



**FIRST SEMESTER 2019-2020**  
Course Handout Part II

Date: 01-08-2019

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*, 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]
4. Tai-Ran Hsu, *MEMS and Microsystems: Design and Manufacture*, John Wiley & Sons. 2008. [5]

**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
3-5	Understanding working principles and applications of sensors	Sensors and Instrumentation: Sensor functions, Characteristics, Applications, Specifications & Selection	[1]-2, 3 [2]-11



6-8	Understanding the working principles and applications of different actuation and transmission systems used for automation	Actuation Systems: Pneumatic and hydraulic actuation systems	[1]-5
9		Mechanical actuation and systems	[1]-6, class notes
10-12		Electrical Actuators	[1]-7, [2]-12, class notes
13-14		Torque estimation, Performance & Selection of actuation system	[2]-12, class notes
15-17	Understanding basic control concepts	Open-loop, close-loop, proportional derivative, integral, multivariable, digital, adaptive control systems	[1]-13, class notes
18-19	Understanding the application and implementation of automatic control for small and large automation systems	Digital electronics, Digital logic, Microprocessors	[1]-14, 15
20-21		Programmable and selection of PLC's (Programmable Logic Controller)**	[1]-19, 21 class notes
22-24	Understanding the application of Industrial manipulator	Introduction, specification, selection and programming of industrial manipulator (robot).	class notes
25-26	Understanding the challenges in real time Mechatronics and Automation system	Case-Studies**	[2]-14, [4], class notes
27-28	Understanding the basics of MEMS	Introduction to MEMS, Modeling and simulation of MEMS	[5]-1,2

**\*\* Lecture on one of these topics will be taken by industrial expert**

#### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid. Sem. Test	90 min	25	28/9, 11.00 -- 12.30 PM	Partially Close & Open Book (min. 10%)
Quiz	--	10		--
Laboratory	--	10		--
Tutorial	--	15		--
Comprehensive- Examination	3 Hrs	45	2/12 AN	Partially Close & Open Book (min.15%)

**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**

