

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	ORGANSKA KEMIJA III
Course Title:	ORGANIC CHEMISTRY III

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Kemija, 1. stopnja	/	3.	5.
USP Chemistry, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type: obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: KE131

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	30	/	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Bogdan Štefane / Dr. Bogdan Štefane, Associate Professor

Jeziki / Languages: slovenski / Slovenian
Predavanja / Lectures: /
Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:
Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:
The course has to be assigned to the student.

Vsebina:
Pretvorbe π -sistemov: periciklične reakcije. Cikloadicije, elektrociklizacije, sigmatropne premestitve.
Molekulske premestitve. Premestitve karbokationov in karboanionov, premestitve na C=X vezeh.
Oksidacije in redukcije organskih spojin. Klasifikacija organskih spojin po oksidacijskem nivoju. Značilne metode za oksidacijo in redukcijo ogljikovega skeleta in funkcionalnih skupin.
Heterociklične spojine: nomenklatura, lastnosti, osnovni sintezni principi, tipična reaktivnost, primeri pomembnih heterocikličnih spojin.

Content (Syllabus outline):
Transformations of π -systems: pericyclic reactions. Cycloadditions, electrocyclisations, sigmatropic rearrangements.
Molecular rearrangements. Rearrangements of carbocations and carboanions, rearrangements on C=X bonds.
Oxidations and reductions of organic compounds. Classification of organic compounds by oxidation level. Typical methods for oxidation and reduction of carbon framework and functional groups.
Heterocyclic compounds: nomenclature, properties, basic synthetic principles, typical reactivity, examples of important heterocycles.
Carbohydrates: structure of monosaccharides,

Ogljikovi hidrati: struktura monosaharidov, sinteze, pretvorbe, disaharidi in polisaharidi.

Nukleinske kisline.

Amino kisline, peptidi in beljakovine: sinteze amino kislin, reaktivnost in nastanek peptidov, struktura peptidov in beljakovin.

Organska barvila. Naravna in sintezna barvila.

Sintezne makromolekule in organski materiali. Osnovni tipi sinteznih polimerov, njihova sinteza in lastnosti. Značilni organski materiali.

syntheses, transformations, disaccharides and polysaccharides.

Nucleic acids.

Amino acids, peptides and proteins: synthesis of amino acids, reactivity, formation of peptides, structure of peptides and proteins

Organic dyes. Natural and synthetic dyes.

Synthetic macromolecules and organic materials. Types of synthetic polymers, their synthesis and properties. Characteristic organic materials.

Temeljna literatura in viri / Readings:

- K. P. C. Vollhardt, N. E. Schore: Organic Chemistry, W. H. Freeman & Co. 5th Edition, New York, 2007. (Ustrezna poglavja 30%)

Cilji in kompetence:

Cilj: usvojiti temeljno in celostno znanje organske kemije.

Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:

- poznavanje posameznih vrst organskih spojin
- poznavanje strukturnih značilnosti organskih spojin
- poznavanje reaktivnosti organskih spojin
- poznavanje tipičnih organskih reakcij
- poznavanje funkcionalnih skupin in njihovih pretvorb
- poznavanje osnov organske stereokemije
- poznavanje nomenklature organskih spojin
- poznavanje reakcijskih mehanizmov in intermediatov
- poznavanje osnovnih principov organske sinteze
- poznavanje dostopanja do literaturnih virov in njihove uporabe

Objectives and Competences:

Objectives: To obtain basic and comprehensive knowledge of organic chemistry.

Competences:

Knowledge about:

- classes and types of organic compounds,
- structural properties of organic compounds,
- reactivity of organic compounds,
- typical organic reactions,
- functional groups and their transformations,
- basic organic stereochemistry,
- nomenclature of organic compounds,
- reaction mechanism and reaction intermediates,
- basic principles of organic synthesis,
- accessing to and the use of literature sources.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent pozna:

- organske spojine glede na strukturo osnovnega skeleta
- tipične funkcionalne skupine v organskih spojinah
- tipične pretvorbe glavnih funkcionalnih skupin
- izomerijo organskih spojin

Intended Learning Outcomes:

Knowledge and Comprehension

The student knows:

- classes and types of organic compounds with respect to their structure,
- typical functional groups in organic compounds
- typical transformations of organic functional groups
- isomerism of organic compounds,

