



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Matematika I
Course title:	Mathematics I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	zimski Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

V001

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		30			165	8

Nosilec predmeta / Lecturer:

Žigert Pleteršek Petra

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

- Srednješolsko znanje matematike.

Prerequisites:

- High-school knowledge of mathematics.

Vsebina:

Osnovni pojmi:

številske množice in računske operacije.

Realne funkcije:

definicija in osnovni pojmi, graf, pregled elementarnih funkcij in njihovih lastnosti, realna zaporedja, limita funkcije, zvezne funkcije in njihove lastnosti.

Diferencialni račun:

definicija odvoda, geometrijski pomen, pravila za odvajanje, odvodi elementarnih funkcij, diferencial,

Content (Syllabus outline):

Basic concepts:

number sets and calculating operations, basic properties of maps.

Real functions:

definition, basic concepts, graph, review of elementary functions and their properties, real sequences, limit of the function, continuous functions and their properties.

Differential calculus:

definition of the derivative, geometrical interpretation, derivation rules, derivatives of

izreki o odvedljivih funkcijah, uporaba odvoda, Taylorjeva formula, parcialni odvodi in totalni diferencial.

elementary functions, differential, theorems on differentiable functions, use of the derivative, Taylor formula, partial derivatives and total differential.

Temeljni literatura in viri / Readings:

- P. Žigert, Matematika za študente VS programa, FKKT Maribor, 2009.
- B. Butinar, Matematika I, naloge z rešitvami, FKKT Maribor, 2004
- J. Žerovnik, I. Banič, I. Hrastnik, S. Špacapan, Zbirka rešenih nalog iz tehniške matematike, FS Maribor, 2003.

Cilji in kompetence:

- študent naj pridobi in utrdi znanja ter veščine s področja temeljnih matematičnih znanj in jih zna uporabiti pri drugih predmetih,
- študent je sposoben samostojnega študija po študijskih virih.

Objectives and competences:

- the student should gain and establish the basic mathematical knowledge and skills and know how to use them at other courses,
- the student is capable of an individual study.

Znanje in razumevanje:

- študent pozna osnove realnih funkcij in jih zna odvajati,
- študent zna uporabljati študijske vire.

Knowledge and Understanding:

- the student is familiar with the basic concepts of real functions and knows how to derive them,
- the student knows how to use textbooks and other study resources.

Prenesljive/ključne spretnosti in drugi atributi:

- uporaba odvoda,
- samostojni študij.

Transferable/Key Skills and other attributes:

- the use of the derivative,
- individual work.

Metode poučevanja in učenja:

- predavanja in seminarske vaje,
- demonstracija računalniškega programa za simbolno računanje,
- domače naloge.

Learning and teaching methods:

- lectures and exercises,
- the demonstration of a computer program for algebraic manipulation,
- homework.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če sta opravljeni obveznosti: • računski del izpita in • teoretični del izpita. Računski in teoretični del tvorita celoto in se preverjata hkrati. Izpit se lahko nadomesti s sprotnimi testi.	60 40	Student passes the examination if s(he) successfully passed all the following obligations: • the calculus part and • the theoretical part of the exam. The calculus and the theoretical part of exam are performed simultaneously. The exam can be replaced with partial exams.

Reference nosilca / Lecturer's references:

ŽIGERT PLETERŠEK, Petra, BERLIČ, Martina. Lucas cubes and resonance graphs of cyclic polyphenanthrenes. *MATCH Communications in Mathematical and in Computer Chemistry*, ISSN 0340-6253, 2012, vol. 68, no. 1, str. 79-90. <http://www.pmf.kg.ac.rs/match/content68n1.htm>. [COBISS.SI-ID [16050198](#)]

IMRICH, Wilfried, LIPOVEC, Alenka, PETERIN, Iztok, ŽIGERT PLETERŠEK, Petra. Fast recognition of subclasses of almost-median graphs. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], 2007, vol. 307, iss. 3-5, str. 464-471. <http://dx.doi.org/10.1016/j.disc.2006.07.011>, doi: [10.1016/j.disc.2006.07.011](https://doi.org/10.1016/j.disc.2006.07.011). [COBISS.SI-ID [14180697](#)],

KLAVŽAR, Sandi, ŽIGERT PLETERŠEK, Petra. Fibonacci cubes are the resonance graphs of fibonaccenes. *The Fibonacci quarterly*, ISSN 0015-0517, 2005, vol. 43, no. 3, str. 269-276. [COBISS.SI-ID [13865049](#)]

DOBRYNIN, Andrey A., GUTMAN, Ivan, KLAVŽAR, Sandi, ŽIGERT PLETERŠEK, Petra. Wiener index of hexagonal systems. *Acta applicandae mathematicae*, ISSN 0167-8019, 2002, vol. 72, issue 3, str. 247-294. [COBISS.SI-ID [11934297](#)]

KLAVŽAR, Sandi, VESEL, Aleksander, ŽIGERT PLETERŠEK, Petra, GUTMAN, Ivan. Binary coding of Kekulé structures of catacondensed benzenoid hydrocarbons. *Computers & Chemistry*, ISSN 0097-8485. [Print ed.], 2001, vol. 25, issue 6, str. 569-575. [COBISS.SI-ID [11202393](#)]



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Splošna in anorganska kemija I
Course title:	General and Inorganic Chemistry I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	zimski Autumn

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		15	60		120	8

Nosilec predmeta / Lecturer:

Irena Ban

Jeziki /

Languages:

Predavanja / Lectures: slovenski / Slovene

Vaje / Tutorial: slovenski / Slovene

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

Ne

Prerequisites:

None

Vsebina:

Predmet zajema osnove splošne kemije

Snovi (lastnosti snovi, zakonitosti kemijskih sprememb)

Materija v plinskem stanju (plinski zakoni, idealni in realni plin, utekočinjenje plinov)

Termokemija (prvi in drugi zakon termodinamike, entalpija, entropija, mrežna energija)

Periodni sistem (periodni sistem elementov, elektronska zgradba atoma, elektronegativnost)

Vezi med atomi (kemijske vezi in njihove lastnosti)

Raztopine (topnost, hidratacija, koloidne raztopine, koligativne lastnosti)

Elektrokemija (redoks reakcije, redoks potenciali, galvanski členi, elektroliza, korozija)

Content (Syllabus outline):

The subject comprises the elementary principles of chemistry

Matter (properties of matter, chemical formulas and equations)

Gases (the gas laws, nonideal behavior of gases)

Thermochemistry (first and the second law of thermodynamics)

Periodic properties (the periodic law, periodicity of electronic structure, electronegativity)

Chemical bonding (chemical bonds and their properties)

Solutions (nature of solutions, concentration of solutions, colligative properties of solutions)

Electrochemistry (oxidation and reduction,

Žlahtni plini in van der Waalsove

vezi(pridobivanje in lastnosti žlahtnih plinov, inermolekularne sile)

