# 7.1 CE0710 – Earthquake Engineering I

## (1) **GENERAL**

SCHOOL	ENGINEERING SCHOOL					
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT					
LEVEL OF STUDIES	UNDERGRADUATE					
COURSE CODE	CE0710 SEMESTER 7					
COURSE TITLE	Earthquake Engineering I					
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits			WEEKLY TEACHING HOURS	CREDITS		
			4	4		
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).						
COURSE TYPE general background, special background, specialised general knowledge, skills development	Special Backg	round Course				
PREREQUISITE COURSES:						
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek					
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes					
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/ET184/					

## (2) LEARNING OUTCOMES

### Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area
- Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B
- Guidelines for writing Learning Outcomes

The course is a basic introductory course in the seismic design of structures.

This course aims to acquaint the students in theoretical and practical developments in seismic construction and technology, new analysis capabilities and earthquake resistant design and developments in regulations and standards issues. To design earthquake resistant structures according to Eurocode 8

After the course the student will be able to:

- Shape the bearing structure of the building according to the principles of seismic design.
- Propose the structural systems that will carry the horizontal loads due to earthquake.
- Implement the provisions of the European Earthquake Regulations, EC8, and to design earthquake-resistant structures.
- Recognize the various failures in construction and finding the causes of such breaches.

### Proposes ways of strengthening and retrofitting for seismic upgrading of existing structures.

### **General Competences**

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?;.

Search for, analysis and synthesis of data and information,	Project planning and management
with the use of the necessary technology	Respect for difference and multiculturalism
Adapting to new situations	Respect for the natural environment
Decision-making	Showing social, professional and ethical responsibility and
Working independently	sensitivity to gender issues
Team work	Criticism and self-criticism
Working in an international environment	Production of free, creative and inductive thinking
Working in an interdisciplinary environment	
Production of new research ideas	Others

Specifically, students will be able to:

- Perform a seismic analysis and desing the structures according to Eurocode 8.
- Use the suitable analysis software to perform seismic analysis.
- Participate in a team of engenneers and express his opinion about the seismic desing of the project.
- Execute an autonomous work in his private office for desinging or construction of structures
- Search, analysis and synthesis of data and information, using the necessary technologies.
- Decision Making.
- Autonomous work

## (3) SYLLABUS

The course content is summarized below:

- 1. The effect of the earthquake, the main characteristics of the model displacement of lithospheric plates.
- 2. Evaluation of earthquakes, small earthquakes deep, near and far field, earthquake magnitude, motions at the free surface of the ground, apparently directivity.
- 3. . Seismic action on the structures, seismic behavior of structures. Creation of structural system based on seismic design principles.
- 4. . Response spectra, design spectra
- 5. . Eigen value analysis and dynamic characteristics
- 6. Seismic response of structures
- 7. Lateral force method
- 8. Response spectrum method,
- 9. Time history analysis. European Seismic Code (EC8).
- 10. Capacity design in steel and concrete structures
- 11. General Principles of Seismic Design
- 12. Practical rules of forming earthquake resistance structures
- 13. Semester project

## (4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face or / and distance learning			
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Teaching using ICT, Communication and Electronic Submission. Teaching using special software analysis			
TEACHING METHODS				
The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.		Activity	Semester workload	
		Lectures	52	
		Classwork	38	
		Preparation for Project	10	
		Personal Study	10	

The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS		Course total	110	
<b>STUDENT PERFORMANCE EVALUATION</b> Description of the evaluation procedure	Lar	nguage of evaluation: Greek		
Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other	Final written examination: 60% Preparation for the project: 40%			
Specifically-defined evaluation criteria are given, and if and where they are accessible to students.				

# (5) ATTACHED BIBLIOGRAPHY

## Greek Bibliography:

- 1. Pnevmatikos N. (2017), Introduction to earthquake design, ISBN 978-960-6607-58-5, Editor Lixnos, (In Greek).
- 2. Ioannis Avramidis, Asimina Athanatopoulou, Konstantinos Morfidis, Anastasios Sextos, AgathoklisGiaralis, Eurocode-Compliant Seismic Analysis and Design of R/C Buildings Concepts, Commentary and Worked Examples with Flowcharts, editor Springer, DOIhttps://doi.org/10.1007/978-3-319-25270-4
- 3. Ioannis Avramidis, Asimina Athanatopoulou, Konstantinos Morfidis, Anastasios Sextos, Eurocode-Compliant Seismic Analysis and Design of R/C Buildings Concepts, Commentary and Worked Examples, Editor Sophia, (In Greek).
- 4. Katsikadelis I., (2020), Dynamic analysis of structures (3<sup>rd</sup> Edition), Editor Tsiotras, (In Greek).

## Foreign Bibliography:

- 1. Chopra, A.K. (2016), Dynamics of Structures: Theory and application to earthquake engineering (5th edition), Pearson.
- 2. Bozorgnia, Y., & Bertero, V. V. (Eds.). (2004). Earthquake engineering: from engineering seismology to performance-based engineering. CRC press.
- 3. Lindeburg, M.R., Baradar, M. (2001). Seismic Design of Building Structures: A Professional's Introduction to Earthquake Forces and Design Details, Professional Pubns Inc.
- 4. Newmark, N. M., Rosenblueth, E. (1971). Fundamentals of earthquake engineering, Englewood Cliffs, N.J. : Prentice-Hall
- 5. Ghosh, S. K. (2001). Seismic Design Using Structural Dynamics

## Related academic journals:

- 1. Earthquake engineering and structural dynamics
- 2. Earthquake and structures
- 3. Structural control and health monitoring
- 4. Engineering structures
- 5. Earthquake spectra
- 6. Journal of earthquake engineering
- 7. International Journal of Earthquake Engineering and Hazard Mitigation (IREHM)
- 8. Journal of Structural Engineering, ASCE
- 9. Advances in Structural Engineering