forms, SQL constraints and views, recovery techniques, data warehouse, and distributed databases.
CO3	apply: inheritance, SQL queries, normal forms, SQL constraints, dependencies, data security, concurrency control and recovery techniques on database.
CO4	differentiate: subclass, super class, inheritance, SQL queries, normal forms, SQL constraints, functional dependencies, data security, concurrency control and recovery techniques.
CO5	justify: subclass, super class, inheritance, SQL queries, normal forms, SQL constraints, functional dependencies, data security, concurrency control and recovery techniques.
CO 6	design: database for a particular application.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC5

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO 6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC5

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	1	-	-	-	-	1	3
CO2	2	1	1	3	1	1	-	-	-	-	2	3
CO3	3	1	1	3	3	1	-	-	-	-	3	3
CO4	3	3	1	3	1	1	-	-	-	-	3	3
CO5	3	1	1	1	3	1	-	-	-	-	3	3
CO 6	3	3	3	3	3	1	-	-	-	-	3	3
Average	2.5	2	1.33	2.33	2	1	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course: MTech/CSE/FT/1/CC5

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3

CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
CO 6	3	2	3	-	3
Average	3	2	2.5	-	3

MTech/CSE/FT/1/CC6: Software Lab based on MTech/CSE/FT/1/CC2(Implementation in C/C++)							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to get the students hands on practice with the advanced concepts of data structure and how to implement those concepts using C/C++. The course shall be based on MTech/CSE/FT/1/CC2.

Course Outcomes	At the end of this course, the student will be able to:
CO1	identify: data type, time and space complexity, various data structure – stack, queue, linked list, trees, graph, searching, sorting and hashing.
CO2	understand and explain: abstract data types, data structure like- (stack, queue, linked list, tree, and graph), searching, sorting, and traversing algorithms and hashing function.
CO 3	apply and use: various data types, algorithms, stack, queue and link list operations, tree traversal operation, graph representation and traversals algorithms, and searching sorting techniques on data.
CO 4	distinguish: time and space complexity, stack and queue, single, double and circular linked list, binary, AVL, B tree and multiway search tree, depth and breadth first search, Dijkstra's and Kruskal's algorithm, various searching and sorting techniques.
CO 5	select: algorithm, data representation technique , searching and sorting technique suitable in a given situation.
CO 6	design: algorithm, various data structure – stack, queue, linked list, trees, graph, searching, sorting and hashing.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/1/CC6

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO 6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/1/CC6

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3

CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	1	3	-	-	-	-	-	3	3
CO 6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.33	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/1/CC6

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO 6	3	3	3	-	3
Average	3	3	2.5	-	3

MTech/CSE/FT/2/CC7: Advanced Web Technology							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with different concepts related with HTML, Java Scripts, Search Engines and CMS.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the basic concepts of HTML, CSS, XHTML, HTML5, XML, JavaScript, PHP, MySQL, search engine and content management systems.
CO2	describe: HTML common tags, HTML5 capabilities and use of XML, JavaScript concept with PHP & MySQL, search engine techniques and optimize search results.
CO3	perform: HTML tags with XML, JavaScript with PHP and MySQL queries, optimize search engine result using SEO techniques, Webhosting and different type of CMS technologies.
CO4	illustrate: relationship of HTML with XML, building query on tables and forms, improve ranking using search engine optimization techniques, analyze different CMS like Wordpress, Joomla and Drupal with help of their features.
CO5	compare: HTML with HTML5, relationship of HTML, SGML and XML. determine: client side or server side JavaScript. evaluate: queries on table and forms using MySQL. choose: effective plan to achieve higher ranking in search results.
CO6	design: webpages using HTML, CSS, XML and JavaScript, generate various query using MySQL in webpages, modify webpages to achieve higher ranking in search engine. create: blog or websites using Content Management System.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/CC7

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/CC7

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3

CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.66	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/CC7

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

Course Content
MTech/CSE/FT/2/CC7: Advanced Web Technology

Unit I	Overview of HTML: Common tags, XHTML, capabilities of HTML5, Cascading Style sheets, XML relationship between HTML, SGML, and XML, Basic XML, ways to use XML, The future of XML.
Unit – II	Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, PHP and MySQL**:** PHP/MySQL Functions, displaying queries in tables, Building Forms from queries, Sessions, Cookies.
Unit – III	Search Engines: Searching techniques used by search engines, Keywords, Search Engine Optimization (SEO), Effective content writing plan, Achieving high rankings, SEO analysis intervals.
Unit – IV	CMS: Introduction, types, architecture. CMS Technologies: WordPress, Drupal, Joomla, Website Creation and maintenance, Web Hosting and Publishing Concepts.

Text/Reference Books

Text Books.	1. Peter Smith, “Professional Website Performance”, Wiley India Pvt. Ltd. 2. Kogent Learning, "Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX - Black Book”, Wiley India Pvt. Ltd.' 3. J. C. Jackson, “Web Technologies”, Pearson Education,
Reference Books	1. Steven Holzner, PHP: The Complete Reference, Tata McGraw Hill 2. DT Editorial Services, “HTML 5 Black Book”, 2e, Wiley India, 2016. 3. S. Potts, “JAVA 2 Unleashed”, 6e, Sams Publishing, 2002

MTech/CSE/FT/2/CC8: MATLAB Programming								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Compulsory Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to study, learn, and understand the major concepts of MATLAB Programming, namely, data types, data structure, matrices, data import/export, graphics, control structure, toolboxes, image and video processing.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: features, commands, data types, hierarchy of operations, matrix, tools, functions related to input/output, file handling and graphics, control structure and toolboxes used in MATLAB.
CO2	describe: history, origin, features, commands, data types, hierarchy of operations, matrix, tools, functions related to file, function related to graphics, control structure and various toolboxes of MATLAB.
CO3	use: commands, operations, tools, menus, toolbars, input/output functions, file handling, functions related to graphics, 2D and 3D plotting, control structure, debugging, simulink and image & video processing toolboxes in MATLAB.
CO4	analyze: commands, data types, operations, control structure, matrix, tools, different functions related to graphics and file handling in given MATLAB program.
CO5	determine: command, data type, tool, menu, control structure, debugging technique, function, feature or toolbox of MATLAB to use in given condition.
CO6	create: basic or advanced program in MATLAB using different commands, 2D and 3D plotting, functions, tools, features, simulink, fuzzy logic, neural network and image & video processing toolbox of MATLAB.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/CC8

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/CC8

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3

CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.67	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/CC8

