MUJ Faculty of Engineering

The New Curriculum Schema has been approved at the Faculty Board for the B.Tech. in Biotechnology program is listed below (2023-2024)

Code	First Semester 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**

Code	Second Semester 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**

Code	Third Semester Course Name	Cr
	Statistics & Probability	3
	Biochemistry	4
	Microbiology	4
	Bioprocess Calculations	4
	Economics	3
	University Elective 1	3
	Microbiology Lab	1
	Biochemistry Lab	1
	Self-Study or Project	1
	Third Semester Credits	**24**

Code	Fourth Semester Course Name	Cr
	Management	3
	Cell and Molecular Biology	4
	Bioreaction Engineering and Bioenergetics	4
	Flexi Core 1	4
	Program Elective 1	3
	University Elective 2	3
	Bioreaction Engineering Lab	2
	Project Based Learning 1	1
	Fourth Semester Credits	**24**

Code	Fifth Semester Course Name	Cr
	Bio-separation Engineering	4
	Bioprocess Engineering	4
	Flexi Core 2	4
	Program Elective 2	3
	Program Elective 3	3
	University Elective 3	3
	Bio-separation Engineering Lab	2
	Project Based Learning 2	1
	Fifth Semester Credits	**24**

Code	Sixth Semester Course Name	Cr
	Medical Biotechnology	4
	Flexi Core 3	4
	Program Elective 4	3
	Program Elective 5	3
	University Elective 4	3
	Technical Writing Clinic 2	1
	Bioprocess Engineering Lab	2
	Res, Innov & Entrepreneurship	3
	Sixth Semester Credits	**23**

Code	Seventh Semester 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**

Code	Eighth Semester 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 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 for BTech (Biotechnology)

Proposed Department Core Courses

1. Cell and molecular biology
2. Microbiology
3. Bioprocess Calculations
4. Biochemistry
5. Bioreaction Engineering and Bioenergetics
6. Bio-separation Engineering
7. Bioprocess Engineering
8. Medical Biotechnology

Proposed Flexi- Courses

FC1: Transport Phenomena in Biological Processes
FC1: Enzyme Technology
FC1: Data structures and algorithms

FC2: Animal and Plant Biotechnology
FC2: Immunology
FC2: Object Oriented Programming

FC3: Bioinformatics
FC3: Biomedical Materials
FC3: Relational Database Management System

Department Program Electives

Program Elective I

1. Biostatistics
2. Analytical techniques in biotechnology
3. Food Processing Technology

Program Elective II

1. Modeling and Simulation in Biotechnology
2. Instrumentation and process control
3. Bioprocess Equipment

Program Elective III

1. Valorization of Biomass
2. Biofuels Engineering
3. Biopolymers

Program Elective IV

1. Bioremediation
2. Biomaterials in Regenerative Medicine
3. IPR
4. Genetic Engineering

Program Elective V

1. Microbial treatment of wastewater
2. Bone Tissue Engineering
3. Recombinant DNA Technology
4. Bioethics

Program Elective VI

1. Solid waste management
2. Bioprinting of artificial organs
3. Metabolic engineering

Program Elective VII

1. Design of biological treatment processes
2. Biomechanics
3. Biological application of 3D printing

Program Elective VIII

1. Biosensors in medical devices
2. Bioprocess Equipment Design
3. Solid state fermentation

Focus Areas offered by Department of Biotechnology and Chemical Engineering for BTech (Biotechnology)

Focus Area 1: Environmental Biotechnology

1. Valorization of Biomass (PE1)
2. Bioremediation (PE2)
3. Microbial treatment of wastewater (PE3)
4. Solid waste management (PE4)
5. Design of biological treatment processes (PE5)

Focus Area 2: Biomaterials

1. Biomaterials in Regenerative Medicine (PE1)
2. Bone Tissue Engineering (PE2)
3. Bioprinting of artificial organs (PE3)
4. Biomechanics (PE4)
5. Biosensors in medical devices (PE5)

Proposed Department University Electives. These courses are only open to students outside of FOE

1. Analytical Techniques in biotechnology
2. Genetic engineering and applications
3. Fermentation technology and downstream processing