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Industrial Automation and Control — Complete Syllabus (Program Elective-1, Option 1)

BTEUP Diploma in Electrical Engineering • 4th Semester • Session 2026-27

Subject 4.4.1 (Program Elective-1, Practicum) • Total 100 Marks • 3 Credits • L 1 - P 4 •

Choose this OR Industrial Instrumentation and Condition Monitoring

Please note — cover year vs approval: BTEUP's own file for this curriculum prints "YEAR 2025-2026" on its cover, while carrying the approval line "UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026" on every page. It is filed in BTEUP's 2026-27 folder (folder2627), so it is treated here as the 2026-27 syllabus on the strength of that approval. The scheme it carries is identical, subject for subject and mark for mark, to the 2025-26 scheme.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
4.4	Program Elective -1: Industrial Automation and Control	Practicum	1 - 4	3	60	40 (3 hrs)	100
Industrial Automation and Control Total				3	60	40	100

What This Subject Aims To Do

To help students maintain industrial automation systems.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
I	Introduction to Industrial Automation	02	17%
II	PLC Fundamentals Building blocks of PLC	02	17%
III	PLC Programming and Applications	05	28%
IV	Electric Drives and special machines	02	19%
V	Supervisory Control and Data Acquisition (SCADA) System	03	19%

Unit - I: Introduction to Industrial Automation (02 Periods, 17%)

Topics: Need and benefits; Types of automation system: Fixed, Programmable, Flexible; Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives.

Unit - II: PLC Fundamentals Building blocks of PLC (02 Periods, 17%)

Topics: Components of PLC - CPU, Memory organization, Input-output modules (discrete and analog), I/O Modules, Power supply, Fixed and Modular PLC, Redundancy in PLC module, I/O module selection criteria, Interfacing different I/O devices with appropriate I/O modules.

Unit - III: PLC Programming and Applications (05 Periods, 28%)

Topics: PLC I/O addressing; PLC programming Instructions: Relay type instructions, Timer instructions: On delay, off delay, retentive, Counter instructions: Up, Down, High speed, Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions; PLC programming language: Functional Block Diagram (FBD), Instruction List, Structured text, Sequential Function Chart (SFC), Ladder Programming; Simple Programming examples using ladder logic: Language based on relay, timer counter, logical, comparison, arithmetic and data handling instructions; PLC Based Applications: Motor sequence control, Traffic light control, Elevator control, Tank Level control, Conveyor system, Stepper motor control.

Unit - IV: Electric Drives and special machines (02 Periods, 19%)

Topics: Electric drives: Types, functions, characteristics, four quadrant operation; DC and AC drive controls: V/F control, Parameters, direct torque control; Drives: Specifications, Applications - Speed control of AC motor / DC Motor.

Unit - V: Supervisory Control and Data Acquisition (SCADA) System (03 Periods, 19%)

Topics: Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA; Various editors of SCADA; Interfacing SCADA system with PLC: Typical connection diagram, Object Linking & embedding for Process Control (OPC) architecture, Steps in Creating SCADA Screen for simple object, Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program using OPC; Applications of SCADA: Traffic light control, water distribution, pipeline control.

Practical Work

- Unit I — Identify various automation systems available in different appliances/ devices/ machines in day-to-day use.
- Unit II — Identify various parts of the given PLC and front panel status indicators.
- Unit III — Use PLC to test the START STOP logic using two inputs and one output.
- Unit III — Develop/Execute a ladder program for the given application using following: timer, counter, comparison, logical, arithmetic instructions.
- Unit III — Use PLC to control the following devices like lamp, motor, push button switches, proximity sensor.
- Unit III — Measure the temperature of the given liquid using RTD or Thermocouple and PLC.
- Unit III — Develop and test ladder program to blink the LED/lamp.
- Unit III — Develop ladder program for Traffic light control system.
- Unit III — Develop and test ladder program for pulse counting using limit switch / Proximity sensor.
- Unit III — Develop and test ladder program for rotating stepper motor in forward and reverse direction at constant speed.
- Unit IV — Identify various front panel controls of VFD (smart drive).
- Unit V — Use various functions of SCADA simulation editors to develop simple project.
- Unit V — Develop a SCADA mimic diagram for Tank level control.

Reference Books (as listed in the syllabus)

- Dunning, G., Introduction to Programmable Logic Controllers, Thomson / Delmar learning, New Delhi, 2005, ISBN 13: 9781401884260
- Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN: 9788174092281
- Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386
- Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN: 9780130607188

- Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN: 9780130618900
- Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174
- Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097

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