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

Course Content
MTech/CSE/FT/2/CC8: MATLAB Programming

Unit I	MATLAB: Introduction, history, origin, growth and development, features, menus and the toolbar, computing, types of file, editor debugger, useful commands, help system, creating directory and saving files, constants variables and expressions-character set, data type, constants, variables and expressions, operators, hierarchy of operations, built-in-function, assignment statements. Vectors and matrices: scalars and vectors, entering data in matrices, line continuation, matrices subscripts, multi-dimensional matrices and arrays, matrix manipulation, special matrices, commands related to matrices, structure arrays, cell arrays.
Unit - II	Polynomials: entering, evaluation, roots, operations. Input/output statements: data input, interactive inputs, reading/storing data files, output commands, low level input output functions. Introduction to data import and export, supported file format, working with audio/video file, importing audio/video data, reading audio/video data from a file, exporting audio/video data, example, working with spreadsheets, writing to an xls file, reading from an xls files, working with graphics file, importing graphics data, exporting graphics data, creating a simple GUI programmatically, dissertations of different components in guide, creating menus.
Unit - III	MATLAB graphics: 2d/3d plotting visualization, 2d plot , multiple plot, style options, legends, subplots, specialized 2d plot- logarithmic, polar, area, bar, barh, hist, rose, pie, stairs, stem, compass. 3d plot - plot3, bar3, bar3h, pie3, stem 3, meshgrid, mesh, surf, contour, contour3. Control Structures: for, nested for, while, branch control structure- if, switch, break, continue, error, try-catch, debugging.
Unit - IV	Introduction to MATLAB toolboxes: Simulink, image & video processing toolbox, application level image processing techniques, mri image processing, fuzzy logic toolbox, neural network toolbox.
Text/Reference Books	
Text Books.	1. Raj Kumar Bansal, Ashok Kumar Goel, ManojKumar,MATLAB and its Application in Engineering, Pearson Education.

	2. Ram N.Patel, Ankush Mittal, Programming in MATLAB, A Problrm Solving Approach, Pearson Education. 3. Duane Hanselman, Bruce L Littlefield, Mastering MATLAB 7, Prentice Hall. 4. Amos Gilat, MATLAB: An Introduction with Application, Wiley Publisher.
Reference Books	1. Jim Sizemore, John P.Mueller, MATLAB for Dummies, Wiley. 2. Stephen J.Chapman, Matlab Programming for Engineers, Thomson-Engineering Publisher, CENGAGE Learning.

Mtech/CSE/FT/2/DSC1(i): Network Security								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: To study fundamental concepts of Network Security, security attacks, cryptography, authentication, web security, system and email security.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: computer security, security standards, cipher model, encryption techniques, data encryption standards, public-key cryptography, security at transport layer, SSL/TSL attacks, wireless security and IEEE 802.11i.
CO2	explain: computer concepts related with the security, symmetric techniques, advanced encryption standard, RSA, concept of digital signature, security protocols, wireless security measures and email security.
CO3	illustrate: features related with computer security, encryption techniques, data encryption standards, security at transport layer and wireless LAN security.
CO4	classify: information about security, its architecture, types of attacks, security mechanism, encryption standards, protocols at transport layer and wireless LAN security.
CO5	evaluate: security trends, security mechanisms, cipher model, RSA, Diffie-Hellman key exchange, transport layer security, SSL/TSL attacks, wireless security and IP security.

CO-PEO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(i)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(i)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	2	-	-	-	-	1	3
CO2	2	1	1	3	1	2	-	-	-	-	2	3

CO3	3	1	1	3	3	2	-	-	-	-	3	3
CO4	3	3	1	3	1	2	-	-	-	-	3	3
CO5	3	1	1	3	3	2	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	2	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(i) 3

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
Mtech/CSE/FT/2/DSC1(i) Network Security

Unit – I	Computer Security Concepts – Introduction, security, security trends, components of information system, OSI security architecture, security attacks, goals for security, security mechanisms, security standards. Cipher model, cryptanalysis and brute-force attack, classical encryption techniques – symmetric techniques – substitution techniques, transposition techniques, rotor machines, steganography.
Unit – II	Traditional block cipher; data encryption standard – encryption and decryption, advanced encryption standard – structure and expansion functions. Public-key cryptography – principles, applications and requirements; RSA, Diffie-Hellman key exchange. Concept of digital signature.
Unit – III	Security at Transport Layer, web security considerations, Transport Layer Security, TLS record protocol, change cipher spec protocol, alert protocol, handshake protocol, heart-beat protocol; SSL/TSL attacks; HTTPS; Secure shell; user authentication protocol, connection protocol.
Unit – IV	Wireless Security, wireless security measures, mobile device security - threats and strategy. Wireless LAN security, IEEE 802.11i - services, operation and phases. Email security, S/MIME, PGP, overview of IP security.

Text/Reference Books

Text Books	1. William Stallings, Cryptography And Network Security Principles And Practice, Pearson Education 2. Forouzan, Mukhopadhyay, Cryptography & Network Security, McGraw Hill
Reference Book	1. AtulKahate, Cryptography and Network Security, TMH 2. Godbole, Information Systems Security, Wiley India Mark Stamp, Information Security Principles and Practice, Willy India

Mtech/CSE/FT/2/DSC1(ii):Advanced Computer Networks

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with various networking models, different IP addressing, wireless LANS and latest network technologies.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define:computer networking includingnetwork models, media for transmission,IEEE standards, logical addressing, routing protocols, domain name system, world wide web, HTTP, FTP and wireless LANs.
CO2	explain: various concepts of computer networking including network models, media for transmission along with the standards followed, logical addressing, routing protocols, domain name system and wireless LANS.
CO3	apply: techniques learnt here in the design and evaluation of computer networks and decide which network models, routing protocols, logical addressing, transmission media or wireless LAN will suit a particular situation.
CO4	categorize: computer networks, network models, routing protocols, logical addressing, transmission media and wireless LANs.
CO5	choose: IEEE standards, unicast and multicast routing protocols, logical addressing, transmission media and wireless LANs.

CO-PEO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(ii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(ii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3

CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(ii)

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
Mtech/CSE/FT/2/DSC1(ii): Advanced Computer Networks

Unit I	Network Models: OSI reference model, TCP/IP reference model. Transmission Media: Guided Media, Unguided Media. Connecting LANs: Connecting Devices, Backbone Networks. Ethernet: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet.
Unit - II	Logical Addressing: IPv4 Addresses, IPv6 Addresses. Unicast Routing Protocols and Multicast Routing Protocols Intradomain and Interdomain Routing Protocols
Unit - III	Wireless LANs: IEEE 802.11, Bluetooth Wireless Network and Mobile Network: LAN, PAN, Sensor Networks and Adhoc Networks. Mobile IP ATM reference model.
Unit - IV	World Wide Web and HTTP, FTP, E-Mail. Domain Name System: Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Resolution. Voice Over IP, IPSec, DDoS Attack

Text/Reference Books

Text Books	1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 4e, Morgan Kaufmann, 2007. 2. Jean Walrand and PravinVaraiya, High Performance Communication Networks, 2e, Morgan Kauffman, 1999. 3. Markus Hoffmann and Leland R. Beaumont, Content Networking: Architecture, Protocols, and Practice, Morgan Kauffman, 2005.
Reference Books	1. Behrouz A. Forouzan, Data Communications and Networking, 4e, Tata McGraw Hill, 2006.

