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Control System & PLC — Complete Syllabus (Program Elective-1, Option 1)

BTEUP Diploma in Electronics Engineering • 5th Semester • Session 2026-27

Subject 5.2.1 — Program Elective-1, Option 1 (Theory) • Total 100 Marks • 3 Credits • L 3

– P 0 • Choose this OR Microwave and Radar OR Digital Communication Systems

Note: Unit 1 in the PDF prints “Close App Control System” (sic); it is reproduced exactly as printed.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.2.1	Program Elective-1: Control System & PLC	Theory	3 - 0	3	Theory 40	Theory 60 (3 hrs)	100
Control System & PLC Total				3	40	60	100

What This Subject Aims To Do

To provide a solid understanding of control system principles — open-loop and closed-loop systems, feedback and stability analysis — to model and analyse control systems, apply PID control, and implement PLC programming (Ladder Logic, Function Block Diagram) for industrial automation, with hands-on experience in designing, implementing and troubleshooting PLC-based systems.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
1	Introduction to Control System	9	21%
2	Transfer Function	6	14%
3	Time Domain Analysis and Stability Theory	10	24%
4	Basic Controllers	7	17%
5	Introduction to PLC and Instruction Set	10	24%

Unit 1 — Introduction to Control System (9 Periods, 21%)

Topics: Open loop Control System and Close App Control System - block diagram and its elements, properties and application (with example) and Comparison between open and close loop Control System, Block diagram of feedback Control System and its elements, Definition and Explanation of the following Control System - Linear and Non-linear System, Continuous and Discrete System, Static and dynamic System

In simple words: Open-loop vs closed-loop control, feedback, and the basic types of control systems — linear/non-linear, continuous/discrete, static/dynamic.

Unit 2 — Transfer Function (6 Periods, 14%)

Topics: Definition of Transfer function and its use in Control System, Transfer function of the following: Open loop and Close Loop System, Simple RC low pass and High pass filter, Characteristic Equation, Pole-Zero Concept of Transfer Function, Initial value and final value theorem.

In simple words: The transfer function: a mathematical model of a system, its poles and zeros, and the initial- and final-value theorems.

Unit 3 — Time Domain Analysis and Stability Theory (10 Periods, 24%)

Topics: Time response of first order system with unit step input, Time response of second order system with unit step input, Basic idea of delay time, rise time, setting time, steady state error, max overshoot, damping ratio (No Derivation), Over damped, under damped, critically damped, un damped system (basic idea only) and Pole-zero representation, Nature of transit response, Damping ratio (No Derivation), Basic concept of stability analysis by Routh-Hurwitz Criterion

In simple words: How a system responds over time to a step input — rise time, overshoot, damping — and the Routh-Hurwitz test for whether it is stable.

Unit 4 — Basic Controllers (7 Periods, 17%)

Topics: Introduction to controllers, need of controller, Type of controller (Basic idea and Mathematical expression only): (a) On-off controller b) Proportional controller c) PD controller d) PI controller e) PID controller

In simple words: The controllers that keep a system on target: on-off, proportional, PD, PI and the workhorse PID controller.

Unit 5 — Introduction to PLC and Instruction Set (10 Periods, 24%)

Topics: Concept of PLC, building block of PLC, function of various blocks, limitation of relays, advantage of PLC over electromagnetic relays, different programming languages, PLC manufacturer, working of PLC, basic operation and principles of PLC, architectural details. Basic instructions like latch, master control self-holding relays, timer instruction like retentive timers, resetting of timers, counter instructions like up counter, resetting of counters.

In simple words: The programmable logic controller: its blocks, why it replaced relay panels, its programming languages, and its basic instructions — latches, timers and counters.

Reference Books (as listed in the syllabus)

- Modern Control Engineering, K. Ogata, PHI Publications.
- Control System Engineering I.J. Nagrath and M. Gopal, New Age International Publishers.
- Linear Control Systems, B.S. Manke, Khanna Publishers.
- Introduction to PLCs, Gary Dunning, Tata McGraw Hill.
- Control System (With MATLAB Programs), Sonveer Singh and Sanjay Agrwal, I. K. International

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.

