Devi Ahilya Vishwavidyalaya, Indore, India Institute of Engineering & Technology						II Year B. Tech. (Mechanical Engineering) (Full Time)
Course Code & Name	**Instructions Hours per Semester and Credits**					
4RMPC5 **MECHATRONICS**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**		
	30	**10**	**0**	**50**	**90**	**3**

Course Learning Objective:

The course is designed

1. To provide an understanding of the mechatronic systems and their design process.
2. To learn about the response and behavior of the devices that go into a mechatronic product, their interactions and overall behavior of the mechatronic system.
3. To learn about the variety of sensors/tranducers used in mechatronic applications and the processes used for the conditioning of signals.
4. To learn about the methods used for the actuation and control of mechatronic systems.

Pre requisites: Basic course in electrical and electronic devices along with the concepts of digital electronics and a basic course in computer science and engineering.

COURSE CONTENTS

UNIT-I

Introduction to Mechatronics: Introduction to the field of mechatronics, Elements of a mechatronic system, Mechatronic design process, Applications in mechatronics. Introduction to signals & system: Block diagram approach to system modeling, Modeling of electrical, mechanical, translational and rotational, fluid and thermal systems, Measurement of system response, Linearization of non linear systems, Fourier series representation of signals, O/P response of first order and second order systems.

UNIT-II

Sensors & Transducers: Introduction of sensors and transducers, Performance characteristics of sensors and measurement systems,Sensors for motion & position measurement, Force torque & tactile sensors, Flow sensors, Temperature measuring devices, Ultra sonic sensors, Range sensors, Magnetostrictive transducers, Semiconductor, Fiber optic & Microelectromechanical system (MEMS) devices in mechatronics.

UNIT-III

Signal conditioning & recording of data: Basic steps of signal conditioning, Devices for signal conditioning & data conversion : Voltage divider & rectifiers , bridge circuits, Operational and instrumentation amplifiers, filters, comparators & oscillators multiplexers, timers, amplitude modulation & demodulation,voltage to frequency & frequency to voltage converters, pulse width modulation. Analog to digital conversion & digital to analog conversion.

UNIT-IV

Actuators: Introduction, Mechanical actuation systems , Electrical actuation systems: solenoids & relays, electric motors: DC motors , AC motors , Stepper motors, Servo motor drive circuits, selection of a motor, Fluid power actuators: Hydraulic and Pneumatic actuation systems, Piezoelectric actuators.

UNIT-V

Interfacing & control of mechatronic systems: Elements of a data acquisition & control system, Microprocessor and Microcontroller based systems, Overview of input / output systems: Interfacing, I/O addressing, Interface requirements, Peripheral interface adapters, Serial common interface, Input /Output card & software, open systems, Communication interfaces, Voltage regulators and power supplies, Introduction of various control systems, Control modes and control system performance.

BOOKS RECOMMENDED

[1] W.Bolton, *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 4th Ed,* Pearson Education.

[2] Nitai Gour & P.Mahalik, *Mechatronics: Principles, concepts and applications,* Tata McGraw-Hill Publishing Company Ltd.

[3] Alciatore David G. & Histand Michael B., *Introduction to mechatronics and measurement systems, 4th Ed* McGraw-Hill Publication.

[4] Carryer J.Edward, Ohline R.Matthew, Kenny Thomas W., *Introduction to Mechatronic Design,* Pearson Education, Indian Edition 2013.

[5] Ramachandran K.P., Vijayaraghavan G.K., Balasundaram M.S., *Mechatronics Integrated Mechanical Electronic Systems, Wiley India Pvt.Ltd.*

[6] Narka and Choudhary, *Instrumentation, Measurement and analysis* Tata Mc Graw Hill Publishing Company Ltd.

Course Outcome:

Course Out Come (CO)	After completion of the course, students will be able to:
CO1	Acquire the basic knowledge for the application of the core technologies in the areas of mechanics, electronics and information processing to the solution of problems.
CO2	Recognize the need for models of the systems in order to predict their behavior.
CO3	Select and integrate the appropriate devices for the pickup, conditioning and display of signals related to the various processes involved in a mechatronic system.
CO4	Select the suitable actuation system for a mechatronic application.
CO5	Select the suitable control system for a mechatronic application.

CO-PO-PSO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO 1	3	3	3	1	3	0	0	0	0	0	1	3	2	1
CO 2	3	3	1	3	1	0	1	0	0	0	1	3	2	0
CO 3	3	2	3	3	3	1	2	0	0	0	0	3	2	0
CO 4	3	2	3	3	1	0	0	0	0	0	2	3	1	0
CO 5	3	1	3	1	1	0	0	0	0	0	1	3	1	1

* CO (rows) mention nil/very small/insignificant contribution to the PO (column)
1→ relevant and small significance 2 → medium or moderate and 3 →strong