|  |  |
| --- | --- |
|  | **ACHARYANAGARJUNAUNIVERSITY**  **IV/IV B.TECH - II SEMESTER,**  **ELECTRICAL & ELECTRONICS ENGINEERING BRANCH** |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Course Details** | | **Scheme of Instruction** | | | **Scheme of Examination** | | | **Credits** |
| **Code No.** | **Subject Name** | **Periods per week** | | | **Maximum Marks** | | **Total Marks** |
| **L** | **T** | **P** | **Internal** | **External** |
| 1 | EC 311 | Linear Control Systems | 4 | 1 | - | 40 | 60 | 100 | 4 |

**UNIT – I**

Introduction: Basic concept of simple control system – open loop – closed loop control systems. Effect of feed back on overall gain – stability sensitivity and external noise. Types of feed back control systems – Liner time invariant, time variant systems and non linear control systems

Mathematical models and Transfer functions of Physical systems: Differential equations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open loop and closed loop systems. Block diagram representation of control systems – block diagram algebra – signal flow graph – Mason’s gain formula

Components of control systems: DC servo motor – AC servo motor – synchro transmitter & receiver

**UNIT – II**

Time domain analysis: Standard test signals – step, ramp, parabolic and impulse response function – characteristic polynomial and characteristic equations of feedback systems – transient response of first order and second order systems to standard test signals. Time domain specifications - steady state response – steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width – dominant poles of transfer functions.

Stability analysis in the complex plane: Absolute, relative, conditional, bounded input –bounded out put, zero input stability, conditions for stability, Routh –Hurwitz criterion.

**UNIT - III**

Frequency domain analysis: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

**UNIT – IV**

Root locus Technique: Introduction – construction of root loci Introduction to Compensation Techniques

State space analysis: Concepts of state, state variables and state models – diagonalisation – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

**TEXT BOOKS:**

1. B.C. Kuo, Automatic control systems, 7th edition, PHI.

2. I.J.Nagrath & M Gopal, Control Systems Engineering, 3rd edition, New Age

International.

3. K. Ogata, Modern Control Engineering, 3rd edition, PHI.

**REFERENCE BOOKS**:

1. Schaum Series, Feedback and Control Systems, TMH

2. M.Gopal, Control Systems Principles and Design, TMH

3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall,1993.

**Signature of the faculty**