

CSE_M.TECH_SYLLABUS_DETAILS_2021-2022



Specialization in:

Data Science

Cloud Computing

Big Data Analytics

Information Security

Blockchain Technology

Artificial of Intelligence & Machine Learning

DEPT. OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR



PREAMBLE

Education plays an enormously significant role in the building of a nation. There are quite a large number of educational institutions, engaged in imparting education in our country. Majority of them have entered recently into semester system to match with international educational pattern. However, our present education system is churning out youth who have to compete locally, regionally, nationally as well as globally. The present alarming situation necessitates transformation and/or redesigning of system, not only by introducing innovations but developing “learner-centric approach”.

Majority of Indian higher education institutions have been following marks or percentage-based evaluation system, which obstructs the flexibility for the students to study the subjects/courses of their choice and their mobility to different institutions. There is need to allow the flexibility in education system, so that students depending upon their interests can choose inter-disciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted. The choice based credit system not only offers opportunities and avenues to learn core subjects but also explore additional avenues of learning beyond the core subjects for holistic development of an individual. The CBCS will undoubtedly facilitate benchmarking of our courses with best international academic practices.

Advantages of the choice based credit system:

- Shift in focus from the teacher-centric to student-centric education.
- Student may undertake as many credits as they can cope with (without repeating all courses in a given semester if they fail in one/more courses).
- CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.
- CBCS makes education broad-based and at par with global standards. One can take credits by combining unique combinations.
- CBCS offers flexibility for students to study at different times and at different institutions to complete one course (ease mobility of students). Credits earned at one institution can be transferred to another institution.

CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions have been moving from the conventional annual system to semester system. Currently many of the institutions have already introduced the Choice Based Credit System. The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The Choice Based Credit System provides a ‘cafeteria’ type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses to acquire more than the required credits and adopt an interdisciplinary approach to learning.



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

It has been a necessity to align higher education with the emerging needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship since last few years. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a well-groomed graduate. CSE department aims to encourage research and innovation in the field of Machine Learning, Cyber security, Artificial Intelligence and other allied areas such as Computational Theory, Cloud Computing, Blockchain Technology, Data Science, Big Data Analytics and many more.

The objective of the M.Tech programme in Computer Science & Engineering (CSE) is to prepare students to undertake careers involving innovative technologies, develop a problem solving capability, or to opt for advanced studies for research oriented careers.

JOB OPORTUNITIES

Booming IT sector in India has plenty of jobs for computer science post graduates. Candidates with a high percentage of mark and good communication skills as well as sound computer knowledge do not face problem in getting a job. Computer engineers can get jobs in non-IT companies like universities, research, private and public industries, government departments, business organizations, commercial organizations and the manufacturing sector, etc. Besides the Computer Engineers have plenty of options to work in IT companies in departments such as design, development, assembly, manufacture, and maintenance, etc. Software Developers: Software developers are professionals who are concerned with facets of the software development process which involves activities such as design and coding, computer programming, project management, etc.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: Teach the appropriate computer application methods: Post Graduates of the program will engage in the effective practice of computer science to identify and solve important problems in a diverse range of application areas such as functional programming and object-oriented programming paradigms to enable participants to analyze, design, implement and evaluate computerized solutions (such as developing computer program) to real-life problems.

PEO 02: Real Life Problem Solving: Demonstrate the critical thinking and communication skills required in a technical environment and synthesize data and technical concepts to create novel products and solutions for the real life problems.

PEO 03: Leadership: Post Graduates of the program will engage in successful careers in industry, academia and attain positions of importance where they have impact on their business, profession and community.

PEO 04: Lifelong Learning: Help participants acquire the knowledge, skills, experience and values to become lifelong learners and be able to obtain employment in a computer-related field or go on to graduate study.

