Course Syllabi: UEI501: Control Systems (L : T : P :: 3 : 1 : 2)

1. **Course number and name**: UEI501: Control Systems

2. **Credits and contact hours**: 4.5 and 6

3. **Text book, title, author, and year**

Text Books / Reference Books

- *Gopal, M., Digital Control System, Wiley Eastern (1986).*
- *Nagrath, I.J. and Gopal, M., Control System Engineering, New Age International (P) Limited, Publishers (2003).*
- *Ogata, K., Modern Control Engineering, Prentice–Hall of India Private Limited (2001).*
- *Kuo, B.C., Automatic Control System, Prentice–Hall of India Private Limited (2002).*
- *Sinha, N.K., Control System, New Age International (P) Limited, Publishers (2002).*

a. Other supplemental materials

- Nil

4. Specific course information

a. Brief description of the content of the course (catalog description)

Basic Concepts: Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems, Linear and non-linear systems, Transfer function, , Block diagrams and signal flow graphs.

Components: D.C. and A.C. Servomotors, D.C. and A.C. Tachogenerators, Potentiometers and optical encoders, Synchros and stepper motors

Analysis: Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

Stability: Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

Compensation: Lead, Lag and lag-lead compensators, Design of compensating networks for specified control system performance.

State Space Analysis: Concepts of state, State variables and state models, State space equations, Transfer function, Transfer model, State space representation of dynamic systems, State transition matrix, Decomposition of transfer function, Controllability and observability.

Laboratory : Linear system simulator, Compensation design, D.C. position control and speed control, Synchro characteristics, Servo demonstration, Stepper motor, Potentiometer error detector, Rate control system, Series control system, Temperature control system.

5. Specific goals for the course

After the completion of the course, the students will be able to:

- Develop the mathematical model of the physical systems.
- Analyze the response of the closed and open loop systems.
- Analyze the stability of the closed and open loop systems.
- Design the various kinds of compensator.
- Develop and analyze state space models.

6. Brief list of topics to be covered

- Open loop and closed loop system

- Steady state analysis
- Stability
- Compensation
- State space analysis