RO6401 AUTOMATIC CONTROL SYSTEMS

DETAILED SYLLABUS

UNIT I INTRODUCTION

Open loop and closed loop systems - Examples - Elements of closed loop systems - Transfer function - Modeling of physical systems – Mechanical, Thermal, Hydraulic systems and Electric Networks - Transfer function of DC generator, DC servomotor, AC servomotor, Potentiometer, Synchros, Tacho- generator, Stepper motor - Block diagram - reduction techniques, Signal flow graph – Mason' gain formula. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions).

UNIT II TIME DOMAIN ANALYSIS

Standard Test signals – Time response of second order system - Time domain specifications – Types of systems - Steady state error constants - Introduction to P, PI and PID modes of feed back control. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions).

UNIT III FREQUENCY DOMAIN ANALYSIS

Frequency domain specifications - Time and frequency response correlation – Polar plot – Bode plot – All pass minimum phase and non-minimum phase systems. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions).

UNIT IV SYSTEM STABILITY

Characteristic equation - Routh Hurwitz criterion of stability - Absolute and Relative stability - Nyquist stability - Nyquist stability criterion - Assessment of relative stability – Gain and Phase Margin. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions).

UNIT V ROOT LOCUS METHOD

Root locus concepts - Construction of root loci – Root contours. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions). STATE SPACE ANALYSIS: Limitations of conventional control theory - Concepts of state, state variables and state

model – state model for linear time invariant systems - Introduction to state space representation using physical - Phase and canonical variables. (Related Tutorials Using MATLAB/ Simulink – Toolboxes & Functions).

TEXT BOOKS

1. Nagrath I J, and Gopal, M, 'Control Systems Engineering" Prentice Hall of India, New Delhi, 2008.

2. Richard C Dorf and Robert H Bishop, "Modern Control Systems.", Addison-Wesley -2007.

REFERENCES

1. Ogata K, "Modern Control Engineering", Pearson Education, New Delhi, 2006.

2. Kuo B C, "Automatic Control Systems", Prentice-Hall of India Pvt. Ltd, New Delhi, 2004.

3. Norman C. Nise S, "Control system Engineering', John Wiley & Sons, Singapore, 2004.

OBJECTIVES

To study the basics of control system and its response. stability of mechanical and electrical systems. Use of MATLAB to design a stable control system.