PROGRAMME OUTCOMES

PO1: At the completion of the M. Tech in Computer Science & Engineering Program, a student will achieve the following outcomes:



PO2: Gain an ability to apply the knowledge of mathematics, science, Engineering fundamentals and computer engineering in solving complex engineering problems.

PO3: Acquire the ability to survey the literature, conduct experiments, interpret data and analyze complex engineering problems.

PO4: Acquire the ability to design a system, its components and processes to meet requirements with due regard to social, economic and environmental considerations.

PO5: Acquire the ability to apply research based knowledge and methods to investigate complex engineering problems with focus on computer engineering.

PO6: Acquire the ability to select existing tools, techniques and resources and create new ones to model complex engineering problems and activities.

PO7: Understand the responsibilities of an engineering profession towards society, economy, health, safety and legal issues.

PO8: Understand a computer engineer's role in enhancing sustainable development.

PO9: Demonstrate professional ethics and responsibilities with utmost integrity at all times

PO10: Acquire the ability to contribute effectively as members or leaders of diverse and multidisciplinary teams.

PO11: Communicate effectively among professional and with society through reports, presentations, documentations and instructions.

PO12: Engage in lifelong learning in ever evolving landscape of computer science and engineering.

PROGRAM SPECIFIC OUTCOMES(PSO)

PSO1: The student will learn the fundamental and theoretical aspects of computer science related subjects to analyze the complex real world problems and in turn design an intelligent solution to it.

PSO2: The ability to lead and work in a team with good communication, project management, domain knowledge and expertise for enhancing research capability to transform innovative ideas into reality and documentation skills.

TYPES OF COURSES

1. Courses are the subjects that comprise the Computer Engineering & Engineering Programme.
2. A course may be designed to comprise lectures, tutorials, laboratory work, fieldwork, outreach activities, project work, vocational training, viva, seminars, term papers, assignments, presentations, self-study etc. or a combination of some of these components.
3. The learning outcomes of each course will be defined before the start of a semester.
4. Following are the course types:
 - i. **Core Course (PCC):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of M.Tech in Computer Science & Engineering.

ii. **Elective Course:** An elective course is a course, which can be chosen from a pool of courses. It is intended to support the discipline of study by providing an expanded scope, enabling exposure to another discipline/domain and nurturing a student's proficiency and skill. An elective may be of following types:

- a) **Discipline Elective Courses (DE):** It is an elective course that adds proficiency to the students in the discipline.
- b) **Open Elective Courses (OE):** It is an open elective course taken from other engineering disciplines and enhances the generic proficiency and interdisciplinary perspective of students.
- c) **Specialization Elective (SEC):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of M.Tech in Computer Science & Engineering with Specialization in Cloud Computing/Big Data Analytics/Data Science/Block chain Technology/Information Security/Artificial Intelligence & Machine Learning.
- d) **Audit/Humanities, Social Sciences & Management (HSM):** It is an elective course taken from non-engineering disciplines (humanities, social sciences and management) that broadens the perspective of an engineering student.

5. Each credit course contributes certain credits to the programme. A course can be offered either as a full course (4 credits) or as a half course (2 credits). A full course is conducted with 3 hours of lectures and either 1 hour of tutorial or 2 hours of practical work per week. A half course is conducted with 2 hours of lectures. There are also some exceptional electives with 3 credits and 1 credit.

Definition of Credit: -

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credits
Or	Or
2 Hr. Practical (Lab)/week	1 Credit

6. A project work/dissertation is considered as a special course involving application of the knowledge gained during the course of study in exploring, analyzing and solving complex problems in real life applications. A candidate completes such a course with an advisory support by a faculty member.

