

BTech Computer Science and Biosciences
The New Curriculum Schema (2023-2024)

First Semester		
Code	Course Name	Cr
	Engineering Chemistry & Lab	3
	Calculus & Matrices	3
	Basic Electrical Engineering	3
	Basic Electronics	3
	Biology for Engineers	2
	Computer Programming & Lab	4
	IoT Fab Lab	1
	Constitution of India	1
First Semester Credits		20

Second Semester		
Code	Course Name	Cr
	Engineering Physics & Lab	4
	Computational Mathematics	3
	Environmental Studies	2
	Engineering Materials & Mechanics	4
	Matlab for Engineers	2
	Creativity & Innovation Lab	2
	Engineering Graphics	1
	Technical Writing Clinic 1	1
	Universal Human Values	1
Second Semester Credits		20

Third Semester		
Code	Course Name	Cr
	Statistics & Probability	3
	Data structures and algorithm	4
	Relational database management system	4
	Biochemistry	4
	Economics	3
	University Elective 1	3
	Relational Database Management System Lab	1
	Data Structures and Algorithms Lab	1
	Self-Study or Project	1
Third Semester Credits		24

Fourth Semester		
Code	Course Name	Cr
	Management	3
	Design and Analysis of Algorithms	4
	Cell and Molecular Biology	4
	Object Oriented Programming using Java / Bioprocess Calculation/Bioinformatics (Flexi Core - 1)	4
	Program Elective 1	3
	University Elective 2	3
	Design and Analysis of Algorithms Lab	1
	Cell and molecular biology lab	1
	Project Based Learning 1	1
Fourth Semester Credits		24

Fifth Semester		
Code	Course Name	Cr
	Microbiology	4
	Software Engineering	4
	Information System Security / High Performance Computing	4
	Program Elective 2	3
	Program Elective 3	3
	University Elective 3	3
	Software Engineering Lab	1
	Microbiology Lab	1
	Project Based Learning 2	1
Fifth Semester Credits		24

Sixth Semester		
Code	Course Name	Cr
	Artificial Intelligence and Machine Learning	4
	IoT in Healthcare/ Soft Computing Techniques/Genetic Engineering (Flexi Core – 3)	4
	Program Elective 4	3
	Program Elective 5	3
	University Elective 4	3
	Technical Writing Clinic 2	1
	Artificial Intelligence and Machine Learning Lab	1
	Self study	1
	Res, Innov & Entrepreneurship	3
Sixth Semester Credits		23

Seventh Semester		
Code	Course Name	Cr
	University Elective 5	3
	Program Elective 6	3
	Program Elective 7	3
	Program Elec 8 / Univ Elect 6	3
	Internship (Industry/ Research)	1
Seventh Semester Credits		13

Eighth Semester		
Code	Course Name	Cr
	Major Project	12
Eighth Semester Credits		12

Key Phrases and Expectations in the New Curriculum Schema in MUJ Faculty of Engineering (FOE):

Department Core (DC) Courses: Fundamental courses for the program of study. Mandatory for all students in the program. Each program has eight departmental core courses of 4 credits each and 8 labs of 1 credit each. Departments have flexibility to shuffle credits and labs or develop integrated didactic and laboratory courses (Total 40 Credits).

Flexi Core (FC) Courses: Core Courses based on emerging trends in the field. Students can select three FCs (4Cr each) from options offered during the fourth, fifth or sixth semester (Total 12 Credits).

Program Electives (PE): Departments will offer a set of program specific elective courses (3 Credits each) each semester. Students have the flexibility to select PEs from all Faculty of Engineering departments. For example, a student from Civil Engineering can study PEs offered by the Department of Computer Science and Engineering. Students will be responsible for completing the prerequisites from other department courses as online value-added courses. No additional credit is offered for these pre-requisite courses taken online or value-added courses (Total 24 Credits).

- **Industry Expert Courses:** Selected few Program Electives will be jointly developed by FOE faculty and industry experts, introducing the latest learnings from industry. In these courses, one or more industry experts may conduct a significant portion (> 50%) of the course. These courses will be marked with an IEC in Course Catalog.

