1.1.1 Theory of Elasticity

GENERAL

SCHOOL	Engineering
ACADEMIC UNIT	CIVIL ENGINEERING
LEVEL OF STUDIES	Undergraduate
COURSE CODE	ΔOM006 **SEMESTER** 3rd
COURSE TITLE	Theory of Elasticity

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*	Scientific Field
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

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 familiarization of students with the concepts of stress and strain in continuous elastic media and the stress-strain relationship in the elastic region. Understanding the equilibrium and compatibility equations. The use of boundary conditions. The ability to apply analytical, energy, and numerical methods to determine deformations in truss and solid structures.

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
- Adapting to new situations
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- Working independently
- Team work
- Working in an interdisciplinary environment
- Project planning and management
- Criticism and self-criticism
- Production of free, creative and inductive thinking

SYLLABUS

• Stresses. Normal and shear stress. Stress tensor. Equations of equilibrium.
 • Basic principles of elasticity – plasticity. Continuous media. Homogeneous – isotropic materials. Small and large deformations. Second-order phenomena. Static and dynamic loads.
 • Change of coordinate system. Transformation of stresses.
 • Principal stresses – principal axes. Mohr's circles. Invariants of stresses. Three-dimensional and plane stress state.
 • Deformations. Strain tensor. Laws of material behavior, stress-strain relationship. Compatibility equations.
 • Linear elasticity. Constitutive equations. Mechanical characteristics of materials. Hooke's law. Modulus of elasticity. Poisson's ratio. Shear modulus. Elasto-plastic materials.
 • Properties of fluids. Viscosity.
 • Boundary conditions. Principle of superposition. Saint Venant's principle. Plane stress state. Plane strain state.
 • Airy stress function. Solving two-dimensional problems in orthogonal and polar coordinates. Boundary conditions.
 • Lamé's constants. Elasticity equations. P and S wave velocities. Speeds of propagation.
 • Energy methods. Strain energy. Maxwell - Betti reciprocity theorem. Castigliano's theorem.

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	52
	Individual study	78
	Course total (26 hours workload per ECTS credit)	*130*

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure*	1. Assignment of tasks aimed at exploring the understanding of the concepts taught. 2. Final written exam at the end of the semester (in Greek).

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.*	3. Each student is given the opportunity to review their written exam and have their mistakes analyzed.

ATTACHED BIBLIOGRAPHY

Gdoutos E. «Theory of Elasticity», Symmetria publications 2003 (in Greek)
http://eclass.opencourses.teicm.gr/eclass/modules/document/file.php/TMB111/FULL.pdf
Timoshenko S, Goodier G.N. «Theory of Elasticity», McGraw-Hill, 1969.
Timoshenko S, «Theory of Elasticity», McGraw-Hill, 1987.
L. D. Landau, E. M. Lifshitz, «Theory of Elasticity», Pergamon Press, 1989.
A.I. Lurie, «Theory of Elasticity», Springer Science Business Media, 2010.