Kemijsko ravnotežje in zakon o vplivu mas (kisline in baze, disociacija šibkih kislin in baz, ionski produkt, definicija pH, hidroliza, puferji)

Koordinacijske spojine

Zgradba kristalov

Laboratorijske vaje

Formule kemijskih spojin, plinski zakoni, priprava raztopin, topnost, elektrolitska disociacija, kemijsko ravnotežje, topnostni produkt, reakcije - oksidacije in redukcija

electrical terms, galvanic cells)

Noble gas and van der Waals(acquiring of noble gases and their properties, intermolecular forces)

Ionic equilibrium (weak acids and weak bases, common ion effect, definition of pH, hydrolysis, buffer solution)

Coordination compounds

Structure of crystals

Laboratory work

Chemical stoichiometry, the gas laws, preparation of solutions, solubility, electrolytic dissociation, chemical equilibrium, solubility product, oxidation-reduction reactions

Temeljni literatura in viri / Readings:

M. Drofenik, »Splošna in anorganska kemija«, Fakulteta za kemijo in kemijsko tehnologijo – Univerza v Mariboru (2003)

P. W.,Atkins, et al, »Kemija, zakonitosti in uporaba«, Tehniška založba Slovenije, 1989

F. Lazarini in J. Brenčič: *Splošna in Anorganska kemija*, DZS, Ljubljana, 1984.

Cilji in kompetence:

Kandidat bo seznanjen z osnovnimi pojmi splošne kemije, ki mu bodo omogočali obvladati osnovno kemijsko računanje potrebno za delo v kemijskih laboratorijih.

Objectives and competences:

The candidate will be acquainted with the basic concepts of general chemistry. The student acquire knowledge needed for chemical calculation during working in a chemical Lab.

Predvideni študijski rezultati:

Znanje in razumevanje:

Samostojno kemijsko računanje osnovano na kemijskih enačbah in osnovnih kemijskih konceptih
Samostojno načrtovanje osnovnih kemijskih procesov

Prenesljive/ključne spretnosti in drugi atributi:

Pridobitev kemijskih znanj potrebno za razumevanje ostalih kemijskih predmetov (organska, analizna in fizikalna kemija)
Pridobitev splošnega kemijskega znanja za sodelovanje pri ostalih tehnoloških predmetih

Intended learning outcomes:

Knowledge and Understanding:

Autonomous calculation based on chemical equations and concepts
Autonomous planning of basic chemical processing

Transferable/Key Skills and other attributes:

Acquirement of elementary chemical knowledge needed for attending other chemical courses (analytic, physical and organic chemistry) and chemical engineering courses.

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

Ustna predavanja Katedralna vaje Uporaba predstavitev s Power Point-om Uporaba interneta Uporaba »virtualne« splošne kemije	Oral lectures Desk exercises Power-Point presentation Use of internet Use of Interactive General Chemistry
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Pogoj za pristop k teoretičnemu delu izpita sta opravljena dva delna pisna testa (vsak opravljen z najmanj 50% možnih točk) oz. zaključni pisni test iz vaj (opravljen z najmanj 50% možnih točk), ki predstavljajo računski del izpita , ter v celoti opravljene laboratorijske vaje. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Conditions to access to the the calculus part of exam are two partial written tests or final test from laboratory course (each min. 50% of all possible points), which represents the calculus part of exam and completely performed laboratory course. Student passes the examination if s(he) successfully passed all the following obligations:
računski del izpita (vaje) teoretični del izpita	40 60	the calculus part of exam (lab course) the theoretical part of the exam.

Reference nosilca / Lecturer's references:

STERGAR, Janja, BAN, Irena, DROFENIK, Mihael, FERK, Gregor, MAKOVEC, Darko.

Synthesis and characterization of silica-coated Cu_(1-x)Ni_x nanoparticles.

IEEE trans. magn., 2012, vol. 48, 1344-1347, doi: 10.1109/TMAG.2011.2173168

FERK, Gregor, BAN, Irena, STERGAR, Janja, MAKOVEC, Darko, HAMLER, Anton, JAGLIČIĆ, Zvonko, DROFENIK, Mihael. A facile route to the synthesis of coated maghemite nanocomposites for hyperthermia applications. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2012, vol. 59, no. 2, str. 366-374.

<http://acta.chem-soc.si/59/59-2-366.pdf>. [COBISS.SI-ID 16097046]

BAN, Irena, KRISTL, Matjaž, DANČ, Valerija, DANČ, Anita, DROFENIK, Mihael. Preparation of cadmium telluride nanoparticles from aqueous solutions by sonochemical method. *Materials letters*, ISSN 0167-577X. [Print ed.], 15. Jan. 2012, vol. 67, iss. 1, str. 56-59, doi: [10.1016/j.matlet.2011.09.001](https://doi.org/10.1016/j.matlet.2011.09.001). [COBISS.SI-ID 15371798]

STERGAR, Janja, FERK, Gregor, BAN, Irena, DROFENIK, Mihael, HAMLER, Anton, JAGODIČ, Marko,

MAKOVEC, Darko. The synthesis and characterization of copper-nickel alloy nanoparticles with a therapeutic Curie point using the microemulsion method. *Journal of alloys and compounds*, ISSN 0925-8388. [Print ed.], 5. nov. 2013, vol. 576, str. 220-226, ilustr., doi: [10.1016/j.jallcom.2013.04.130](https://doi.org/10.1016/j.jallcom.2013.04.130). [COBISS.SI-ID [16893718](#)]

FERK, Gregor, STERGAR, Janja, DROFENIK, Mihael, MAKOVEC, Darko, HAMLER, Anton, JAGLIČIĆ, Zvonko, BAN, Irena. The synthesis and characterization of copper-nickel alloy nanoparticles with a narrow size distribution using sol-gel synthesis. *Materials letters*, ISSN 0167-577X. [Print ed.], 2014, vol. 124, str. 39-42, ilustr., doi: [10.1016/j.matlet.2014.03.030](https://doi.org/10.1016/j.matlet.2014.03.030). [COBISS.SI-ID [17817110](#)]



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizika I
Course title:	Physics I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja Chemical Technology / 1. Level VS		1.	Zimski Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individual work	ECTS
45		15			90	5

Nosilec predmeta / Lecturer:

Samo Korpar

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages: S

Vaje / Tutorial: slovenski / Slovene

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

Znanje srednješolske matematike.

Prerequisites:

Knowledge of high-school mathematics.

