

**B.E. ELECTRONICS ENGINEERING**  
**FOURTH YEAR SEMESTER VIII**

**SUBJECT: Mechatronics**

**Lectures: 4 Hrs per week**  
**Practical: 2 Hrs per week**

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

***Rationale :** Mechatronics is a synergistic combination of Mechanical, Electrical and Computer Engineering and Information Technology, which includes control systems as well as numerical methods to design products. This subject shall lay the foundations of this multidisciplinary field of engineering.*

**DETAILED SYLLABUS**

**Introduction to Mechatronics**

Mechatronics key elements, Mechatronics design process, approaches in Mechatronics

**Modeling and Simulation of Physical System**

Simulation and Block Diagrams, Analogies and Impedance Diagrams, Electrical Systems, Mechanical Translation Systems, Mechanical rotational System , Electromechanical Coupling, Fluid Systems.

**Sensors and Transducers**

Introduction to Sensors and Transducers, Sensors for Motion and Position Measurement , Force, Torque, and Tactile Sensors, Flow Sensors , Temperature - Sensing Devices , Ultrasonic Sensors, Range sensors, Active Vibration Control Using Magnetostrictive Transducers, Fiber Optic Devices in Mechatronics

**Actuating Devices**

Direct Current Motor, Permanent Magnet Stepper Motor, Fluid Power Actuation, Fluid Power Design Elements, Piezoelectric Actuators.

**Hardware Components for Mechatronics**

Transducer Signal Conditioning and Devices for Data Conversion, Programmable Controllers.

**Signals, Systems, and Controls**

Introduction to Signals, Systems, and Controls, System Representation, Linearization of Nonlinear Systems, Time delays, Measures of System Performance, Root Locus and Bode Plots.

**Real - Time Interfacing**

Introduction, Elements of a Data Acquisition and Control System, Overview of the I/O Process, Installation of the I/O Card and Software, Installation of the Application Software, Examples of interfacing.

<b>Closed Loop Controllers</b>
Continuous and discrete processes , control modes, two step mode, proportional mode, derivative control, integral control, PID controller, Digital controllers, Control system performance, Controller tuning, Velocity Control and Adaptive control.
<b>Advanced Applications in Mechatronics</b>
Sensors for Condition Monitoring , Mechatronic Control in Automated Manufacturing, Artificial Intelligence in Mechatronics , Fuzzy Logic Applications in Mechatronics , Fuzzy Logic Applications in Mechatronics, Microsensors in Mechatronics.
<b>BOOKS</b>
<b>Text Books:</b>
<ol style="list-style-type: none"> <li>1. Devdas Shetty and Richard A. Kolk, Mechatronics System Design, Thomson Asia Pte. Ltd., Second Reprint, 2001</li> <li>2. W. Bolton, Mechatronics, Pearson Education Asia, Third Indian Reprint 2001</li> </ol>
<b>Additional Reading:</b>
<ol style="list-style-type: none"> <li>3. David G. Alciatore and Michael B. Histan, Introduction to Mechatronics and Measurement Systems, Tata McGraw Hill, Second Edition, 2003</li> </ol>
<b>TERM WORK</b>
Term work should consist of at least six practicals and four assignments covering the topics of the syllabus. A term work test must be conducted with a weightage of 10 marks.
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.