SEMESTER S5

CONTROL SYSTEMS

Course Code	**PCRAT501**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3 :1: 0: 0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. This course aims the study of analysis and design of control systems.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**System modelling - Transfer function approach:** Introduction to control systems – Classification of control systems. Principles of automatic control. Feedback control systems – Practical examples – Transfer function – Transfer function of electrical, mechanical and electromechanical systems – Block diagram – Signal flow graph – Mason's gain formula.	11
2	**Time domain analysis:** Standard test signals - Response of systems to standard test signals – Step response of second order systems in detail – Time domain specifications – delay time, rise time, peak time, maximum percentage overshoot and settling time. Steady state response – Steady state error- Static & Dynamic error coefficients.	11
3	**Stability of linear systems in time domain:** Asymptotic and BIBO stability, Routh-Hurwitz criterion of stability. Root locus - Construction of root locus – Effect of addition of poles and zeros on root locus.	11
4	**Controller Design:** Basic Control actions and Controller characteristics: Classification of	11

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	Controllers, Two position control, proportional, integral and derivative controllers- Principle of working, advantages and disadvantages. Transfer Function of PI, PD and PID controllers.	

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Analyze the control systems by transfer function approach.	**K4**
CO2	Get an adequate knowledge in the time response of systems & steady state error analysis	**K2**
CO3	Learn the concept of stability of control systems and methods of stability analysis.	**K3**
CO4	Design of basic control actions like proportional, integral & derivative controllers.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	2	2										
CO4	3	2										

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Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Automatic Control Systems	S. Hassan Saeed	KATSON Books	Third Edition
2	Control System Engineering	Norman S Nise	McGraw Hill	Sixth Edition

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Modern Control Engineering	Katsuhiko Ogata	Pearson Education	
2	Control Systems	M. Gopal	McGraw Hill Education	2012
3	Automatic Control Systems.	B.C. Kuo	Pearson Education	
4	Modern Control Systems.	Richard C Dorf and Robert H. Bishop	Pearson Education	