

CONTROL SYSTEMS LABORATORY

IV Semester: EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEEC14	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		
Prerequisite: Linear Algebra and Calculus (AHSC02), DC Machines and Transformers ().								
<p>I. COURSE OVERVIEW: Control Systems Laboratory presents facilities of computing and simulation through MATLAB and demonstration on FEEDBACK designed equipment with PCI cards creating an impressive digital control system development environment..., which can later be implemented in real-time applications using Real-time Workshop.</p> <p>II. COURSE OBJECTIVES: The students will try to learn:</p> <ol style="list-style-type: none"> I. Understand mathematical models of electrical and mechanical systems. II. Analysis of control system stability using digital simulation. III. Demonstrate the time domain and frequency domain analysis for linear time invariant systems IV. Apply programmable logic controllers to demonstrate industrial controls in the laboratory. <p>III. COURSE SYLLABUS:</p> <p>Week – 1: TIME RESPONSE OF SECOND ORDER SYSTEM To obtain the time response of a given second order system with time domain specifications</p> <p>Week – 2: TRANSFER FUNCTION OF DC MOTOR Determine the transfer function, time response of DC motor and verification with digital simulation</p> <p>Week – 3: AC SERVO MOTOR Study of AC servomotor and plot its torque speed characteristics</p> <p>Week – 4: EFFECT OF VARIOUS CONTROLLERS ON SECOND ORDER SYSTEM Study the effect of P, PD, PI and PID controller on closed loop second order systems</p> <p>Week – 5: COMPENSATOR Study lead-lag compensator and obtain its magnitude, phase plots</p> <p>Week – 6: TEMPERATURE CONTROLLER Study the performance of PID controller used to control the temperature of an oven</p> <p>Week – 7: DESIGN AND VERIFICATION OF OP-AMP BASED PID CONTROLLER Implementation of PID controller using Op-Amps and verification using MATLAB</p> <p>Week – 8: STABILITY ANALYSIS USING DIGITAL SIMULATION Stability analysis using root locus, Bode plot, Polar, Nyquist criterions of linear time invariant system by digital simulation</p> <p>Week – 9: STATE SPACE MODEL USING DIGITAL SIMULATION Verification of state space model from transfer function and transfer function from state space model using digital simulation</p> <p>Week – 10: LADDER DIAGRAMS USING PLC Input output connection, simple programming, ladder diagrams, uploading, running the program and debugging in</p>								

programmable logic controller

Week – 11: TRUTH TABLES USING PLC

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 – 12: IMPLEMENTATION OF COUNTER

Implementation of counting number of objects and taking action using PLC.

Week – 13: BLINKING LIGHTS USING PLC

Implementation of blinking lights with programmable logic controller

Week – 14: WATER LEVEL CONTROL

Control of maximum and minimum level of water in a tank using PLC

IV. REFERENCE BOOKS:

1. J Nagrath, M Gopal, “Control Systems Engineering”, New Age International, 3rd Edition, 2007.
2. K Ogata, “Modern Control Engineering”, Prentice Hall, 4th Edition, 2003.
3. Benjamin Kuo, “Automatic Control Systems”, PHI, 7th Edition, 1987.

V. WEB REFERENCES:

1. <https://www.ee.iitkgp.ac.in>
2. https://www.ggnindia.dronacharya.info/ece2dept/Downloads/Labmanuals/VI Sem/Control_System_Lab.pdf
3. <https://www.iare.ac.in>
4. <https://www.deltaww.com>