Vsebina:

- Kinematika: opazovalni sistem, premo gibanje, krivo gibanje, kroženje, sinusno nihanje, relativno gibanje.
- Dinamika: sila, Newtonovi zakoni, teža, trenje, kroženje, inercialni in neinercialni opazovalni sistemi, sistem točkastih teles, gibanje težišča, vrtenje togega telesa, izrek o ravnovesju, gibalna količina, ohranitev gibalne količine, vrtilna količina, ohranitev vrtilne količine, delo in kinetična energija, potencialna energija, ohranitev energije, trki, gravitacija.
- Elastomehanika: napetost, Hookov zakon,

Content (Syllabus outline):

- Kinematics: reference frames, 1-D kinematics, 2-D and 3-D motion, circular motion, simple harmonic motion, relative motion.
- Dynamics: force, Newton's laws, weight, friction, circular motion, inertial and non-inertial frames, system of particles, centre of mass, rigid-body rotation, equilibrium of rigid bodies, momentum, conservation of momentum, angular momentum, conservation of angular momentum, work, kinetic energy, potential energy, conservation of energy, collisions, gravitation.
- Elasticity: tension, Hook's law, elastic constants, shearing.

elastične konstante, strižne deformacije.

- Mehanika tekočin: tlak, hidrostatični tlak, vzgon, Bernoullijeva enačba, linearni in kvadratni zakon upora, viskoznost.
- Termodinamika: temperatura, temperaturno raztezanje, notranja energija, toplota, prvi zakon termodinamike, prevajanje toplote, kinetična teorija plinov, idealni plini, toplotni stroji, entropija, drugi zakon termodinamike.
- Seminarske vaje: reševanje problemov iz obravnavane snovi.

• Fluid mechanics: pressure, hydrostatic pressure, Archimedes' principle, Bernoulli's equation, drag force, viscosity.

• Thermodynamics: temperature, thermal expansion, internal energy, heat, first law of thermodynamics, heat transfer, kinetic theory of gases, ideal gases, heat engines, entropy, second law of thermodynamics.

• Tutorial: solving problems covered by the subject.

Temeljni literatura in viri / Readings:

- A. Stanovnik: Fizika I – zapiski predavanj, 4. izd., Univerza v Ljubljani, Fakulteta za elektrotehniko, Ljubljana, 2006.
- D. Halliday, R. Resnick, J. Walker: Fundamentals of Physics, Sixth Edition, John Wiley & Sons, Inc., New York, 2001.
- S. Korpar, M. Bračko: Arhiv pisnih izpitov in kolokvijev iz fizike, 1998-2012, Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 01. 03. 2013. Vir je dostopen v elektronski obliki na naslovu <http://fizika.fkkt.uni-mb.si/~www/literatura/fizika>.

Cilji in kompetence:

Cilja tega predmeta sta: sistematična obravnava osnov fizike – mehanike in termodinamike – z obravnavo izbranih poskusov in dosledno uporabo infinitezimalnega in vektorskega računa ter pridobitev osnovnih znanj za razumevanje ostalih naravoslovnih predmetov.

Objectives and competences:

Objectives of this course are: to provide a systematic treatment of elementary physics phenomena (mechanics and thermodynamics) by making use of selected experiments, as well as calculus and vectors; to acquire foundations for the understanding of other natural-science courses.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- izkazati znanje in razumevanje osnovnih fizikalnih zakonitosti,
- sestaviti matematični opis fizikalnih problemov in najti ustrezne rešitve.

Prenesljive/ključne spretnosti in drugi atributi:

- Spretnosti komuniciranja: pisno izražanje pri pisnem izpitu, ustno izražanje pri ustnem izpitu.
- Spretnosti računanja: reševanje računskih nalog pri seminarskih vajah in izpitih.
- Reševanje problemov: modeliranje problemov z uporabo poenostavitev in izbiro potrebnih podatkov, interpretacija meritev.

Intended learning outcomes:

Knowledge and understanding:

On completion of the course a student will be able to:

- Demonstrate knowledge and understanding of basic principles in physics.
- Mathematically formulate problems and find appropriate solutions.

Transferable/Key Skills and other attributes:

- Communication skills: manner of expression at both written and oral examination.
- Calculation skills: solving numerical problems at tutorial and written examination.
- Problem solving: modelling problems using simplifications and necessary data selection, interpretation of measurements.

Metode poučevanja in učenja:

Learning and teaching methods:

• klasična predavanja, • obravnava izbranih poskusov in • reševanje nalog.	• lectures, • treatment of selected experiments and • problem solving.
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Delež (v %) / Weight (in %)		
Načini ocenjevanja:		Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • pisni izpit (ali dva testa), • ustni izpit.	40% 60%	Student passes the examination if s/he successfully passed all the following obligations: • written examination (or two tests), • oral examination.

Reference nosilca / Lecturer's references:

1. Belle Collaboration, FRATINA, Saša, BITENC, Urban, BIZJAK, Ilija, BRAČKO, Marko, GOLOB, Boštjan, GORIŠEK, Andrej, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, STARIČ, Marko, ZUPANC, Anže. Evidence for CP Violation in $B^0 \rightarrow D^+ D^-$ decays. Phys. rev. lett., 2007, vol. 98, no. 22, str. 221802-1-221802-6. [COBISS.SI-ID 20796455]
2. Belle Collaboration, STARIČ, Marko, GOLOB, Boštjan, BITENC, Urban, BRAČKO, Marko, FRATINA, Saša, GORIŠEK, Andrej, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, ZUPANC, Anže. Evidence for $D^0 - (\bar{D})^0$ mixing. Phys. rev. lett., 2007, vol. 98, no. 21, str. 211803-1-211803-6. [COBISS.SI-ID 20795943]
3. Belle Collaboration, GO, A., BITENC, Urban, BIZJAK, Ilija, BRAČKO, Marko, FRATINA, Saša, GOLOB, Boštjan, GORIŠEK, Andrej, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, STARIČ, Marko, ZUPANC, Anže. Measurement of Einstein-Podolsky-Rosen-type flavor entanglement in $[\Upsilon(4S)] \rightarrow B^0 (\bar{B})^0$ decays. Phys. rev. lett., 2007, vol. 99, no. 13, str. 131802-1-131802-6. [COBISS.SI-ID 21109287]
4. Belle Collaboration, LIN, S.-W., BITENC, Urban, BRAČKO, Marko, FRATINA, Saša, GOLOB, Boštjan, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, STARIČ, Marko, ZUPANC, Anže. Difference in direct charge-parity violation between charged and neutral B meson decays. Nature (Lond.), 2008, vol. 452, str. 332-335. [COBISS.SI-ID 21553703]
5. KORPAR, Samo. Status and perspectives of solid state photon detectors. Nucl. instrum, methods phys res., Sect. A, Accel.. [Print ed.], 2011, vol. 639, no. 1, str. 88-93, doi: 10.1016/j.nima.2010.10.154. [COBISS.SI-ID 24868135]
6. KORPAR, Samo, DOLENEC, Rok, KRIŽAN, Peter, PESTOTNIK, Rok, STANOVNIK, Aleš. Study of TOF PET using Cherenkov light. Nucl. instrum, methods phys res., Sect. A, Accel.. [Print ed.], 2011, vol. 654, no. 1, str. 532-538, doi: 10.1016/j.nima.2011.06.035. [COBISS.SI-ID 25039655]
7. Belle Collaboration, BONDAR, A., BRAČKO, Marko, GOLOB, Boštjan, KORPAR, Samo, KRIŽAN, Peter, PETRIČ, Marko, SMERKOL, Peter, STARIČ, Marko, ZUPANC, Anže. Observation of two charged bottomoniumlike resonances in $[\Upsilon(5S)]$ decays. Phys. rev. lett., 2012, vol. 108, no. 12, str. 122001-1-122001-6, doi: 10.1103/PhysRevLett.108.122001. [COBISS.SI-ID 25989159]
8. PROJEKT J1-9340 (D): Kombinirana metoda za identifikacijo delcev (temeljni raziskovalni projekt); VODJA: Korpar Samo (TRAJANJE: 1.1.2007 – 31.12.2009)



