



FIRST SEMESTER 2022-2023

Course Handout Part II

Date: 29-08-2022

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. : **MF F311**
Course Title : **MECHATRONICS AND AUTOMATION**
Instructor-in-Charge : **Dr. ARSHAD JAVED**

Scope and Objective of the Course: This course is intended to a comprehensive knowledge of the technology related to Mechatronics and Automation. The necessity of integrating and embedding electronics and microprocessor into mechanical systems have been long felt, due to rapid progress in microprocessor computer based technology, in domestic products to manufacturing systems. Mechatronics is a recently defined engineering field 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. Also, mechatronics has been applied to manufacturing and other industrial automation: robotic automation found in car automated production lines, such as welding, and assembly line in computer integrated manufacture etc. This course will develop overall background of the student in interdisciplinary mechatronic technology and a broad introduction to the issues encountered and techniques required in developing mechatronic products and automation systems.

Textbooks:

1. W. Bolton, *Mechatronics*, 3rd 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
3-7	Understanding working principles and applications of sensors	Sensors and Instrumentation: Sensor functions, Characteristics, Applications, Specifications & Selection	[1]-2, 3 [2]-11



8-12	Understanding the working principles and applications of different actuation and transmission systems used for automation	Actuation Systems: Pneumatic and Hydraulic actuation systems	[1]-5
13		Mechanical actuation and systems	[1]-6, class notes
14-19		Electrical Actuators	[1]-7, [2]-12, class notes
20-21		Torque estimation, Performance & Selection of actuation system	[2]-12, class notes
22-24	Selection and working of basic Industrial controls	Open-loop, close-loop, proportional derivative, integral, multivariable, digital, adaptive control systems	[1]-13, class notes
25-26	Selection of controller. Student will be able to apply for small and medium automation systems.	Digital electronics, Digital logic, Microprocessors	[1]-14, 15
27-29		Programmable and selection of PLC's (Programmable Logic Controller)	[1]-19, 21 class notes
30-32	Student will know the architecture and classification of Industrial Automation	Introduction of Industrial Automation	Class notes
33-35	Student will able to understand the basics, components, structure and classification of SCADA system	Introduction to SCADA system	Class notes
36-38	Understanding the application of Industrial manipulator	Introduction, specification, selection and programming of industrial manipulator (robot).	class notes
39-40	Understanding the challenges in real time Mechatronics and Automation system	Case-Studies	[2]-14, [4], class notes

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid semester Test	90 min	25	02/11 9.00 - 10.30AM	CB & OB (at least 10% OB)
Quiz	--	20	---	Open Book
Laboratory	--	10	---	---
Project	--	10	---	---
Comprehensive- Examination	180 min	35	22/12 FN	CB & OB (at least 10% OB)

*CB: Close Book, OB: Open Book

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

Notices: All notices will be put up on CMS/email/GoogleClassroom.

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.

INSTRUCTOR-IN-CHARGE

