ETY802 – Polymer Engineering

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETY802	**SEMESTER**	8
COURSE TITLE	Polymer Engineering		

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	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*	Specialized general knowledge
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	LECTURES IN GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	www.polymers.gr

(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 course is a continuation of the course Polymer Materials of 7th semester. It aims to provide understanding of fundamental properties of polymers and to elucidate the correlation of properties with structure and processing of such materials.

Upon successful completion of the course the student would be in a position to:

- Understand basic properties of polymers such as viscoelasticity, rheological behavior, yielding and fracture mechanisms, and the elasticity of rubber
- Be able to design a simplified process for object production from plastics, such as furniture, packaging materials, plastic paints, etc.
- Be able to choose the most appropriate polymer for specific application demands
- To develop problem solving skills
- To encourage self-motivation and thinking

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…* *…….*

- Production of free, creative and inductive thinking
- Decision-making
- Adapting to new situations
- Project planning and management

(3) SYLLABUS

- Historical development of synthetic polymers, vulcanization, cellulose semi synthetic textiles, thermosets, thermoplastics, modern engineering plastics, empirical and market terminology for polymers
- Polymer reaction engineering, industrial production of polymers, mass polymerization, solution polymerization, suspension polymerization, emulsion polymerization, surfactants and emulsifiers
- Thermal transitions of polymers, crystallization, crystallography, thermodynamics and kinetics of crystallization, glass transition, experimental methods for studying thermal transitions in polymers
- Elasticity theory, linear elasticity, rubber elasticity, thermodynamics of rubber elasticity, ideal and real rubbers, thermoplastic rubbers
- Viscoelasticity, viscoelastic models, Boltzmann superposition principle, time-temperature superposition, creep, stress relaxation, dynamic mechanical behaviour
- Mechanical failure of polymers, yielding, fracture, fatigue, impact
- Polymer rheology, Newtonian and non-Newtonian fluids, simple rheological models
- Polymer processing, extrusion and mixing, injection moulding, thermoforming.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the class, distant learning during COVID19 pandemic
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/MS Teams/e-course 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	LANGUAGE OF EVALUATION: Greek

Activity	***Semester workload***
Lectures	32
Problem solving	20
Personal study	48
Course total	100

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.*	METHOD OF EVALUATION: Written exam at the end of the semester based on theory and problem solving of practical problems

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography (in Greek):

- Κ. Παναγιώτου, Επιστήμη και Τεχνολογία Πολυμερών, 3η έκδοση, Εκδόσεις Πήγασος, 2000 2006
- •Γ.Π. Καραγιαννίδης, Ε.Δ. Σιδερίδου, Δ.Σ.Αχιλιάς, Δ.Ν. Μπικιάρης, Τεχνολογία Πολυμερών, Εκδόσεις Ζήτη, 2009