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Procesno računanje I
Course title:	Process Calculation I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	zimski autumn

Vrsta predmeta / Course type

obvezni/obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			30		60	4

Nosilec predmeta / Lecturer:

doc. dr. Majda Krajnc/Assistant Professor

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski/Slovene

slovenski/Slovene

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

Srednješolsko znanje anorganske kemije in matematike.

Prerequisites:

General knowledge of anorganic chemistry and mathematics.

Vsebina:

Predavanja:

Spoznavanje in uporaba elektronskega učnega okolja Moodle in interaktivnih, multimedijskih e-učnih gradiv. Spoznavanje programskega jezika in programov kot orodij za reševanje kemijskih problemov. Izdelava kratkega filma.

Programiranje s fortranom:

- spoznavanje računalnika, binarno kodiranje,
- spoznavanje operacijskega sistema VMS,
- definiranje algoritmov, diagrama poteka
- spremenljivke, konstante,
- aritmetični izrazi,
- pogojni stavki,
- zanke,
- branje in pisanje podatkov,
- podprogrami (funkcije, subroutine).

Spoznavanje programa Excel:

- prikaz podatkov v preglednicah in grafih,
- zapis in uporaba aritmetičnih izrazov,
- uporaba funkcij za reševanje problemov,
- definiranje in uporaba pogojnih stavkov.

Uporaba programa Jing:

- izdelava kratkega filma.

Računalniške vaje:

Spoznavanje in delo s:

- programom Force za programiranje,
- programom Excel za obdelavo podatkov,
- programom SmartDraw za risanje diagramov poteka in procesnih shem,
- program Word za pisanje poročil.

Študentje rešujejo kemijske probleme s programiranjem v programskem jeziku fortran. S programom SmartDraw rišejo diagrame poteka in procesne sheme, s programom Excel spoznavajo obdelavo podatkov in možnosti reševanja problemov.

Content (Syllabus outline):

Lectures:

Basis of e-tools usage (e-learning environment Moodle, interactive, multimedia e-textbooks). Knowing program language and programs as tools for solving chemical problems. Creation of the short film.

Programming with fortran:

- computer structure, binary coding,
- virtual memory system VMS,
- algorithms, flowcharts
- variables, constants,
- arithmetic expressions,
- conditional statements,
- loops,
- data reading and writing,
- subprograms (function, subroutine).

Adoption of the program Excel:

- processing the data in tables and graphs,
- formatting and using of the arithmetical expressions,
- using functions for solving problems,
- the definition and use of the conditional statements.

Usage of the Jing program:

- creating short film (mini lecture or screen capture).

Computational work:

Adoption and usage of:

- the program Force for programming,
- the program Excel for data processing,
- the program SmartDraw for drawing flowcharts and process schemes,
- the program Word for writing reports.

Students solve chemical problems with programming in fortran. They draw flowcharts and process flow diagrams with the SmartDraw program and with the Excel learn how to processing data and solve problems.

Temeljni literatura in viri / Readings:

1. M. Krajnc, Računalništvo v kemiji, zapiski predavanj, 2. Popravljen in dopolnjen izd. Maribor: FKKT Univerze v Mariboru, 2014, 186 str.
2. V. Žumer, Fortran, TF Maribor, 1993.
3. S. Oreški, Računalništvo v kemiji – Navodila za računalniške vaje, 1. izdaja, FKKT, Maribor, 2012.
4. M. MacDonald, Excel 2010. The Missing Manual, O'Reilly Media, Inc. 2010.
5. TechSmith Corporation, TechSmith – Screen Capture and Recording Software, <http://www.techsmith.com> (dostop: 7. oktober 2014).

Cilji:

Spoznati uporabo elektronskih učnih pripomočkov. Osvojiti osnove programiranja forttranu, kot načina reševanja kemijskih problemov, ki jih ne moremo rešiti s komercialnimi paketi, ter programa Excel.

Objectives:

Adopt the usage of electronic tools. Knowing the basis of programming in fortran as a tool for solving chemical problems which can not be solved with commercial programs, and Excel program.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Do rezultatov vodi sistematično, ustvarjalno delo. Programiranje omogoča logično razmišljanje, uporaba programov pa usvajanje veščin rokovanja z izdelanimi programi.

Intended learning outcomes:**Knowledge and Understanding:**

Systematic and creative work leads to results. Programming makes possible logical thinking, and the usage of the programs the acquisition of the skills for using commercial programs.

Metode poučevanja in učenja:

Aktivno poučevanje in učenje, skupinsko (sodelovalno) delo, e-izobraževanje (e-preverjanje znanja).

Learning and teaching methods:

Active teaching and learning, cooperative learning, e-learning (e-assessment of knowledge).

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Kriterij za pristop k računalniškim vajam: 35 % rešenih problemov na 1. pisnem testu. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- pisni izpit ali 2 pisna testa,
- ustno izpraševanje ali 2 e-testa,
- računalniške vaje.

40
20
40

The criterion for the approach to computational work: 35 % of solved problems in the first written test. Student has to pass successfully the following obligations:

- written exam or 2 written tests,
- oral examination or 2 e-tests,
- work in computational laboratory.

