COURSE CONTENT

MECHATRONICS (Professional Elective – IV)								
II Semester: CAD/CAM								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2424020	**Foundation**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: Mechanical Engineering Fundamentals, Basic Electrical and Electronics Engineering								

Course Overview:

This subject introduces the fundamentals of Mechatronic Systems and Design, covering system elements, sensors, transducers, and signal conditioning. It explores actuators, hydraulic and pneumatic systems, microprocessors, microcontrollers, PLCs, and their applications in control. Students learn system modeling, simulation, data acquisition, and SCADA. Emphasis is placed on integrating mechanical, electronic, and control technologies for advanced mechatronic design and understanding future trends.

Course Objectives:

1. To understand the mechatronics systems.
2. To provide an in-depth understanding of components of knowledge-based systems.
3. To provide an understanding of artificial intelligence.
4. To design and develop automated process planning.
5. To develop group technology for intelligent manufacturing systems.

Course Outcomes: After Completion of the Course, Students should be able to

1. Understand and describe different mechatronics systems.
2. Explain the principle of operation of various solid-state devices.
3. Describe the working of hydraulic and pneumatic actuating systems and use them appropriately.
4. Use program logic controls effectively.
5. Design mechatronic systems.

UNIT - I: Mechatronic Systems and Design Process

Mechatronics Systems, Elements, Levels of Mechatronics System, Mechatronics Design Process, System, Measurement Systems, Control Systems, Microprocessor Based Controllers, Advantages and Disadvantages of Mechatronics Systems. Sensors and Transducers, Types, Displacement, Position, Proximity, Velocity, Motion, Force, Acceleration, Torque, Fluid Pressure, Liquid Flow, Liquid Level, Temperature and Light Sensors.

UNIT - II: Sensors, Transducers and Signal Conditioning

Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS and typical applications.

UNIT - III: Actuators and Drive Systems

Design Consideration, Hydraulic and Pneumatic Actuating Systems, Fluid Systems, Hydraulic and Pneumatic Systems, Components, Control Valves, Electro Pneumatic, Hydro Pneumatic, Electro Hydraulic Servo Systems: Mechanical Actuating Systems and Electrical Actuating Systems.

UNIT - IV: Microprocessors, Microcontrollers and Interfacing

Digital Electronics and Systems, Digital Logic Control, Micro Processors and Micro Controllers, Programming, Process Controllers, Programmable Logic Controllers, PLCs Versus Computers, Application of PLCs for Control.

UNIT - V: System Modeling and Simulation

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to a conversions; Dynamic models and analogies, System response. Design of mechatronics systems and future trends.

TEXT BOOKS:

1. Mechatronics Integrated Mechanical Electronics Systems, K P Ramachandran and GK Vijaya Raghavan, Wiley India Edition, 2008.
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, W Bolton, Pearson Education Press, 3rd Edition, 2005.

REFERENCE BOOKS:

1. Mechatronics Source Book, Newton C. Braga, Thomson Publications, Chennai, 1st Edition, 2002.
2. Mechatronics System Design, Devdas Shetty, Richard A. Kolk, Thomson Learning, 2nd Edition, 2005.
3. Mechatronics, M.D. Singh, J.G. Joshi, Prentice-Hall of India (PHI), 1st Edition, 2006.
4. Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering, W. Bolton, Pearson Education, 4th Edition, 2012.
5. Mechatronics – Principles and Applications, Godfrey C. Onwubolu, Elsevier, Indian Print, 1st Edition, 2006.
6. Introduction to Mechatronics and Measurement Systems, David G. Alciatore and Michael B. Histand, McGraw-Hill Education, 6th Edition, 2023.

ELECTRONIC RESOURCES:

1. https://nptel.ac.in/courses/11210729
2. https://nptel.ac.in/courses/108106132
3. https://nptel.ac.in/courses/112105269
4. https://nptel.ac.in/courses/108105102
5. https://nptel.ac.in/courses/108105064

MATERIALS ONLINE:

1. Course template
2. Tech talk and Concept Video topics
3. Assignments
4. Model question paper – I
5. Model question paper – II
6. Lecture notes
7. E-Learning Readiness Videos (ELRV)