FUTURE INSTITUTE OF ENGINEERING AND MANAGEMENT

Department of Electrical Engineering

Control Systems Laboratory

Description: Control Engineering Laboratory takes care of teaching at the undergraduate level in basics of control and instrumentation, modelling, simulation, optimization and intelligent methods. Control systems lab is well equipped with all academic experiments and having cathode ray oscilloscopes (CRO's), controllers (PID), MATLAB software package, stepper motor control kit, voltage and current measuring devices etc. Through hands on experiment with real components & equipments, students can gain practical exposure.

Major Facilities	: Equipped with both simulation and hardware set up
Faculty In-Charge	: Dr. Dipayan Nath, M.E, Ph.D.
Technician	: Mr. Sunam Saha, B Tech
Area	: Software Lab - 73.81sq.m
	Hardware Lab - 56.7sq.m
No. of experiments /Systems	: 23
Courses conducted	: Control Systems Lab I
	Control Systems Lab II
Exclusive / Shared	: Exclusive

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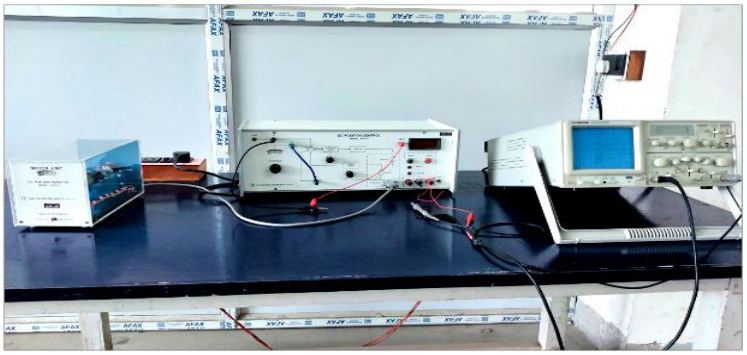
Control Systems Laboratory



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List of Major Equipment

Sl.No.	Major Equipments	Quantity
1	D.C position control unit	3
2	Linear system simulation unit	1
3	PID controller unit	3
4	Hardware Set up for Bode Plot	1
5	Cathode Ray Oscilloscope	6
6	Function Generator	4
7	Digital Signal Oscilloscope	1
8	Computer	27
9	MATLAB software package with simulink tool box	

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CONTROL SYSTEM I

List of Experiments as per Syllabus

Sl.No	Name of the Experiment
1	Familiarization with MATLAB control system tool box, MAT-Lab- simulink tool box & P-SPICE .
2	Determination of Step response for first order & Second order system with unity feedback on CRO & calculation of control system specification like Time constant, % peak overshoot, settling time etc. from the response.
3	Simulation of Step response & Impulse response for type-0, type-1 & Type-2 system with unity feedback using MATLAB & PSPICE.
4	Determination of Root locus, Bode plot, Nyquist plot using MATLAB control system tool box for 2nd order system & determination of different control system specification from the plot.
5	Determination of PI, PD and PID controller action of first order simulated process.
6	Determination of approximate transfer functions experimentally from Bode plot.
7	Evaluation of steady state error, setting time , percentage peak overshoot, gain margin, phase margin with addition of Lead Compensator & by Compensator in forward path transfer function unity feedback control system using PSPICE or otherwise.
8	Study of a practical position control system & determination of control system specification for variation of system parameters.

List of Experiments beyond the Syllabus

Sl.No	Name of the Experiment
1	To observe the characteristics of Filter through Matlab Simulation
2	Design a cascade PID Controller using Root Locus method
3	Effect of using PID controller in Time response specification of a second order system

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CONTROL SYSTEM II

List of Experiments as per Syllabus

Sl. No.	Name of the Experiment
1	Study of a practical position control system obtaining closed step responses for gain setting corresponding to over-damped and under-damped responses. Determination of rise time and peak time using individualized components by simulation. Determination of un-damped natural frequency and damping ratio from experimental data.
2	Tuning of P, PI and PID controller for first order plant with dead time using Z-N method. Process parameters (time constant and delay/lag) will be provided. The gain of the controller to be computed by using Z-N method. Steady state and transient performance of the closed loop plant to be noted with and without steady disturbances. The theoretical phase margin and gain margin to be calculated manually for each gain setting
3	Design of Lead, Lag and Lead-Lag compensation circuit for the given plant transfer function. Analyze step response of the system by simulation.
4	Obtain Transfer Function of a given system from State Variable model and vice versa. State variable analysis of a physical system - obtain step response for the system by simulation.
5	State variable analysis using simulation tools. To obtain step response and initial condition response for a single input, two-output system in SV form by simulation.
6	Performance analysis of a discrete time system using simulation tools. Study of closed response of a continuous system with a digital controller and sample and hold circuit by simulation.
7	Study of the effects of nonlinearity in a feedback controlled system using time response. Determination of step response with a limiter nonlinearity introduced into the forward path of 2nd order unity feedback control systems. The open loop plant will have one pole at the origin and other pole will be in LHP or RHP. To verify that (i) with open loop stable pole, the response is slowed down for larger amplitude input (ii) for unstable plant, the closed loop system may become oscillatory with large input amplitude by simulation
8	Study of effect of nonlinearity in a feedback controlled system using phase plane plots. Determination of phase plane trajectory and possibility of limit cycle of common nonlinearities.

List of Experiments beyond the Syllabus

Sl. No.	Name of the Experiment
1	DC motor Position control using PID Controller
2	State Feedback pole placement Controller design using Matlab Command
3	State Transition Matrix calculation using (i)Laplace Transform (ii)Matrix Diagonalization ,(iii)Vandermonde Matrix
4	Lyapnouv Stability Analysis using Matlab