Higher Institute of Earthquake studies and Research

Department: Earthquake Structural Engineering
Course: Structural Dynamics (Part 1)
Hours: (2Hours Theoritical+2hours Practical) Weekly
Teaching Staff:

Description:

Structures are often subjected to dynamic forces of one form or the other during their lifetime. This course introduces the theory of dynamic response of structures with emphasis on physical insight into the analytical procedures and with particular application to earthquake engineering. The structural dynamics component of the course includes free and forced vibration response of SDF 'single-degree of freedom' systems. The earthquake engineering component considers seismic analysis methods, earthquake resistant design philosophy and includes elements of engineering seismology.

Aims & Objectives:

By the end of the course, the student should be able to:
- Derive differential equations for single degree of freedom (SDF) systems.
- Calculate the free vibration characteristics of SDF systems.
- Derive the response of SDF systems subjected to forced vibrations.
- understand structural dynamics and the response of civil engineering structures to time-varying loads, including those due to wind and earthquakes. This requires the extension of structural theory to include the effects of the mass and damping and to evaluate the action of various deterministic and random dynamic loads. The importance of dynamic loads in the design of dynamically sensitive civil engineering structures, such as tall buildings, towers and chimneys and long span bridges is examined.

Syllabus:

Chapter 1: Introduction of Structural Dynamic
Chapter 2: Equation of Motion of SDOF Systems.
Chapter 3: Dynamic Properties of Structures
Chapter 4: Generalized SDOF Systems
Chapter 5: The Responses of Undamped and Damping Free.
Chapter 6: The Responses of Undamped and Damping Forced Vibrations (Harmonic)
Chapter 7: The Responses of Undamped and Damping Forced Vibrations (Periodic Excitation)
Chapter8: The Responses of Undamped and Damping Forced Vibrations (Different and Special Excitation)
Chapter9: The Responses of SDOF System to Impulsive Loading Using Duhamel Integral)
Chapter 10: The Responses of Response to Ground Motion
Chapter 11: Vibration Analysis by Rayleigh's Method.
Chapter 12: Behavior of Structures Under Seismic Loads
Chapter 13: Numerical Evaluation of Dynamic Response (Newmark's Integral Method)
Chapter 14: Numerical Evaluation of Dynamic Response (Direct Numerical Integral Method)

Course Outline:

Week 1: Introduction of Structural Dynamic & Equation of Motion of SDOF Systems
Week 2: Dynamic Properties of Structures
Week 3: Generalized SDOF Systems
Week 4: The Responses of Undamped and Damping Free
Week 5: The Responses of Undamped and Damping Forced Vibrations (Harmonic)
Week 6: The Responses of Undamped and Damping Forced Vibrations (Periodic Excitation)
Week 7: The Responses of Undamped and Damping Forced Vibrations (Different and Special Excitation)
Week 8: The Responses of SDOF System to Impulsive Loading Using Duhamel Integral)
Week 9: The Behavior of Structures Responses Under Seismic Loads.
Week 10: Vibration Analysis by Rayleigh's Method.
Week 11: Behavior of Structures Under Seismic Loads
Week 12: Numerical Evaluation of Dynamic Response (Newmark's Integral Method)
Week 13: Numerical Evaluation of Dynamic Response (Direct Numerical Integral Method)

Instructional Methodology & Teaching Resources: Lectures, examples, applications
Head of Department: Date: **Vice Dean:** Date: **Dean:** Date: