COURSE OUTLINE

(1) GENERAL

SCHOOL	**UNIVERSITY OF THESSALY – SCHOOL OF ENGINEERING**		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΚ1601	**SEMESTER**	4th
COURSE TITLE	Structural Analysis 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	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, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	Mechanics of the undeformable body
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://lsad.civ.uth.gr/el/mathimata/statiki-1

(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*

- Determination of the section forces, displacements and lines of influence for frame and truss isostatic structures
- Distinguish between unstable, isostatic and hyperstatic structures.
- Distinction between stresses from loads and constraints.
- Calculation of reactions of isostatic structures, M,Q,N diagrams of isostatic structures.
- Calculations of influence lines.
- Generation of the poles formation for 1-degree-of-freedom unstable structures.
- Calculation of fundamental displacements and deflected shape of structures.
- Analysis of complex structures into simpler ones and formation of complex structures from simpler ones.

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…
	…….

Analysis and Synthesis - Design of structures

Extensive references are made in the course regarding the design of civil engineering projects with emphasis on infrastructure (buildings, bridges, public spaces, etc.)

Decision-making

In addition to the formal skills, the course is oriented towards cultivating decision-making skills regarding optimal design of structures.

Working independently - Team work

The course cultivates skills for independent work as well as the culture of teamwork that is essential for the production of infrastructure projects.

Working in an international environment - Working in an interdisciplinary environment

Lectures highlight young graduates' ability to work internationally, citing past examples. They also promote interdisciplinary collaboration, essential for creating high-quality, modern, and environmentally safe projects.

(3) SYLLABUS

1. Statically determinate structures. Basic principles. The support of rigid bodies. Determination of reactions and internal forces.
2. Diagrams of bending moments, shear and axial forces due to concentrated and distributed loads. Properties and interrelation of the diagrams. The diagrams of polygonal structures.
3. Frame structures. The construction of the M,Q diagrams through the diagrams of the simply supported beam.
4. The notion of influence lines. The influence lines of simple beams.
5. Formulation and analysis of complex structures. The influence lines of complex structures.
6. Formulation and analysis of simple and complex trusses. The influence lines of truss structures.
7. The curved beam. Applications in tension and compression structures. Applications of symmetry in structural analysis.
8. Stable and unstable structures. The motion of rigid bodies in two dimensions. The study of one- degree-of-freedom unstable rigid systems. Applications.
9. Generalized forces and displacements. Fundamental displacements. The principle of virtual work for rigid systems with bilateral and unilateral supports.
10. Applications of the principle of virtual work for rigid systems. Calculation of internal or external forces.
11. Deformations of beams. Virtual displacements. The principle of virtual work for deformable systems.
12. The reciprocal theorems and their applications. The determination of deflections.
13. Deflections from external loading, support displacements, internal discontinuities and temperature effects.
14. Determination of the deflected shapes of beams

(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 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*	

Activity	*Semester workload*
Lectures	56 hours
Study of lecture notes	28 hours
Non-guided study	56 hours
project preparation	20 hours
Examinations preparation	20 hours
Examinations	3 hours
Course total	*183*

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 The evaluation includes: - Written examinations (70% of the final grade) - Semester project (30% of the final grade) The semester topic is not compulsory. In this case, the assessment will be based solely on the written examination (100% of the final grade). Evaluation criteria (for both the written examination and the semester topic) The assessment is whether the student: - Has the ability to analyze complex structures into simpler ones - Has the ability to calculate M,Q,N diagrams, truss forces, displacements from loads and constraints in isostatic structures. - Has the ability to calculate influence lines in isostatic structures. The assessment criteria are described in the course website.

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- *Ι. Αβραμίδης. Στατική των Κατασκευών, Τόμος Ι (Θεωρία), Εκδόσεις ΣΟΦΙΑ, Θεσσαλονίκη 2008*
- *Ι. Αβραμίδης, Κ. Μορφίδης, Στατική των Κατασκευών, Τόμος Ια (ασκήσεις), Εκδόσεις ΣΟΦΙΑ, Θεσσαλονίκη 2008.*
- *Γ. Νιτσιώτας, Στατική των Γραμμικών Φορέων, Τόμος πρώτος – Κλασική Στατική, Εκδόσεις Ζήτη, 1995.*
- *Anthony E. Armenakas, Classical Structural Analysis: A Modern Approach, McGraw Hill Text, 1988.*
- *Ghali, A.M. Neville, Structural Analysis, SPON Press*
- R. Hibbeler, Structural analysis, Pearson, 10th edition, 2017.
- K. Leet, C-M Uang, J. Lanning, Fundamentals of structural analysis, Mc Graw Hill, 2017
- A. Williams, Structural analysis in theory and practice, Elsevier, 2009.
- J. Stanford, Structural Analysis Made Easy: A practice book for calculating statically determined systems, 2018.

- Related academic journals:

- *Computers and structures*

- *Computational mechanics*
- *Engineering structures*
- *Computer methods in applied mechanics and engineering*
- *Advances in engineering software*