GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Electrical Engineering
Semester	VII	Version	1.0.0.0
Effective from Academic Year	2025-2026	Effective for the batch Admitted in	July 2022
Course code	2EE71PE3	Course Name	Control System Design

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

-

Course Outcomes:

On successful completion of the course, the students will be able to:

CO1	Understand designing parameter for good control system.
CO2	Interpret difference between time domain and frequency domain design constraint.
CO3	Design of P, PI and PID control system with feedback
CO4	Analyse control system based on their state space equations and also nonlinearity effect on system performance.

Theory syllabus

Unit	Content	Hrs
1	**Design Specifications:** Introduction to design problem and philosophy, Introduction to time domain and frequency domain design specification and its physical relevance, Effect of gain on transient and steady state response, Effect of addition of pole on system performance, Effects of addition of zero on system response.	**09**
2	**Design of Classical Control System in the Time Domain:** Introduction to compensator, Design of Lag, lead lag-lead compensator in time domain, Feedback and Feed forward compensator design, Feedback compensation, Realization of compensators.	**10**
3	**Design of Classical Control System in Frequency Domain:** Compensator design in frequency domain to improve steady state and transient response, Feedback and Feed forward compensator design using bode diagram.	**09**
4	**Design of PID Controllers:** Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems, Control loop with auxiliary feedback – Feed forward control.	**09**
5	**Control System Design in State Space:** Review of state space representation, Concept of controllability & observability, effects of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback, Ackerman's Formula for feedback gain design, LQR control design, Design of Observer, Separation Principle.	**08**

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	N. Nise, "Control system Engineering", John Wiley.
2.	I. J. Nagrath and M. Gopal, "Control system engineering", Wiley.

Reference Books

1.	M. Gopal, "Digital Control Engineering", Wiley Eastern.
2.	K. Ogata, "Modern Control Engineering", Prentice Hall.
3.	J. J. D'Azzo and C. H. Houpis, "Linear control system analysis and design (conventional and modern)", McGraw Hill.
4.	R.T. Stefani and G.H. Hostetter, "Design of feedback Control Systems", Saunders College Pub.

ICT/MOOCS

1.	https://nptel.ac.in/courses/115/108/115108104/
2.	https://nptel.ac.in/courses/108/107/108107115/
3.	https://nptel.ac.in/courses/108/103/108103007/
4.	https://nptel.ac.in/courses/108/106/108106024/

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	0	0	2	0	0	2	0	1	1	2	3	1
CO2	2	0	2	0	0	1	0	0	1	2	1	2	1	3	2
CO3	3	0	2	0	2	2	0	0	1	0	2	2	2	2	1
CO4	3	2	2	0	0	1	0	0	2	0	2	2	2	1	1