

## ETE808 - Polymer Synthetic Chemistry and Chemical Modification Reactions

### COURSE OUTLINE

#### (1) GENERAL

<b>SCHOOL</b>	SCHOOL OF ENGINEERING		
<b>ACADEMIC UNIT</b>	DEPARTMENT OF MATERIALS SCIENCE ENGINEERING		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	ETE808	<b>SEMESTER</b>	10
<b>COURSE TITLE</b>	Polymer Synthetic Chemistry and Chemical Modification Reactions		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>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</i>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>	
Lectures	3	3	
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialized general knowledge, skills development</i>	special background and specialized general knowledge		
<b>PREREQUISITE COURSES:</b>	NO		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	GREEK		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	-		
<b>COURSE WEBSITE (URL)</b>	<a href="http://www.materials.uoi.gr/en/0,02,01.html">http://www.materials.uoi.gr/en/0,02,01.html</a>		

#### (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 was introduced in the curriculum in the last six months with the aim of learning, understanding, and comprehending the synthetic routes of several widely used polymers and copolymers. The various ways of synthesizing, the ease and difficulty of making polymers, advantages and disadvantages are given. Differences are given in the systems of primers, solvents and cleaning methods where they are required.

Students learn and understand the differences between linear and non-linear copolymers and homopolymers as well as the ways of characterizing the intermediate and final products of reactions with modern methods and appropriate instrumentation.

Students who have chosen the direction of Polymers for the preparation of their compulsory diploma thesis are obliged to choose the specific course in order to deepen their knowledge in the Science of Polymers, to improve their ability to solve problems in the synthetic routes and to realize the requirement for characterization of polymers accomplished by various characterization techniques in solution and in melt.

Furthermore, students are now able to compare the different ways of polymerization, choose the

best method and the economic advantage for a polymer preparation and support their point of view in various tasks given such as to realize how to grasp the major points of a published article (what was synthesized, why it was synthesized and how).

The teaching aids are also updated with a detailed overview of all the new aids that have been issued or are to be issued in the direction of the course material while the material is renewed at least every 2 years since the subject of the course is an important research activity worldwide in various types of polymers and polymerization techniques.

### 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?*

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	.....
<i>Production of new research ideas</i>	<i>Others...</i>
	.....

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

### (3) SYLLABUS

Synthesis of linear block polymers via:  
 anionic polymerization (AB, ABA, ABA', ABC, ABCD),  
 cationic polymerization (AB, ABA, ABC),  
 living radical polymerization (AB, ABA, ABC, ABCD),  
 group transfer polymerization (AB, ABA, ABC),  
 ring opening metathesis polymerization (AB, ABA),  
 Ziegler-Natta polymerization,  
 by combining various polymerization methods (AB, ABA).  
 Synthesis of non-linear polymers. Molecular characterization of the synthesized materials.

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	In class, lectures through powerpoint presentations	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i>	Use of ICT in teaching, communicating with students during teaching and also communicating with the students during office hours	
<b>TEACHING METHODS</b> <i>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,</i>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	39
	Self-study and essay	36

<p><i>educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>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</i></p>		
	<b>Course total</b>	<b>75h</b>
<p><b>STUDENT PERFORMANCE EVALUATION</b></p> <p><i>Description of the evaluation procedure</i>  <i>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</i>  <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>LANGUAGE OF EVALUATION: Greek</p> <p>METHOD OF EVALUATION:  Project assignment of an important part of the class topics to see whether they understand its content by translating a published article. The assignment is graded from 0 up to 2 and works as an aid for the final grade of each student.  The procedure involves written final exam which is graded from 0 up to 10 (and includes the grade from the assignment).</p>	

#### **(5) ATTACHED BIBLIOGRAPHY**

*-Suggested bibliography:*

Block Copolymers: Synthetic Strategies, Physical Properties and Applications (N. Hadjichristidis – S. Pispas – G. Floudas) Wiley-Blackwell, New York, 2002 (ISBN: 978-0-471-39436-5)

Lecture Notes, A. Avgeropoulos, University of Ioannina, Ioannina, 2017

The Chemistry of Polymers, J. W. Nickolson, Royal Society of Chemistry, London, 2006

Scientific articles from international scientific journals of various publishers (ACS, RSC publicizing, Wiley, Springer, κλπ.)