CE-809 Structural Dynamics

Code	Credit Hours	Category
CE-809	3	Core

Course Description:

This course provides the knowledge and understanding of fundamental principles about the response of a structure to dynamic. Process starts with basic knowledge of fundamentals of vibration and motion. Course contents allow learning of various Newtonion and D'Alembert principles to investigate behaviour of single degree of freedom system. Response of Structure to harmonic, periodic and non-periodic excitation is studied in detail. After developing basic concept of response of SDOF system, course offers detailed insight into multiple degree freedom system (MDOF) and continuous system to various excitations. Use of matrices to compute equation of motion for MDOF is taught. Course also dwells on earthquake response spectrum as application of structural dynamics.

Text Book:

- Fundamentals of Structural Dynamics. 2nd Edition, Roy R. Craig Jr. and Andrew J. Kurdila, John Wiley & Sons, 2006.
- Dynamics of Structures. Theory and Applications to Earthquake Engineering. Third Edition, Anil K. Chopra

Reference Books:

- Raw W. Clough, and Joseph Penzien, (1993): Dynamics of Structures, McGraw-Hill, New York, 2nd Edition.
- Theodore R. Tauchert, (1974): Energy Principles in Structural Mechanics, McGraw-Hill, ISE.
- D. E. Newland, (1993): An Introduction to Random Vibrations, Spectral and Wavelet Analysis, Longman, 3rd Edition, London.
- Mario Paz, (1997): Structural Dynamics: Theory and Computation, Chapman and Hall, 4th Edition, New York.

Prerequisites:

BE (Civil, Architecture, Construction Engineering & Management)

Assessment System

Component	Percentage Range
Quizzes	10-15%
Assignments	10-15%
Mid Terms	20-30%
ESE	40-50%

Project (optional) 10-15%

Teaching Plan:

Week	Topic Covered
1	Introduction to CE 809, Objectives, Outcomes and Assessment Method. Basic concept and principles of vibration and dynamics
	Single Degree of Freedom Systems
2-3	Newtonian and D'Alembert Principles (Lumped Parameter models)
4-5	Principles of Virtual Displacement and Assumed Mode Method
	Free Vibration (Un-damped and damped systems)
6	Harmonic excitation
7	Non-Periodic and Periodic Loading
8	Multiple Degree of Freedom Systems
9	**Mid Term Exam/ OHT, (As per NUST Exam Policy)**
10	Formulation of the Equations of Motion using Newton and Lagrange methods
11-12	The Eigen problem -- Properties and Solution Techniques
13-14	Modal Analysis - Un-damped and Damped
	Mode Superposition for MDOF Systems
	Continuous Systems
15-16	Discretization of Continuous Systems
17,18	**End Semester Exam**