Mtech/CSE/FT/2/DSC1(iii): Wireless Networks								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: To study fundamental concepts in wireless network, various LAN standards, IP and IPV6 Layer, Transmission protocols and WAN standards.

Course Outcomes	At the end of this course, the student will be able to:	At the e
CO1	define: wireless LAN, architecture, mobile network layer, mobile transport layer and wireless wide area network.	wireless
CO2	describe: WLAN technologies, IEEE 802.11 types , IEEE 802.16, Bluetooth, IPV6, mobile ad-hoc network, TCP enhancements for wireless network, UTMS, 3G-MSC, 3G-SGSN, 3G-GGSN, applications of 4G, features and challenges of 5G.	mobile
CO3	illustrate: wireless LAN, system architecture, physical layer, Mac layer, Bluetooth architecture, mobile IP, mobile ad-hoc network, mobile transport layer, TCP improvements, wireless wide area network, HSDPA, features and challenges of 4G, 5G.	Transmi
CO4	analyze: WLAN technologies, 802.11b, 802.11a, IEEE 802.16, IPV6, Routing, TCP enhancements, TCP improvements,UMTS core network architecture, firewall, 3G,4G and 5G networks.	Wireless
CO5	compare: different Wireless LAN technologies, mobile network layer, mobile transport layer, Mobile IP, mobile ad-hoc networks, protocols, TCP improvements and wireless WAN types.	

CO-PEO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(iii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(iii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3

CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course Mtech/CSE/FT/2/DSC1(iii)

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
Mtech/CSE/FT/2/DSC1(iii): Wireless Networks

Unit – I	Wireless LAN: Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX.
Unit - II	Mobile Network Layer: Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing.
Unit - III	Mobile Transport Layer :TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.
Unit - IV	Wireless Wide Area Network: Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol, features and challenges of 4G, Applications of 4G, Introduction to 5G vision,5G features and challenges.

Text/Reference Books

Text Books	1. Jochen Schiller, ”Mobile Communications”, 2e, Pearson Education 2012. 2. Vijay Garg, “Wireless Communications and Networking”, 1e, Elsevier, 2007.
Reference Books	1. William Stallings, Wireless Communications and Networks, Pearson/Prentice Hall of India. 2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, 2e, Academic Press, 2008. 3. Anurag Kumar, D. Manjunath, Joy Kuri, “Wireless Networking”, 1e, Elsevier 2011. 4. Simon Haykin, Michael Moher, David Koilpillai, “Modern Wireless Communications”, 1e, Pearson Education, 2013.

MTech/CSE/FT/2/DSC2(i) : Soft Computing								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to cover fundamental soft computing concepts with an exposure to ANN, fuzzy Logic, optimization techniques using Genetic Algorithm (GA).

Course Outcomes	By the end of this course, the student will be able to:
CO1	recognize the concepts of: soft computing and hard computing, simple genetic algorithm, fuzzy set, neuron, neural network and activation function.
CO2	understand and describe: the role of genetic algorithm operators, representation of fuzzy set and its operation, types of neural network and activation function including their pros and cons.
CO3	use: algorithm i.e. genetic algorithm, fuzzy logic , ANN and their constituents for solving optimization problem.
CO4	differentiate: soft computing and hard computing, operators of genetic algorithm and activation functions of ANN. analyze: fuzzification and defuzzification.
CO5	compare: soft computing and hard computing, operators of genetic algorithm and different activation functions of ANN.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(i)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(i)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3

CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(i)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
MTech/CSE/FT/2/DSC2(i)

Unit I	Introduction to Soft Computing: Overview of Soft Computing, differencebetween soft and hard computing, brief descriptions of different components of soft computing including artificial neural networks, fuzzy logic, genetic algorithms.
Unit - II	Genetic Algorithm: Introduction to genetic algorithm, simple genetic algorithm, its representation. Selection: Roulette wheel selection, random, rank, tournament, Boltzmann selection. Crossover and its types: Single point crossover, two point crossover, multipoint crossover, ordered crossover, uniform crossover, crossover for real-valued representation. Mutation and its types: Flipping, Interchanging, reversing, replacement, mutation for real-valued representation, crossover rate, mutation rate and convergence criteria.
Unit - III	Fuzzy Logic: Introduction to fuzzy logic, representation of a classical set, representation of fuzzy set, basic properties of fuzzy sets. Fuzzy set operation: Intersection of fuzzy sets, union of fuzzy sets, complement of fuzzy sets, important terminologies in fuzzy set operations, properties of fuzzy sets, fuzzy arithmetic. Fuzzy Composition: Max-Min composition, max-star composition, max-product composition, max-average composition. fuzzification and de-fuzzification.
Unit - IV	Artificial Neural Network: Basic of neural network: neuron, artificial neuron, neural network, artificial neural network, perceptron, feed forward, multilayer perceptron neural network, advantage and disadvantage of ANNs. Activation function and types of activation function. perceptron network, XOR problem.

Text/Reference Books

Text Books	1. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison Wesley. 2. ZbigniewMichalewicz, Genetic Algorithms +Data Structures = Evolution Programs, SpringerVerlag.
Reference Books	1. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall. 2. S. Rajasekaran& G. A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI. 3. S. N. Sivanandam& S. N. Deepa, Principles of Soft Computing, Wiley - India. 4. Simon O. Haykin, Neural Networks, A Comprehensive Foundation, PHI.

MTech/CSE/FT/2/DSC2(ii):Machine Learning								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to enable student to perform experiments in Machine Learning using real-world data.

Course Outcomes	At the end of this course, the student will be able to :
CO1	define the terms of machine learning: data pre-processing, classification, regression and neurons.
CO2	explain the types of: data, data pre-processing regression, classification ,unsupervised learning. discuss:architecture of ANN.
CO3	apply:training and testing data using data pre processing and model selection techniques and classification, regression, clustering techniques according to their problem.
CO4	classify techniques of: data pre-processing, model selection, regression, classification and unsupervised learning techniques.
CO5	compare techniques of: data pre-processing, supervised and unsupervised learning.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(ii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(ii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(ii)					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content MTech/CSE/FT/2/DSC2(ii):Machine Learning	
Unit – I	Basics of Machine Learning; Introduction to Artificial Intelligence and Machine Learning, Types of Machine Learning and its comparisons, Applications of Machine Learning, Issues in Machine Learning.
Unit – II	Preparing to Model: Introduction, Machine Learning Activities, Types of Data in Machine Learning, Exploring structure of data, Data Pre-processing(Dimension Reduction and Feature subset selection), Model Selection.
Unit – III	Supervised Learning: Introduction, Classification (Introduction, classification model, learning steps, Common classification algorithm), Regression (Linear Regression, Multivariable Regression, Logistic Regression).
Unit – IV	Unsupervised Learning: Introduction and its applications, Techniques in Unsupervised Learning (Clustering, K-Means). Neural Network: Introduction, Architecture of Artificial Neural Network.
Text/Reference Books	
Text Books	1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited. 2. EthemAlpaydin, Introduction to Machine Learning - Adaptive Computation and Machine Learning, The MIT Press.
Reference Book	1. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press. 2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press. 3. Peter Harrington, Machine Learning in Action, Manning 4. ShaiShalevShwartz and Shai Ben David, Understanding Machine Learning From Theory to Algorithms, Cambridge University Press

