



FIRST SEMESTER 2015-2016

Course Handout Part II

Date: 16-08-2020

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

Course 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

Scope and Objective of the Course: This course is intended to a comprehensive knowledge of the technology related to mechatronics. 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.

The course will develop overall background of the student in interdisciplinary mechatronic technology with emphasis on integration of mechanical engineering with electronics and computer. In depth study of sensors and transducer, signal conditioning, drives and actuators, micro-controllers, microprocessors, interfacing 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*, 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
3-6	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	[1]-5
16		Mechanical actuation and systems	[1]-6, class notes
17-21		Electrical Actuators	[1]-7, [2]-12, class notes
22-24		Torque estimation, Performance & Selection of actuation system	[2]-12, class notes
28-28	Understanding basic control concepts, Modern control systems	Open-loop, close-loop, proportional derivative, integral, multivariable, digital, adaptive control systems, modelling and analysis	[1]-13, class notes
29-31	Basics of SCADA	Introduction, Architecture, HMI	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	[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	Case-Studies	[2]-14, [4], class notes

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Test-1	30 min	15		Open Book
Test-2	30 min	15		Open Book
Test-3	30 min	15		Open Book
Quiz	--	10		Open Book
Laboratory Project	--	15		---
Comprehensive- Examination	120 min	30	14/12 AN	---

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

Notices: All notices will be put up on CMS only.



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

