Sankalchand Patel University
Faculty of Engineering and Technology
First Year Master of Technology - Mechanical Engineering (CAD - CAM)
In Effect from Academic Year 2016-17

Program Code: ET201	
Subject Code: 1ET2010206	**Subject Title:** MECHATRONICS APPLICATIONS IN MANUFACTURING (Elective-II)
Pre-requisite Subject	Fundamentals of Instrumentation, Control and Electronics

Course Objective: To create knowledge in Mechatronic systems and impart the source of concepts and techniques, which have recently been applied in practical situations. It gives a framework of knowledge that allows engineers to develop an interdisciplinary understanding and integrated approach to engineering.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory		Practical		
Lecture	Tutorial	Practical	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total
2	-	2	4	60	40	30	20	150

Subject Contents			
Sr. No	**Topic**	**Total Hours**	**Weight (%)**
01	**INTRODUCTION:** Introduction to Mechatronics, need and applications, elements of Mechatronic systems, role of mechatronics in automation, manufacturing and product development and applications.	3	12
02	**SENSORS AND TRANSDUCERS:** Introduction-Importance of sensors in Mechatronics, Static and Dynamic characteristics of sensors-Performance Terminology-Displacement, Position and Proximity- Velocity and Motion - Fluid pressure - Temperature sensors- -Light sensors -Selection of sensors- Signal processing -Servo systems.	7	28
03	**Hydraulic System:** Actuators, Hydraulic Cylinders and their types, Hydraulic Motors and their types, Valves and their types, symbols for Hydraulic System Components, general hydraulic circuit, different types of hydraulic circuits and hydrostatic transmission.	4	16
04	**Pneumatic Systems:** Introduction to pneumatics, gas laws, compressed air generation and contamination control, pneumatic act uators, valves and control circuits, multiple-actuators circuits, pneumatic applications, maintenance, trouble shooting and safety.	4	16
05	**Computational Elements and Controllers:** Basic concepts of control systems, open loop, closed loop, semi closed loop control system, block and functional diagrams controllers for robotics and CNC, linear and rotary encoders, timers, counters, microprocessors and microcontrollers: architecture and pin details, introduction to PLC, simple programs for process control application based on relay ladder logic-Supervisory Control and Data Acquisition Systems (SCADA) and Human Machine Interface (HMI).	7	28

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.
Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.

Course Outcome: After learning the course the students should be able to

1. Students would understand be able to apply fundamentals of mechatronics for various mechanical systems.
2. Students would be able to use various types of sensors and controllers.
3. Students would be able to analyze hydraulic and pneumatic systems.
4. Students would understand the PLC and application of Mechatronics systems.

List of Experiments:

1. Introduction to Mechatronics.
2. Knowledge of mechanical engineering required for Mechatronics.
3. Overview of sensors and transducers.
4. Hydraulic system and its components.
5. Prepare hydraulic circuit for given application.
6. Pneumatic system and its components.
7. Prepare pneumatic circuit for given application.
8. PLC control of sequencing circuit using PLC ladder diagram.

List of References:

1. Introduction to Mechatronics Appu Kuttan K.K.Oxford University Press.
2. Mechatronics: Integrated Mechanical Electronic Systems Ramchandran K P, Vijayaraghavan Balasundaram, M S.Wiley India.
3. Measurement Systems Design and applications Doeblin E.O., McGraw Hill.
4. Mechatronics: Principle, Concepts and Applications Mahalik N.P. McGraw Hill.
5. Fundamentals of Programmable Logic Controllers, Sensors and Communications Jon Stenersons Prentice Hall, 2004.
6. Mechatronics Bolton W. Pearson Education.
7. Computer Control of Manufacturing Systems Yorem Koren McGraw Hill.
8. Introduction to Mechatronic Design J E Carryer, R M Ohline and T W Kenny Pearson.
9. Mechatronics- Ganesh S. Hegde, Published by Uni versity Science Press (An imprint of Laxmi Publication Private Limited).
10. Mechatronics by H.M.T., Ltd., Tata McGraw Hill Publication Co. Ltd.
11. Pneumatic Controls- Joji P, Wiley India Private Limited.