**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF ELECTRONIC ENGINEERING**

Title of Subject : Control Systems

Disciplines : Electronic Engineering

Semester : (6th Semester)

Course Code : ES-353

Effective : 13ES-Batch and onwards

Pre-requisites : Complex Variables & Transforms, Signal Processing

Assessment : **20%** Sessional **20%** Midterm and **60%** Written Final Examination

Marks : Theory: 100 Practical: 50

Credit Hours : 3 1

Minimum Contact Hours : 42 42

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| **Aims** : | This course has been designed to introduce the students with basic theory of Feedback Control Systems. After studying this course students should be able to derive mathematical methods of physical systems and check stability of control system in frequency domain. The students should also be able to analyze transient as well as steady state behaviour of linear time invariant systems.  |
| **Objectives** : | After completion of this course, students should be able to:* Derive mathematical methods of simple physical systems.
* Represent control systems using block diagrams, block diagrams and state space representation.
* Perform transient and steady state analysis.
* Construct Bode diagram, Nyquist plots and Nichols charts.
* Check stability, controllability and obervability of control systems.
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**Contents:**

Introduction to control systems; open-loop and closed-loop systems, transfer functions, block diagrams, signal flow graphs; introduction to modeling; formation of differential equations of electrical, mechanical and other systems, transfer functions; stability, Routh’s stability criterion, types and analysis of feedback control systems; root locus, Bode plots, polar plots, Nyquist stability criterion, gain and phase margins, Nichol’s chart; steady-state and transient response of first-order, second-order and higher-orders ystems; introduction to state-space concepts and design techniques, formation and solution of state equations, eigen values and eigenvectors, transfer function matrices; PID controllers and compensators.

**Recommended Books:**

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, Latest Edition.

2. K. Ogata, “Discrete – Time Control Systems”, Prentice Hall, Latest Edition.

3. B.C. Kuo, “Automatic Control Systems”, Latest Edition.

Approval: Board of Studies Res. No. 02 Dated: 13-10-2014

Board of FEEC Engineering Res. No. 7.8 Dated: 29-12-2014

Academic Council Res. No. Dated: \_\_\_\_\_\_\_\_\_