Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2020-2021

Course Handout Part II

Date: 16-01-2021

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

8-10	Understanding the working principles and applications of different actuation and transmission systems used for automation	Actuation Systems: Pneumatic and hydraulic actuation systems	[1]-5
11		Mechanical actuation and systems	[1]-6, class notes
12-14		Electrical Actuators	[1]-7, [2]-12, class notes
15-16		Torque estimation, Performance & Selection of actuation system	[2]-12, class notes
17-18	Understanding basic control concepts	Open-loop, close-loop, proportional derivative, integral, multivariable, digital, adaptive control systems	[1]-13, class notes
19-20	Understanding the application and implementation of automatic control for small and large automation systems	Digital electronics, Digital logic, Microprocessors	[1]-14, 15
21-23		Programmable and selection of PLC's (Programmable Logic Controller)**	[1]-19, 21 class notes
24-26	Understanding the application of Industrial manipulator	Introduction, specification, selection and programming of industrial manipulator (robot).	class notes
27-28	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	05/03 3.30 - 5.00PM	Open Book
Quiz	--	20		Open Book
Laboratory	--	15		---
Comprehensive- Examination	120 min	40	15/05 AN	Open Book

Chamber Consultation Hour: Wil 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