Department of Mechanical Engineering
NIT Srinagar
Spring 2020

Course: MEC 605: Introduction to Mechatronics
CLT: 4 3 1 (Credit Lecture Tutorial)
Course Instructor: Majid Hameed Koul

NPTEL link: https://nptel.ac.in/courses/112/103/112103174/

Google Classroom Code: uzm6236

For discussions and doubts, log in to the Google classroom with your email ID's. Useful resources will be shared via classroom interface.

Course Contents:

Overview of Mechatronics System Design, Integrated Design Issues, Mechatronics Design Process, Mechatronics Key Elements, Applications, Examples of Mechatronic Systems from Robotics, Manufacturing, Machine Diagnostics, Road Vehicles and Medical Technology.

Modern Electrical and Electronic Components: Kirchhoff's laws, Equivalent circuits, DC and AC circuit analysis, Transformers. Semiconductor electronics: Junction diode, BJT's and FET's. Analog signal processing using Operational Amplifiers. Theory and applications in mechatronic systems.

Physical System Modelling: Modelling – Direct Method and Analogy Approach, Dynamic characteristics of systems, Modelling Electrical and Mechanical Systems, Translational/Rotational, Case Studies.

Sensors and Actuators: Digital Sensors for Motion Measurement, Force/Torque and Tactile Sensors, Vibration/Flow/Temperature Sensing Devices. DC Motors, Servo Motors, Stepper Motors, Driver Circuits, Hydraulic and Pneumatic, Piezoelectric, Magneto-strictive Actuator theory and application to mechatronic systems.

Embedded Systems: Microcontroller programming and interfacing, Programming a PIC, Interfacing to the PIC, Microcontroller based system design. Mini project on development of a mechatronic product controlled with a PIC microcontroller.

Text Books:

1. Introduction to Mechatronics and Measurement Systems, David Alciatore, Michael Histand, 5th Edition, McGrawHill.

References:

1. The Mechatronics Handbook, Robert Bishop, CRC Press.
2. MATLAB: An introduction with applications, Rao Dukkipati, New Age International.

Useful Webpage: https://mechatronics.colostate.edu/

Course Outcomes (CO's)

Upon completion of this course, a student will be able to:

1. Explain the architecture of various mechatronic systems.
2. Identify and analyze the modern electrical and electronic components used in mechatronic systems.
3. Select and integrate various sensors and actuators to meet a mechatronic product requirement.
4. Determine and analyze the dynamic response of the zero, first and second order mechatronic systems.
5. Program and analyze new mechatronic products using embedded systems.