

Structural Dynamics and Earthquake Engineering

1. **Course number and name:** 020DYSGS5 Structural Dynamics and Earthquake Engineering
2. **Credits and contact hours:** 4 ECTS credits, 2x1.25 hours
3. **Name(s) of instructor(s) or course coordinator(s):** Professor Fadi GEARA
4. **Instructional Materials:**
 - a. Professor textbook and class notes
 - b. PS92, EC8
5. **Specific course information**
 - a. **Catalog description:** Understand the dynamics of structures and be able to design earthquake loads on structures according to codes PS92 and Eurocode EC8. The course covers the following topics: The earthquakes - Dynamics of simple degree of freedom systems – Response spectrum - Dynamics of multi degree of freedom systems – PS92 code – Eurocode EC8.
 - b. **Prerequisites or co-requisites:** 020PHONI3 Physics of waves
 - c. **Required:** Required major course for Buildings and Engineering Management Specialty and Public Works and Transportation Specialty students.
6. **Educational objectives for the course**
 - a. **Specific outcomes of instruction:**
 - Provide the basic concepts and principles of structural dynamics.
 - Calculate and analyze earthquake loads on structures according to many codes: PS92, EC8, etc.
 - Ability to apply the knowledge of structural dynamics and earthquake engineering in the design of civil engineering structures.
 - b. **PI addressed by the course:**

PI	1.1	1.2	1.4	2.2
Covered	yes	yes	yes	yes
Assessed				
7. **Brief list of topics to be covered:**
 - Earthquake: History, types, waves, magnitude, intensity, soil behavior (4 Lectures)
 - Dynamics of simple degree of freedom systems: Dynamic equation of equilibrium, free vibrations of SDOF, undamped systems, damped systems, forced vibrations, harmonic, periodic loadings, SDOF arbitrary load function, case of earthquake. (5 Lecture)

- Response spectrum: Characteristics, displacement, velocity, acceleration, design spectrum, (3 Lectures)
- Dynamics of multi degree of freedom systems: Dynamic equation of equilibrium, free vibrations of MDOF, undamped systems, numerical solution for the eigenvalue problem, damped systems, forced vibrations, modal analysis, MDOF arbitrary load function, case of earthquake. Examples of MDOF structures (7 Lectures)
- PS92 code: scope, performance requirements and compliance criteria, ground conditions, seismic zones, horizontal and vertical elastic spectrum, design spectrum, seismic action, introduction to design buildings, regular and irregular buildings, structural analysis (5 Lectures)
- Eurocode EC8: scope, performance requirements and compliance criteria, ground conditions, seismic zones, horizontal and vertical elastic spectrum, design spectrum, seismic action, introduction to design buildings, regular and irregular buildings, structural analysis (4 Lectures)