SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR -517127
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

B.TECH II-II SEM (E.E.E)	**L**	**T**	**P**	**C**
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SUB CODE: 16EEE223

CONTROL SYSTEMS (ECE & EEE)

OBJECTIVES:

- To demonstrate knowledge on modelling of physical systems
- To analyze the stability of the system in time and frequency domains.
- To educate problem solving skills in block diagram reduction technique and the state equations of a system
- To impart knowledge on evaluating controllability and observability of a system

UNIT I CONTROL SYSTEMS CONCEPTS

The control system - Mathematical models of physical systems – Introduction - Differential equations of physical systems – Mechanical systems - Friction - Translational systems - Rotational systems - Electrical systems - Analogous systems . Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver - Block diagram algebra – Signal flow graph - Reduction using Mason's gain formula. Effect of feedback – sensitivity effect on feedback

UNIT II TIME DOMAIN ANALYSIS

Standard test signals - Unit step response of First and second order systems - Time response specifications - Time response specifications of second order systems - Steady state errors and error constants. Effects of proportional, integral, derivative Controllers, Design of P, PD, PI PID Controllers.

UNIT III STABILITY ANALYSIS AND ROOT–LOCUS TECHNIQUES

Concepts of stability - Necessary conditions for Stability - Routh- stability criterion - Relative stability analysis: More on the Routh stability criterion - The root locus concepts - Construction of root loci

UNIT IV FREQUENCY DOMAIN ANALYSIS

Mathematical preliminaries - Nyquist Stability criterion - Polar plots - Assessment of relative stability using Nyquist criterion - Bode plots - Assessment of relative stability using Bode Plots. Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization- Solving

the Time invariant state Equations- State Transition Matrix and it's Properties. Concepts of controllability and observability

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

1. Acquire knowledge on
   - modelling of physical systems
   - time and frequency domain specifications used for stability analysis.
   - various methods of determining the stability of the system
   - realization of various compensators
   - concept of controllability and observability.
2. analyze the stability of the system in time and frequency domains.
3. demonstrate problem solving skills in
   - deriving the transfer function using block diagram reduction technique and signal flow graph.
   - determination of steady state error and static error constants.
   - evaluating the system stability in time and frequency domains.
   - solving the state equations of a system.
   - evaluating controllability and observability of a system.

Text books:

1. "Control Systems Engineering" – 5/e- I J Nagrath and M. Gopal -New Age International (P) Limited - Publishers.
2. "Modern Control Engineering" - 5/e - 2010 by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd ,New Delhi.

Reference books:

1. "Automatic Control Systems" - 8 /e- 2003 reprint 2009 B. C. Kuo and Farid Golnaraghi – John wiley and son's -New Delhi .
2. "Control Systems" –1 /e- 2007 A. Anand Kumar, Prentice Hall of India Pvt. Ltd, New Delhi.
3. "Control Systems Engineering" - 6 /e - 2010 by Norman S NISE John wiley.
4. "Modern Control Engineering" - 1 /e- 2011 by Yaduvir Singh and S. Janardhan, Cengage Learning.

University Nominee	**Subject Expert**	**Subject Expert**
Dr.G.V.Marutheswar Professor, EEE Dept. S.V.U CE Tirupathi	Dr.T.Gowri Manohar Professor, EEE Dept. S.V.U.C.E,Tirupathi	Dr. V.Rajnikanth Professor,Dept. of EEE, S.K.I.T, SriKalahasti
Industry Expert	**Alumni Student**	**Dept. BOS Chairman**
Mr. K.Somashekar M.Tech SE in Electrical department SAPA Alluminium company, Kuppam	Mr.K. Hemachandra Reddy Assistant Professor,Dept. of EEE, REVA University,Bangalore.	Prof. Ramesh Halakurki HOD EEE SITAMS, Chittoor