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Department of Electrical Engineering	
Control Systems (63343)	
Total Credits	**3**
major compulsory	
Prerequisites	P1 : Systems &Signal Analysis (63321) OR System &Signal Analysis (63373) OR Systems &Signal Analysis (69230)

Course Contents

Mathematical Modeling, Review of Laplace transform and the transfer function, Root Locus, Quantifying Performance, Cascade Root Locus Design, Cascade Root Locus Design, Motor speed control : A case study, Solution of differential equations, Position Control: A case study

	Intended Learning Outcomes (ILO's)	Student Outcomes (SO's)	Contribution
1	an ability to apply knowledge of calculus, differential equations, linear algebra, complex variables, Laplace transforms, physics, and engineering science to solve control system problems	A	40 %
2	an ability to design a control system to meet specified requirements	C	20 %
3	an ability to identify, formulate, and solve control system problems	E	20 %
4	an ability to use Bode, root locus, Nyquist, state variable, and Matlab-based methods to solve control system engineering problems	K	20 %

Textbook and/ or Refrences

1. John Dorsey, Continuous and discrete control systems, international edition, 2002, McGraw-Hill. 2. DAzzo and Houpis,Linear control system analysis and design conventional and modern, 3rd edition , 1988, McGraw-Hill.

Assessment Criteria	Percent (%)
First Exam	20 %
Second Exam	20 %
Homeworks	10 %
Final Exam	50 %

Course Plan

Week	Topic
1,2,3	Mathematical Modeling Electrical circuits, state concepts, and Mechanical translation and rotational systems.
4	Review of Laplace transform and the transfer function.
5,6	Introducing feedback Overview, Basic Formulation, Routh Criterion, and transient behavior, and steady state error. Midterm I Exam
7,8	Root Locus Exchanging Algebra for Geometry (Polar Formulation; Graphical Representation), Rules of root locus, Negative gain Root Locus, and polynomial Factorization
9,10	Quantifying Performance Normalized Second-Order systems, step response of TN2 (Period of oscillation, time to peak, percent overshoot, settling time, and rise time), Figure of Merits, Steady state accuracy (close-loop Formulation, Unity feedback formulation).
11	Cascade Root Locus Design Proportional Plus Derivative, Cascade lead Compensation,

	Proportional Plus Integral Compensation, Lag Compensation, and PID and Lead/Lag Compensation. Midterm II Exam
12	Motor speed control : A case study New Identification procedure, identification of dc motor with and without cylinder, compensator design and implementation, integral control, PI control.
13	Solution of differential equations State-variable equations, characteristic values, state transition matrix, complete solution of the state equation.
14	Position Control: A case study Model identification, pulse identification of transfer function, lead compensation.