



Univerza v Mariboru

Medicinska fakulteta

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

|               |           |
|---------------|-----------|
| Predmet:      | Kemija    |
| Course title: | Chemistry |

| Študijski program in stopnja<br>Study programme and cycle | Študijska smer<br>Study option | Letnik<br>Year of study | Semester<br>Semester |
|---|--------------------------------|-------------------------|----------------------|
| Dentalna medicina/Dental Medicine<br>2. stopnja/2nd Cycle |                                | 1                       | 1.                   |

Vrsta predmeta / Course type:

Univerzitetna koda predmeta / University course code:

| Predavanja<br>Lectures | Seminar<br>Seminar | Vaje<br>Tutorial | Klinične vaje<br>Clinical training | Druge oblike<br>študija<br>Other forms of<br>study | Samost. delo<br>Individual work | ECTS |
|------------------------|--------------------|------------------|------------------------------------|--|---------------------------------|------|
| 30                     |                    | 30               |                                    |  | 30                              | 3    |

Nosilec predmeta / Lecturer:

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:  Prerequisites:

## Vsebina:

- Zgradba atoma, kemične vezi, medmolekulske sile, biološko pomembni elementi, radioizotopi.
- Voda: H-vezi, hidrofobne interakcije, voda kot topilo.
- Raztopine
- kisline in baze, pufri, puferski sistemi v organizmu, porazdelitev ionov v organizmu, biološki pomen pH.
- Oksidoredukcija: karakterizacija redoks reakcij.
- Redoks potencial
- Hitrost kemičnih reakcij: definicije, red in molekularnost reakcij.
- Hitrost kemičnih reakcij in ravnotežje.
- Vpliv koncentracije, pH, ionske moči in temperature na hitrost reakcije.
- Molekulske osnove življenja: biološko pomembni elementi, ioni in biomolekule.
- Organske biomolekule: izomerija, medsebojni vpliv funkcionalnih skupin.
- Pregled organskih spojin po funkcionalnih skupinah.
- Biološko pomembne organske molekule s primeri v medicini.
- Kemija ogljikovih hidratov: monosaharidi, disaharidi, polisaharidi, homoglikani in heteroglikani.

## Content (Syllabus outline):

- Structure of atom, chemical bound and intermolecular forces, biologically important elements, radioisotops.
- Water:-H-bound, hydrophobic interactions, water as solvent.
- Solutions
- acids and bases, buffers, buffer systems in organism, distribution of ions in the body, biological importance of pH.
- Oxidoreduction: characterization of redox reactions.
- Redox potential
- Kinetics of chemical reactions: definitions, order and molecularity of reactions.
- Kinetics and equilibrium of chemical reactions.
- Influence of concentration, pH, ionic power and temperature on chemical reaction.
- Molecular basics of life: biological important elements, ions and biomolecules.
- Organic biomolecules: isometry, interacting influence of functional groups.
- Review of organic substances according to their functional groups.

- Kemija lipidov in steroidov.
- Aminokisljine.
- Nukleotidi in nukleinske kisline.
- Vitamini.
- Molekularno modeliranje medicinsko pomembnih molekul in zdravil.
- Dentalni materiali - temelji in aplikacije
  1. Uvod v dentalne materiale
  2. Properties od dentalnih materialov
  3. Preventivni dentalni materiali
  4. Neposredni estetski obnovitveni materiali
  5. Dentalni Amalgam
  6. Finalizacija, poliranje in čiščenje materialov
  7. Cementi
  8. Impresijski materiali
  9. Voski
  10. Lite zlitine, kovane zlitine, in spajke
  11. Litje, spajkanje in varjenje
  12. Polimeri v protetiki
  13. Dentalna keramika
  14. Zobni vsadki

