ME602 Mechanical Vibration

Credit: 3 Approval: Approved in 3rd Senate

Prerequisite: Consent of the faculty member

Students intended for: MS/PhD

Elective or Core: Elective Semester: Odd/Even:

Course objective: The main objective of the course is to present fundamentals to a modern treatment of vibrations, placing the emphasis on analytical developments and computational solutions

Course contents:

- **Introduction**: Free and forced vibrations with and without damping.
- **Vibration isolation** and transmissibility; Un-damped vibration absorbers.
- **Generalized coordinates** and coordinate coupling; Orthogonality of modes.
- **MDOF systems** Free and forced vibration of multi-degree of freedom systems with and without viscous damping; Lagrange's equation; Holzer's method; Solution of Eigen value problem, transfer matrix and modal analysis.
- **Self excited vibrations**. Criterion of stability; Effect of friction on stability.
- **Continuous Systems**: Vibrations of strings; Free and forced longitudinal vibrations of prismatic bars; Ritz and Galerkin methods.
- **Diagnosis**: Introduction to diagnostic maintenance and signature analysis
- **Nonlinear Vibration:** Introduction to Nonlinear Vibration
- **Random Vibration:** Introduction to Random Vibration
- **Numerical Integration methods in Vibration Analysis:** Finite difference method, Runga-Kutta method, and Newmark method
- **Finite Element Method :** Equation of motion of an element, Mass matrix, stiffness matrix and Force vector for Bar element, Torsion element and Beam element. Consistent and Lumped mass matrices

Suggested Book

"Mechanical Vibrations", S. S. Rao, Pearson Education Inc. (4th Ed.)2007

"Fundamental of Vibrations" Leonard Meirovitch, Mc-Graw Hill Inc.2001

"Vibration and Control", D. J. Inman, John Willey & Sons Inc2002

"Mechanical Vibrations", S. Tamadonni & Graham S. Kelly, Schaum's Out line Series, Mc-Graw Hill Inc 1998