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Reference nosilca / Lecturer's references:

1. TODORVIČ, Anita, KRAJNC, Majda, ZORIČ-VENUTI, Metka. Analiza kakovosti e-preverjanja znanja. V: KRAVANJA, Zdravko (ur.), BOGATAJ, Miloš (ur.), NOVAK-PINTARIČ, Zorka (ur.). *Slovenski kemijski dnevi 2014, Maribor, 11. - 12. september 2014*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2014, str. 1-7.
2. LUKMAN, Rebeka, KRAJNC, Majda. Exploring non-traditional learning methods in virtual and real-world environments. *Educ. technol. soc.*, 2012, vol. 15, no. 1, str. 237-247.
http://www.ifets.info/journals/15_1/21.pdf.
3. KRAJNC, Majda. E-learning environment integration in the chemical engineering educational process. *Int. j. eng. educ.*, 2009, vol. 25, no. 2, str. 349-357.
http://www.ijee.ie/latestissues/Vol25-2/s18_ijee2119.pdf.
4. KRAJNC, Majda. Poučevanje in učenje programiranja v kemijski tehniki. *Kem. šoli*, okt. 2007, letn. 19, št. 3, str. 9-13.
5. KRAJNC, Majda, OREŠKI, Severina. Reševanje problemov v kemijski tehniki s programskim paketom POLYMATH. *Kem. šoli*, marec 2006, letn. 18, št. 1, str. 12-19.
6. KRAJNC, Majda. Uvajanje e-izobraževanja v študijski proces. *Kem. šoli*, junij 2006, letn. 18, št. 2, str. 14-19.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Elementi procesnih naprav
Course title:	Elements of process equipment

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija/ 1. stopnja VS Chemical Technology / 1. Level VS		1.	zimski Autumn

Vrsta predmeta / Course type

Obvezni /Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30		45			75	5

Nosilec predmeta / Lecturer:

Darko Goričanec

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

- Pravila in standardi za konstruiranje elementov procesnih naprav.
- Statika: osnovni principi, ravnotežje sil za toga telesa, dvojice sil, težišča
- Določevanje obremenitvenih in napetostnih stanj elementov.: trdnost in napetost, razteznostni diagram, vrste obremenitev, varnost in dopustna napetost, osnovne obremenitve (nateg, tlak, upogib, strig)

Content (Syllabus outline):

- Rules and standards for designing the process equipment elements
- Static: general principles, equilibrium of forces for a rigid body, couples of forces, centre of gravity
- Determining loading and stress – strain state of machine elements: strength and stress, elongation diagram, types of loads, safety factor and allowable stress, fundamentals loads (tensile stress, pressure stress, bending stress, shearing

- Cevovodi: raztezanje, kompenzatorji
- Razstavljive vijačne zveze
- Nerazstavljivi zvarni spoji
- Osi in gredi
- Tlačne in reaktorske posode
- Mešala, homogenizacija tekočin, suspenzij in emulzij
- Seminarske vaje:
Reševanje primerov iz vsebine predmeta

- stress)
- Pipelines: expansion, expansion joint
- Separable screw fasteners
- Inseparable welding joints
- Axles and beams
- Pressure and reactors vessels
- Mixers, homogenization of liquids, suspensions and emulsions
- Tutorials
Examples from the theme of the subject

Temeljni literatura in viri / Readings:

- Gotlih Karl: Tehniška mehanika za študente elektrotehnike 1. izd., Fakulteta za elektrotehniko, Maribor, 2000
- B. Mejak, Osnove strojnih elementov, Tehniška založba Slovenije, Ljubljana 1998
- L. Robert, P. E. Mott: Machine Element in Mechanical Design, Prentice Hall, 1999
- Ren Z. Godlež S, Strojni elementi – I. del, učbenik, Fakulteta za strojništvo, Univerza v Mariboru, 2001
- Ren Z, Belšak A.: Zbirka nalog iz strojnih elementov – I. Del, Zbirka nalog, Fakulteta za strojništvo, Univerza v Mariboru, 2001
- DECKER Maschinenelemente: Funktion, Gestaltung und Berechnung / prenovil Karlheinz Kabus – 15. prenovljena izdaja, München, Wien, Hanser, cop. 2004

Cilji :

- Podati poglobljeno znanje s področja teorije, funkcionalne uporabe, oblikovanja elementov procesnih naprav.
- Spoznati značilnosti materialov, obremenitev in s tem povezano dimenzioniranje elementov.

Objectives :

- To provide detailed knowledge of basic theory, functional use and design of elements of process equipment.
- To provide necessary knowledge about used material, loading and dimensioning of elements.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Znanje priprave tehnične dokumentacije in branja načrtov.
- Sposobnost načrtovanja in dimenzioniranja elementov procesnih naprav.

Prenesljive/ključne spretnosti in drugi atributi:

- Uporaba standardov in tehniškega znanja za dimenzioniranje elementov.
- Kombinirana uporaba različnih osnovnih znanj za reševanje inženirskih problemov.

Intended learning outcomes:

Knowledge and Understanding:

- Knowledge to prepare theoretical documentations and knowledge for reading projects.
- Ability to design and dimension process equipment elements.

Transferable/Key Skills and other attributes:

- Use of different standards and technical knowledge for dimensioning of process equipment elements.
- Combined use of different fundamental skills for solution of engineering problems.

Metode poučevanja in učenja:

Learning and teaching methods:

• predavanja • avditorne vaje	• lectures • practical work at tutorials
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Načini ocenjevanja:		Delež (v %) / Weight (in %)	Assessment:
Teoretični in računski del tvorita celoto in se preverjata hkrati. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:			The theoretical and the calculus part of exam are performed simultaneously. Student has to pass successfully the following obligations:
	• teoretični del	40	• Theoretical part
	• računski del	50	• Calculation part
	• poročilo	10	• Seminar

Reference nosilca / Lecturer's references:

1. MATAVŽ, Albin, KROPE, Jurij, GORIČANEC, Darko, GUBELJAK, Nenad. The impact of ageing on mechanical characteristics of resin bonded wheels. *Strojarstvo*, ISSN 0562-1887, 2007, vol. 49, 4, str. 311-316.
2. MATAVŽ, Albin, KROPE, Jurij, GORIČANEC, Darko. The impact of ageing to mechanical characteristics of resin bonded wheels. V: LOPEZ MORALES, Martin (ur.), ZEMLIAK, Alexander (ur.), KURI-MORALES, Angel Fernando (ur.). *Proceedings of the WSEAS International conferences MATH '05, IMCCAS '05, ISCA '05, SOSM '05, Cancun, Mexico, May 11-14, 2005*
3. KROPE, Jurij, GORIČANEC, Darko, DOBERŠEK, Danijela. *Študija in analiza mehanskih lastnosti pri staranju smolno vezanih brusov : končno poročilo*. Maribor: Fakulteta za strojništvo, Laboratorij za toplotno tehniko, 2009.
4. GORIČANEC, Darko, GUBELJAK, Nenad, KREPEK, Roman, PREDAN, Jožef. *Vpliv staranja na mehanske lastnosti smolno vezanih brusov : poročilo o industrijski raziskovalno-razvojni nalogi za Comet d.d. Zreče*. Maribor: Fakulteta za strojništvo, 2001



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Matematika II
Course title:	Mathematics II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	poletni spring

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

V002

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		30			165	8

Nosilec predmeta / Lecturer:

Žigert Pleteršek Petra

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Znanje Matematike I

Prerequisites:

Knowledge of Mathematics I.

Vsebina:**Linearna algebra:**

matrike, operacije z matrikami, računanje determinante, obratna matrika, reševanje sistemov linearnih enačb z Gaussovo metodo in Cramerjevim pravilom, lastne vrednosti in lastni vektorji matrik, reševanje sistemov navadnih diferencialnih enačb.

