COURSE OUTLINE

1. GENERAL

FACULTY	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
SECTION	Valorization of Natural Resources & Agricultural Engineering		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE CODE	**2550**	**SEMESTER OF STUDY**	**6**
COURSE TITLE	Material Strength		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded to distinct parts of the course e.g. lectures, laboratory exercises, etc. If the credits are awarded uniformly for the entire course, indicate the weekly teaching hours and the total credits*	**TEACHING WEEKS**	**CREDITS**
Theory	5	5
Total		**5**
Add rows if needed. The teaching organization and teaching methods used are described in detail in (d).		

COURSE TYPE *general background, special background, specialization general knowledge, skills development*	General Knowledge Specialization
PREREQUISITE COURSES:	STATICS
LANGUAGE OF INSTRUCTION AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	Openeclass AUA - Asynchronous Distance Learning Platform | MATERIAL STRENGTH (aua.gr)

2. LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, the specific knowledge, skills and competences of an appropriate level that students will acquire after the successful completion of the course.

Consult Appendix A

- *Description of the Level of Learning Outcomes for each cycle of study according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Learning Outcomes Writing Summary Guide*

Students, upon successful completion of the course, will be able to:

• Understand and be able to work with the basic definitions of stresses-distortions

• Understand the relationships between loads, stresses, deformations, strength of materials and
safety factors

• Understand the Mohr cycle and be able to calculate main trends and levels

• Analyze and calculate stresses and deformations, and design structural members of isostats
and hyperstatic carriers undergoing axial, torsional, flexural, interdepartmental and combined loading in the elastic area

• Understand the behavior of structural elements subjected to axial, torsional, flexural, interdepartmental and combined loading in the plastic area

• Understand the basic concepts for beam displacement and critical calculation Euler buckling load

• Understand the importance of choosing the right materials in terms of mechanical properties, cost, weight and sustainability

General Competencies

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Supplement and listed below), which of them does the course aim at?.

Search, analyze and synthesize data and information, using the necessary technologies	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Respect for the natural environment*
Autonomous work	*Demonstrate social, professional and ethical responsibility and sensitivity to gender issues*
Teamwork	*Criticism and self-criticism*
Working in an international environment	*Promoting free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Generation of new research ideas	*Other...*
	…….

Search, analysis and synthesis of bibliographic data and information from the internet, with the use of necessary technologies
Solving autonomous tasks for home
Problem-solving teamwork in the room
Respect for the natural environment with the right choice of materials
Promote free, creative and inductive thinking by assessing its importance
design and behavior of mechanical systems from various materials in terms of safety, functionality and economy

3. COURSE CONTENT

1. Introduction (Introductory concepts. Basic assumptions about the solid deformable body). Trends
(The concept of voltage. Correct voltages. Contact stresses. Shear stresses. Tensor character of
Voltage. Equilibrium equations. Permissible voltages, safety factors). Deformities. (OR concept of deformation. Correct deformation. Shear deformation. The tensor of Deformities. Reduced swelling. Deformations due to temperature).
2. Stress-deformation relationships (Sublimation of material behavior. Relationships between quantities defining the intensive state and deformation of a linear element. The Hooke's law, modulus of elasticity, Poisson's ratio. Equations of state. The generalized Hooke's law. The beginning of Saint-Venant).
3. Axial loading (Stresses and deformations of axially charged linear carriers in elastic area; Tensile-Compression: ductile, brittle materials. Calculation of length change linear element). Plastic deformation.
4. Torsion (Basic torsion assumptions. The type of torsion. Design of bars of circular cross-section
in torsion. Power transmission and design of power transmission shafts. Bar torsion angle circular cross-section. Torsion of bars of rectangular cross-section. Torsion in the elastoplastic region).
5. Bending (Basic bending assumptions. The type of elastic net bending of a flat beam. Moments
Idle. Bending beams from 2 or more materials. Cutting bending: shear flow and shear stresses on beams; Carrier design in bending. Elastic line. Bending in elastoplastic area.. Oblique bend).
6. Compound stress – Main stresses (Compound stress with right and shear stresses. Bending composition-Change of axes. Main trends. Maximum shear stresses. Mohr's circle. Behavior of materials under complex stress, failure theories).
7. Buckling (Introduction. Critical loads, buckling stress, bending. Euler's curve, Application

the generalized Euler equations for calculating axial loads of column buckling with variable boundary mounting and material conditions).
8. Hyperstatic carriers (Analysis of hyperstatic carriers for the following load conditions: a. axial b. torsional and c. transverse)

4. TEACHING AND LEARNING METHODS - ASSESSMENT

DELIVERY *METHOD Face to face, Distance learning, etc.*	*Face to face*
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, Laboratory Training, Communication with students*	**a) Use of PowerPoint in teaching, b) support of the learning process through electronics** **(c) communication by e-mail**
TEACHING ORGANIZATION *The method and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliography Study & Analysis, Tutorial, Internship (Placement), Clinical Practicing, Art Workshop, Interactive Teaching, Educational visits, Project Writing, Writing a project / assignments, Artistic creation, etc.* *The student's study hours for each learning activity as well as the hours of unguided study according to ECTS principles are listed*	

Activity	*Semester Workload*
Lectures	85
Total Course	***85***

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay/Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Examination of a Patient, Artistic Interpretation, Other/Others* *Explicitly defined evaluation criteria and whether and where they are accessible to students are mentioned.*	Written exam 100% of the grade

5. RECOMMENDED-BIBLIOGRAPHY

- Suggested Bibliography:

"Mechanics of Materials, Beer-Johnston, 6th edition", TZIOLA Publications, ISBN 978-960-418-381-4, 2012, THESSALONIKI, 22693328

• Strength of materials Charalampakis, Nikos C., Papamichos, Euripides, Ed. GIOLA, ISBN : 960-418-048-7 2004-1, 2004, THESSALONIKI, 18548695

• Strength of materials and structural elements. Concise theory and exercises, Charalampakis, Nikos Ch, Tziola Publications, ISBN : 960-418-017-7, 2004, THESSALONIKI, 18548960 - Related scientific journals: