ETE818 - Laboratory of Materials VII (Composite Materials)

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE818	**SEMESTER**	8
COURSE TITLE	**Laboratory of Materials VII (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 / Labs	4	6
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*	special background
PREREQUISITE COURSES:	Composite materials, Mechanics of materials, Laboratory of Materials VI Mechanical Behavior and Quality Control_
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	LECTURES IN GREEK, POWERPOINT PRESENTATIONS IN ENGLISH/GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://users.uoi.gr/csmlab ; http://ecourse.uoi.gr/course/view.php?id=2038

(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*

Materials Laboratory VII is a compulsory laboratory course that deals with the manufacturing of composite materials, the preparation of specimens and the characterization of their mechanical behavior. At the end of the course the student should:

- **Be able** to select suitable reinforcement and matrix for the manufacturing of composite materials
- **Be able** to prepare fibers and characterize their mechanical behavior
- Have **deep knowledge** of a range of processes for the manufacturing of polymeric matrix composites
- **Be able** to implement the manufacturing processes in the field
- **Know** the specimen's preparation procedures for characterization and **be able** to apply them in the field
- **Be able** to selects appropriate methods for characterizing the mechanical behavior of

composite materials based on international standards
- **Be able** to apply international standards and write out reports of results according to them

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
- Production of free, creative and inductive thinking
- Team work

(3) SYLLABUS

The course follows the theoretical course "Composite Materials" and offers specialized knowledge on polymer matrix composites. The Lab-Course deals with the preparation of fibers, manufacturing of composite laminates, preparation of specimens and characterization of their mechanical behavior.

The content of the course is as follows:

- Definition of composite materials, components / phases, classification
- Matrix/Reinforcement
  - Thermoplastic/Thermosetting matrix
  - Important Fibers, strong fibers, fabrics
  - Structural composites
- Specific properties, Anisotropy, Manufacturing Technology
- Applications for polymer matrix composites
- Fiber Spinning, Melt Spinning, Solid State Drawing
- Preparation of fiber for mechanical testing, mechanical performance
- Preparation of single fiber composites, interfacial characterization using mechanical testing, acoustic emission and microscopy
- Manufacturing of composite laminates using:
  - Hand lamination
  - Vacuum bagging
  - Resin infusion
  - Hot pressing
- High speed impact of composite laminates
- Quality control of composite laminates
- Mechanical behavior characterization according to international standards (ASTM, ISO)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In the class / In the lab - Compulsory Introductory Theory - Mandatory Laboratory Exercises
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ecourse platform
TEACHING METHODS *The manner and methods of teaching are described in detail.*	

Activity	*Semester workload*
Lectures	26

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*	<table><tr><td></td><td></td></tr><tr><td>Laboratory practice</td><td>39</td></tr><tr><td>Homework: Study and analysis of data</td><td>65</td></tr><tr><td>Self-study</td><td>20</td></tr><tr><td></td><td></td></tr><tr><td>Course total</td><td>150</td></tr></table>
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: (i) Final written examination (70% of total mark) (ii) Laboratory exercises (30% of total mark)

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Materials Science and Engineering: An Introduction (5th edition), chapter 17, William D. Callister
- Composite materials: Engineering and Science, F. L.Matthews and R. D. Rawlings
- Principles of Polymer Engineering, N. G. McCrum, C. P. Buckley, C. B. Bucknall, Oxford University Press, Jan 1, 1997
- An introduction to Composite Materials, D. Hull, University of Liverpool, T. W. Clyne, University of Cambridge