ETE813 – Special Topics in Mechanics

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE813	**SEMESTER**	7
COURSE TITLE	Special Topics in Mechanics (Analysis and Optimal Design of Composite Materials)		

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**
Lectures	2	3
Computational Approaches	1	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Specialized general knowledge
PREREQUISITE COURSES:	There are no typical prerequisite courses but the knowledge of basic ideas from Mechanics of Materials and Continuum Mechanics are needed
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	LECTURES IN GREEK, PRESENTATION IN ENGLISH/GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=815

(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 main objective of the course is to familiarize the students with the fundamental concepts of Mechanics of Composite Materials and their applications to engineering problems.

The course is an introduction to modeling and analysis of laminated elastic composite materials, in the form of fiber reinforced multilayer structures. In this context, the ways of reinforcing materials with the use of fibers, the relationships of mechanical elastic stresses - strains, the determination of mechanical constants and the theory of multilayer composite elastic plates are described.

The purpose of the courses in Mechanics is to provide the students with the appropriate methods (mathematical and computational) of modeling the mechanical behavior of materials, so that they can study the physical and technical problems in the field of engineering science.

In this context, the objectives of the course are:

- Understanding the general structure of composite materials and in particular the fiber reinforced laminate composites.
- Description and understanding the methods for micromechanical and macromechanical analysis of the layers in a laminated composite material.
- Description and understanding the method for macromechanical analysis of a multilayer composite material.
- Design and optimization of the stiffness, thickness and orientation of the layers in a laminated composite material.
- Study of failures of this type of materials

By completing the course, the students are expected to have acquired the following:

Knowledge:

- Good **understanding** of the fundamental concepts of Mechanics of Laminated Composite Materials and its applications to engineering problems.
- Understand the microstructure of composite materials and analyze the mechanical behavior of composite laminates.
- Apply the analysis to the optimal design of such type of composite materials

Abilities:

- To collect, organize and evaluate interdisciplinary information obtained from various sources
- To organize scientific information and present it effectively
- To solve problems in an organized way using brainstorming meetings
- To work in groups, manage meetings, write agenda and minutes

Skills:

- Around organizing interdisciplinary meetings
- Around teamwork, capturing key information, selecting appropriate actions for optimal scientific and technological results

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…*
	…….

- Good understanding and treatment of physical problems
- Improving skills in scientific calculations
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of free, creative and inductive thinking
- Team work
- Decision-making
- Adapting to new situations
- Project planning and management
- Criticism and self-criticism

(3) SYLLABUS

- Introduction to Composite Materials
- Micromechanical Analysis of a Lamina
- Macromechanical Analysis of a Lamina
- Macromechanical Analysis of Laminates
- Failure, Analysis and Design of Laminates
- Smart Composite Materials and Structures

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the class Practice in Computer Lab
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of PC for data and information, preparation of deliverables, communication of the team using email/social media/ecourse platform
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*	
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 METHOD OF EVALUATION: o Written exam (solving problems) at the end of the semester. (100%) OR o Written project work and presentation (100%)

Activity	*Semester workload*
Lectures	26
Laboratory Practice	13
Self-study	13
Project	23
Course total	75

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Voyiadjis, G. Z., Kattan, P.I., Μηχανική των Σύνθετων Υλικών με το MATLAB, Εκδόσεις Fountas Books
- Ραυτογιάννης, Ι., Σύνθετα Υλικά, Τόμος 1: Μηχανική Συμπεριφορά, Εκδόσεις Συμεών