MTech/CSE/FT/2/DSC2(iii)Artificial Intelligence

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks				Exam Duration	Assessment Methods
				External	Internal				
Optional Theory	04	04	Lecture	70	30			3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5	5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: Aim of this course is to familiarize the students with various techniques of artificial intelligence like predicate calculus, production rules; expert systems.

Course Outcomes	At the end of this course, the student will be able to :
CO1	define: artificial intelligence terms, types of search strategy, production system, knowledge representation, learning techniques and genetic algorithm terminologies.
CO2	explain: the types and properties of search algorithm, predicate calculus, knowledge representation and explore the theories that demonstrate intelligent behavior including intelligent editor, learning by induction and dealing with uncertainty.
CO3	use: search strategy, genetic algorithm, fuzzy logic and learning technique.
CO4	classify types of: search strategy, production system, learning, operator of genetic algorithm, knowledge representation and approaches that deals with uncertainty.
CO5	compare and select types of: search strategy, production system, learning, operator of genetic algorithm, knowledge representation and approaches that deals with uncertainty.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(iii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(iii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/DSC2(iii)					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
MTech/CSE/FT/2/DSC2:Artificial Intelligence

Unit – I	Introduction: Background and history, Overview of AI applications areas. The predicate calculus: Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification. Knowledge representation: Network representation-Associative network & conceptual graphs, Structured representation- Frames & Scripts.
Unit – II	Search strategies: Strategies for state space search-data driven and goal driven search; Search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, Properties of search algorithms - Admissibility, Monotonicity, Optimality, Dominance.
Unit – III	Production system: Types of production system-commutative and non-commutative production systems, Decomposable and non-decomposable production systems, Control of search in production systems. Rule based expert systems: Architecture, development, managing uncertainty in expert systems - Bayesian probability theory, Stanford certainty factor algebra, Nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempster/Shaffer and other approaches to uncertainty
Unit – IV	Knowledge acquisition: Types of learning, learning by automata, intelligent editors, learning by induction. Genetic algorithms: Problem representation, Encoding Schemes, Operators: Selection, Crossover, Mutation, Replacement etc.

Text/Reference Books

Text Books	1. George F. Luger, William A. Stubblefield, Artificial Intelligence, The Benjamin/Cummings Publishing Company, Inc. 2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert system, PHI. 3. Wills J. Nilsson, Principles of Artificial Intelligence, Narosa Publishing House. 4. Jackson Peter, Introduction to Expert Sytems, 3e, Addison Wesley -2000.
Reference Books	1. Ben Coppin, Artificial Intelligence Illuminated, Narosa Publishing House. 2. Eugene Charniak, Drew McDermott, Introduction to Artificial Intelligence, Pearson Education.

MTech/CSE/FT/2/CC9: Software Lab based on MTech/CSE/FT/2/CC7(Advanced Web Technology)

Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to get the students hands on practice with programming constructs of HTML, Java Scripts, Search Engines and CMS.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the basic concepts of HTML, CSS, XHTML, HTML5, XML, JavaScript, PHP, MySQL, search engine and content management systems.
CO2	describe: HTML common tags, HTML5 capabilities and use of XML, JavaScript concept with PHP & MySQL,search engine techniques and optimize search results.
CO3	perform: HTML tags with XML, JavaScript with PHP and MySQL queries,optimize search engine result using SEO techniques, Webhosting and different type of CMS technologies.
CO4	illustrate: relationship of HTML with XML,building query on tables and forms, improve ranking using search engine optimization techniques, analyze different CMS like Wordpress, Joomla and Drupal with help of their features.
CO5	compare: HTML with HTML5, relationship of HTML, SGML and XML. determine: client side or server side JavaScript. evaluate: queries on table and forms using MySQL. choose: effective plan to achieve higher ranking in search results.
CO6	design: webpages using HTML,CSS,XML and JavaScript, generate various query using MySQL in webpages,modify webpages to achieve higher ranking in search engine. create: blog or websites using Content Management System.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/CC9

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/CC9

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3

CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.66	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/CC9

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

MTech/CSE/FT/2/CC10: Software Lab based on MTech/CSE/FT/2/CC8 (MATLAB Programming)

Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to get the students hands on practice with programming constructs of MATLAB and their usage. This course is based on MTech/CSE/FT/2/CC8: MATLAB Programming.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: features, commands, data types, hierarchy of operations, matrix, tools, functions related to input/output, file handling and graphics, control structure and toolboxes used in MATLAB.
CO2	describe: history, origin, features, commands, data types, hierarchy of operations, matrix, tools, functions related to file, function related to graphics, control structure and various toolboxes of MATLAB.
CO3	use: commands, operations, tools, menus, toolbars, input/output functions, file handling, functions related to graphics, 2D and 3D plotting, control structure, debugging, simulink and image & video processing toolboxes in MATLAB.
CO4	analyze: commands, data types, operations, control structure, matrix, tools, different functions related to graphics and file handling in given MATLAB program.
CO5	determine: command, data type, tool, menu, control structure, debugging technique, function, feature or toolbox of MATLAB to use in given condition.
CO6	create: basic or advanced program in MATLAB using different commands, 2D and 3D plotting, functions, tools, features, simulink, fuzzy logic, neural network and image & video processing toolbox of MATLAB.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/2/CC10

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/2/CC10

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3

CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.33	2.67	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/2/CC10

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

MTech/CSE/FT/3/CC11: Python Programming								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Compulsory Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objectives of this course is to get the students familiar with basic concepts of Python programming, decision making and functions, file handling and object oriented programming concepts, database programming and to implement machine learning concepts.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: installations, working, structures, control statements, operators, lists ,object oriented programming concepts, python libraries.
CO2	explain: conditional & control statements, strings, OOPs, file handling concepts, libraries and packages of python programming.
CO3	use: various python libraries such as numpy, matplotlib, pandas . apply: python programming constructs to solve real world problems.
CO4	categorize: data types, dictionaries, conditional & control statements, functions, python libraries.
CO5	compare: data types, dictionaries, conditional & control statements, functions, python libraries.
CO6	design: basic and advanced applications in python.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/CC11