7. A student has to register for all courses before the start of a semester.

8. **Program codes:** The codes for various post graduate programmes are as follows:

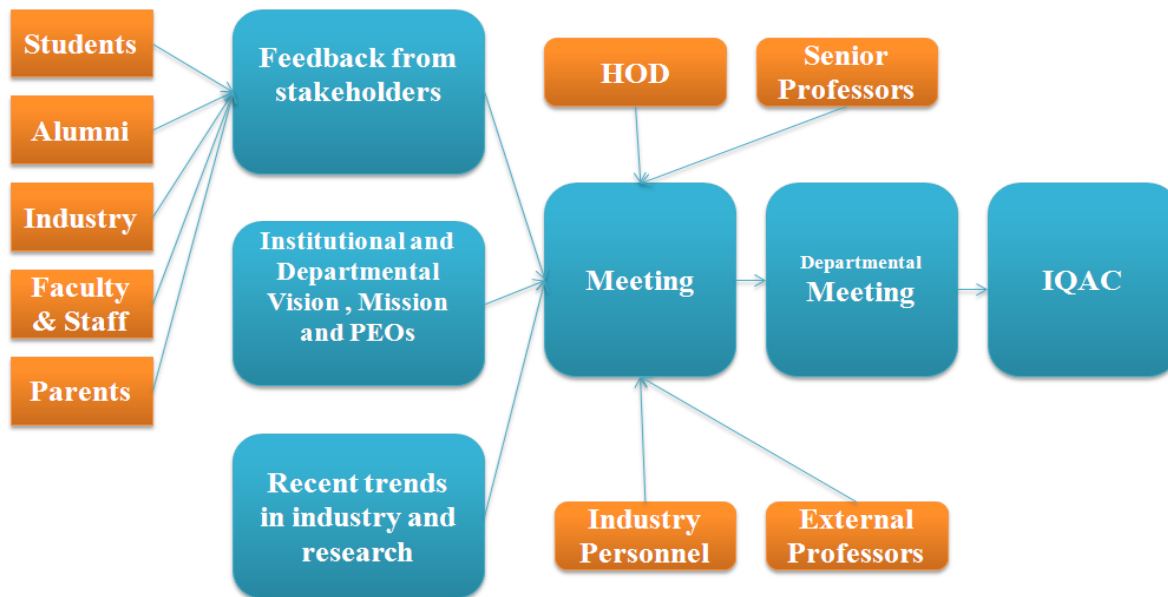
- i. Civil Engineering: CE
- ii. Computer Science & Engineering: CSE
- iii. Electronics and Communication Engineering: ECE
- iv. Electrical Engineering: EE
- v. Mechanical Engineering: ME

9. **Departmental and Non Departmental Course Codes:** The codes for departmental core courses and discipline-specific electives are specific to each discipline. The first two characters are derived from departmental codes listed above. This is followed by a digit sequence number:
 - i. CSCyyy: Core Course
 - ii. CSDxxx: Discipline-Specific Elective Course
 - iii. ProgramCodexxx: Specialization-Specific Elective Courses
 - iv. XXXxxx: Open Elective Courses (Depends on the respective Dept.)
 - vi. INTxxx: Project/Training/Internship/ Dissertation
 - v. HSMxxx: Humanities, Social Sciences & Management Course
10. **General Electives Type:** A student may take a course under the category of General Elective (GE) offered by any other Department of the Institute under the categories of Core Course (CC), Discipline Specific Electives (DE). However, such options shall be offered to a student as per prescribed guidelines of the Institute.
11. The opting of a course by the student will depend upon the requisites for that course and with the consent of the course advisor.

PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

The process for designing the program curriculum involves consideration of the following aspects:

- i) Feedback from stakeholders
- ii) Institutional and Departmental Vision, Mission and PEOs
- iii) Recent trends in industry and research





SCHEME – SEMESTER WISE COURSE ALLOCATION

First Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	PCC	CSC111	Mathematical Foundations of Computer Science	4	0	0	4
2.	DE	CSD---	Discipline Elective-I	3	0	2	4
3.	SEC	---	Specialization Elective-I	3	0	2	4
4.	SEC	---	Specialization Elective-II	3	0	0	3
5.	OE	---	Open Elective-I	2	0	0	2
6.	HSM	---	Humanities	2	0	0	2
Total				17	0	4	19/21

