

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	UNIVERSITY OF THESSALY – SCHOOL OF ENGINEERING		
<b>ACADEMIC UNIT</b>	DEPARTMENT OF CIVIL ENGINEERING		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	ΔO1300	<b>SEMESTER</b>	5th
<b>COURSE TITLE</b>	Modelling of civil engineering structures		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>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</i>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>	
	4	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialized general knowledge, skills development</i>	Specialized general knowledge		
<b>PREREQUISITE COURSES:</b>	Structural analysis I Structural analysis II Structural analysis III		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	Greek		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>COURSE WEBSITE (URL)</b>	<a href="http://lsad.civ.uth.gr/el/mathimata/simulation">http://lsad.civ.uth.gr/el/mathimata/simulation</a>		

### (2) LEARNING OUTCOMES

<p><b>Learning outcomes</b> <i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> <li>• <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i></li> <li>• <i>Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i></li> <li>• <i>Guidelines for writing Learning Outcomes</i></li> </ul>
<ul style="list-style-type: none"> <li>• Determination of the optimal numerical model of civil engineering structures.</li> <li>• Production of structural models for steel and concrete structures</li> <li>• Generation of load models (gravity, snow, wind, earthquake loads)</li> <li>• Application of numerical methods for the determination of the stress state and the calculation of the displacements (static and dynamic analysis).</li> <li>• Synthesis of spatial structures from individual structural elements</li> <li>• Evaluation of the results of numerical models on the basis of the expected behaviour and their verification by simple methods.</li> </ul>

### 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 main objective is the comprehension of modeling methods for civil engineering structures. The course is taught through computer software and includes characteristic cases of civil engineering structures. Special attention is given to points where the unsuccessful modeling may lead to significant mistakes. The course contains the following:

#### Structural types

- Framed structures
- Plate structures
- Structures with both frame and planar elements (plates, walls, etc)
- Foundations.

#### Analysis types

- Static analysis
- Dynamic analysis
- Soil-structure interaction

#### Materials

- Concrete
- Structural steel
- Composite members
- Mixed structures (containing elements of different materials)

The course contains also the following:

- Methods for quick error identification
- Results interpretation
- Connection of structural analysis with design

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b>	face-to-face
<i>Face-to-face, Distance learning, etc.</i>	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>	
<i>Use of ICT in teaching, laboratory education, communication with students</i>	

<b>TEACHING METHODS</b>	<i>Activity</i>	<i>Semester workload</i>
<p><i>The manner and methods of teaching are described in detail.</i></p> <p><i>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.</i></p> <p><i>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</i></p>	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
	<b>Course total</b>	<b>150</b>
<p><b>STUDENT PERFORMANCE EVALUATION</b></p> <p><b>Description of the evaluation procedure</b></p> <p><i>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</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>Language of evaluation: Greek</p> <p>The evaluation includes:</p> <ul style="list-style-type: none"> <li>- Semester project (50% of the final grade)</li> <li>- Oral examination (50% of the final grade)</li> </ul> <p>The preparation of the semester topic is compulsory.</p> <p>Assessment criteria</p> <p>The assessment is based on the extent to which the student:</p> <ul style="list-style-type: none"> <li>- Has the ability to compose a structure from individual building elements.</li> <li>- Has the ability to produce reliable models of structural elements and their loads.</li> <li>- Has the ability to understand the correctness of the results produced by numerical structural models and verify them by simple methods.</li> </ul> <p>The assessment criteria are described on the course website.</p>	

## (5) ATTACHED BIBLIOGRAPHY

### **-Suggested bibliography:**

1. Αβραμίδης, Ι., Αθανατοπούλου, Μ., Αναστασιάδης, Κ. Μορφίδης, Κ., Πρότυπα αριθμητικά παραδείγματα ανάλυσης κατασκευών για την ορθή εφαρμογή του ΕΑΚ και τον έλεγχο των προγραμμάτων Η/Υ, ΕΚΔΟΣΕΙΣ ΑΙΒΑΖΗΣ
2. Αβραμίδης Ιωάννης, Αθανατοπούλου Ασημίνα, Αντισεισμικός Σχεδιασμός Κτιρίων Ο/Σ και Αριθμητικά Παραδείγματα, Εκδόσεις Σοφία.
3. Π.Κ. Κολιόπουλος, Γ.Δ. Μανώλης, Δυναμική των κατασκευών με εφαρμογές στην αντισεισμική μηχανική, Εκδόσεις Γκιούρδα.
4. Αβραμίδης Ιωάννης, Αθανατοπούλου Ασημίνα, Μορφίδης Κων/νος, Η Μέθοδος των Πεπερασμένων Στοιχείων. Προσομοίωση και Ανάλυση κατασκευών. Μια πρακτική εισαγωγή, Εκδόσεις Σοφία.
5. Εμμανουήλ Κίρτας, Γεώργιος Παναγόπουλος, Προσομοίωση κατασκευών σε προγράμματα ηλεκτρονικού υπολογιστή. Εφαρμογές με το πρόγραμμα πεπερασμένων στοιχείων SAP2000, Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα, Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών (HEALINK).
6. R. Hibbeler, Structural analysis, Pearson, 10<sup>th</sup> 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. J. Stanford, Structural Analysis Made Easy: A practice book for calculating statically determined systems, 2018.
10. 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