ETY703 - Polymer Science

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETY703	**SEMESTER**	7
COURSE TITLE	Polymer Science		
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*	General background		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-		
COURSE WEBSITE (URL)	http://www.materials.uoi.gr/en/0.02.01.html		

(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*

This course is the first contact of undergraduate students with Polymers. Reference is made to the basic concepts, examples from everyday life are selected and described so that students can understand and recognize the great usefulness and use of polymers in several basic necessities on a daily basis and activity.

A detailed description and explanation of the methods and types of polymerization as well as ways of characterizing the final polymers are made, so that students can perceive, distinguish and conclude from which parameters the quality of a polymer depends, its physicochemical properties and ways of synthesis.

By teaching the basic properties of polymers such as: chain dimensions, crystallization, melting, glass transition, elasticity and viscoelasticity and by which parameters they are affected, students are able to distinguish, perceive, distinguish, combine and classify polymers at least into general basic categories depending on the basic properties when they are provided.

Students can, after completing the lectures, apply their knowledge and everything they have

understood to comprehend why specific polymers are used in the production of specific plastics by combining additional materials to improve properties, reduce costs and easy to process.
Students are also able to solve general problems, exercises that are given to them in a practical way of thinking by combining, developing and designing the respective polymeric material based on the knowledge they have acquired.
Every year, the teaching material is gradually renewed in order to provide full information on issues related to the development of research and development of Polymer Science & Engineering.
There is no overlap of the course teaching material with other courses. To a very limited extent, there is a reference to properties (crystallization, melting) that are developed in detail in Polymer Technology (8th semester course) but are developed differently in each course.
For those students who are very interested in this course, which is essentially an introduction to the direction of Polymers, additional literature is provided if requested by them.
It should be noted that Polymer Science & Engineering in the Undergraduate Course Curriculum has a total of 3 Compulsory courses and 5 electives; therefore, if students want to be specialized in this field, they are provided with the appropriate knowledge and laboratory practice throughout the lectures of these 8 courses.
Also, the teaching aids are updated with a detailed overview of all the new aids that have been issued or are going to be issued in the direction of Polymer Science with emphasis on Polymer Chemistry.
When a more modern book related to the course lectures is provided (e.g. Polymers Chemistry, G. P. Karayiannides – E. D. Sideridou, Zitis Publishing, Thessaloniki, 2006 or Polymers Chemistry, P. C. Hiemenz, T. P. Lodge, Greek translation by S. Vratolis, H. Kakoulidis, Th. Prevedorou, Scientific Editing by S. Anastasiadis, University of Crete Publishing, 2014) it is proposed to the students and is given as a possible book choice by the online system EVDOXOS.

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…*
	…….

1) Adapting to new situations
2) Decision-making
3) Working independently
4) Team work
5) Working in an interdisciplinary environment
6) Production of free, creative and inductive thinking
7) Production of new research ideas

(3) SYLLABUS

Introduction to basic knowledge on polymers. Synthesis, characterization in solution and in bulk. Analysis of basic properties for various types of important and everyday use polymers. The course contents are:
Basic definitions of polymers. Nomenclature. Configurations of polymer chains and architecture of homo- and co-polymers. Step and chain polymerization reactions. Basic characteristics of radical, anionic and cationic polymerization. Polymers characterization. Polymers in bulk (Transmission electron microscopy, small-angle X-ray scattering). Polymers in solution (membrane and vapor pressure osmometry, laser light scattering, size exclusion

chromatography, dilute solution viscometry). Polymer chain dimensions. Polymer crystallization. Melting point and glass transition temperature for polymers. Elasticity and viscoelasticity of polymers.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class, lectures through powerpoint presentations
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT in teaching, communicating with students during teaching and also communicating with the students during office hours
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*	

Activity	*Semester workload*
Lectures	39
Scientific Problems	13
Self-study	48
Course total	100

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 100%

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- Polymer Science Lectures, N. Hadjichristidis, University of Athens, 1990
- Polymer Science Lectures, A. Avgeropoulos, University of Ioannina, 2005
- Polymers chemistry, P. Karagiannidis, E. D. Sideridou, Zitis Publishing, Thessaloniki, 2006 (ISBN: 960-431-991-4)
- Synthetic macromolecules, A. Ntontos, Kostarakis Publishing, Athens, 2002, (ISBN: 960-87655-0-1)
- Polymers chemistry, C. Hiemenz, T. P. Lodge, Greek translation by S. Vratolis, H.

Kakoulidis, Th. Prevedoros, Scientific Editing by S. Anastasiadis, University of Crete Publishing, Heraklion-Crete, 2014 (ISBN: 978-960-524-429-3)

Related academic journals:

- Macromolecules (ACS Publications)
- Polymer Chemistry (RSC Publishing)
- Polymer (Elsevier)
- Biomacromolecules (ACS Publications)
- ACS Macro Letters (ACS Publications).