ETY704 - Composite Materials

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETY704	**SEMESTER**	7
COURSE TITLE	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 / Tutorials	4	4
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:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=2941

(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*

Upon successful completion of the course, a student:

(a) Understands the purpose and the ways to develop new composite materials upon proper combination of known materials (either as they stand or following modification).

(b) Is able to predict a wide range of mechanical and other properties of materials as a function of parameters such as volume fraction, orientation & regularity arrangement and particle aspect ratio

(c) Is capable of comparing/evaluating the relative merits of using alternatives (corresponding to various simple and composite materials) for important engineering and other applications.

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 *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *……*

- Search for, analysis and synthesis of data and information
- Decision-making
- Working independently
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas
- Production of free, creative and inductive thinking

(3) SYLLABUS

The course covers a broad range of composite geometries and properties. As this is a course in a Materials Science and Engineering Dept., constituent phases are not viewed as available components but their fabrication and ways to control effectively morphology, orientation, mechanical and surface properties are considered in full detail; fabrication of composites is a also treated in detail. Mechanical properties considered are focused to those of composites with regular arrangements of fibers, however properties of composites with random arrangements of fibers, dispersions of low-aspect ratio particles and platelets are also considered.
The structure of the course is as follows:

- Definition of composite materials, components / phases, classification, Ashby Diagrams, Application areas, SWOT analysis
- Matrix Materials with emphasis on Thermoplastic/Thermosetting matrices
- Reinforcement – important types of reinforcement – fabrication, modification, characterization
- Interface – Interphase: Definition, role, wetting, adhesion mechanisms, modification methods
- Manufacturing Technologies with emphasis on polymer-based composites (continuous and short fibers, particulate and nanocomposites). Selected other methods for the fabrication of composites.
- Non-conventional Composites – Biobased Composites - Recycling
- Micromechanics of Composites (density, mechanical properties, thermal properties, load transfer)
- Macromechanics of Composites (elastic deformation, tensor analysis lamina – laminate)

(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 – use of Microsoft Teams 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.*	

Activity	*Semester workload*
Lectures / tutorials	52
Self-study	48
Course total	100

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: Final written examination. The examination includes interrelated choice questions, short-answer questions and brief calculations.

(5) ATTACHED BIBLIOGRAPHY

Textbooks

- G. Papanicolaou & D. Mouzakis, Composite Materials (Greek Original), Kleidarithmos Publ, 2007
- K. G. Beltsios, Science and Engineering of Composite Materials (Greek Original), p. 706, Tziola Publishing, 2010

Selected Bibliography

- K.K. Chawla, Composite Materials Science and Engineering, (3rd edition), Springer
- 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
- Composite Materials, Design and Applications, D. Gay, S.V. Hoa and S.W. Tsai, CRC Press, 2003
- Fundamentals of Fibre Reinforced Composite Materials, A.R. Bunsell and J. Renard, IOP, 2005
- R.M. Jones, Mechanics of Composite Materials, 2st Ed., Taylor & Francis, 1999
- R.M. Christensen, Mechanics of Composite Materials, Dover (Rev. Ed.), 2005