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/CC11

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3

CO5	3	1	1	3	3	-	-	-	-	-	3	3
CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.3	2.6	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/CC11

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

Course Content
MTech/CSE/FT/3/CC11: Python Programming

Unit – I	Installation and Working with Python, Using Help, Structure of a Python Program, Control flow, Interpreter shell, Tokens, Identifiers, Reserved keywords, Literals, Variables, Python basic Operators, Declaring and using Numeric data types: int, float, complex, using string data type. Python Casting, Scope of a Variable, Working with: String, List, Tuples and Dictionaries.
Unit – II	Conditional blocks using if, else and elif, For loops in python, While loops, Continue, Break and Else, organizing python codes using functions, Modules: Creating Module, using Modules and Built-in Modules. Packages: Package Types, Importing Package, Viewing Package Content and Documentation. Powerful Lambda Function in python, Programming: Using Functions, Modules and Packages.
Unit – III	Object Oriented Programming: Concept of Class, Object and Instances, Constructor, Class Attributes and Destructors, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Overloading Operators, Data Hiding, Exception Handling, Programming using Oops concepts. File Handling: Creating, Opening, Closing, Writing & Reading File Content, Deleting a File. Programming using file operations.
Unit – IV	Python NumPy: Array Slicing, Array Indexing, Data Types, Array Shape & Reshape, Array Join, Array Split, Random. Python Pandas: Data Frames, Read CSV, Analyzing Data and Cleaning Data. Python Matplotlib: Line, Grid, Scatter, Bars, Histograms and Pie Charts.

Text/Reference Books

Text Books	1. Chun, J Wesley, Core Python Programming, 2e, Pearson, 2007. 2. E. Balagurusamy, Introduction to Computing and Problem Solving Using Python, McGraw Hill Education, 2016.
Reference Books	1. Barry and Paul, Head First Python, 2e, O Reilly, 2010. 2. Lutz and Mark, Learning Python, 4e, O Reilly, 2009

MTech/CSE/FT/3/CC12:Research Methodology									
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks				Exam Duration	Assessment Methods
				External	Internal				
Optional Theory	04	04	Lecture	70	30			3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5	5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with different aspects of research methodology, namely, research design, collection and analysis of data, and interpretation of results.

Course Outcomes	At the end of this course, the student will be able to :
CO1	define: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO2	describe: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO3	Illustrate: measurement. data collection, processing, sampling, analysis and its strategies, reports.
CO4	categorize: research, sampling methods, data collection techniques, reports ,and data processing strategies. perform: data analysis.
CO5	compare: sampling methods, data collection techniques, reports and data processing strategies.
CO6	create: thesis, reports. design: research tool . interpret(drive): results.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/CC12

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/CC12

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	3	-	3	1	3

CO2	2	1	1	3	1	-	-	3	-	3	2	3
CO3	3	1	1	3	3	-	-	3	-	3	3	3
CO4	3	3	1	3	1	-	-	3	-	3	3	3
CO5	3	1	1	3	3	-	-	3	-	3	3	3
CO6	3	3	3	3	3	-	-	3	-	3	3	3
Average	2.5	2	1.3	2.6	2	-	-	3	-	3	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/CC12

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	3	3	2.5	3	3

Course Content
MTech/CSE/FT/3/CC12: Research Methodology

Unit – I	Objectives and types of research: motivation and objectives- research methods vs. methodology, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs empirical research formulation: defining and formulating the research problem-. selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary source reviews, hypothesis- definition, qualities of a good hypothesis, null hypothesis and alternatives.
Unit – II	Research design and methods: basic principles, need of research design- features of good design, important concepts relating to research design, criteria of selecting a sampling procedure, characteristics of a good sample design, sampling methods, measurement: concept of measurement, problems in measurement in research - validity and reliability. levels of measurement- nominal, ordinal, interval, ratio.
Unit – III	Data collection and analysis: execution of the research, observation and collection of data, methods of data collection, data processing and analysis strategies, data analysis with statistical packages, hypothesis testing, generalization and interpretation, univariate analysis (frequency tables, bar charts, pie charts, percentages).
Unit – IV	Meaning of interpretation, need of interpretation, technique of interpretation, precaution in interpretation, layout of a research paper, journals in computer science, impact factor of journals, ethical issues related to publishing, plagiarism and self-plagiarism. reports and thesis writing: structure and components of scientific reports, types of report- technical reports and thesis, writing-synopsis, abstract, illustrations and tables, results, summary, reference citing and listing.
Text/Reference Books	
Text Books	1. J. Garg, B.L, Karadia, R, Aggarwal F, An Introduction to Research Methodology, RBSA Publishers, 2002. 2. Kothari,C.R, Research Methodology: Methods and Techniques. New Age

	International, 1990 3. Santosh Gupta, Research Methodology and Statistical Techniques, Deep & Deep Publications Pvt. Ltd., 2008
Reference Books	1. N. Gurumani, Scientific Thesis Writing and Paper Presentation, MJP Publishers. Montgomery, Douglas C, Design and Analysis of Experiments, Wiley India Pvt. Ltd.

MTech/CSE/FT/3/DSC3(i)IoT and Cloud Computing								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: To study the fundamental concepts of cloud computing, its enabling technologies, cloud service modes and security concerns, to learn core issues of Internet of Things, IoT communication protocols and security concerns.

Course Outcomes	By the end of this course, the student will be able to:
CO1	list/define IoT: framework, architecture, design, communication challenges, applications, principles of web connectivity. list/define cloud computing: evolution, characteristics, working, service models, virtualization, architecture, security challenges and risks.
CO2	understand and describe IoT: framework, architecture, design, communication challenges, applications, principles of web connectivity. understand and describe cloud computing: evolution, characteristics, working, service models, virtualization, architecture, security challenges and risks.
CO3	use cloud computing services in different fields of applications.
CO4	diagrammatise IOT: framework, architecture, physical and logical design. diagrammatise cloud computing: service models, service-oriented architecture.
CO5	grade/compare IoT: communication challenges, security issues, enabling technologies, application areas, and protocols. grade/compare cloud computing: service models. virtualization, and hypervisors.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(i)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(i)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3

Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(i)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3
CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
Average	3	2	2.4	-	3

