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Mechatronics — Complete Syllabus (Program Elective-2, Option 1)

BTEUP Diploma in Electronics Engineering • 5th Semester • Session 2026-27
Subject 5.4.1 — Program Elective-2, Option 1 (Practicum) • Total 100 Marks • 3 Credits •
L 1 – P 4 • Choose this OR Signal and Image Processing

Note: No marks-distribution table and no reference-books list are given for this subject in the PDF, so unit weightages and books are not shown.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.4.1	Program Elective-2: Mechatronics	Practicum	1 – 4	3	Practical 60	Practical 40 (3 hrs)	100
Mechatronics Total				3	60	40	100

What This Subject Aims To Do

To understand mechatronics — the integration of mechanical, electrical, electronics, computer and control engineering — for designing advanced, reliable and cost-effective electro-mechanical systems, with growing demand for diploma engineers skilled in installing, operating and maintaining these integrated systems in industry.

Unit-Wise Complete Topic List

Note: no marks-distribution table is given for this subject in the official syllabus, so unit weightages are not shown.

Unit 1 — Introduction (3 Periods)

Topics: Introduction to Mechatronics: Mechatronics; Importance of Mechatronics; Systems: Measurement systems; Control systems and their types; Closed-loop control System; Automatic water level controller; Sequential controllers-washing machine. Mechatronics system architecture: Sensors, signal conditioners, PLC/Embedded controllers, pneumatic, hydraulic and electrical actuators. Introduction to Real Time Mechatronics System

In simple words: What mechatronics is, its system architecture (sensors, controllers, actuators), and everyday examples like a water-level controller and a washing machine.

Unit 2 — Sensors & Switches (3 Periods)

Topics: Sensors: Principle of operation and application of each. Proximity, Motion Sensors, Pressure sensor, High and low temperature measurement sensors, Light Sensors, Selection of Sensors. Switches: Principle, working and applications of-Limit switches, proximity switches like inductive, capacitive and optical (deflecting and through beam type),

In simple words: The senses of a mechatronic system: proximity, motion, pressure, temperature and light sensors, and the switches that detect position and presence.

Unit 3 — Electrical & Mechanical System (3 Periods)

Topics: Electric actuators, Stepper motor, servo motors, DC motor, DC brushless motors, AC motor (Only diagram). Relays Principle of operation and application, latching, triggering, Types of relays- solid state. Hydraulic systems: Physical components of hydraulic systems. Pneumatic systems: Air compressors, filters and regulators.

In simple words: The muscles: electric motors (stepper, servo, DC, brushless, AC), relays, and hydraulic and pneumatic systems.

Unit 4 — Signal Conditioners (3 Periods)

Topics: Need of isolators, filters, amplifiers, fluid amplifiers, and optical amplifiers mechatronics systems. Computer Aided Control Systems: CNC Machines: various blocks of CNC machine, advantages of CNC, Part programming of CNC machines, G codes and M codes, small application programs, CNC based machine example.

In simple words: Conditioning sensor signals for use, and CNC machines: their blocks, advantages, and part programming with G and M codes.

Unit 5 — Introduction to SCADA and PLC (2 Periods)

Topics: SCADA: Data acquisition system, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Applications, Interfacing of PLC to SCADA. Case studies of mechatronics systems: A Microcontroller based pick-and-place robot, Microcontroller based antilock brake system.

In simple words: SCADA and PLC: supervising and controlling industrial processes, and two case studies — a pick-and-place robot and an antilock brake system.

Practical Work

- Familiarize students with measurement systems and control systems, including the working principle of closed-loop control systems.
- Design and implement an automatic water level controller system, which uses sensors to control the water flow into a tank.
- Implement a sequential control system, such as a washing machine controller, using a microcontroller or PLC.
- Study the integration of sensors, signal conditioners, actuators, and controllers in a mechatronics system, with a focus on industrial applications.
- Understand the principle of operation and applications of proximity sensors.
- Study how motion sensors detect and respond to movement.
- Study the operation and applications of pressure sensors.
- Study the principle and applications of LDR, photodiodes, and phototransistors.
- To understand the working principle and applications of electric actuators.
- To understand the working principle and applications of stepper motors, Servo motor, DC motors, DC brushless motors.
- To understand the principle of operation and applications of relays (including latching, triggering, and solid-state relays).
- To understand the function and need for various isolators, filters, amplifiers, and their applications in mechatronics systems.
- To understand the components, working, and programming of CNC machines and the role of computer-aided control systems in mechatronics.
- To simulate and troubleshoot common CNC machine operations and errors.
- To understand the SCADA system, its components, and its role in data acquisition, communication, and supervisory control.
- To understand the principles of PLC programming, its block diagram, and its application in real-time systems.
- To explore various microcontroller-based mechatronics systems by designing, simulating, and implementing real-world applications.

Reference Books

Reference books are not listed for this subject in the official syllabus.

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Source: BTEUP 3rd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.

Please confirm with your own polytechnic for any local changes.

