



УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ

UNIVERSITY OF BANJA LUKA

ПРИРОДНО-МАТЕМАТИЧКИ ФАКУЛТЕТ
FACULTY OF NATURAL SCIENCES AND MATHEMATICS



CHEMISTRY DEPARTMENT

PhD STUDIES

Course name	Water-soluble Polymers - Structure, Properties and Application			
Course code	Course status	Semester	Hours of instruction	ECTS
DHEM23VRP	Elective	IV	5+0	10
Teacher(s)	Prof. Vesna Antić, PhD			

Prerequisite course(s)	Entry requirements
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Course goals

An acquaintance of students with the structure and properties of natural and synthetic water-soluble polymers and their application in various branches of industry such as the food and pharmaceutical industry, production of cosmetic and agrochemical products, paints, adhesives, surface coatings, production of paper, ceramics, products for personal use, water purification, etc. Providing systematic knowledge and understanding of the latest developments in the synthesis and characterization of water-soluble polymers. Informing students about the physicochemical properties of these polymers in solution, phase behavior, adsorption at the phase boundary, and effects on colloid stability. Enabling students to apply the acquired knowledge to the analysis and critical interpretation of complex data related to the structure, properties, and application of water-soluble polymers in laboratory and industrial conditions.

Learning outcomes

After passing the exam, the student should understand the structure, properties, and synthesis methods of water-soluble polymers. The student should also know the types of commercially available water-soluble polymers and their application in various branches of industry. The student can recognize the influence of the determination of the chemical structure on the behavior of polymers in solution and at the phase boundary. The student can follow current trends related to the synthesis, characterization, and use of water-soluble polymers, with the application of critical thinking, as well as solve complex problems during experimental research and on an industrial scale.

Course content

Chemical structure of water-soluble polymers. Synthesis of water-soluble polymers, including linear and branched polymers, homopolymers, block and graft copolymers. A review of the latest developments in polymer synthesis. Determination of physical and chemical characteristics of water-soluble polymers. Measurement techniques for determining key properties, e.g. molar mass (and its distribution) and hydrodynamic volume. Viscosity and viscoelastic properties of polymers in solution. Prerequisites for viscosity increase and gelation in aqueous solutions. Interactions of polymers and surfactants. Molecular basis of interactions and instrumental techniques for their investigation. Adsorption of polymers on surfaces and techniques for examining adsorption isotherms, the thickness of the adsorbed layer, and configuration of adsorbed polymer. Influence of polymers on colloid stability, effects of electrostatic and steric stabilization, bridging, and flocculation. Commercially important water-soluble polymers and their common uses. Consideration of properties leading to the appropriate application. Future perspectives for water-soluble polymers. Environmental and safety issues, e.g. biodegradability, sustainability, toxicity. Consumer demands. Factors affecting supply and price stability. New markets.

Teaching methods

Lectures, research work, consultations

Books and other learning materials

Peter A. Williams (Ed). (2007): "Handbook of industrial water soluble polymers", Oxford - Blackwell Publishing Ltd., 344pp.

Course activities and grading method

Project/seminar, final oral exam

Project/seminar	40	Final oral exam	60
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Additional course notes

Name of the teacher who prepared this form	Vesna Antić
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