7.6 CE0720 – Reinforced Concrete Structures

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0720**	**SEMESTER**	**7**
COURSE TITLE	**Reinforced Concrete Structures**		

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*	Specialisation Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CIV225/

(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 aim of the course is the comprehension of the behavior of concrete and its use in structures, the ability to evaluate its properties through experimental procedures and the design of members and structures.

Upon completion of the course, students will have:

1. Knowledge of the behavior of reinforced concrete structures.
2. In-depth knowledge and critical understanding of theory and principles of structural design and calculation of reinforced concrete structures, since they could use new technologies and information systems in analysis and design of reinforced concrete structures.
3. Knowledge and skills in calculation of reinforced concrete structures.
4. Ability to draw construction plans and reinforcement drawings.
5. Knowledge to put what they learn to solve practical problems of civil engineering.

6. Knowledge and skills in evaluating key parameters as the ductility and strength of reinforced concrete members.
7. Ability to develop personal responsibility and offer scientific opinion.
8. Ability to manage time in an appropriate manner.

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, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and 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:

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Decision Making.
- Autonomous work

(3) SYLLABUS

12. Analysis of concrete structures at the ultimate and serviceability limit state.
13. Flat slabs. Stairs.
14. Torsion. Reinforcement details.
15. Punching shear. Reinforcement details.
16. Shear Walls. Reinforcement details.
17. Crack control and deflection. Estimation of crack widths.
18. Foundation. Isolated footing, strip foundation, raft or mat foundation.
19. Beam-Column Joints.
20. Buckling of reinforced concrete columns.
21. Modelling of reinforced concrete structures.
22. Design and detailing for seismic forces. Ductility, behaviour factor.
23. Confinement σκυροδέματος.
24. Analysis examples of reinforced concrete members.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Teaching using ICT, Communication and Electronic Submission. Communication via email or MS-Teams. Announcements and educational material through the e-learning platform e-Class. Use of Excel software.
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.* *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*	
STUDENT PERFORMANCE EVALUATION	

Activity	*Semester workload*
Lectures	52
Preparation for Project	30
Personal Study	38
Course total	**120**

Description of the evaluation procedure *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Final written examination: 80% Preparation for the project: 20%

(5) **ATTACHED BIBLIOGRAPHY**

Greek Bibliography:

1. Mosley, B., Bungey, J. & Hulse R. (2016), Reinforced Concrete Design to Eurocode 2. Athens: Klidarithmos (in Greek).
2. Tsonos A.D. (2016), Design of reinforced concrete structures to Eurocodes, Thessaloniki: Sofia Publications (in Greek).
3. Chouliaras I.G. (2003), Reinforced Concrete Structures, Athens: Papasotiriou Publications (in Greek).
4. Gros, G. (2004), Reinforced Concrete according to the Greek Code 2000. Comparison with Eurocode 2 and DIN 1045/2001. Materials - Design – Structures, Athens: Symmetria Publications (in Greek).
5. Georgopoulos, Th. (2015), Reinforced Concrete (vol. A), Pavlos Georgopoulos Publications (in Greek).
6. Georgopoulos, Th. (2015), Athens: Tziola Publications (vol. B), Pavlos Georgopoulos Publications (in Greek).
7. Ekonomou, C.M. (2009), Reinforced Concrete from A to Z, Athens: SELKA-4M Publications (in Greek).
8. Zararis, Pr. (2002), Calculation Methodology of Reinforced Concrete, Thessaloniki: Kyriakidis Bros. Publications (in Greek).
9. Moutsopoulou A., Merkou E., Georgantzia D. (2015), Design of Reinforced Concrete Structures According to Current Earthquake Resistant Design Codes, Athens: Tziola Publications (in Greek).
10. Karayiannis, Ch., (2013), Design of Reinforced Concrete Structures for Seismic Actions, Thessaloniki: Sofia Publications (in Greek).
11. Konstantinidis, Ap. (2008), Earthquake Resistant Buildings Made of Reinforced Concrete, Vol. A – Construction and Detailing, Athens: π-Systems Publications (in Greek).
12. Konstantinidis, Ap. (2013), Earthquake Resistant Buildings Made of Reinforced Concrete, Vol. B – Static and Dynamic Analysis, Athens: π-Systems Publications (in Greek).
13. Karaveziroglou V.M. (2015), Calculation and Design of Structures, Athens: Tziola Publications.
14. Konstantinidis, Ap., (1994), Reinforced Concrete Applications – Vol. A, Athens: π-Systems Publications (in Greek).
15. Konstantinidis, Ap., (1994), Reinforced Concrete Applications – Vol. B, Athens: π-Systems Publications (in Greek).
16. Mehta P.K. and Monteiro P.J.M. (2009), Concrete: Microstructure, Properties, and Materials, 3rd edition, Athens: Klidarithmos (in Greek).
17. Leonhardt F. and Monning E. (1975), Concrete Structures (Vol. 3: Η Τέχνη του Οπλισμού), Athens: Giurdas Publications (in Greek).
18. Geistefeldt K.J. (2000), Eurocode 2: Reinforced Concrete Structures, Athens: Giurdas Publications (in Greek).

Foreign Bibliography:

1. Bhatt, P., MacGinley, T. J., & Choo, B. S. (2006). "Reinforced Concrete, Design Theory and Examples". 3rd Edition. Taylor & Francis.
2. Brooker, O. et. al. (2006). "How to Design Concrete Structures using Eurocode 2". The Concrete Centre.
3. Goodchild, C. H. (2009). "Worked Examples to Eurocode 2". Volume 1. The Concrete Centre.
4. Mosley, B., Bungey, J. & Hulse R. (2007). "Reinforced Concrete Design to Eurocode 2". 6thEdition. Palgrave McMillan.
5. Narayanan, R. S., & Goodchild, C. H. (2006). "Concise Eurocode 2". The Concrete Centre.
6. Nilson A.H., Design of Concrete Structures, McGraw-Hill, 1997.
7. Wight J.K. and MacGregor J.G. (2008), Reinforced Concrete: Mechanics and Design, Prentice Hall.
8. Chen W.F. (1995), The Civil Engineering Handbook, CRC Press.

Related academic journals:

1. ACI Structural Journal (American Concrete Institute)
2. Structural Concrete Journal of the FIB
3. Engineering structures
4. Journal of Structural Engineering, ASCE
5. International Journal of Concrete Structures and Materials
6. Concrete International
7. Computers and Concrete
8. Advances in Concrete Construction
9. Earthquakes and Structures
10. Structural Engineering International (SEI) Journal
11. Structural Engineering and Mechanics
12. Cement and Concrete Research
13. International Journal of Cement Composites and Lightweight Concrete
14. Cement and Concrete Composites