

MUJ Faculty of Engineering
Department of Mechatronics Engineering
The Proposed Schema for
Bachelor of Technology (Robotics and AI) Degree Programs Starting 2024-2025 Batch and Onwards

First Semester			Second Semester		
Code	Course Name	Cr	Code	Course Name	Cr
	Engineering Chemistry + Lab	3		Engineering Physics + Lab	4
	Mathematics 1	3		Mathematics 2	3
	Basic Electrical Engineering	3		Environmental Studies	2
	Basic Structural Engineering	3		Basic Mechanical Engineering	3
	Biology for Engineers	2		Basic Electronics	3
	Computer Programming+ Lab	4		Creativity & Innovation Lab	2
	Arduino, IoT Fab Lab	1		Engineering Graphics	1
	Constitution of India	1		Technical Writing Clinic 1	1
				Universal Human Values	1
	First Semester Credits	20		Second Semester Credits	20
Third Semester			Fourth Semester		
Code	Course Name	Cr	Code	Course Name	Cr
	Statistics & Probability	3		Engineering Economics	3
	Digital Systems and Integrated Circuits	4		Robotics control system	4
	Robot Kinematics and Dynamics	4		Basics of AI and ML	4
	Sensors and Actuators for Robots	4		Program Elective 1	3
	Technology Management	3		Flexi Core 2	3
	Flexi Core 1	3		Open Elective 1	3
	Modeling and Simulation Lab	1		Control Lab	2
	Sensors and Actuators Lab	1		AI and ML Lab	1
	Self-Study or Project based Learning 1	1		Project Based Learning 2	1
	Third Semester Credits	24		Fourth Semester Credits	24
Fifth Semester			Sixth Semester		
Code	Course Name	Cr	Code	Course Name	Cr
	AI in Robotics	4		Deep Neural Network	4
	Drives in Robotics	4		Program Elective 4	3
	Flexi Core 3	4		Program Elective 5	3
	Program Elective 2	3		Program Elective 6	3
	Program Elective 3	3		Open Elective 3	3
	Open Elective 2	3		Professional Practice	1
	Robotics Lab	1		Advance Robotics Lab	1
	Drives Lab	1		Microcontroller Lab	2
	Project Based Learning 3	1		Project-based Learning 4	3
	Fifth Semester Credits	24		Sixth Semester Credits	23
Seventh Semester			Eighth Semester		
Code	Course Name	Cr	Code	Course Name	Cr
	Program Elective 7	3		Major Project	12
	Program Elective 8	3			
	Open Elective 4	3			
	Open Elective 5	3			
	Internship (Industry/ Research)	1			
	Seventh Semester Credits	13		Eighth Semester Credits	12

**Proposed List of Courses
offered by Department of
Mechatronics for B. Tech in
Robotics and AI**

**Proposed Department Core
Courses (DC)**

1. Digital Systems and Integrated Circuits
2. Robot Kinematics and Dynamics
3. Sensors and Actuators for Robots
4. Robotics control system
5. Basics of AI and ML
6. AI in Robotics
7. Drives in Robotics
8. Deep Neural Network

Proposed Flexi- Courses

1. FC1: Object Oriented Programming using Python
2. FC1: Strength of Materials
3. FC2: Data Structures and Algorithms
4. FC2: Mobile robotics
5. FC3: Relational Database Management System

6. FC3: Robot Path Planning and Control

**Proposed Department
Program Electives (PE)**

1. Design of Machine Elements
2. Signal and System
3. Digital Signal Processing
4. Finite Element Methods
5. Machine Vision
6. Vision Intelligence in Robotics
7. Smart Materials
8. Cyber Physical System
9. Computer Networks and Protocols
10. Biomedical Robots
11. Collaborative Robots
12. Micro Aerial Robots
13. Advanced Robot programming and simulation
14. Robot Gripper Design
15. Agricultural Robotics
16. Design and Analysis of Algorithms
17. Drone and its Components
18. Drone Modelling and Simulation

19. Wireless Sensor Networks
20. Automated Manufacturing Systems
21. Industrial IOT Systems

**Proposed Department Open
Electives (UE)**

1. Fundamentals of Robotics
2. Automation in Industry
3. Fundamentals of Cyber-Physical Systems
4. Project Planning and Control
5. Building Automation
6. Smart Farming
7. Optimization and decision techniques
8. Sensor Technologies
9. Predictive maintenance
10. Drone Technology
11. Inventory and Quality Control
12. Biomedical Instrumentation
13. Emotional Intelligence
14. System Analysis and Management

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 eleven departmental core courses of 4 credits each and 8 labs of 1 credit each for a total of 40 credits. Departments can shuffle the credits and labs or develop integrated didactic and laboratory courses.

Flexi Core (FC) Courses: Core Courses based on emerging trends in the field. Students have the opportunity to select three FCs (4Cr x 3) from a bucket offered during the fourth, fifth or sixth semester for a total of 12 Credits.

Program Electives (PE): Departments will offer a set of program specific elective courses for 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.

- **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 our Course Catalog.

Open Electives (UE): These are graded, open elective courses offered across the University. This is an opportunity for our students to expand their knowledge base and learn topics in non-engineering domains. FOE students cannot take FOE offered UEs.

Focus Areas: Focus Areas provide students an opportunity to study and 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 Open Electives. For students pursuing a Focus Area outside of Engineering, they can substitute PE8 for a sixth Open Elective 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

Research Innovation and Entrepreneurship (RIE): In this course, 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.

