Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019-2020

Course Handout Part II

Date:28-11-2019

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

Course No. :**MF F311**
Course Title :**MECHATRONICS AND AUTOMATION**
Instructor-in-charge : **Dr. Kundan Singh**

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.

Text Books

- W. Bolton, Mechanronics, 3^{rd} Ed., Perason, 2004 [1]
- Automation, production systems, and computer-integrated manufacturing,4^{th} Ed., Perason, 2015 [2]

Reference Books

- A. Smaili and F. Mrad, Applied Mechatronics, Oxford University Press, 2008.
- W. Stadler, Analytical Robotics and Mechatronics, McGraw Hill, 1995.
- Tai-Ran Hsu, MEMS and Microsystems: Design and Manufacture, John Wiley & Sons. 2008.

Course Plan:

Lecture No.	Learning Objectives	Topic to be covered	Chapter in the text book
1-2	Fundamentals of mechatronics	Mechatronics meaning and its history, mechantronics principles, elements of mechatronics system, mechatronic system design approach	[1]-1
3-5	Sensors and its working principles	Sensors characterisation, Different types of sensors, selection and calibration of sensors	Class notes and [1]-2
6-9	Signal conditioning theory	Amplifiers and its working principles, different amplifiers, basics of signal filtering, applications of signal filtering	Class notes and[1]-3
10-12	Digital signal processing	Concept of analogue and digital signals, sampling theory, basics of data acquisition, digital signal processing theory	class notes and [1]-4
13-15	Digital logic	Different logic gates and its application	[1]-5

16-19	Actuation system design and theory	Pneumatic and hydraulic systems, directional control valves	Class notes and [1]-7
20-22	Microprocessors and microcontrollers theory	Microprocessor system and its different components, microcontrollers theory and block diagram	[1]-10
23-24	Introduction to Automation	Automation definition, different elements of automation, industrial automation levels	Class notes and [2]-4
25-28	Understanding the transfer function and its application	Transfer function detailing, open loop, closed loop proportional derivative,integral, multivariable, digital, adaptive control systems, application to manufacturing process automation	Class notes
29-32	Understanding the industrial control systems	Continuous and discrete control systems, computer process control, Theory of PLC, SCADA and CNC	Class notes and [2]-5

Evaluation Scheme

Component	**Duration**	**Weightage(%)**	**Date & Time**	**Nature of Component**
Mid Sem. Test	90 Min.	20	11/3	Close Book
Quiz	–	15	–	Close Book
Project	–	15	–	–
Laboratory	–	15	–	–

Comprehension examination	3 Hrs.	35	01/05 FN	Partially Open & Close 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 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