

ES 408 Mechatronics

Course Organization

Instructor Madhu Vadali madhu.vadali@iitgn.ac.in

GTF Shail Jadav shail.jadav@iitgn.ac.in

Teaching Assistants Souritra Garai souritra.garai@iitgn.ac.in
Suraj Borate surajb@iitgn.ac.in

Google Classroom 4rnqnx

Venue Maker Bhavan

Schedule

- Lecture Tue, 3:30 pm to 5:00 pm
- Labs/Project Discussions Fri, 3:30 pm to 5:00 pm
- Office Hours Tue, Fri, 5:00 pm to 5:45 pm

Schedule and Topics to be Covered

Week	Tuesday	Friday
01	Course Policy, Syllabus; Why to learn Mechatronics? How will it help you to resolve real-world problems?	Basic Elements of Manufacturing, PCB design, 3D printing, CNC
02	Holiday; Last Day of Add/Drop. Project Teams Finalization	Project ideas discussion and review
03	Basic Elements of Mechanical Design: Bearings, Circlips, Nut/Bolts, Joints & Transmissions Basics on design for manufacturing and assembly (MV Travelling, to be rescheduled)	Holiday. Project finalization
04	Fundamentals of Microcontrollers, Digital Read & Write, Analog Read & Write, Interrupts & Timers, Basics on Loops	Lab Microcontrollers
05	Fundamentals of Sensors, Analog Sensors, Digital Sensors	Project review
06	Fundamentals of Communication, SPI, I2C, USART, CAN	Lab Sensors and Communication
07	Fundamentals of Signal Conditioning -1: Sampling, Filters (Highpass, Lowpass, Bandpass, Notch), RC\RL Implementation of filters	Lab Signal Conditioning

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08	Fundamentals of Signal Conditioning -2: Digital Filters, IIR & FIR filters, Fast Fourier Transform, Least Squares	Project Pre-Demo
Mid Semester Exam Week		
Mid Semester Recess		
09	Fundamentals of Actuators – 1: Electrical, Hydraulic, & Pneumatic Actuators, DC Motor & its modelling, BLDC & PMSM	Lab Motor Control
10	Fundamentals of Actuators – 2: Transistors & Power Electronics, MOSFET & Op-amp, PWM & H-Bridge	Project Review
11	Fundamentals of Control Implementation – 1: Feedback, Feedforward, Difference equations, Ziegler-Nichols PID tuning	Project Demo Day
12	Fundamentals of Control Implementation – 2: Observer Design, Basics of Kalman Filter, Control in presence of uncertainty	Robot Sumo Wrestling
13	Holiday	Case Study 1 - Design & Implementation of RR Serial Chain Manipulator Case Study 2 - Design & Implementation of Mobile Robots
14	Robot Sumo Wrestling	Robot Sumo Wrestling
15	Robot Sumo Wrestling Competition	
End Semester Exam Week		

This list of topics and the schedule provided here act as a general guide during the course. Every attempt is made to adhere to it. However, circumstances and events may make it necessary for the instructors to modify the syllabus during the semester and may depend, in part, on the progress, needs, and experiences of the students.

Changes to the syllabus will be made with notice to the students in the course.

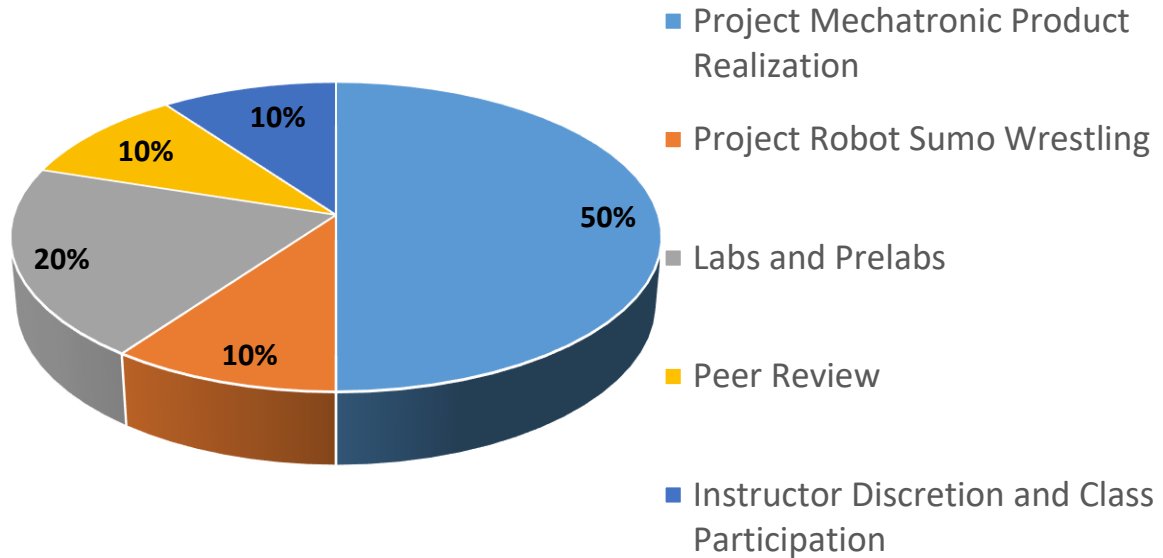
References

- W. Bolton, "Mechatronics", Pearson Education India
- R. H. Bishop, "Mechatronic Systems, Sensors, and Actuators", The Mechatronics Handbook, CRC Press
- J. E. Carryer, R. M. Ohline and T. W. Kenny, "Introduction to Mechatronic Design".
- C. R. Mischke and J. E. Shigley, "Mechanical Engineering Design".
- M. D. Singh, J. G. Joshi, "Mechatronics", PHI Learning Pvt. Ltd

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Grading Policy

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|---|-----|
| • Project Mechatronic Product Realization | 50% |
| • Project Robot Sumo Wrestling | 10% |
| • Labs and Prelabs | 15% |
| • Peer Review | 10% |
| • Instructor Discretion and Class Participation | 10% |



Peer Review

Peer review will happen within a team in the following manner:

- The peer review will be based on all activities declared as team activities by the instructor
- Each student in a team of 2 will be graded out of 10.
- Each team should submit the total team score (out of 20) and individual scores (out of 10)
- It is important to note that the total team score **cannot** exceed 16 (80% of 20). This means that the team has 16 points to distribute among themselves, with a maximum score of 10 and a minimum score of 0. An example of such a distribution would be {9, 7}
- The instructor will randomly and continuously request for submission of peer review grades.

Project

An additional document detailing the expectations and deliverables of the project will be shared separately.

Robot Sumo Wrestling

An additional document relating to the rules and format of the event will be shared separately.

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Attendance Policy

There is NO attendance policy. However, it is assumed that the absence of students from lectures and labs will be reflected in their peer review and class participation grades.

Academic Honesty and Integrity

The student honor code applies on all aspects of the course. The teams are strongly encouraged to work collaboratively. However, the final submissions must be the submissions of individuals or individual teams.