Mechanical behavior of Engineering Materials

1. GENERAL			
SCHOOL	Faculty of Sciences in collaboration with Faculty of Engineering, Aristotle University of Thessaloniki		
DEPARTMENT	Materials Science and Engineering		
LEVEL OF STUDIES	ISCED level 7 (5-year Integrated Master's programme) ISCED level 6 (4-year BSc programme)		
COURSE CODE	**MSEN 505**	**SEMESTER**	5th Semester
COURSE TITLE	**Mechanical behavior of Engineering Materials**		
TEACHING ACTIVITIES Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
		4 (3L + 1T)	6
COURSE TYPE	Mandatory / Scientific area / Skills development		
PREREQUISITES	No prerequisities		
TEACHING AND EXAMINATION METHODS	Face-to-face lectures and guided problem-solving sessions; short in-class quizzes; final written examination.		
COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE URL	https://elearning.auth.gr/course/view.php?id=xxxxx		

2. LEARNING OUTCOMES	
Learning Outcomes	By the end of this course, students will be able to: • Understand stress, strain, and displacement as fundamental quantities for the design of structural members. • Analyze and calculate structural stability, specifically regarding column buckling • Apply these concepts to the design and analysis of both statically determinate and indeterminate structures subjected to tension, compression, bending, shear, torsion, and combined loading • Utilize energy methods (such as Castigliano's theorems) for the analysis and design of structural members.
General Skills	• Search for, analysis and synthesis of data and information, with the use of the necessary technology • Work autonomously • Advance free, creative and causative thinking • Adapting to new situations • Decision-making • Modeling and solving real-world problems • Working in a multidisciplinary environment

3. COURSE CONTENT

Description:

This course establishes the fundamental principles required to analyze the mechanical behavior of solid bodies under load. Bridging the gap between static equilibrium and structural design, students will explore the relationships between external loads, internal stresses, strains, and deformations. The course emphasizes the sizing and analysis of structural members—both statically determinate and indeterminate—subjected to various loading conditions, including tension, compression, bending, and torsion.

Key topics:

- Stress & Strain Analysis.
- Fundamental Loading Conditions.
- Combined Loading & Indeterminacy
- Structural Stability (Buckling)

4. LEARNING & TEACHING METHODS – EVALUATION

Teaching method	Face-to-face.
Use of ICT	Use of ICT in Course Teaching, Use of ICT in Communication with Students Description: Use of Information and Communication Technologies (ICT) in teaching the course with tools of modern distance learning (MS-Teams) and asynchronous education (e-learning). Use of learning aids based on ICT: Excel Use of ICT in student assessment: Electronic grading (e-learning). Use of ICT in communication with students: e-leaning, email, MS-Teams.
Teaching organization	The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).

Activity	Workload/semester (hours)
Lectures	39
Tutorials / problem sessions	13
Short assignments / quizzes	10
Independent study	70
Exam preparation	16
Final written exam	2
Total	**150**

Student evaluation	Written Exams with Problem Solving with Short Answer Written Exams with Problem Solving (Summative)

5. SUGGESTED BIBLIOGRAPHY

EUDOXUS

To be specified in EUDOXUS.

Additional bibliography for study

- Beer, F. P., Johnston, E. R., DeWolf, J. T., Jr., Mazurek, D. F. (2015). Mechanics of Materials (7th ed.). McGraw-Hill Education.