Learning Outcomes based Curriculum Framework
(LOCF)

For

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

Department of Computer Science & Engineering
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Table of Contents

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

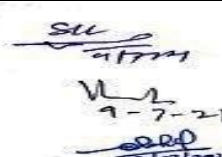| Add-On Courses(Optional)	
No. of Courses	Total Credits
02(AOC1 &AOC2)	04

Note: Please mention L+P+T if practical is a part above.
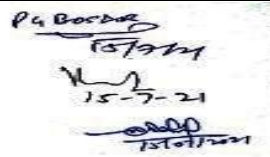
Table 2: Detailed break-up of Courses' Type (Semester wise)

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

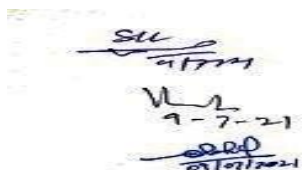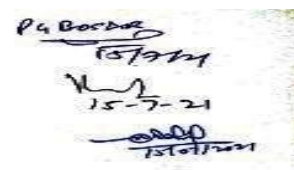| Course Code	Course Title	Credits
Core Courses		
MTech/CSE/FT /1/CC1	Advanced Database Systems	4

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.