INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad – 500043

Electrical and Electronics Engineering

List of Laboratory Experiments

CONTROL SYSTEMS LABORATORY								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AEED14	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		0	0	3	1.5	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes:36**		
Branch: EEE	**Semester: IV**	**Academic Year: 2023-24**				**Regulation: UG20**		

Course overview:

The Control Systems laboratory course is indeed to train the students practically on the modelling, analysis and design of linear feedback control systems. This course deals with modelling of dynamical systems, and the control components and designing the compensator. The hands on training in the laboratory enable students to apply and modelling control principles in various areas of industrial applications.

Course objectives:

The students will try to learn:

I. The estimation of stability of dynamical systems using Digital simulation
II. The various techniques of modeling and analyzing system's performance
III. Design the time and frequency response of system by both classical and modern techniques.

Course outcomes:

After successful completion of the course, students should be able to:

CO1: Make use of the knowledge of digital simulation tool for system analysis with different standard Inputs.

CO2: Model the dynamic systems in transfer function using digital simulation tool and validate the performance characteristics of motors.

CO3: Analyze and select various electronics devices for improving system performance along with tuning mechanism in virtual environment

CO4: Experiment the types of compensation techniques for improving the system's accuracy.

CO5: Analyze the system's stability in time and frequency domain by computing gain and phase margin.

WEEK NO	EXPERIMENT NAME	CO
WEEK – I	**TIME RESPONSE OF SECOND ORDER SYSTEM** a. To determine response of first order and second order systems for step input for several of constant 'K' using linear simulator unit and compare theoretical and practical results. b. Examine the time response of a given second order system with time domain specifications using MATLAB.	CO1
WEEK – II	**TRANSFER FUNCTION OF DC MOTOR** Determine Transfer function of armature controlled dc motor a. Perform the load test on dc motor and speed control by armature voltage control on dc motor. b. Determine the transfer function, time response of DC motor and verification with MATLAB.	CO2

WEEK – III	**TRANSFER FUNCTION OF AC SERVO MOTOR**	**CO2**
	a. Study of AC servomotor and plot its torque speed characteristics. b. Transfer Function of Ac Servo Motor using MATLAB.	
WEEK – IV	**EFFECT OF VARIOUS CONTROLLERS ON SECOND ORDER SYSTEM**	**CO3**
	c. Study the effect of P, PD, PI and PID controller on closed loop second order systems. d. Analyze the effects of various controllers on a second-order system using the control system toolbox.	
WEEK – V	**COMPENSATOR**	**CO4**
	Study of Lag, Lead, Lead - Lag compensation networks and obtain its frequency response with its magnitude, phase plots	
WEEK – VI	**TEMPERATURE CONTROLLER**	**CO3**
	a. Study the performance of PID controller used to control the temperature of an oven. b. To study the performance of a PID controller in controlling the temperature of an oven by using MATLAB.	
WEEK – VII	**DESIGN AND VERIFICATION OF OP-AMP BASED PID CONTROLLER**	**CO3**
	Implementing the design and verification of an op-amp based PID controller involves a combination of analog circuit design and simulation using tools like MATLAB.	
WEEK –VIII	**STABILITY ANALYSIS USING DIGITAL SIMULATION**	**CO5**
	Stability analysis of a linear time-invariant system using root locus, Bode plot, polar plot, and Nyquist criterion through digital simulation. MATLAB	
WEEK - IX	**STATE SPACE MODEL USING DIGITAL SIMULATION**	**CO5**
	Verification of state space model from transfer function and transfer function from state space model using digital simulation	
WEEK - X	**LADDER DIAGRAMS USING PLC**	**CO4**
	Input output connection, simple programming, ladder diagrams, uploading, running the program and debugging in programmable logic controller	
WEEK - XI	**TRUTH TABLES USING PLC**	**CO4**
	Study and verification of truth tables of logic gates, simple boolean expressions and application to speed control of DC motor using programmable logic controller.	
WEEK - XII	**IMPLEMENTATION OF COUNTER**	**CO4**
	Implementation of counting number of objects and taking action using PLC.	
WEEK - XIII	**BLINKING LIGHTS USING PLC**	**CO4**
	Implementation of blinking lights with programmable logic controller.	
WEEK - XIV	**WATER LEVEL CONTROL**	**CO4**
	Control of maximum and minimum level of water in a tank using PLC	