Course code	MK201		
Course title	**SELECTED TOPICS OF ORGANIC SYNTHESIS**		
General information			
Study programme	Graduate study „Medical chemistry“	Academic year	
Lecturer	Doc. Dr. Sc. Karlo Wittine		
Status	**Required**	Elective	
ECTS system			**6**

Course objectives

Higher level of organic chemistry encompassing organic molecules of higher complexity and methods of their synthesis. Acquiring the basic knowledge of photochemical reactions (cycloaddition, rearrangements and hydrogen abstractions by the carbonyl compounds ect.), heterocyclic compounds and peptides. Introduction to use of enzymes in organic synthesis with special attention to production of enantiopure compounds. Synthetic strategy and methods for preparation of more complex molecules of interest in pharmaceutical industry.

Course description

- Introductory concepts for planning of synthesis: strategy for designing synthesis of organic molecules; functional group transformations; protecting groups; ring-forming reactions; coupling reactions; heterolytic fragmentation of organic molecules.
- Application of photochemistry in the synthesis of complex molecules, examples of: cycloadditions, pericyclic reactions, (influence of the orbital symmetry on the stereoselectivity), photochemical isomerizations (cis-trans isomerization, di-π-methane rearrangement) and hydrogen abstraction by the carbonyl moiety.
- Synthesis of five- and six-membered heterocyclic rings, in particular, imidazoles, pyrroles, pyrimidines and fused-heterocyclic rings such as purines. Reactions of purines and pyrimidines (nucleophilic and electrophilic substitution, alkylation – regioisomers in the pyrimidine and purine ring. Pyrimidines and purines of medicinal interest.
- Enantioselective synthesis by enzymes: basic concept, application in different reactions (hydrolysis, reduction, oxidation, C-C bond formation, etc.), and special techniques and methods.
- Introduction with the role and mechanism of action of diverse group of peptides (neuropeptides, antimicrobial peptides, β-amyloid peptides, natriuretic peptides). Synthesis and action of peptidomimetics (simple modifications, cyclic analogs, peptide bond modification, β-amino acids, peptide nucleic acids.
- Examples of synthetic approach to selected natural compounds. Analysis of different synthetic strategies used in preparation of complex bioactive molecules: quinine, morphine, vancomycin etc.

Learning outcomes

- Students will gain the knowledge necessary for design synthetic pathways for preparation of organic molecules of moderate and higher structural complexity including small peptides and heterocyclic compounds.
- Acquire the knowledge how to use light and enzymes in the synthesis of organic molecules.