COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ARC_230	SEMESTER	1o
COURSE TITLE	Structures 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
Lectures and Exercises	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*	Specialized General Knowledge
PREREQUISITE COURSES:	All the basic required knowledge, the students should have for the understanding of the content of the course, is presented during the first lectures. This knowledge mainly concerns the fundamental elements of the course of Physics (concepts of forces, moments, action-reaction), taught in High-School. Moreover, during the same period, an extensive explanation of the connection between these concepts and engineering is made.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (the course for Erasmus students is taught in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/ARCH105/

(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 "Structures I" is held during the 1st semester of studies of the Department of Architecture of the University of Patras and aims to present the methods available to engineers for the analysis and design of structures and the principles on which they are based. More specifically, the course presents the basic concepts and principles of Static Analysis and how they relate to the Architecture of Buildings. The several types of structural members composing a structure and the various kinds of loads are examined. The types of support and methods for connecting structural members to create isostatic and hyperstatic bodies are analyzed. An extensive presentation of the equilibrium equations, which are the basic tool for the analysis of simple isostatic structures (beam elements, trusses, etc.) and complex isostatic formations, is implemented. The support reactions and the internal stresses --forces of the above-mentioned structures are computed. The concept

of the stresses, their role in the control of the strength of the structures and the choice of materials for their construction are examined. For the understanding of the theory, several structures are analyzed.

- The basic aim of the course "Structures I" is to introduce students to the basic knowledge and skills for the design of structural members and the computation of their internal stress distribution due to the external loads. With the successful completion of the course, the students will be able to recognize the vulnerable points of each construction and therefore perform the necessary static analysis computations. Moreover, the student will understand that each design of a new structure should not only meet the criteria of aesthetic but also static adequacy

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…*
	…….

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Respect for the natural environment*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

The course includes several lectures, presentations, representative exercises.

Description of the weekly lectures

1st lecture	Architecture and structure. Basic concepts and principles of Static Analysis. The several types of structural members. Materials for the construction of structural members and their characteristics.
2nd lecture	Synthesis, analysis and equilibrium of forces and moments. Replace forces with equivalent ones. International system of measurement units and their modifications.
3rd lecture	Solution of exercises on the composition of forces and moments.
4th lecture	Types of loads applied to constructions. Distributed and concentrated loads. Introduction to Regulations - Eurocodes. Load combinations. Presentation of parts of structures affected by various types of loads.
5th lecture	Types of supports. Presentation of how to implement them. Equilibrium equations and determination of support reactions. Exercises.
6th lecture	Internal stress condition of structures. Internal forces. Which internal forces are developed in the various types of structural members
7th lecture	Definition of stress. Normal and shear stresses. Distribution of stresses in the cross section. The role of stresses in the strength test of structural members and in the choice of construction material. Bending inertia of cross section. Elastic stability of members.
8th lecture	Statically determinate and indeterminate structures. Separation of isostatic – and hyperstatic structures. Introduction to methods of determining the stress condition of structures.

9th lecture	Methods of analyzing trusses. Exercises for the determination of internal stress condition of truss members. Space-trusses.
10th lecture	Equilibrium of beam members. Determination of internal stresses. Diagrams of internal forces of beams. Check for cross-sectional adequacy. Study of multi-span beams.
11th lecture	Determination of internal stresses and forces of multi-span beams and verification of cross-section adequacy.
12th lecture	Plane frame and complex structures. Design of internal forces' diagrams. Design of cross sections.
13th lecture	Solution of exercises for the determination of internal forces of frames and complex structures. Resolving space structures.
14th lecture	Revision exercises.

(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*	Apart from the theoretical lectures, practical exercises related to engineering constructions are solved. Additionally, photos and videos of existing structures are presented for the recognition of structural members and the developed stresses and deformations. Moreover, pc software for the determination of stresses is briefly presented. For the Erasmus students, all the additional notes, bibliography and lectures will be given in English. Support Learning through the e-class platform is also implemented.
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.*	The evaluation of the students' performance is based on their participation to the exercises and project performed during the semester (30%) and the evaluation of the written examination at the end of the semester (70%).

Activity	*Semester workload*
Lectures	52
Simple individual exercises	13
Project	5
Independent Study & Examination of bibliography	30
Course total	*100 (25 hours per credit)*

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

Greek bibliography

- Π. Βουθούνης, Μηχανική απαραμόφωτου στερεού – Στατική, εκδ. Π.Βουθούνης, 2014
- Λεωνίδας Θ. Σταυρίδης, Στατική των Δομικών Φορέων, εκδ. Κλειδάριθμος, 2008.
- Ευάγγελος Σαπουντζάκης, Στατική Ραβδωτών Φορέων-Ισοστατικοί Φορείς, εκδ. Τσότρας 2014.
- Ελευθέριος Ι. Πανταλέων, Στατική : Δομομηχανική Ι , εκδ. Φούντας, 2009.

English bibliography

- Krenk, Steen, Mechanics and Analysis of Beams, Columns and Cables, Ed. Springer- Verlag Berlin Heidelberg
- Pilkey, Walter D. Analysis and Design of Elastic Beams: Computational Methods, Wiley; ISBN-13: 978-0471381525
- Karl-Gunnar Olsson, and Ola Dahlblom Structural Mechanics: Modelling and Analysis of Frames and Trusses, Wiley; ISBN: 978-1-119-15933-9
- Timoshenko, Stephen Theory of Structures, McGraw-Hill College, ISBN-13: 978-0070648685