2.2 CE0220 – Mechanics of Deformable Bodies

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0220**	**SEMESTER**	**2**
COURSE TITLE	**Mechanics of Deformable Bodies**		

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	6
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*	Special Background Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CIV245/

(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 aim of the course is to give the students fundamental knowledge on the concepts of Mechanics of Materials.

Upon completion of the course, students will have:

1. Knowledge and understanding of the basic concepts of Mechanics of Materials (stress and strain in uniaxial experiments, Young's modulus, Hooke's law, normal / shear stresses and strains, stress-strain diagrams, idealized behavior of materials, axial/lateral strain, Poisson's ratio, generalized Hooke's law, failure criteria of materials).
2. Knowledge of the behavior of materials under various loadings.

Specifically, students will be able to:

1. Have adequate comprehension skills of the basic concepts of Mechanics of Materials, such as strain and stress.

2. Recognize various characteristics of the behavior of a material based on stress-strain diagrams.
3. Use Mohr's circle to depict the stress at a specific point.
4. Evaluate the principle stresses and strains.
5. Understand the use of strain gauges and strain rosettes.
6. Assess whether a material has failed or not, based on appropriate failure criteria, and understand the differences between various failure criteria.
7. Evaluate the centroid, the first and second moments of area of a cross section
8. Solve simple problems in pure bending.
9. Manage time in an appropriate manner.

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…*

Specifically, students will be able to perform:

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Decision Making.
- Autonomous work

(3) SYLLABUS

1. Definition of stress. Normal and shear stresses.
2. Stresses on inclined planes during axial loading of an elastic beam.
3. Definition of strain. Normal and shear strain.
4. Constitutive relations of isotropic materials in 1D. Hooke's law. Axial loading of elastic and elastoplastic beams. Loading-unloading. Permanent stresses and strains. Ductile and brittle materials. Idealized behavior of materials.
5. Lateral strains, Poisson's ratio. Shear modulus. Hooke's law for shear loading.
6. Stress transformation. Principle stresses and directions.
7. Mohr's circle.
8. Strain transformation. Principle strains and directions.
9. Generalized Hooke's law.
10. Strain gauges and rosettes. Compatibility Equations.
11. Failure criteria of materials (maximum normal stress, Tresca, von Mises).
12. Centroids, first and second moments of area of cross sections.
13. Pure bending of elastic beams with symmetric cross section. Stresses, strains, curvature.

(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 using ICT, Communication and Electronic Submission.
TEACHING METHODS *The manner and methods of teaching are described in detail.*	

Activity	***Semester workload***
Lectures	52

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*	Classwork: 28 Preparation for Project: 70 Personal Study: 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 Final written examination: 100%

(5) **ATTACHED BIBLIOGRAPHY**

Greek Bibliography:

1. Vouthounis P. (2019) Strength of Materials – Mechanics of deformable solids, 4th edition, Vouthouni A. publications (in Greek).
2. Papamichos E., Charalampakis N. (2017) Strength of materials and structural components, 2nd edition, Tziolas publications (in Greek).

Foreign Bibliography:

1. Beer F., Johnston E.R. Jr, DeWolf J., Mazurek D. (2014), Mechanics of materials, 7th edition, McGraw Hill.