Course Content
MTech/CSE/FT/3/DSC3(i)IoT and Cloud Computing

Unit I	Internet of Things: What is the IOT and why is it important, IoT Conceptual Framework, IoT Architectural view, Technology Behind IoT, Sources of IoT, Examples of IoT, M2M Communication, Layered Architecture (3 & 5 Layered) of IoT, Physical Design and Logical Design, Domain-specific IoTs, Security Issues of IoT.
Unit - II	Communication challenges related to IoT, Enabling technologies for IoT. Applications of IoT: Home Automation, Smart Cities, Social Life and Entertainment, Health & Fitness, Smart Environment and Agriculture, Supply Chain and Logistics, Energy conservation. Design principles for web connectivity: Web Communication protocols for Connected Devices, Message Communication Protocols for Connected Devices.
Unit - III	Introduction to Cloud Computing: What is a cloud, definition of cloud computing, Evolution of cloud computing, characteristics of cloud computing, How Cloud Computing Works, Role of networks in Cloud computing. Service Models: IaaS, PaaS, SaaS, Public, private and hybrid cloud.
Unit - IV	Introduction to virtualization, Resource Virtualization-Server, Storage, Network, Load Balancing and Virtualization. Hypervisors and its types, Service Oriented Architecture (SOA), Overview of Security Issues, Challenges and Risks of Cloud.
Text/Reference Books	
Text Books	1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing a Practical Approach, Tata McGraw Hill, New Delhi, 2010 2. Robert Elsenpeter, Toby J. Velte, Anthony T. Velte, Cloud Computing: A Practical Approach, 1e, Tata McGraw Hill Education, 2011. 3. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Cloud Computing for Dummies, Wiley Publishing, 2010
Reference Books	1. RajkumarBuyya, James Broberg, AndrzejGoscinski, Cloud Computing- Principles and Paradigms, Wiley, 2011. 2. Raj Kamal, Internet of Things-Architectures and Design Principles, McGraw Hill Education, 2017

MTech/CSE/FT/3/DSC3(ii)Grid Computing								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives The objective of this course is to study, learn, and understand the concepts of grid computing.

Course Outcomes	By the end of this course, the student will be able to:
CO1	define: cluster computing ,grid computing, meta computing, SOAP, WSDL, e-governance, OGSA, WSRF, GT4,cluster middleware, protocols for clusters, HiPPI, process scheduling.
CO2	understand and describe: cluster computing ,grid computing, meta computing, SOAP, WSDL, e-governance, OGSA, WSRF, GT4,cluster middleware, protocols for clusters, HiPPI, process scheduling.
CO3	illustrate/demonstrate: concepts of networking, protocols, load balancing and sharing, web services, globus toolkit, setting up and administration of cluster.
CO4	diagrammatize the architecture of: grid Computing ,service oriented architecture,GT4, OGSA-DAI, cluster.. categorize: clusters, protocols for clusters, networking and switching devices, scheduling policies, strategies for load balancing
CO5	compare and evaluate: clusters, protocols for clusters, scheduling policies, strategies for load balancing

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(ii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(ii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	1	3	1	1	1	-	-	-	-	-	1	3
CO.2	2	1	1	3	1	-	-	-	-	-	2	3
CO.3	3	1	1	3	3	-	-	-	-	-	3	3

CO.4	3	3	1	3	1	-	-	-	-	-	3	3
CO.5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(ii)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3
CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
Average	3	2	2.4	-	3

Course Content
MTech/CSE/FT/3/DSC3(ii)Grid Computing

Unit I	**Introduction:** Cluster and Grid computing, Meta-computing, Web services and Grid Computing, e-Governance and the Grid **Technologies and Architectures for Grid Computing:** Issues in Data Grids, Functional requirements in Grid Computing, Standards for Grid Computing, Recent technologies trends in Large Data Grids. **Web Services and the Service Oriented Architecture:** Service Oriented Architecture, SOAP and WSDL, Creating Web Services, Server Side.
Unit - II	**OGSA and WSRF:** OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF, WSRF Specification **Globus Toolkit:** History, version, Applications, Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data Choreography and Coordination, GT4 Architecture, GT4 Containers. **The Grid and Databases:** Requirements, Storage Request Broker, Integration of Databases with the Grid, Architecture of OGSA-DAI for offering Grid Database services.
Unit - III	**Cluster Computing:** Approaches to Parallel Computing, Definition and Architecture of a Cluster, Categories of clusters. **Cluster Middleware:** Levels and Layers of Single System Image, Design objectives, Resource Management and Scheduling, Cluster programming Environment and Tools. **Networking, Protocols and I/O for clusters:** Networking and Interconnection/Switching Devices, Design Issues, Design Architecture, HiPPI, ATM, Myrinet, Memory Channel
Unit - IV	**Setting Up and Administering a Cluster:** Setup of simple cluster, setting up nodes, clusters of clusters, System monitoring, Global Clocks Sync. **Cluster Technology for High Availability:** High availability clusters, high availability parallel computing, types of failures and errors, cluster architectures and configurations for high availability, Failure/Recovery clusters. **Process Scheduling:** Job management System, Resource management system, policies of resource utilization, Scheduling policies. **Load Sharing and Load Balancing:** Introduction, Strategies for load balancing, Modelling parameters

Text/Reference Books

Text Books	1. Grid and Cluster Computing by C.S.R. Prabhu, PHI 2. The Grid: Blueprint for a New Computing Infrastructure, Ian Foster, Carl Kesselman, Elsevier Series, 2004.

	3. Grid Computing for Developers, Vladimir Silva, Charles River Media, January 2006.
Reference Books	1. Global Grids and Software Toolkits: A Study of Four Grid Middleware Technologies, High Performance Computing: Paradigm and Infrastructure, Laurence Yang and MinyiGuo (editors), Wiley Press, New Jersey, USA, June 2005. 2. Grid Resource Management: State of the Art and Future Trends, JarekNabrzyski, Jennifer M. Schopf, Jan Weglarz, International Series in Operations Research & Management Science, Springer; 1e, 2003.

MTech/CSE/FT/3/DSC3(iii)Quantum Computing								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Optional Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course to understand the basic concept of quantum computing it's relation to mathematics and physics, quantum circuits, quantum information and cryptography, quantum algorithms.

Course Outcomes	By the end of this course, the student will be able to:
CO1	define quantum computation: mechanics, circuit, multiple ,teleportation, cryptography and programming languages
CO2	understand and describe quantum computation: mechanics, circuit, multiple, teleportation, quantum algorithms cryptography and programming languages. interpret: error correction and computation of fault-tolerant.
CO3	determine the relationship of quantum with: mathematics, physics. ilustrate the relationship between quantum and classical complexity classes.
CO4	analyze: quantum programming languages, quantum computations, error correction, fault-tolerant computation.
CO5	compare :quantum algorithms, classical and quantum information theory, classical gates and quantum gates. evaluate: classical computation on quantum computers.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(iii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(iii)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	1	3	1	1	1	-	-	-	-	-	1	3
CO.2	2	1	1	3	1	-	-	-	-	-	2	3
CO.3	3	1	1	3	3	-	-	-	-	-	3	3
CO.4	3	3	1	3	1	-	-	-	-	-	3	3
CO.5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC3(iii)					
COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	3
CO2	3	2	2	-	3
CO3	3	2	3	-	3
CO4	3	2	3	-	3
CO5	3	2	3	-	3
Average	3	2	2.4	-	3

Course Content MTech/CSE/FT/3/DSC3(iii)Quantum Computing	
Unit I	Introduction to Quantum Computation: Concept and need of quantum computing, Quantum bits and quantum operations, Postulates of quantum mechanics, Bloch sphere representation of a qubit, multiple qubits, classical gates versus quantum gates.
Unit - II	Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits.
Unit - III	Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem, Quantum programming languages, Probabilistic and Quantum computations.
Unit - IV	Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search. Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation.
Text/Reference Books	
Text Books	1. An Introduction to Quantum Computing Algorithms, Pittenger A. O., 2000. 2. Quantum computing explained, David McMahon, John Wiley & Sons, Inc. Publication 2008 3. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010 4. Introduction to Quantum Mechanics, 2e, David J. Griffiths, Prentice Hall New Jersey 1995
Reference Books	1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008 2. Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, Benenti G., Casati G. and Strini G., World Scientific, 2004.