- Biologically important organic molecules with examples in medicine.
- Chemistry of carbohydrates: monosaccharides, disaccharides, polysaccharides, homoglycanes and heteroglycanes.
- Chemistry of lipids and steroids.
- Amino acids.
- Nucleotides in nucleonic acids.
- Vitamins.
- Molecular modelling of medically important molecules and medicines
- Dental Materials: Foundations and Applications:
  1. Introduction to Restorative Dental Materials
  2. Properties of Dental Materials
  3. Preventive Dental Materials
  4. Direct Esthetic Restorative Materials
  5. Dental Amalgam
  6. Finishing, Polishing, and Cleansing Materials
  7. Cements
  8. Impression Materials
  9. Waxes
  10. Casting Alloys, Wrought Alloys, and Solders
  11. Casting, Soldering, and Welding
  12. Polymers in Prosthodontics
  13. Dental Ceramics
  14. Dental Implants

#### Temeljni literatura in viri / Readings:

##### Temeljna literatura

- A. Zeeck, S. Grond, S. C. Zeeck: Chemie für Mediziner, Published by Urban & Fischer/Elsevier, 2017.
- P. M. Dewick: Essentials of Organic Chemistry: For Students of Pharmacy, Medicinal Chemistry and Biological Chemistry, John Wiley & Sons, 2013.
- Powers, John M., and John C. Wataha. Dental Materials: Foundations and Applications. Elsevier Health Sciences, 2017.

##### Dopolnilna literatura

- A. L. Lehninger, D. L. Nelson, M. M. Cox,: Principles of biochemistry 5 th ed., 3rd printing, Worth, New York, 2008.
- D. D. Ebbing, S. D. Gammon: General chemistry, 9th ed., Houghton Mifflin, cop., Boston, New York, 2009.
- Trevor Palmer, Philip L.R. Bonner, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, Woodhead Publishing 2007.

#### Cilji in kompetence:

Cilj tega predmeta je obnoviti osnovna znanja iz splošne kemije in poznavanja kemijske zgradbe molekul in reakcij, ter razumeti kemijske reakcije in procese v človeškem organizmu.

#### Objectives and competences:

The objective of this course is to renew the basic knowledge of general chemistry and knowledge of the chemical structure of molecules and reactions, and to understand the chemical reactions and processes in human body.

#### Predvideni študijski rezultati:

##### Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- prepoznati in razlikovati molekule,
  - razumeti kemijske reakcije, ki potekajo v človeškem organizmu,
- razložiti transportne pojave v človeškem organizmu.

Prenesljive/ključne spretnosti in drugi atributi:

#### Intended learning outcomes:

##### Knowledge and Understanding:

On completion of this course the student will be able:

- to recognize and differentiate molecules,
- to understand the chemical reactions in human body,
- to explain transport phenomenon in human body

Transferable/Key Skills and other attributes:

|   |
|---|
| <ul style="list-style-type: none"> <li>• delo v skupini,</li> <li>• spretnost računanja.</li> </ul> |
|---|

|  |
|--|
| <ul style="list-style-type: none"> <li>• team work,</li> <li>• computation skill.</li> </ul> |
|--|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                     |
|-------------------------------------|
| Predavanja<br>Vaje (laboratorijske) |
|-------------------------------------|

|                                   |
|-----------------------------------|
| Lectures<br>Tutorial (laboratory) |
|-----------------------------------|

