# SECOND SEMESTER 2019-2020

Course Handout Part II

Date:06-01-2020

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* :**MECHATRONOCS AND AUTOMATION**

*Instructor-in-charge* : **Dr. Kundan Singh**

**Scope and Objective of the Course:** This course is intended to a compre- hensive 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 microproces- sor 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, mechatron- ics has been applied to manufacturing and other industrial automation: robotic automation found in car automated production lines, such as welding, and as- sembly 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 devel- oping mechatronic products and automation systems.

# Text Books

ˆ W. Bolton, Mechanronics, 3*rd* Ed., Perason, 2004 [1]

ˆ Automation, production systems, and computer-integrated manufacturing,4*th* Ed., Perason, 2015 [2]



# Reference Books

ˆ A. Smaili and F. Mrad, Applied Mechatronics, Oxford University Press, 2008.

ˆ W. Stadler, Analytical Robotics and Mechatronics, McGraw Hill, 1995.

ˆ Tai-Ran Hsu, MEMS and Microsystems: Design and Manufacture, John Wiley & Sons. 2008.

# Course Plan:

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| --- | --- | --- | --- |
| **Lecture**  **No.** | **Learning Objec-**  **tives** | **Topic to be covered** | **Chapter in the**  **text book** |
| 1-2 | Fundamentals of mechatronics | Mechatronics meaning and its history, mechantron- ics principles, elements of mechatronics system, mechatronic system design  approach | [1]-1 |
| 3-5 | Sensors and its work- ing 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 ampli- fiers, basics of signal filter- ing, applications of signal  filtering | Class notes and[1]-3 |
| 10-12 | Digital signal process- ing | Concept of analogue and digital signals, sampling theory, basics of data ac- quisition, digital signal pro-  cessing theory | class notes and [1]-4 |
| 13-15 | Digital logic | Different logic gates and its  application | [1]-5 |

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| 16-19 | Actuation system de- sign 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 Au- tomation | Automation definition, dif- ferent elements of automa- tion, industrial automation  levels | Class notes and [2]-4 |
| 25-28 | Understanding the transfer function and its application | Transfer function detail- ing, open loop, closed loop proportional deriva- tive,integral, multivariable, digital, adaptive control systems, application to manufacturing process  automation | Class notes |
| 29-32 | Understanding the in- dustrial control sys- tems | Continuous and discrete control systems, computer process control, Theory of  PLC, SCADA and CNC | Class notes and [2]-5 |

**Evaluation Scheme**

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| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage(**%**)** | **Date** & **Time** | **Nature of**  **Component** |
| Mid Sem. Test | 90 Min. | 20 | 6/3 1.30 -3.00 PM | Close Book |
| Quiz | – | 15 | – | Close Book |
| Project | – | 15 | – | – |
| Laboratory | – | 15 | – | – |

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| Comprehension  examination | 3 Hrs. | 35 | 13/05 FN | Partially Open  & Close Book |

**Chamber Consultation Hour:** Will be decided based on Time table and avail- ability 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