MTech/CSE/FT/3/DSC4 (i): Data Warehousing and Data Mining							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with different concepts of data warehouse and data mining, namely, OLAP, Association rule mining, classification and prediction.

Course Outcomes	At the end of this course, the student able to :
CO1	define: the concepts of data mining, data pre-processing, outliers, data warehouse, OLAP, association rule mining, data classification prediction and cluster Analysis.
CO2	describe: key process of data mining ,data warehousing, OLAP, data warehousing to data mining , association rule, classification and prediction methods.
CO3	apply: OLAP technology and association rules. use: decision induction, bayesion and back propagation classification methods.
CO4	differentiate: operational database systems and data warehousing, single dimensional and multidimensional association rules, and between various data mining classification methods.
CO5	evaluate: data mining and data warehouse, OLAP technology, single and multi-dimensional association rule.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(i)

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(i)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(i)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
MTech/CSE/FT/3/DSC4(i): Data Warehousing and Data Mining

Unit I	Data Mining: Introduction: Motivation, Importance, Knowledge discovery process, data mining, kind of data, Functionalities, interesting patterns, classification of data mining system, Major issues, Data Mining Primitives. Data Pre-processing: Data cleaning, Data Integration and transformation, Data reduction, Discretization and concept hierarchy generation. Data visualization. Outliers, Types of Outliers and challenges of Outlier Detection
Unit - II	Data warehouse and OLAP Technology for data mining: data warehouse, difference between operational data base systems and data warehouse, A Multidimensional Data Model, Data warehouse Architecture, Data warehouse Implementation, data warehousing to data mining, Data warehouse usage.
Unit - III	Association Rule Mining: Mining single-dimensional Boolean association rules from transactional databases, mining multilevel association rules from transaction databases, Mining multidimensional association rules from relational databases and data warehouses, From association mining to correlation analysis, constraint-based association Mining.
Unit - IV	Data Mining-Classification and Prediction: issues regarding classification and prediction, classification by decision induction, Bayesian classification, classification by back propagation, classification based on concepts from association rule mining other classification methods. Cluster Analysis: Introduction, Types of Data, Applications and Trends in Data Mining.

Text/Reference Books

Text Books.	1. Ale Berson, Stephen Smith, KorthTheorling, Data Mining,TMH. 2. Adruaans, Longman, Addison-wesley Data Mining, 3. Addison-Wesley Longman, Data Warehousing in the Real World.
Reference Books	1. Chanchal Singh, Data Mining and Warehousing, Wiley. 2. Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, San Francisco: Morgan Kaufmann Publishers, 2001.

MTech/CSE/FT/3/DSC4(ii)Big Data Analytics

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: The Final Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with concepts of big data, its architecture and applications; NoSQL and HADOOP.

Course Outcomes	At the end of this course, the student would have understanding of:
CO1	define: Big Data and Hadoop, digital data, Apache Hadoop, analysing Data with Unix tools andHadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, HDFS, Hadoop Ecosystem, Pig, Hive shell and services, HBasics, Big SQL.
CO2	understand and describe: Big Data and Hadoop, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Hadoop Distributed File System, command line interface, job scheduling, shuffle and sort, task execution, Hadoop Ecosystem, Pig, HiveQL, Hbase.
CO3	apply and use: Apache Hadoop, HDFC, HBasic, Big Data and Hadoop, HDFS command line interface, Hadoop file system interfaces, data flow, Hive services.
CO4	classify: Big Data and Hadoop, Big Data Analytics, Apache Hadoop, HDFS ,Hive shell, Hive services.
CO5	Compare feature set of Pig, Hadoop, HDFC

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(ii)

COs	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(ii)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(ii) 2.4

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
MTech/CSE/FT/3/DSC4(ii): Big Data Analytics

UNIT -1	Introduction to Big Data and Hadoop**:** Types of digital data, introduction to Big Data,Vs of Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Big Data applications.
UNIT -II	HDFS (Hadoop Distributed File System):The design of HDFS, HDFS concepts, command line interface, Hadoop file system interfaces, data flow, data ingest with flume and Scoop and Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures.
UNIT -III	Map Reduce: Anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types and formats, Map Reduce features.
UNIT -IV	Pig: Introduction to Pig, execution modes of Pig, comparison of Pig with databases, grunt, Pig latin, user defined functions, data processing operators. Hive: Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions. Hbase: HBasics, concepts, clients, example, Hbase versus RDBMS. Big SQL: Introduction

Text/Reference Books

Text Books	1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012. 2. SeemaAcharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015. 3. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press.
Reference Books	1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Jay Liebowitz, "Big Data and Business Analytics" AuerbachPublications, CRC press (2013) 3. AnandRajaraman and Jeffrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012. 4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, 2012.

MTech/CSE/FT/3/DSC4(iii)Data Science							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final Term Examination: Final Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to get the students familiar with the concepts of data science, data analysis and associated visualization techniques.