Integralni račun:

definicija in osnovne lastnosti nedoločenega integrala, integracijske metode, Riemannova definicija določenega integrala, Leibniz-Newtonova formula, uporaba integralnega računa pri reševanju navadnih diferencialnih enačb prvega in višjih redov.

Content (Syllabus outline):**Linear algebra:**

matrices, operations with matrices, calculation of the determinant, inverse matrix, methods of solving of systems of linear equations - Gauss method and the Cramer rule, eigenvalues and eigenvectors of matrices, solution of systems of ordinary differential equations.

Integral calculus:

definition and basic concepts of antiderivative, integration methods, Riemann's definition of the definite integral, Newton-Leibniz formula, ordinary differential equations of first and higher order.

Temeljni literatura in viri / Readings:

- P. Žigert, Matematika za študente VS programa, FKKT Maribor, 2009.
- B. Butinar, Matematika I, naloge z rešitvami, FKKT Maribor, 2004
- J. Žerovnik, I. Banič, I. Hrastnik, S. Špacapan, Zbirka rešenih nalog iz tehniške matematike, FS Maribor, 2003

Cilji:

- študent naj pridobi in utrdi znanja ter veščine s področja temeljnih matematičnih znanj linearne algebre in diferencialnih enačb in jih zna uporabiti pri drugih predmetih,
- študent je sposoben samostojnega študija po študijskih virih.

Objectives:

- the student should gain and establish the basic mathematical knowledge and skills of linear algebra and ordinary differential equations and know how to use them at other courses,
- the student is capable of an individual study.

Predvideni študijski rezultati:**Znanje in razumevanje:**

- študent zna integrirati in računati z matrikami in jih uporabljati pri reševanju sistemov enačb, zna reševati navadne diferencialne enačbe in njihove sisteme,
- študent zna uporabljati študijske vire.

Intended learning outcomes:**Knowledge and Understanding:**

- the student has knowledge of integration methods and matrix calculus and is able to use it in finding the solutions of a systems of linear equations, the student can solve ordinary differential equations and their systems,
- the student knows how to use textbooks and other study resources.

Prenesljive/ključne spretnosti in drugi atributi: - uporaba matrik in diferencialnih enačb, - samostojni študij.	Transferable/Key Skills and other attributes: - the use of matrices and ordinary differential equations, - individual work.
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Metode poučevanja in učenja:

- predavanja in seminarske vaje,
- demonstracija računalniškega programa za simbolno računanje,
- domače naloge

Learning and teaching methods:

- lectures and exercises,
- the demonstration of a computer program for symbolic calculations,
- homework.

Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja:		
Izpit je opravljen, če sta opravljeni obveznosti: • računski del izpita in • teoretični del izpita. Računski in teoretični del tvorita celoto in se preverjata hkrati. Izpit se lahko nadomesti s sprotnimi testi.	60 40	Student passes the examination if s(he) successfully passed all the following obligations: • the calculus part and • the theoretical part of the exam. The calculus and the theoretical part of exam are performed simultaneously. The exam can be replaced with partial exams.

Reference nosilca / Lecturer's references:

ŽIGERT PLETERŠEK, Petra, BERLIČ, Martina. Lucas cubes and resonance graphs of cyclic polyphenanthrenes. *MATCH Communications in Mathematical and in Computer Chemistry*, ISSN 0340-6253, 2012, vol. 68, no. 1, str. 79-90. <http://www.pmf.kg.ac.rs/match/content68n1.htm>. [COBISS.SI-ID [16050198](#)]

IMRICH, Wilfried, LIPOVEC, Alenka, PETERIN, Iztok, ŽIGERT PLETERŠEK, Petra. Fast recognition of subclasses of almost-median graphs. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], 2007, vol. 307, iss. 3-5, str. 464-471. <http://dx.doi.org/10.1016/j.disc.2006.07.011>, doi: [10.1016/j.disc.2006.07.011](http://dx.doi.org/10.1016/j.disc.2006.07.011). [COBISS.SI-ID [14180697](#)],

KLAVŽAR, Sandi, ŽIGERT PLETERŠEK, Petra. Fibonacci cubes are the resonance graphs of fibonaccenes. *The Fibonacci quarterly*, ISSN 0015-0517, 2005, vol. 43, no. 3, str. 269-276. [COBISS.SI-ID [13865049](#)]

DOBRYNIN, Andrey A., GUTMAN, Ivan, KLAVŽAR, Sandi, ŽIGERT PLETERŠEK, Petra. Wiener index of hexagonal systems. *Acta applicandae mathematicae*, ISSN 0167-8019, 2002, vol. 72, issue 3, str. 247-294. [COBISS.SI-ID [11934297](#)]

KLAVŽAR, Sandi, VESEL, Aleksander, ŽIGERT PLETERŠEK, Petra, GUTMAN, Ivan. Binary coding of Kekulé structures of catacondensed benzenoid hydrocarbons. *Computers & Chemistry*, ISSN 0097-8485. [Print ed.], 2001, vol. 25, issue 6, str. 569-575. [COBISS.SI-ID [11202393](#)]



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Splošna in anorganska kemija II
Course title:	General and Inorganic Chemistry II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	Poletni springi

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		15			60	4

Nosilec predmeta / Lecturer:

Irena Ban

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Ne

Prerequisites:

None

Vsebina:

Predmet zajema osnove anorganske kemije

Sedma skupina periodnega sistema - halogeni elementi

Šesta skupina periodnega sistema-halogeni elementi

Peta skupina periodnega sistema

Četrta skupina periodnega sistema

Tretja skupina periodnega sistema

Druga skupina periodnega sistema

Prva skupina periodnega sistema

Žlahtni plini

Kemija prehodnih elementov: Ti, Fe, Cu, Ag,

Content (Syllabus outline):

The subject basic principles of inorganic chemistry

The Group VII elements: F, Cl, Br, I

The Group VI elements: O, S, Se, Te, Po

The Group V elements: N, P, As, Sb, Bi

The Group IV elements. C, Si, Ge, Pb

The Group III elements: B, Al, Ga, In, Tl

The Group II elements : Be, Mg, Ca, Sr, Ba

The Group I elements : Li, Na, K, Rb, Cs

The Group VIII (The noble gases) - He, Ne, Ar, Kr, Xe, Ra

The chemistry of transition elements: Ti, Fe, Cu, Ag, Au, Zn

Au, Zn

Temeljni literatura in viri / Readings:

- M. Drofenik, Splošna in anorganska kemija, Fakulteta za kemijo in kemijsko tehnologijo – Univerza v Mariboru (2013)
- F. Lazarini in J. Brenčič, Splošna in Anorganska kemija, Založba FKKT, Ljubljana (2011)
- N. N. Greenwood , A. Earnshaw Chemistry of the Elements, Second Edition Paperback – Elsevier Butterworth-Heinemann, 2009
- D. F. Shriver, P.W. Atkins: *Inorganic Chemistry*, Oxford-University Press, 1999.

