

Course Code : ME 792

Course Title : Advanced control of Mechanical systems

Credit Hours : 3

Course Description

State space representation, Controllability and observability, State estimation and observers, Pole assignment via state feedback, Linear quadratic regulator(LQR), Riccati equation, Design of servo control systems, Stability analysis, Review of systems analysis using Z-transform, Discrete systems representations and modeling, Controllers in discrete and digital forms, Applications to different mechanical systems.

Course Objectives

Learn and apply advanced techniques in control systems.

Design, analyze and use controllers in continuous and digital forms.

Use computer to optimize the controller.

Provide an overview of the applications of microprocessors and micro controllers for smart products and process control.

Course Topics

Week no. 1: State space representation.

Week no. 2: Controllability and observability.

Week no. 3: State estimation and observers.

Week no. 4: Pole assignment via state feedback.

Week no. 5: Linear quadratic regulator(LQR), Riccati equation.

Week no. 6: Design of servo control systems.

Week no. 7: Design of servo control systems. / 7th week evaluation.

Week no. 8: Stability analysis.

Week no. 9: Stability analysis.

Week no. 10: Review of systems analysis using Z-transform.

Week no. 11: Discrete systems representations and modeling.

Week no. 12: Discrete systems representations and modeling. / 12th week evaluation

Week no. 13: Controllers in discrete and digital forms

Week no. 14: Applications to different mechanical systems.

Week no. 15: Presentation on selected topics.

Week no. 16: Final exam.

References

- Gene F. Franklin, J. D. Powell, "Digital Control of Dynamic Systems", 3rd Edition, 2008.
- G. F. Lawler, "Optimal Control Theory for Applications", Springer-Verlag, N.Y., 2003.
- D. E Kirk, "Optimal Control Theory: An Introduction", 2004.
- B. W. Williams, "Power Electronics - Devices, Drivers, Applications, and Passive Components", 2007