

Course Unit Descriptor

Study Programme: Materials Engineering
Course Unit Title: Polymer chemistry
Course Unit Code: MO201
Name of Lecturer(s): assistant professor Ivan Ristić
Type and Level of Studies: Undergraduate academic
Course Status (compulsory/elective): compulsory
Semester (winter/summer): summer
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): face-to-face
Number of ECTS Allocated: 8
Prerequisites: none
<p>Course Aims:</p> <p>The course provides an overview of basic academic knowledge of the mechanisms and kinetics of polymer synthesis, classical techniques of chain and step polymerization, and develop practical skills in the subject area. In this Polymer Chemistry course, different methods of the synthesis of polymers are addressed and discussed, including the various types of polymerizations and their applications toward both common and new promising polymer products. This class presents the most common synthetic methods used in polymerization, the basic differences in the kinetics of these methods, the final end-products obtained, and the synthetic processing techniques that might be used for various applications.</p>
<p>Learning Outcomes:</p> <p>The course gives a general introduction to polymer chemistry. On completion of the course, the student will be able to describe the general structure of polymers, understand the mechanisms and kinetics of polymerization, polycondensation and polyadditions, or reactions that produce polymeric products in the industrial sector. Student should be able to carry out polymerization of different types of materials using the basic principles of chain and step polymerization. Throughout the course students will be qualified to control the structure of the obtained polymer, and thus the properties of the polymer by select the monomer, catalyst and polymerization conditions. In the class, we emphasize the use of chemistry as a tool for the development of new materials or the modification of existing polymer systems.</p>
<p>Syllabus:</p> <p><i>Theory</i></p> <p>Basics knowledge of chemistry of synthetic polymers. Polymerization as a chain reaction. Mechanism and kinetics of radical polymerization. Thermodynamics of polymerization. Methods of carrying out polymerization. Cationic, anionic and coordinate polymerization. Mechanisms and kinetics of copolymerization. Mechanisms and kinetics of step growing polymerization. Reactions of multifunctional monomers. Crosslinking of polymers. The theory of the prediction of the gelation reaction. Significant polymerization and polycondensation products. Examples of industrial application of polymers.</p> <p><i>Practice</i></p> <p>Computational exercises: Kinetics of chain and step homo- and copolymerization. Laboratory exercises: Investigation of vinyl monomer polymerization kinetics. Self-accelerating vinyl monomer polymerization. Synthesis of the copolymer by radical copolymerization. Preparation of polycondensation products based on two- and multifunctional monomers. Checking existing theoretical concepts. Carry out a polymer synthesis based on a given protocol. Summarise and account</p>

for in writing the laboratory work that has been performed.

Required Reading:

1. G. Odian, Principles of Polymerization, John Wiley & Sons, 4th ed., New York, 2004
2. Encyclopedia of Polymer Science and Engineering, John Wiley and Sons, Inc 1988

Weekly Contact Hours:

Lectures: 4

Practical work: 3

Teaching Methods:

Lectures, laboratory work, individual laboratory exercises.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	Final exam	points
Active class participation	10	written exam	10
Laboratory work	25	oral exam	30
Test I and Test II	20		
Seminar	5		