

**GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING (A)
MADHURAWADA, VISAKHAPATNAM**

SCHEME OF COURSE WORK

Course Details:

Course Title	: Control Systems		
Course Code	: 22EE1104	L T P C	:3 0 0 3
Program:	: B.Tech.		
Semester	: III		
Prerequisites	: Physics		
Courses to which it is a prerequisite	: - Physics, Ordinary Differential Equation and Vector Calculus, Ordinary Differential Equation and Vector Calculus		

Course Outcomes (COs):

CO1:	Evaluate the performance and benefits of basic open loop and closed loop systems.
CO2:	Determine transfer function from block diagram using reduction techniques
CO3:	Determine the time response and stability of linear time invariant systems
CO4:	Test the stability of systems using Bode plot, Polar plot and Nyquist criterion
CO5:	Assess the state space model and test the controllability and observability

Program Outcomes (POs):

A graduate of B.Tech will be able to

1	Be on par with those from any advanced institution.
2	Take up any job either in the core industry (or) in allied disciplines.
3	Fit to write any competitive examinations for getting selected either for M.S. program (or) to undertake relevant career at a high end.
4	Develop a techno ethical personality that makes him serve the people in general & Electrical & Electronics Engineering in particular.
5	Enable the students adopt themselves in any socio-technological situation.
6	Develop communication and leadership skills so that the candidates in their future become leaders in the industry & academia.
7	Make students do projects either of fundamental nature (or) of the ones useful to industry such that in either case they enter the frontiers of research.
8	Have a basic capability to analyze and /or design an electrical &electronics system and be useful to the community in general.
9	Function effectively as an individual and also as a member and leader in diverse teams.
10	Communicate effectively problems of his discipline to the experts of other disciplines.
11	Have sufficient working knowledge in IT tools for him to correctly model the system and predict the solution.
12	Prepare for a life-long learning in the broadest context of technological changes.

Course Outcome Versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	3	3	2	-	3	2	3	-	-	2
CO-2	3	3	3	3	2	-	3	2	3	-	-	2
CO-3	2	-	3	3	2	-	2	2	2	2	-	2
CO-4	3	3	3	3	3	3	3	3	3	3	3	3
CO-5	2	2	2	2	2	2	2	2	2	2	1	2

3 - Strongly correlated, 2 - Moderately correlated, 1- Weakly Correlated *Blank - No correlation*

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Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam
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Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	System representation – Classification of systems – Open loop control - Feedback control – Benefits of feedback –.	CO-1	1. Classify control systems. 2. What are the benefits of feedback.	Lecture/ Discussion	Assignment-1 Week 1-4
2	Open – loop and closed-loop systems – Industrial control examples	CO-1	1. Give examples for open loop and closed loop systems.	Lecture/ Discussion	Assignment-1 Week 1-4
3	Mathematical models of Physical systems- Transfer function models of linear time-invariant systems- Electrical, Mechanical and Electro-Mechanical Systems- Electrical Analogues-	CO-1	1. Compare electrical systems with mechanical systems. Indicate the analogy.	Lecture/ Discussion	Assignment-1 Week 1-4
4	Block diagram and their Reduction techniques, Signal flow graphs,	CO-1	1. What are block diagram reduction rules? 2. For the given block diagram, reduce the block diagram into a single transfer function by	Lecture/ Discussion	Assignment-1 Week 1-4

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			block diagram reduction rules.		
5	AC and DC servo motors, Potentiometer pair, Synchros.	CO-2	1. Explain the operation of a synchro 2. Obtain the transfer function of a DC servomotor?	Lecture/ Discussion	Assignment-1 Week 5-7
6	Concept of stability – Absolute stability and relative stability – Routh - Hurwitz criterion.	CO-2	1. What is Routh Hurwitz criterion. 2. Define stability. What is absolute stability.	Lecture/ Discussion	Assignment-1 Week 5-7
7	Revision	CO-2		Lecture/ Discussion	Assignment-1 Week 5-7
8	Revision	CO-3		Lecture/ Discussion	Quiz-1
9	MID EXAMINATION				
10	Time domain Analysis: Standard test signals. Time responses of first order and second order systems for standard test inputs. Design specifications for second-order systems-Steady state error -Static and generalized error	CO-3	1. Obtain the time response specifications of a second order system for a standard test signal such as step input.	Lecture/ Discussion	Assignment-2 Week 10-13

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	constants.				
11	ROOT LOCUS TECHNIQUE Construction of root-loci	CO-3	1. What are the construction rules for root loci?	Lecture/Dicussion	Week 10-13
12	Introduction to frequency domain specifications - Relationship between time and frequency responses, Polar plots, Bode plots, Stability analysis using gain margin and phase margin. Nyquist stability criterion, Relative stability using Nyquist criterion.	CO-3	1. What is nyquist criterion? 2. How is relative stability established using Nyquist criterion.	Lecture/ Discussion	Assignment-2 Week 10-13
13	Compensation Techniques: Types of compensators, and design of Lag, Lead and Lag-Lead compensators using Bode plots,	CO-3	1. Elaborate on the methods of design of lag, lead and lag-lead compensators.	Lecture/ Discussion	Assignment-2 Week 10-13
14	P, PI, PD and PID controllers.	CO-3	Compare PI & PD controllers.	Lecture/ Discussion	Assignment-2 Week 10-13

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15	Concept of state variables- State space model-	CO-4	1. What are the advantages of state space model.	Lecture/ Discussion	Assignment-2 Week 14-15
16	Diagonalization of a matrix- Solution of state equations- Eigenvalues and stability analysis-	CO-4	1. How do you obtain the solution for the state equation.	Lecture/ Discussion	Assignment-2 Week 14-15
17	State Transition Matrix- Concepts of controllability and observability.	CO-5	1. What are the properties of state transition matrix.	Lecture/ Discussion	Assignment-2 Week 15-17
18	Revision	CO-5	-	Lecture/ Discussion	Assignment-2 Week 15-17
19	Revision	-	-	Lecture/Dicussion	Quiz-2
20	MID EXAMINATIONS & FINAL EXAMINATION	-	-	-	-