

# CONTROL ENGINEERING

Written by Administrator  
Wednesday, 04 November 2009 07:12 -

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Subject Code

:

06ME71

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

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:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

## PART - A

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## Unit - 1

**Introduction:** Concept of automatic controls, open and closed loop systems, concepts of feedback, requirement of an ideal control system. Types of controllers– Proportional, Integral, Proportional Integral, Proportional Integral Differential controllers.

**6 Hours**

## Unit - 2

**Mathematical Models:** Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems. Pneumatic system. Analogous systems: Force voltage, Force current.

**6 Hours**

## Unit - 3

**Block Diagrams and Signal Flow Graphs:** Transfer Functions definition, function, block representation of system elements, reduction of block diagrams, Signal flow graphs: Mason's gain formula.

## 7 Hours

### Unit - 4

**Transient and Steady State Response Analysis:** Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

## 7 Hours

### PART - B

### Unit - 5

**Frequency Response Analysis:** Polar plots, Nyquist Stability Criterion, Stability Analysis, Relative stability concepts, phase and gain margin, M & N circles.

## 7 Hours

### Unit - 6

**Frequency Response Analysis using Bode Plots:** Bode attenuation diagrams, Stability Analysis using Bode plots, Simplified Bode Diagrams.

## 7 Hours

### Unit - 7

**Root locus plots:** Definition of root loci, general rules for constructing root loci, Analysis using root locus plots.

## 7 Hours

### Unit - 8

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**Control Action and System Compensation:** Series and feedback compensation, Physical devices for system compensation.

**5 Hours**

## Text Books:

1. **Modern Control Engineering:** Katsuhiko Ogata, Pearson Education, 2004.
2. **Control Systems Principles and Design:** M. Gopal, TMH, 2000

## Reference Books:

1. **Feedback Control Systems:** Schaum's series 2001.
2. **Control systems:** I. J. Nagarath & M. Gopal, New age International publishers 2002.
3. **Automatic Control Systems** – B. C. Kuo, F. Golnaraghi, John Wiley & Sons, 2003.