Cilji:

Kandidat bo seznanjen z osnovnimi lastnostmi kemije reprezentativnih elementov periodnega sistema. Znanje mu bo pomagalo pri aktivni vključitvi v problematiko s področja anorganske kemije.

Objectives:

The candidate will be acquainted with the basic chemical properties of representative elements what will enable students to follow the other subjects connected with inorganic chemistry and will qualify them to work in a chemical Lab.

Predvideni študijski rezultati:

Znanje in razumevanje:

Samostojno načrtovanje osnovnih kemijskih procesov

Prenesljive/ključne spretnosti in drugi atributi:

Pridobitev kemijskih znanj potrebnih za razumevanje ostalih kemijskih predmetov (organska, analizna in fizikalna kemija)
Pridobitev splošnega kemijskega znanja za sodelovanje pri ostalih tehnoloških predmetih

Intended learning outcomes:

Knowledge and Understanding:

Autonomous planning of basic chemical processing

Transferable/Key Skills and other attributes:

Acquirement of elementary chemical knowledge needed for attending other chemical courses (analytic, physical and organic chemistry) and chemical engineering courses.

Metode poučevanja in učenja:

Predavanja in seminarske vaje

Infomacijsko Komunikacijska Tehnologija (IKT)

Uporaba predstavitev s Power Point-om

Uporaba interneta

Uporaba »virtualne« splošne kemije

Learning and teaching methods:

Oral lectures and Desk exercises

IKT

Power-Point presentation

Use of internet

Use of Interactive General Chemistry

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

Izpit je opravljen, če so opravljene naslednje obveznosti: • računski in seminarski del • teoretični del izpita. Računski, seminarski in teoretični del tvorijo celoto in se preverjajo hkrati.	30 70	Student passes the examination if s(he) successfully passed all the following obligations: • the calculus part and tutorial • the theoretical part of the exam. The calculus, tutorial and the theoretical part of exam are performed simultaneously.
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Reference nosilca / Lecturer's references:

KRISTL, Matjaž, BAN, Irena, DANČ, Anita, DANČ, Valerija, DROFENIK, Mihael. A sonochemical method for the preparation of cadmium sulfide and cadmium selenide nanoparticles in aqueous solutions. *Ultrasonics Sonochemistry*, ISSN 1350-4177, June 2010, vol. 17, iss. 5, str. 916-922, doi: [10.1016/j.ultsonch.2009.12.013](https://doi.org/10.1016/j.ultsonch.2009.12.013). [COBISS.SI-ID [13766422](#)], [JCR, SNIP, WoS do 3. 7. 2014: št. citatov (TC): 15, čistih citatov (CI): 9, normirano št. čistih citatov (NC): 8, Scopus do 25. 3. 2014: št. citatov (TC): 16, čistih citatov (CI): 10, normirano št. čistih citatov (NC): 9]

BAN, Irena, DROFENIK, Mihael, MAKOVEC, Darko. The synthesis of iron-nickel alloy nanoparticles using a reverse micelle technique. *Journal of Magnetism and Magnetic Materials*, ISSN 0304-8853. [Print ed.], Dec. 2006, vol. 307, iss. 2, str. 250-256. <http://dx.doi.org/10.1016/j.jmmm.2006.04.010>. [COBISS.SI-ID [10488342](#)], [JCR, SNIP, WoS do 8. 6. 2014: št. citatov (TC): 20, čistih citatov (CI): 20, normirano št. čistih citatov (NC): 12, Scopus do 8. 6. 2014: št. citatov (TC): 21, čistih citatov (CI): 21, normirano št. čistih citatov (NC): 13]

BAN, Irena, KRISTL, Matjaž, DROFENIK, Mihael, POPOVIĆ, Arkadije. Hydroxylammonium fluorogermanates. *Thermochimica acta*, ISSN 0040-6031. [Print ed.], 2004, vol. 419, iss. 1/2, str. 253-257. <http://dx.doi.org/10.1016/j.tca.2004.02.016>. [COBISS.SI-ID [8703766](#)], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 6, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2, Scopus do 15. 4. 2013: št. citatov (TC): 6, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2]

BAN, Irena, STERGAR, Janja, DROFENIK, Mihael, FERK, Gregor, MAKOVEC, Darko. Synthesis of chromium-nickel nanoparticles prepared by a microemulsion method and mechanical milling. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2013, vol. 60, no. 4, str. 750-755. <http://acta.chem-soc.si/60/60-4-750.pdf>. [COBISS.SI-ID [17438998](#)], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analizna kemija
Course title:	Analytical Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1 st level		1.	poletni Spring

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			60		135	8

Nosilec predmeta / Lecturer:

Mladen Franko

Jeziki /

Predavanja / Lectures: Slovenski / Slovene

Languages:

Vaje / Tutorial: Slovenski / Slovene

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

Osnovno znanje splošne in anorganske kemije, matematike in fizike

Prerequisites:

Basic knowledge of general and inorganic chemistry, mathematics and physics

Vsebina:

Predavanja

Obdelava in interpretacija rezultatov: sistematske in slučajne napake, tipi, selektivnost in občutljivost reagentov in kemijskih reakcij
ravnotežja v homogenih in heterogenih sistemih, nevtralizacija, oksidacija in redukcija, obarjanje ter tvorba kompleksov kot osnova analiznih metod.

Content (Syllabus outline):

Lectures

Evaluation and interpretation of results, systematic and random errors,
Types, selectivity and sensitivity of reagents and chemical reactions
Equilibrium in homogeneous and heterogeneous systems, neutralization, oxidation and reduction, precipitation and formation of complexes as a base

Volumetrija

Titrimetrija z vizuelnimi indikatorji (priprava standardnih raztopin, acidi in alkalimetrične titracije, redukcijsko-oksidacijske, obarjalne in kompleksometrične titracije),

Gravimetrija

Laboratorijske vaje

gravimetrija

- titrimetrija z vizuelnimi indikatorji (priprava standardnih raztopin, acidi-in alkalimetrične titracije, redukcijsko oksidacijske, obarjalne in kompleksometrične titracije).

of analytical methods.

Volumetry

Titrimetry using visual indicators (preparation of standard solutions, acid/base titrations, oxidation/reduction titrations, precipitation titrations, complex formation titrations)

Gravimetry

Laboratory work

Gravimetry

-Titrimetry using visual indicators (preparation of standard solutions, acid/base titrations, oxidation/reduction titrations, precipitation titrations, complex formation titrations),

Temeljni literatura in viri / Readings:

- D.A. Skoog, D.M. West, F.J. Holler: *Fundamentals of Analytical Chemistry*, Saunders College Publishing, 8. izdaja, N.Y.2003.
- D.A. Skoog, , F.J. Holler S.R. Crouch: *Analytical Chemistry An Introduction*, John Wiley, 7. izdaja, New York, 2000.
- G.D. Christian: *Analytical Chemistry*, John Wiley, New York, 2003.
- D.Brodnjak Vončina, Analizna kemija 1, zapiski predavanj, UMFKKT 2011
- M. Kolar, Laboratorijske vaje iz Analizne kemije I, UM FKKT 2003

Cilji in kompetence:

Predmet daje popolni pregled znanja ter teoretskih osnov in uporabe analiznih klasičnih analiznih metod kot je gravimetrija in volumetrija.

