

DEPARTMENT OF ELECTRICAL ENGINEERING
GOVERNMENT POLYTECHNIC, BARGARH



LESSON PLAN

CONTROL SYSTEM ENGINEERING (TH 3)

6TH SEMESTER

ELECTRICAL ENGINEERING

PREPARED BY SMT. PRITEE P. MINZ

SR. LECTURER (ELECTRICAL)

DEPARTMENT OF ELECTRICAL ENGINEERING

VISION:

To produce Electrical Engineer professionals who can contribute for socio-economic and technological development to meet global needs.

MISSION:

M1 - To strengthen academic infrastructure leading to quality professional by using modern technical tools and technologies.

M2 - To impart innovative knowledge among the students and make more industry-institution programs to make them successful professionals for serving the society.

M3 - To provide a learning environment to improve problem solving abilities, leadership abilities, ethical responsibilities and lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Apply electrical engineering knowledge and practical skills to solve well-defined engineering problems using modern tools and techniques.

PEO2: Perform effectively in industry and society as competent junior engineer, supervisors, or entrepreneurs with ethical and sustainable engineering practices.

PEO3: Demonstrate teamwork, communication, leadership, and project management skills in professional engineering activities.

PEO4: Engage in lifelong learning and adapt to emerging technologies for career growth and higher education.

PROGRAM SPECIFIC OUTCOMES

The electrical diploma engineers will be able to:

PSO1:- Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate engineering problems of electric circuits, analog and digital electronics, control system, electrical machines and power system.

PSO2:- Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multidisciplinary environments.

PSO3:- Work professionally in power systems engineering, Electrical machinery and electrical circuit.

DISCIPLINE: ELECTRICAL ENGG.		SEMESTER: 3rd	NAME OF THE TEACHING FACULTY: Pritee Prava Minz, Sr. Lecturer (EE)
SUBJECT: Control System Engineering (TH 3)			
NO. OF DAYS/ WEEK CLASS ALLOTTED – 75 Hrs			
SEMESTER FROM DATE: 22.12.2025 to 18.04.2026			
WEEK	CLASS DAY	THEORY TOPICS TOPIC COVERED	
1	1	FUNDAMENTAL OF CONTROL SYSTEM Classification of Control system , Open loop system & Closed loop system and its comparison	
	2	Effects of Feed back	
	3	Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)	
	4	Servomechanism	
2	5	MATHEMATICAL MODEL OF A SYSTEM Transfer Function & Impulse response, Properties, Advantages & Disadvantages of Transfer Function	
	6	Poles & Zeroes of transfer Function	
	7	Simple problems of transfer function of network.	
	8	Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)	
	9	CONTROL SYSTEM COMPONENTS Components of Control System,	
3	10	Gyroscope, Synchros	
	11	Tachometer	
	12	DC servomotors, Ac Servomotors.	
	13	BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS Definition: Basic Elements of Block Diagram	
	14	Canonical Form of Closed loop Systems	
4	15	Rules for Block diagram reduction, Procedure for of Reduction of Block Diagram	
	16	Simple Problem for equivalent transfer function	
	17	Basic Definition in Signal Flow Graph & properties	
	18	Construction of Signal Flow graph from Block diagram	
5	19	Mason's Gain formula Simple problems in Signal flow graph for network	
	20	Mason's Gain formula Simple problems in Signal flow graph for network	
	21	Mason's Gain formula Simple problems in Signal flow graph for network	
	22	Performance Test I	
6	23	TIME RESPONSE ANALYSIS. Time response of control system.	
	24	Standard Test signal.	
	25	Time Response of first order system with: Unit step response, Unit impulse response.	
	26	Time response of second order system to the unit step input.	
7	27	Time response specification.	
	28	Numerical on Time response specification.	
	29	Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error	
	30	Steady state error and error constants	
	31	Numerical on Steady state error and error constants	
8	32	Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]	
	33	Effect of adding poles and zero to transfer function.	
	34	Response with P, PI, PD and PID controller.	
	35	ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE. Root locus concept	
	36	Effect of location of pole on stability	
9	37	Construction of root loci	
	38	Rules for construction of the root locus	

10	39	Rules for construction of the root locus
	40	Numerical on Root locus
	41	Numerical on Root locus
	42	Numerical on Root locus Effect of adding poles and zeros to $G(s)$ and $H(s)$
	43	Effect of adding poles and zeros to $G(s)$ and $H(s)$
11	44	FREQUENCY RESPONSE ANALYSIS. Correlation between time response and frequency response.
	45	Polar plots: Procedure to sketch polar plot
	46	Concept of stability by Polar plot
12	42	Polar plot for different type of system.
	43	Bode plots: Procedure to sketch Bode Plot
	44	Bode Plot for Type 0 system
	45	Bode Plot for Type 1 system
	46	Bode Plot for Type 2 system
13	47	Concept of stability by Bode Plot
	48	All pass and minimum phase system
	49	Computation of Gain margin and phase margin
	50	Log magnitude versus phase plot
	51	Closed loop frequency response.
	52	NYQUIST PLOT Principle of argument.
	53	Nyquist stability criterion
14	54	Nyquist plot for Type 0 system
	55	Nyquist plot for Type 1 system
	56	Nyquist plot for Type 2 system
	57	Concept of stability by Nyquist plot
	58	Nyquist stability criterion applied to inverse polar plot.
15	59	Effect of addition of poles and zeros to $G(S)$ $H(S)$ on the shape of Nyquist plot
	60	Assessment of relative stability
	61	Constant M circle
16	62	Constant N circle
	63	Nicholas chart
	64	Performance Test II
	65	Practice of previous semester exam paper
	66	Practice of previous semester exam paper
17	67	Practice of previous semester exam paper
	68	Practice of previous semester exam paper
	69	Practice of previous semester exam paper
	70	Practice of previous semester exam paper
	71	Practice of previous semester exam paper
	72	Practice of previous semester exam paper

Signature of the Subject Teacher

Signature of the HOD