**Načini ocenjevanja:****Delež (v %) /  
Weight (in %)****Assessment:**

|  |                      |  |
|--|----------------------|--|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt)<br><ul style="list-style-type: none"> <li>• pisni izpit</li> <li>• ustni izpit</li> <li>• opravljene laboratorijske vaje</li> </ul> <p>ŠTUDIJSKE OBVEZNOSTI ŠTUDENTOV<br/>opravljene laboratorijske vaje, ustni in pisni izpit</p> <p>POGOJI ZA PRISTOP K POSAMEZNEMU PREVERJANJU ZNANJA<br/>Uspešno opravljen praktični del laboratorijskih vaj je pogoj za pristop na kolokvij, ki je pogoj za pristop na pisni izpit. Kolokvij iz laboratorijskih vaj je pisno preverjanje opravljenih laboratorijskih vaj.<br/>Ocena vaj pa je sestavljena iz sodelovanja na vajah, kar je ovrednoteno z 20% ocene, ostalih 80% predstavlja kolokvij iz vaj.<br/>Pozitivno opravljen pisni del izpita je pogoj za opravljanje ustnega dela izpita. Izpit je pisni in ustni in je sestavljen iz nalog iz vseh področij.<br/>Tudi ustni del izpita se opravlja praviloma pisno.<br/>Ocena izpita je sestavljena iz ocen posameznih področij pisnega izpita in posameznih področij ustnega izpita.</p> | 60 %<br>30 %<br>10 % | Type (examination, oral, coursework, project):<br><ul style="list-style-type: none"> <li>• written examination</li> <li>• oral examination</li> <li>• completed lab work</li> </ul> <p>ACADEMIC OBLIGATIONS OF STUDENTS:<br/>completed laboratory work, oral and written exam</p> <p>REQUIREMENTS FOR ACCESS TO INDIVIDUAL KNOWLEDGE CHECKING:<br/>Successfully completed practical part of laboratory work is a requirement for access to the partial exam which is a requirement for access to the written exam. Partial exam in laboratory work is written checking of completed laboratory work.<br/>Assessment of laboratory work consists of cooperation during laboratory work which is evaluated with 20% of the mark and the rest 80% of the mark is represented by the partial exam in laboratory work.<br/>Successfully completed written part of the exam is a requirement for taking the oral part of the exam. The exam is written and oral and consists of tasks from all areas. Also the oral part of the exam is regularly performed in a written form.<br/>The exam mark consists of marks of individual areas of the written exam and of individual areas of the oral exam.</p> |
|--|----------------------|--|

**Reference nosilca / Lecturer's references:**

|  |
|--|
| KRAVANJA, Gregor, KNEZ, Željko, KOTNIK, Petra, LJUBEC, Barbara, KNEZ HRNČIČ, Maša. Formulation of nimodipine, fenofibrate, and o-vanillin with Brij S100 and PEG 4000 using the PGSSTMPGSSTM process. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], May 2018, vol. 135, str. 245-253, doi: 10.1016/j.supflu.2018.01.021. [COBISS.SI-ID 21211414]<br>KNEZ HRNČIČ, Maša, CÖR, Darija, KNEZ, Željko. Subcritical extraction of oil from black and white chia seeds with n-propane and comparison with conventional techniques. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], October 2018, vol. 140, str. 182-187, doi: 10.1016/j.supflu.2018.06.017. [COBISS.SI-ID 21526550] |
|--|

CÖR, Darija, KNEZ, Željko, KNEZ HRNČIČ, Maša. Antitumour, antimicrobial, antioxidant and antiacetylcholinesterase effect of ganoderma lucidum terpenoids and polysaccharides : a review. *Molecules*, ISSN 1420-3049, 2018, vol. 23, [article no.] 649, str. 1-21, ilustr., doi: [10.3390/molecules23030649](https://doi.org/10.3390/molecules23030649). [COBISS.SI-ID [21255958](https://www.cobiss.si/id/21255958)]

KNEZ HRNČIČ, Maša, ŠPANINGER, Eva, KOŠIR, Iztok Jože, KNEZ, Željko, BREN, Urban. Hop compounds: extraction techniques, chemical analyses, antioxidative, antimicrobial, and anticarcinogenic effects. *Nutrients*, ISSN 2072-6643, 24. jan. 2019, vol. 11, iss. 2, str. 1-37, ilustr., doi: [10.3390/nu11020257](https://doi.org/10.3390/nu11020257).

KNEZ, Željko, CÖR, Darija, KNEZ HRNČIČ, Maša. Solubility of solids in sub- and supercritical fluids : a review 2010 - 2017. *Journal of chemical and engineering data*, ISSN 0021-9568, Publication Date (Web): November 7, 2017, str. 1-25, doi: [10.1021/acs.jced.7b00778](https://doi.org/10.1021/acs.jced.7b00778).