9.6 CE0921 – Prestressed Concrete

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0921**	**SEMESTER**	**9**
COURSE TITLE	**Prestressed Concrete**		

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	5
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/CIV251/

(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*

Upon completion of the course, students will obtain:

1. In-depth knowledge and critical understanding of the theory and principles of design and analysis of Pretension structures, since they will use new technologies and information systems to design Long-span structures with Prestressed concrete.
2. Knowledge and skills on designing and analyzing Pre- or Post-tension Long span structures (Beams, Columns, Frames).
3. Knowledge and synthesis skills, ability for analysis and evaluation of internal forces (N, Q, M) due to Pretension force losses.

Specifically, students will be able to:

1. Describe and identify the parts, from which a Pre- or Post-tension structure is formed.

2. Apply principles of Strength of Materials and appropriate Equations of Stability for the evaluation of bending stresses due to external loadings and applied Pretension force.
3. Use knowledge from Reinforced Concrete design for evaluating shear stresses due to external loadings and applied Pretension force.
4. Evaluate Pretension force losses and estimate internal forces of structure.
5. Determine the deflection of pre-tension beams at various loadings.

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:

- Study of needs for designing Prestressed long-span structures,
- Decision Making on Choice and solution of structure suffering as much as lower internal forces with higher external loading,
- Design and Construction Management on Design, development and choice of appropriate Prestressed structure subject to safe loading situation accompanied by low deflections,
- Teamwork concerning the Ability for dialog, self-esteem and commitment to reach an agreement.
- Working in an international environment for Communicative ability in international languages, respecting diversity, multiculturalism, the environment and the demonstration of professional and ethical responsibility.
- Working in a interdisciplinary environment and percepting problems and needs for using in-situ long-span Prestressed structures characterized by economical profit as well as safe bearing loading capacity.
- Generate new research ideas by Promoting free, creative and inductive thinking to develop new strategic approaches for designing and analyzing prestressed long-span structures.

(3) SYLLABUS

1. Principles for design of Pretension structures.
2. Constituent materials of Pretension structures. Methods for Pretension of structures.
3. Structural element submitted to a central Pretension force.
4. Structural element submitted to an eccentric Pretension force.
5. Design of section at serviceability limit state.
6. Evaluation of minimum cross section for a prestressed beam for safe bearing loading.
7. Evaluation of minimum Pretension force for a prestressed beam.
8. Design of Tendons profile for a prestressed beam.
9. Losses of Pretension force (long-term and short-term).
10. Evaluation of beam deflections.
11. Anchorage systems for tendons, section adequacy and reinforcement evaluation at anchorage regions of a beam.
12. Design of a beam section in bending and evaluation of its reinforcement.
13. Design of a beam section in shear and evaluation of shear reinforcement.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Teaching using ICT, Communication and Electronic Submission.

Use of ICT in teaching, laboratory education, communication with students	
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 *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: 100%

Activity	***Semester workload***
Lectures	52
Classwork	31
Preparation for Project	52
Course total	**135**

(5) ATTACHED BIBLIOGRAPHY

Greek Bibliography:

1. Penelis, G. (1973), Prestressed Concrete(Vol. III), Thessaloniki (in Greek).
2. Tasios Th., Giannopoulos P., Trezos C. and Tsoukantas S., (1986), Prestressed Concrete, Athens: Symmetria Publications (in Greek).
3. Kalevras Vl. (1989), Lectures of Reinforced Concrete (Vol. IV): Prestressed Concrete, Xanthi (in Greek).
4. C. B. Demakos (2015), Lectures for Prestressed Concrete, University of West Attica.
5. Karayiannis, Ch., (2015), Design of Prestressed Concrete Structures, Thessaloniki: Sofia Publications (in Greek).

Foreign Bibliography:

1. Magnel, G.(1951), Le Beton Precontraint, etudes Theoritique et Experimental, Paris.
2. Leonhardt F.(1955), Spannbeton fuer die Praxis, Berlin.
3. Kong, F. K. and Evans, R. H.(1975),Reinforced and Pre-stressed Concrete,London:Nelson.
4. Naaman, A.E. (1982), Prestressed Concrete Analysis and Design, Mc Graw-Hill.
5. Lin, T. and Burns, N.(1982), Design of Prestressed Concrete Structures, J. Wiley.
6. Nawy, E.G.(1989), Prestressed Concrete-A Fundamental Approach, Prentice Hall, New Jersey.
7. Collins, M. P., Denis, M. (1991), Prestressed Concrete Structures, Prentice Hall.
8. Ned H., Burns, Bruce W., Russell, Tung-Yen, Lin, (2005), Design Of Prestressed Concrete Structures, John Wiley and Sons Ltd.
9. Bhatt Prab (2011), Prestressed Concrete Design to Eurocodes, Spon Press.