



**ACADEMIC-GRADUATE STUDIES AND RESEARCH DIVISION**  
**FIRST SEMESTER 2023-2024**  
Course Handout Part II

Date: 02-08-2023

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : MSE G511  
**Course Title** : MECHATRONICS  
**Instructor-in-Charge** : Dr. ARSHAD JAVED and Ms. P Ramya Priya

**Description:** Concepts of measurement of electrical and non-electrical parameters; displacement, force, pressure etc. and related signal conditioning techniques, drives and actuators, concepts of microprocessors/ microcontrollers architecture and programming, memory and I/O interfacing. System design concepts through case studies. (from the Bulletin)

**Scope and Objective of the Course:** This course is intended to a comprehensive knowledge of the technology related to mechatronics and industrial Automation. Mechatronics is a well-established engineering domain that builds on the traditional mechanical engineering studies, combines it with technologies from the electrical, electronics, computer and control fields, using techniques such as simultaneous engineering to provide solutions in manufacturing applications.

The course will develop the overall background of the student in interdisciplinary mechatronic technology with emphasis on integration of mechanical engineering with electronics and computers. In depth study of sensors and transducer, signal conditioning, drives and actuators, micro-controllers, microprocessors, interfacing, PLC, SCADA etc. will be discussed from the applications point of view. Mechatronic system design concepts will be discussed through case studies.

**Textbooks:**

1. W. Bolton, *Mechatronics*, 3<sup>rd</sup> Ed., Pearson, 2004. [1]

**Reference books**

1. A. Smaili and F. Mrad, *Applied Mechatronics*, Oxford University Press, 2008. [2]
2. M.P. Groover, *Automation, Production systems, and Computer-Integrated Manufacturing*, PHI, 2008. [3]
3. W. Stadler, *Analytical Robotics and Mechatronics*, McGraw Hill, 1995. [4]

**Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	Understand mechatronics and the development of automation system through mechatronics	Introduction, Mechatronic systems – Examples	[1]-1
2		Introduction to automation, Key issues, Approach to Mechatronics and automation	class notes, [1]-4, [2]-14
3-6	Basics of Signal Conditioning, modeling & selection	Signal conditioning methods and application, Electronic elements, models Operational Amps, Applications	[1]-3, [2]-2,3

7-11	Understanding working principles and applications of sensors	Sensors and Instrumentation: Sensor functions, Characteristics, Applications, Specifications & Selection	[1]-2, 3 [2]-11
12-15	Understanding the working principles and applications of different actuation and transmission systems used for automation	Actuation Systems: Pneumatic and Hydraulic actuation systems. Force and velocity analysis	[1]-5
16-21		Electrical Actuators. Performance estimation. Heating characteristics and electro-mechanical model	[1]-7, [2]-12, class notes
22-24		Torque estimation, Performance & Selection of actuation system for stationary and mobile system.	[2]-12, class notes
25-28	Understanding basic control concepts, Modern control systems	Open-loop, close-loop, proportional derivative, integral, multivariable, digital, adaptive control systems. Process controller.	[1]-13, class notes
29-31	Basics of industrial Automation and SCADA	Introduction, Architecture, SCADA HMI system. SCADA programming and application	class notes
32-34	Understanding the application and implementation of automatic control for small and large automation systems	Digital electronics, Digital logic, Microprocessors, control using digital logic	[1]-14, 15
35-38		Programmable and selection of PLC's (Programmable Logic Controller), case studies on PLC. Digital and analog signals.	[1]-19, 21 class notes
39-41	Understanding the application of Industrial manipulator	Introduction, specification, selection and programming of industrial manipulator (robot).	class notes
41-43	Understanding the challenges in real time Mechatronics and Automation system	Industrial Case-Studies	[2]-14, [4], class notes

#### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid. sem. test	90 min	20	13/10 4-5.30PM	Close Book
Quiz	--	10		Open Book
Research Assignment	---	10		---
Laboratory Project	--	20		---
Comprehensive- Examination	180 min	40	19/12 AN	Open Book

**Chamber Consultation Hour:** Will be decided based on Time table and availability of the students.

**Notices:** The necessary announcements will be made in the classroom itself.

**Make-up Policy:** Make-up will be given with prior concern and genuine reasons only.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Plagiarism and AI tool policy:** All take home assignment should be free from any plagiarism and application of (AI) Artificial Intelligence tools. If found, the marks of that component will be nullified.

**INSTRUCTOR-IN-CHARGE**

