Automatic Control

Course Code: 28416
Credits: 3
Course Type: Theoretical
Prerequisites: Vibrations
Course Length: 51 hours

Outline:

1. Introduction to Laplace transform, forward and inverse transforms, initial and final value theorems, definition and categorization of systems, state space model, block diagrams, general properties of feedback, transfer function, simplification of block diagrams (mason method)

2. Mathematical modeling of mechanical, electrical, electromechanical and hydraulic systems

3. Time response of systems, transient and steady state, characteristics of transient (overshoot, settling time, etc.) and steady state response (steady state error), effects of controllers on transient and steady state responses

4. Introduction of industrial control systems such as pneumatic, hydraulic and electronic

5. Stability analysis using Routh-Hurwitz method

6. Root locus method in analysis and design of control systems including the design of PD, PI, PID, lead, lag, lead/lag using root locus method.

7. Frequency response method, Bode and Nyquist diagrams , stability analysis in frequency domain using Nyquist stability criteria, frequency response characteristics

8. Tuning of the controllers, lead/lag compensator design for performance improvement

9. Design of PID controller using Zigler and Nichols tables

References:

1- Ogata, K., “Modern Control Engineering” Third Edition, perntice Hall, 1997.

2- Dorf, Bishop, “Modern Control Systems”, 7 th edition, Addison Wesely, 1995.

3- Kuo, Benjamin, “Automatic Control Systems:, 6th., prentice Hall, 1991.

4- Norman Nise, “Control Systems Engineering” Benjamin / Cummings pub, 1992.