University Electives (UE): These are graded, open elective courses offered across the University. All UEs need to be approved by the Board of Studies of their respective Departments and Faculty Boards. UEs provide an opportunity for students to expand and diversify their knowledge base with topics in non-engineering domains. BTech students cannot take FOE offered UEs (Total 15 Credits).

Focus Areas: Focus Areas provide students an opportunity to develop expertise in any University discipline. Focus Areas are offered within FOE departments and across the University.

- For Focus Areas, students need to take four courses from a pre-selected bucket of six plus Program Electives from across FOE. For example, a Mechanical Engineering student can put together four PEs and attain a Focus Area in: Blockchain, Cybersecurity, Robotics, AI/ML, Electrical Vehicle Technology, or any other area of their interest.
- Similarly, Focus Areas are also available University-wide by taking four courses from a pre-selected bucket of six plus University Electives. For students pursuing a Focus Area outside of Engineering, they can substitute PE8 for UE6 in the Seventh Semester.

Self-Study Courses; Problem Based Learning; Research Innovation and Entrepreneurship:

These courses offered in the third through sixth semester offer students an opportunity to enhance their academic curricula with learning new skills, taking online classes, conducting guided research projects or developing innovative solutions to societal problems.

In a **Self-Study Course**, students have the opportunity to learn a new skill or computer programming language in Online mode. Producing a completion certificate and a brief assessment with a guide is necessary to receive a grade and credit.

Problem-based Learning, and Research Innovation and Entrepreneurship (RIE): In these courses, students can pursue a broader research investigation, innovation or a startup. The expected outcome is a research paper presented at a conference, a paper publication, a patent application for an innovation or launching a startup.

Proposed List of Courses offered by the Department of Biotechnology and Chemical Engineering with CSE

Proposed Department Core Courses

1. Data Structures and Algorithms
2. Relational Database Management System
3. Biochemistry
4. Design and Analysis of Algorithms
5. Cell and molecular biology
6. Microbiology
7. Software Engineering
8. Artificial Intelligence and Machine Learning.

Proposed Flexi- Courses

1. FC1: Object Oriented Programming using Java
2. FC1: Bioinformatics
3. FC1: Bioprocess Calculations
4. FC2: Information System Security.
5. FC2: High Performance Computing.
6. FC3: Bioprocess Engineering
7. FC3: IoT in healthcare
8. FC3: Soft Computing Techniques
9. FC3: Genetic Engineering

Proposed Department Program Electives

1. Enzyme technology
2. Modeling and simulation in biotechnology
3. Structural biology
4. Data Communications
5. Internet of Things
6. Git Essential
7. Computer Graphics & Multimedia

8. Data Visualization Techniques.
9. Android App Development
10. Advanced Java
11. Advanced Data Structures
12. Graph Theory & Application
13. Software Testing & Automation
14. Cyber Physical Systems
15. Big Data Analytics
16. Information Retrieval
17. Virtual & Augmented Reality
18. Quantum Computing
19. Wireless sensor and Adhoc Network
20. Software Defined Network
21. Cognitive Computing
22. Recommender Systems
23. Reinforcement Learning
24. Valorization of Biomass
25. Bioremediation
26. Microbial treatment of wastewater
27. Solid waste management
28. Design of biological treatment processes

Focus Areas offered by the department

Focus Area 1: Cloud Computing

1. Cloud Infrastructures & Virtualization
2. Cloud Applications
3. Cloud Security and Privacy
4. Fog and Edge Computing
5. Cloud Automation Tools

Focus Area 2: Data Analytics

1. Predictive Analytics
2. Computer Vision

3. Natural Language Processing
4. Deep Learning
5. Social Network Analysis

Focus Area 3: Environmental Biotechnology

1. Valorization of Biomass
2. Bioremediation
3. Microbial treatment of wastewater
4. Solid waste management
5. Design of biological treatment processes

Proposed Department University Electives

(For Non-FoE)

1. Data Structures
2. Python Programming
3. Fundamental of Cyber Security
4. Digital Forensics and Cyber Crimes
5. Cyber Physical System
6. Ethical Hacking & Penetration Testing
7. Analytical Techniques in biotechnology
8. Genetic engineering and/ applications
9. Fermentation technology and downstream processing