

Course Name:
Structural Control

Course Number:
20169

Credit:
3

Course Content (outline):

1. Concept of structural control, passive control, semi-active control, active Control, hybrid control
2. Review of some basic definitions: dynamic systems damping and methods of measuring them

A - Passive control:

3. General performance of passive control systems including steel, frictional, viscoelastic, and fluid dampers
4. Energy dissipation systems such as TMD, TLD, Base-Isolation systems

B - Semi-active control:

5. Performance evaluation of MR and ER dampers and intelligent materials (SMA materials and piezoelectric materials)

C - Active control:

6. Review of some basic definitions: Laplace transformation, Similarity Transformation relations, Calculus-of Variation
7. Classical Control theory
8. Optimal Classical Control theory for various states such as Open-Loop, Closed-Loop, Open-Closed-Loop, numerical solutions of equations
9. Instantaneous Optimal Control theory for Open-Loop, Closed-Loop, numerical solutions of equations

References:

- Soong, T.T. and Dargush, G.F., "Passive Energy Dissipation Systems in Structural Engineering", John Wiley & Sons, New York, 1997.
- M. C. Constantinou, T. T. Soong, and G. F. Dargush, "Passive Energy Dissipation Systems for Structural Design and Retrofit", The Multidisciplinary Center for Earthquake Engineering Research (MCEER), New York, 1998.

- Soong, T.T., "Active Structural Control: Theory and Practice", Longman Scientific & Technical, John Wiley & Sons, New York, 1990.
- Ogata, K., "Modern Engineering Control", Prentice-Hall, Englewood Cliffs, New Jersey, 1989.
- Kirk, D.E., "Optimal Control Theory, An Introduction", Prentice-Hall, Englewood Cliffs, New Jersey, 1970.
- Slotine, E. and Li, W., "Applied Nonlinear Control", Prentice-Hall, Englewood Cliffs, New Jersey, 1991.
- Meirovitch, L., "Dynamics and Control of Structures", John Wiley & Sons, New York, 1989.
- Brogan, W.L., "Modern Control Theory", Quantum Publishers Inc., New York, 1974.
- Inman, D.J., "Vibration With Control, Measurement, and Stability", Prentice-Hall, Englewood Cliffs, New Jersey, 1989.