COURSE OUTLINE

(1) GENERAL

SCHOOL	**UNIVERSITY OF THESSALY – SCHOOL OF ENGINEERING**		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΚ1602	**SEMESTER**	5th
COURSE TITLE	Structural Analysis II		

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 Structural analysis I
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-2

(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 structural indeterminate (hyperstatic) structures
- Distinguishing the results of introducing constraints in hyperstatic structures from the results of introducing them in isostatic ones.
- Calculation of M,Q,N diagrams and influence lines of hyperstatic structures.
- Calculation of fundamental displacements and deflected shape of hyperstatic structures.
- Analysis of hyperstatic structures as an equivalent superposition of isostatic systems or sum of individual simple elements (force method / displacement method).
- Justification of the choice of isostatic or hyperstatic structural systems for the load-bearing structure of civil engineering structures, depending on the type and specific loading.

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

The course includes the classical methods for the analysis of statically indeterminate structures, i.e. the flexibility and stiffness methods. Apart from the comprehension of the analysis methods, the target of the course is the indication of the advantages and disadvantages of the statically indeterminate structures with respect to statically determinate ones, depending on the specific application. The course also includes the determination of influence lines of statically indeterminate structures. As a result the students become familiar with the stress flow in statically indeterminate structures.

1. Introduction to the flexibility method for the analysis of statically indeterminate structures. Compatibility relations.
2. Internal forces due to loading, support displacements, internal discontinuities and temperature effects.
3. Displacements and deflections with the flexibility method. Simplified methods for the determination of the displacements.
4. Influence lines using the flexibility method.
5. Continuous beams, statically indeterminate frames.
6. Statically indeterminate trusses. Formulation and analysis.
7. Applications of symmetry in statically indeterminate structures.
8. The stiffness method. General principles. The duality with the flexibility method.
9. Simplification of the stiffness method for the analysis of nonsway systems due to loading, support displacements,internal discontinuities and temperature effects.
10. Nonsway systems in which the truss equivalent is statically indeterminate. Determination of the axial forces.
11. Analysis of sway frames with the stiffness method.
12. Influence lines with the stiffness method.
13. Applications of symmetry in the analysis of structures with the stiffness method.

14. Combined application of the flexibility and stiffness methods.

(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	20 hours
Non-guided study	24 hours
project preparation	30 hours
Examinations preparation	20 hours
Examinations	3 hours
Course total	*150*

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:

1. Ι. Αβραμίδης. Στατική των Κατασκευών, Τόμος Ι (Θεωρία), Εκδόσεις ΣΟΦΙΑ, Θεσσαλονίκη 2008
2. Ι. Αβραμίδης, Κ. Μορφίδης, Στατική των Κατασκευών, Τόμος Ιβ (ασκήσεις), Εκδόσεις ΣΟΦΙΑ, Θεσσαλονίκη 2008.
3. Γ. Νιτσιώτας, Στατική των Γραμμικών Φορέων, Τόμος πρώτος – Κλασική Στατική, Εκδόσεις Ζήτη, 1995.
4. Anthony E. Armenakas, Classical Structural Analysis: A Modern Approach, McGraw Hill Text, 1988.
5. Ghali, A.M. Neville, Structural Analysis, SPON Press
6. R. Hibbeler, Structural analysis, Pearson, 10th edition, 2017.
7. K. Leet, C-M Uang, J. Lanning, Fundamentals of structural analysis, Mc Graw Hill, 2017
8. A. Williams, Structural analysis in theory and practice, Elsevier, 2009.
9. S.T. Mau, Introduction to structural analysis. Displacement and Force methods, CRC Press, 2012

- Related academic journals:

1. *Computers and structures*
2. *Computational mechanics*

3. *Engineering structures*
4. *Computer methods in applied mechanics and engineering*
5. *Advances in engineering software*