COURSE MODULES OF THE SUBJECT TAUGHT FOR THE SESSION EVEN SEM, AY 2025-26

Faculty Name : **Dr.Praveen Kumar M**			Academic Year: **2025-26**				
Department: Electrical &Electronics Engineering							
Course Code	Lab Title	Core/ Elective	Prerequisite	Number of Practical Hours/Week			
				L	T	P	
BEEL606	**Control System Laboratory**	**PCCL: Professional Core Course laboratory**	Mathematical Preliminaries, Laplace Transform, Basic Electricals, Electro-Mechanical System, Subject Knowledge of Control System.		**2**	**2**	CIE Marks: 50 SEE Marks: 50
Objectives	**Course objectives:** • To draw the speed torque characteristics of AC and DC servo motor. • To determine the time and frequency reposes of a given second order system using discrete components. • To design and analyze Lead, Lag and Lag – Lead compensators for given specifications. • To study the feedback control system and to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system. • To simulate and write a script files to plot root locus, bode plot, to study the stability of the system						

Experiments conducted as per Syllabus

1. Experiment to draw the speed torque characteristics of (i) AC servo motor (ii) DC servo motor.
2. Experiment to draw synchro pair characteristics.
3. Experiment to determine frequency response of a second order system.
4. A. To design a passive RC lead compensating network for the given specifications, viz, the maximum phase lead and the frequency at which it occurs and to obtain the frequency response.
   B. To determine experimentally the transfer function of the lead compensating network.
5. A. To design a passive RC lag compensating network for the given specifications, viz, the maximum phase lag and the frequency at which it occurs and to obtain the frequency response.
   B. To determine experimentally the transfer function of the lag compensating network.
6. Experiment to draw the frequency response characteristics of the lag – lead compensator network and determination of its transfer function.
7. A. To simulate a typical second order system and determine step response and evaluate time response specifications.
   B. To evaluate the effect of additional poles and zeros on time response of second order system.
   C. To evaluate the effect of pole location on stability
   D. To evaluate the effect of loop gain of a negative feedback system on stability.
8. To simulate a second order system and study the effect of (a) P, (b) PI, (c) PD and (d) PID controller on the step response.

9. A. To simulate a D.C. Position control system and obtain its step response. B. To verify the effect of input waveform, loop gain and system type on steady state errors. C. To perform trade-off study for lead compensator. D. To design PI controller and study its effect on steady state error. 10. A. To examine the relationship between open-loop frequency response and stability, open-loop frequency and closed loop transient response B. To study the effect of open loop gain on transient response of closed loop system using root locus. 11. A. To study the effect of open loop poles and zeros on root locus contour. B. Comparative study of Bode, Nyquist and root locus with respect to stability.
List of Text Books
1. Control Systems, Third Edition- William Bolton **2.** Modern Control Systems-Twelfth Edition, Prentice Hall Richard C. Dorf **3.** Control Systems Engineering, I. J. Nagarath and M.Gopal, New Age International, 4th Edition 2005 **4.** Modern Control Engineering, K. Ogata, PHI, 5th Edition, 2010. **5.** MatLab for Control Engineers Book by Katsuhiko Ogata **6.** Control Engineering: MATLAB Exercises by Laszlo Keviczky, Ruth Bars, springer
List of URLs, Text Books, Notes, Multimedia Content, etc
• http://nptel.ac.in/courses/108101037/ • https://nptel.ac.in/courses/107106081 • https://ce-dei.vlabs.ac.in/List%20of%20experiments.html • http://vlabs.iitkgp.ac.in/psac/newlabs2024/ctrl/ • https://doi.org/10.1016/j.ifacol.2024.10.272 • https://in.mathworks.com/matlabcentral/fileexchange/100064-virtual-hardware-and-labs-for-controls • https://www.youtube.com/watch?v=iyRWW-5OmBA • https://www.youtube.com/watch?v=FSAfFw_dqgA • https://www.youtube.com/watch?v=xLhvil5sDcU

Course Outcomes	Course outcomes: At the end of the course the student will be able to: 1. Determine the performance characteristics of AC servomotor, DC servomotors and sychro-transmitter receiver pair. [L3] 2. Analyse the time response and frequency response of a second order system using software package and discrete components. [L4] 3. Analyse the effect of P, PI, PD, PID and DC position controllers on the step response of the second order system. [L4] 4. Design and Analyse the Lead, Lag and Lag-Lead compensators for the given specifications. [L4] 5. Evaluate the stability of the system using root locus, bode plot and Nyquist plot.[L4]
	Conduct of Practical Examination: 1. All laboratory experiments are to be included for practical examination. 2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners. 3. Students can pick one experiment from the questions lot prepared by the examiners. 4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Course Code	BEEL606	TITLE: **Control System Lab**					Faculty Name:		**Dr.Praveen Kumar M**				
	Program Outcomes												
List of Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO-1	3	1	-	-	-	2	-	-	3	3	-	3	3	2
CO-2	3	2	2	-	3	2	-	-	3	3	-	3	3	2
CO-3	3	2	3	-	3	2	-	-	3	3	-	3	3	2
CO-4	3	2	2	-	3	2	-	-	3	3	-	3	3	2
CO-5	3	2	2	-	3	2	-	-	3	3	-	3	3	2