



Code: ICAR/09

Credits: 12

Matter: Earthquake engineering

Main language of instruction: Italian

Other language of instruction: English

Teaching Staff

Head instructor

Assistant Professor, Dr. Eng. Maria Zucconi - maria.zucconi@unicusano.it

Introduction

1. Objective of the course:

Earthquake engineering course aims to provide specific skills to the design of structures in a seismic prone area. In particular, in the last decades, many losses and a great number of causalities have been registered after recent earthquakes and the principles of design of earthquake-resistant structures have largely developed. The course focuses on unreinforced concrete structures, allowing the student of the tools for the design and safety verification of civil structures following the criterion of the capacity design.

Objectives

2. Course Structure:

The course is organized in five subjects. The first subject is an introduction to the basic element of seismology, including the propagation of the seismic waves, the geological local effect, the earthquake local registration and the definition of the engineering scales to quantify the magnitude of the seismic event. The second subject is oriented to the engineering representation of earthquake load and seismic hazard. The third subject allows the fundamentals mains of the seismic behavior of buildings, introducing the principle of dynamic of structures, presenting the single degree of freedom SDOF and multiple degrees of freedom systems MDOF under earthquake motions. The fourth and the fifth subjects introduce the definition of structural ductility and the principles of the structural design with regards the building regularity, the methods for structural analysis, and the capacity design criterion.

The knowledge acquired in theory lessons will be applied in the "virtual classroom" forum through exercises and other activities (E-tivity). The E-tivity is aimed to design a new moment resisting RC frame building.

Competencies:

- knowledge of the main concept of seismology
- knowledge of the seismic hazard
- knowledge of seismic load and response spectra
- knowledge of dynamic structures' principals
- knowledge and application of the capacity design criterion and structural ductility
- design of new moment resisting RC frame building

Syllabus

3. Program of the course:

Subject 1. Element of seismology

Subject 2. Seismic hazard characterization

Subject 3. Dynamic of structures

Subject 4. Structure ductility

Subject 5. Capacity design criterion

Evaluation system and criteria

The exam consists of a written test and one E-tivity carried out during the course in virtual classes.

The written test normally includes 1 numerical exercise and 8-10 theoretical questions on the main topics covered in the course.

During the written test, it is NOT allowed to use handouts, notes, texts or forms.

E-tivity is evaluated from 0 to 10 points, while 0-20 points are assigned at the written test.

Bibliography and resources

4. Materials to consult:

The educational materials (lecture notes, slides and video lessons) are available on the Unicusano platform.

5. *Recommended bibliography:*

- Chopra A., Dynamic of structures: Theory and application to Earthquake Engineering - Prentice Hall, 1995
- Clough W, Penzien J., Dynamic of structures - Mc Graw Hill, 1993
- Newmark N.M , Rosenblueth E.: Fundamentals of Earthquake Engineering - Prentice Hall, 1971
- Dowrick D., Earthquake Resistant Design - J. Wiley & S.,1990
- aulay T., Priestley N., Seismic Design of Reinforced Concrete and Masonry Buildings - J. Wiley & S.,1990