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	DE	CSD111	Distributed System	3	0	2	4
2.	DE	CSD112	Advanced Data Structures	3	0	2	4
3.	OE	RM111	Research Methodology and IPR	2	0	0	2
4.	OE	PS112	Pedagogy Studies	2	0	0	2
5.	HSM	HSM111	Constitution of India	2	0	0	2
6.	HSM	HSM112	Stress Management by Yoga	2	0	0	2

Second Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	PCC	CSC212	Advance Algorithms	3	0	2	4
2.	SEC	---	Specialization Elective-III	3	0	2	4
3.	SEC	---	Specialization Elective-IV	3	0	2	4
4.	SEC	---	Specialization Elective-V	3	0	0	4
5.	OE/HSM	---	Open Elective-II	2	0	0	2
6.	INT	INT	Mini Project with Seminar	0	0	4	2
Total				15	0	8	20/23

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	HSM	HSM213	Business Analytics	2	0	0	2
4.	HSM	HSM214	Waste to Energy	2	0	0	2
5.	HSM	HSM215	Disaster Management	2	0	0	2
6.	OE	VE213	Value Education	2	0	0	2
7.	OE	ERP214	English for Research Paper Writing	2	0	0	3



Third Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	SEC	---	Specialization Elective-VI	3	0	0	3
2.	SEC	---	Specialization Elective-VII	3	0	0	3
3.	INT	INT	Dissertation-I / Industrial Project	0	0	20	10
Total				6	0	20	16/26

Fourth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	PTI	INT	Dissertation-II/Industrial Project	0	0	32	16
Total							16

Specialization Specific Course:

Subject Code	Cloud Computing	Subject Code	Block Chain
CC101	Virtualization & Networks in Cloud Computing	BC101	Blockchain Basics
CC102	Cloud Security	BC102	Blockchain Component & Architecture
CC203	Cloud Adaptation and Migration	BC203	Transaction on Block Chain
CC204	Cloud Architecture & Development Model	BC204	Block Chain Opportunity Analysis
CC205	Google Cloud - Organization & IAM	BC205	Bit Coin and Crypto Currency
CC306	Microsoft Azure and Its Services	BC306	Block Chain Bussiness Application & Implication
CC307	AWS Fundamental	BC307	Emerging Areas, The Merkle Tree and Cryptocurrencies

Specialization Specific Course:

Subject Code	Big Data Analytics	Subject Code	Data Science
BDA101	Big Data Analytics	DS101	Data Science with Python
BDA102	Big Data Modeling & Management	DS102	Data Mining & Data Ware Housing
BDA203	Big Data Integration & Modeling	DS203	Statistics Data Analysis
BDA204	Machine Learning With Big Data	DS204	Statistical Methods for Decision Making
BDA205	Statistics for Data Analytics	DS205	Data Visualization
BDA306	Graph Analytics for Big Data	DS306	Exploratory Data Analysis
BDA307	Managing Big Data with SQL	DS307	Data Scientist's Tool Box



Specialization Specific Course:

Subject Code	Artificial Intelligence & Machine Learning	Subject Code	Information Security
AIML101	Deep Learning	IS101	Data Encryption & Compression
AIML102	Machine Learning Techniques	IS102	Steganography & Digital Watermarking
AIML203	Soft Computing	IS203	Information Theory & Coding
AIML204	Algorithm for Intelligence System & Robotics	IS204	Security Identity & Risk Management
AIML205	Ensemble Technique-ML	IS205	Secure Coding
AIML306	Cognitive Analytics	IS306	Biometrics
AIML307	Computer Vision	IS307	Web Search & Information Retrieval
AIML308	Application of Machine Learning in Industries	IS308	Data Security and Access Control
AIML309	Human Computer Interaction		