Course Outcomes	At the end of this course, the student would have an understanding of:
CO1	define: data science process, classification of data, big data, web data, sampling, data analysis techniques-correlation, regression, mean, mode, kurtosis, Bayesian inference etc., neural network, fuzzy logic, rule of mining, hadoop, hive, cloud database, and visualization.
CO2	understand and describe: graphical representation of data, storage and retrieval of data, evolution of analytic scalability, sampling distribution, data analysis techniques, Bayesian model and network, induction rule, neural network, fuzzy logic, data mining techniques, data analysis framework and visualization.
CO3	use: data science process, modern data analytic tools, statistical concepts, data analysis techniques, Bayesian network, induction rule, fuzzy logic, data mining techniques, hadoop file system, hive, S3, cloud database, inference and visualization.
CO4	categorize: analytic processes and tools, analysis, reporting, sampling and re-sampling, data analysis techniques, linear and non-linear time series, sequential, temporal and spatial mining, egonets systems and application.
CO5	choose: data science process, data storage, data analytic tools and processes, sampling method, data analysis technique, time series, mining techniques, visual data analysis framework and technique suitable in given situation.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(iii)

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.4	2.4	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(iii)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3

CO5	3	1	1	3	3	-	-	-	-	-	3	3
Average	2.4	1.8	1	2.6	1.8	-	-	-	-	-	2.4	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/DSC4(iii)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
Average	3	3	2.4	-	3

Course Content
MTech/CSE/FT/3/DSC4(iii): Data Science

Unit – I	Introduction to Data Science : data science process, exploratory data analysis, collection of data, graphical presentation of data, classification of data, storage and retrieval of data, big data, challenges of conventional systems, web data, evolution of analytic scalability, analytic processes and tools, analysis vs reporting, modern data analytic tools; Statistical Concepts: sampling distributions, re-sampling, statistical inference, prediction error.
Unit – II	Data Analysis: Correlation, regression, probability, Conditional probability, random variables, analysis using mean, median, mode, standard deviation, skewness, kurtosis, regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods; Analysis of Time Series: linear systems analysis, nonlinear dynamics.
Unit – III	Data Mining Techniques: Rule induction: neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods, neuro fuzzy modelling, Association Rule Mining: clustering, outlier analysis, sequential pattern mining, temporal mining, spatial mining, web mining.
Unit – IV	Data Analysis Frameworks and Visualization: Map Reduce, Hadoop, Hive, sharding, NoSQL databases, cloud databases, S3, Hadoop Distributed File Systems, visualizations, visual data analysis techniques, interaction techniques, social network analysis, collective inferencing, Egonets systems and applications.

Text/Reference Books

Text Books.	1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007. 2. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
Reference Books	1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & Sons, 2012. 2. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, 2e, Elsevier. 3. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly Publishers, 2013. 4. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly Publishers, 2013. 5. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014. 6. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks Using Matlab 6.0”, Tata McGraw- Hill Education, 2006.

MTech/CSE/FT/3/CC13: Software Lab based on MTech/CSE/FT/3/CC11 (Python Programming)							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to perform the modeling and simulation experiments with PYTHON. Concepts covered in MTech/CSE/FT/3/CC11 will be implemented.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: installations, working, structures, control statements, operators, lists ,object oriented programming concepts, python libraries.
CO2	explain: conditional & control statements ,strings, OOPs ,file handling concepts, libraries and packages of python programming.
CO3	use: various python libraries such as numpy, matplotlib ,pandas . apply: python programming constructs to solve real world problems.
CO4	categorize: data types, dictionaries, conditional & control statements, functions, python libraries.
CO5	compare: data types, dictionaries, conditional & control statements, functions, python libraries.
CO6	design: basic and advanced applications in python.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/CC13

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/CC13

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	-	-	-	1	3
CO2	2	1	1	3	1	-	-	-	-	-	2	3
CO3	3	1	1	3	3	-	-	-	-	-	3	3
CO4	3	3	1	3	1	-	-	-	-	-	3	3
CO5	3	1	1	3	3	-	-	-	-	-	3	3

CO6	3	3	3	3	3	-	-	-	-	-	3	3
Average	2.5	2	1.3	2.6	2	-	-	-	-	-	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/CC13

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3
CO2	3	3	2	-	3
CO3	3	3	3	-	3
CO4	3	3	3	-	3
CO5	3	3	3	-	3
CO6	3	3	3	-	3
Average	3	3	2.5	-	3

MTech/CSE/FT/3/CC14: Lab based on MTech/CSE/FT/3/CC12 (implementation in MATLAB)

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	50	-	3 Hours	TEE/ Practical File

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of practical file, performance in practical and a viva voce exam.

Course Objectives: The objective of this course is to inculcate a flavor of research in students by allowing them to work on a real-life research problem using MATLAB. Concepts covered in MTech/CSE/FT/3/CC12 will be implemented.

Course Outcomes	At the end of this course, the student will be able to :
CO1	define: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO2	describe: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO3	Illustrate: measurement. data collection, processing, sampling, analysis and its strategies, reports.
CO4	categorize: research, sampling methods, data collection techniques, reports ,and data processing strategies. perform: data analysis.
CO5	compare: sampling methods, data collection techniques, reports and data processing strategies.
CO6	create: thesis, reports. design: research tool . interpret(drive): results.

CO-PEO Mapping Matrix for Course MTech/CSE/FT/3/CC14

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT/3/CC14

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	1	3	1	1	1	-	-	3	-	3	1	3
CO2	2	1	1	3	1	-	-	3	-	3	2	3
CO3	3	1	1	3	3	-	-	3	-	3	3	3
CO4	3	3	1	3	1	-	-	3	-	3	3	3
CO5	3	1	1	3	3	-	-	3	-	3	3	3
CO6	3	3	3	3	3	-	-	3	-	3	3	3
Average	2.5	2	1.3	2.6	2	-	-	3	-	3	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT/3/CC14

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	3	3	2.5	3	3

MTech/CSE/FT /4/SEC1:Dissertation							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Research Work	20	04	-	400	100	-	Teacher interaction/ Dissertation/ Viva voce

Instructions to paper setter for Final Term Examination: The Final Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the bases of dissertation and a viva voce exam.

Course Objectives: The objective of this course is to inculcate a flavor of research in the scholars by allowing them to work on a real life research problem.

Course Outcomes	At the end of this course, the student will be able to :
CO1	define: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO2	describe: objectives, hypothesis, interpretation, data analysis, data collection, research design and method, interpretation, data analysis, sampling.
CO3	Illustrate: measurement. data collection, processing, sampling, analysis and its strategies, reports.
CO4	categorize: research, sampling methods, data collection techniques, reports ,and data processing strategies. perform: data analysis.
CO5	compare: sampling methods, data collection techniques, reports and data processing strategies.
CO6	create: thesis, reports. design: research tool . interpret(drive): results.

CO-PEO Mapping Matrix for Course MTech/CSE/FT /4/SEC1

Cos	PEO1	PEO2	PEO3	PEO4	PEO5
CO1	1	1	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	2.5	2.5	3	3	3

CO-PO Mapping Matrix for Course MTech/CSE/FT /4/SEC1

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	-	3	-	3	1	3
CO2	2	1	1	3	1	-	-	3	-	3	2	3

CO3	3	1	1	3	3	-	-	3	-	3	3	3
CO4	3	3	1	3	1	-	-	3	-	3	3	3
CO5	3	1	1	3	3	-	-	3	-	3	3	3
CO6	3	3	3	3	3	-	-	3	-	3	3	3
Average	2.5	2	1.3	2.6	2	-	-	3	-	3	2.5	3

CO-PSO Mapping Matrix for Course MTech/CSE/FT /4/SEC1

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
CO6	3	3	3	3	3
Average	3	3	2.5	3	3