<ul style="list-style-type: none"> - osnovne pretvorbe organskih spojin - nomenklaturu organskih spojin - značilne reagente, ki se uporabljajo pri osnovnih organskih reakcijah. - osnovne tipe naravnih organskih spojin - osnovne tipe sintetskih organskih materialov <p>Študent razume:</p> <ul style="list-style-type: none"> - strukturno raznolikost in izomerijo organskih spojin - osnove organske stereokemije - reaktivnost organskih spojin v povezavi z njihovo strukturo - selektivnost pretvorb pret - mehanizme osnovnih organskih reakcij - nomenklaturu organskih spojin - kemijsko vlogo organskih spojin ki nastopajo v bioloških sistemih. 	<ul style="list-style-type: none"> - basic transformations of organic compounds, - nomenclature of organic compounds, - typical reagents used in organic reactions, - basic types of natural organic compounds, - basic types of synthetic organic materials <p>The student understands:</p> <ul style="list-style-type: none"> - structural diversity and isomerism of organic compounds, - principles of organic stereochemistry, - structure-reactivity relationship in organic compounds, - selectivity of organic transformations, - reaction mechanism and reaction intermediates for fundamental organic reactions, - nomenclature of organic compounds, - chemical role of organic compounds involved in biological systems.
<p><u>Uporaba</u></p> <p>Znanje organske kemije je temeljno znanje, ki je osnova za (nadaljnji) študij kemije in se hkrati navezuje na veliko večino ostalih predmetov študija kemije. Poleg tega je temeljno znanje organske kemije nujno potrebno vsakemu kemiku pri njegovem kasnejšem delu v praksi.</p>	<p><u>Application</u></p> <p>The knowledge of organic chemistry is the fundamental one. It is the basis for the (continued) study of chemistry. Therefore, it is connected and, hence, applicable to the majority of other subjects within the Chemistry study. Besides, the basic knowledge of organic chemistry is the inevitable prerequisite for any chemist in practical work after study.</p>
<p><u>Refleksija</u></p> <p>Znanje organske kemije sodi med temeljna kemijska znanja in je temeljni pogoj za delo na vseh ostalih področjih kemije. Predmet je tudi osnova za biokemijo in predmete izbirnega sklopa organske kemije.</p> <p>Študent je pri kasnejšem praktičnem delu sposoben samostojno poiskati relevantne literaturne vire, sintetizirati, izolirati, očistiti in okarakterizirati organske spojine ter kritično ovrednotiti rezultate glede na skladnost s teoretičnimi načeli.</p> <p>Študent je sposoben na podlagi strukture organske spojine sklepati o njenih lastnostih in reaktivnosti (in obratno).</p>	<p><u>Analysis</u></p> <p>Knowledge of organic chemistry is the fundamental knowledge required for practical work in all areas of chemistry. The knowledge of organic chemistry is also a prerequisite for study of biochemistry and elective courses from various specialized topics in organic chemistry. This knowledge enables a student to find the relevant literature sources, to synthesize, to isolate, and to characterize a given organic compound. The student is also able of critical evaluation of the results and their conformity with theoretical principles.</p> <p>On the basis of the structure of a given organic compound, the student is also able to draw conclusions (or to predict) the properties and reactivity of this compound.</p>

Prenosljive spretnosti

- Poznavanje organske kemije kot temeljno znanje za specifična področja kemije
- Uporaba organskih sinteznih in izolacijskih laboratorijskih tehnik na ostalih področjih kemije
- Dostopanje do klasičnih in elektronskih literaturnih virov in njihova uporaba pri praktičnem delu.

Skill-transference Ability

- Knowledge about organic chemistry as fundamental knowledge for specific areas of chemistry
- The use of synthetic and isolation laboratory techniques on other areas of chemistry
- Accessing classical and electronic literature sources and its use in practical work

Metode poučevanja in učenja:

Predavanja, seminarji.

Learning and Teaching Methods:

Lectures and seminars

Načini ocenjevanja:

Pisni izpit.

Delež (v %) /

Weight (in %)

Assessment:

Written exam.

Reference nosilca / Lecturer's references:

1. ŠTEFANE, Bogdan. Selective addition of organolithium reagents to BF₂-chelates of α -ketoesters. Organic letters, ISSN 1523-7060, 2010, vol. 12, no. 13, str. 2900-2903, doi: 10.1021/ol100620j. [COBISS.SI-ID 34162181]
2. WANG, Jingxin, ŠTEFANE, Bogdan, JABER, Deana, SMITH, Jacqueline A. I., VICKERY, Christopher, DIOP, Mouhamed, SINTIM, Herman O. Remote C-H functionalization : using the N-O moiety as a atom-economical tether to obtain 1,5- and the rare 1,7-C-H insertions. Angewandte Chemie, ISSN 1433-7851. [Print ed.], 2010, vol. 49, no. 23, str. 3964-3968, doi: 10.1002/anie.201000160. [COBISS.SI-ID 34061573]
3. NAKAYAMA, Shizuka, KELSEY, Ilana, WANG, Jingxin, ROELOFS, Kevin, ŠTEFANE, Bogdan, LUO, Yiling, LEE, Vincent T., SINTIM, Herman O. Thiazole orange-induced c-di-GMP quadruplex formation facilitates a simple fluorescent detection of this ubiquitous biofilm regulating molecule. Journal of the American Chemical Society, ISSN 0002-7863, 2011, vol. 133, no. 13, str. 4856-4864, doi: 10.1021/ja1091062. [COBISS.SI-ID 34845957]