Course Name:
Introduction to Earthquake Engineering

Course Number:
20-164

Credit:
3

Course Description (Objectives):
The primary objective of this course is to learn why earthquakes happen and how they affect the structures. The emphasis will be on developing an understanding for factors which influence the dynamic response of structures during seismic excitation. Students completing this course will be able to understand the vast and growing body of the literature on engineering semiology, structural dynamics, and earthquake engineering. Thy will also be able to evaluate the effect of earthquakes on structures, perform dynamic analysis to determine internal forces and deformations in structures, and understand the theory behind seismic design procedures in building codes.

Course Content (outline):
- Introduction to Earthquake Engineering
    - Ground Failure
    - Ground Shaking
    - Engineering Seismology
    - Strong Ground Motions
- Dynamics of Structures
    - Dynamic Response of Single-degree-of-freedom (SDOF) Systems
        - Equations of Motion
        - Free Vibration
        - Response to Harmonic Excitation
        - Response to Impulse and Arbitrary Excitation
        - Earthquake Response of Linear Systems
        - An Introduction to Earthquake Response of Inelastic Systems
    - Dynamic Response of Multi-degree-of-freedom (MDOF) Systems
        - Equations of Motion
        - Free Vibration
        - Damping in Structures
        - Dynamic Response of Linear Systems
- Seismic Code
    - Lateral Force Resisting Systems
    - Irregularities
    - Taxonomy of Seismic Analysis Methods
    - Equivalent Static Analysis
        - Base Shear Relationship
        - Effective Seismic Weight
        - Seismic Zonation

        - Uniform Hazard Spectrum
        - Soil Types
        - Near-fault Effects
        - Risk Categories
        - Strength Reduction Factor
        - Over-strength
        - Shear Distribution along the Height
        - Shear Distribution in Plan
        - Torsion
    - Dynamic Spectral Analysis
        - An Introduction to Earthquake Response of Linear MDOF Systems
        - Modal Combination Methods
    - An Introduction to Linear Dynamic Time History Analysis
        - Ground Motion Selection and Modification
    - Serviceability Level Earthquakes
    - Overturning
    - Vertical Seismic Loads
    - Displacement Controls
    - *P*-Δ Effects
    - Diaphragms
    - Comparative Evaluation of Iranian Standard 2800 with Leading Seismic Codes

References:

- Kramer (1996), Geotechnical Earthquake Engineering, Prentice Hall
- Chopra (2013), Dynamics of Structures: Theory and Applications to Earthquake Engineering, 4th Edition, Prentice Hall
- Building and Housing Research Center (2015), Iranian Code of Practice for Seismic Resistant Design of Buildings, 4th Edition, Standard 2800