Analiza je osnova za vrednotenje kvalitete hrane, okolja in živih bitij. Analizna kemija obravnava zato področje kemijske analize teoretično poglobljeno, praktično pa tako usmerjeno, da usposobi slušatelje ne samo za razumevanje, temveč tudi za reševanje analiznih problemov. Predmet daje integralni pregled teorij in metod uporabnih za identifikacijo in rešitev vrste realnih problemov kemijske analize.

Objectives and competences:

Subject gives the complete overview of knowledge and the theoretical basis concerning applications of classical analytical methods such as gravimetry and volumetry

Analysis is the basis for quality evaluation of food, environment and living organisms. The analytical chemistry gives the complete theoretical overview and during practical work gives the knowledge not only for understanding but also for solving analytical problems. The subject gives the integral overview of theories and methods used for identification and quantitative determination of real problems of chemical analysis.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben

- razumeti osnove kemijske analize osnovnih klasičnih analiznih meritev .
- spoznati osnovne principe in zakone na katerih temeljijo gravimetrične in titrimetrične analizne metode
- spoznati kvantitativno ovrednotenje rezultatov meritev

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will be able to

- understand the base of chemical analysis of classical analytical measurements
- recognize basic principles and laws on which gravimetric and titrimetric analytical methods are based.
- Recognize quantitative evaluation of measurements results.

Prenesljive/ključne spretnosti in drugi atributi:

Ročne spretnosti, predvsem sposobnost praktičnega dela z laboratorijsko steklovino in opremo. Reševanje analiznih problemov, od enostavnejših do bolj zapletenih in reševanje računskih nalog z uporabo stehiometričnih razmerij in ravnotežnih reakcij. Računanje merilne negotovosti.

Transferable/Key Skills and other attributes:

Manual skills, preferable the capability of practical work with laboratory glassware and equipment. Solving analytical problems, from simple to more complex ones and calculations using stoichiometric ratios and equilibrium equations. Calculation of measurement uncertainty.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Lab work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Pristopni pogoji za opravljanje vaj: opravljene vaje iz Anorganske kemije in dva kolokvija Pristopni pogoj za izpit - opravljene vaje in zaključni kolokvij iz vaj iz Analizne kemije I Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: <u>Ocenjevanje predmeta</u> • Računske naloge • Ustni izpit <u>Ocenjevanje lab. vaj</u> • Pisni kolokvij po zaključenih laboratorijskih vajah	30 40 30	<u>Conditions to access the laboratory work:</u> Concluded lab work of Inorganic chemistry and two written tests <u>Conditions to access the examination:</u> Concluded laboratory work and written test of laboratory work in Analytical Chemistry 1.. Student has to pass successfully the following obligations: <u>Assesment of the subject</u> • Coursework, analytical calculations • Oral examination <u>Assesment of lab work</u> • Written colloquium after conclusion of lab work

Reference nosilca / Lecturer's references:

MARTELANC, Mitja, ŽIBERNA, Lovro, PASSAMONTI, Sabina, **FRANKO, Mladen**. Direct determination of free bilirubin in serum at sub-nanomolar levels. *Analytica chimica acta*, ISSN 0003-2670. [Print ed.], 2014, vol. 809, str. 174-182, doi: [10.1016/j.aca.2013.11.041](https://doi.org/10.1016/j.aca.2013.11.041). [COBISS.SI-ID [2983675](#)]

LUTEROTTI, Svjetlana, BICANIC, Dane Danijel, MARKOVIĆ, Ksenija, **FRANKO, Mladen**. Carotenes in processed tomato after thermal treatment. *Food control*, ISSN 0956-7135. [Print ed.], 2015, vol. 48, str. 67-74, doi: [10.1016/j.foodcont.2014.06.004](https://doi.org/10.1016/j.foodcont.2014.06.004). [COBISS.SI-ID [3536891](#)]

JOVANOVIĆ, Pavle, GUZSVÁNY, Valeria (pisar), **FRANKO, Mladen**, LAZIĆ, Sanja, SAKAČ, Marijana, MILOVANOVIĆ, Ivan, NEDELJKOVIĆ, Nataša. Development of multiresidue DLLME and QuEChERS based LC-MS/MS method for determination of selected neonicotinoid insecticides in honey liqueur. *Food research international*, ISSN 0963-9969, 2014, vol. 55, str. 11-19, doi: [10.1016/j.foodres.2013.10.031](https://doi.org/10.1016/j.foodres.2013.10.031). [COBISS.SI-ID [2931707](#)]

LUTEROTTI, Svjetlana, MARKOVIĆ, Ksenija, **FRANKO, Mladen**, BICANIC, Dane Danijel, MADŽGALJ, Azamela, KLJAK, Kristina. Comparison of spectrophotometric and HPLC methods for determination of carotenoids in foods. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2013, vol. 140, no 1/2, str. 390-397, doi: [10.1016/j.foodchem.2013.02.003](https://doi.org/10.1016/j.foodchem.2013.02.003). [COBISS.SI-ID [2701819](#)]

JOVANOVIĆ, Pavle, GUZSVÁNY, Valeria, **FRANKO, Mladen**, LAZIĆ, Sanja, SAKAČ, Marijana, ŠARIĆ, Bojana, BANJAC, Vojislav. Multi-residue method for determination of selected neonicotinoid insecticides in honey using optimized dispersive liquid-liquid microextraction combined with liquid chromatography-tandem mass spectrometry. *Talanta*, ISSN 0039-9140. [Print ed.], 2013, vol. 111, str. 125-133, doi: [10.1016/j.talanta.2013.02.059](https://doi.org/10.1016/j.talanta.2013.02.059). [COBISS.SI-ID [2710011](#)]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizika II
Course title:	Physics II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	Poletni Spring

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individual work	ECTS
45		15	30		90	6

Nosilec predmeta / Lecturer:

Samo Korpar

Jeziki /

Languages: S

Predavanja / Lectures:

Vaje / Tutorial:

Slovenski / Slovene

Slovenski / Slovene

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

Znanje iz predmeta Fizika I.

Prerequisites:

Knowledge of Physics I.

Vsebina:

- Električno polje: el. naboj, Coulombov zakon, el. polje točkastih nabojev, el. dipol, Gaussov zakon, el. potencial, prevodnik v el. polju, kondenzator in kapaciteta, dielektriki, energija el. polja.
- Enosmerni tok: el. tok, el. upornost, enosmerni el. krog, gonilni člen, I. in II. Kirchhoffov zakon, amperimeter in voltmeter, kondenzator v el. krogu.
- Magnetno polje: magn. polje, magn. sila, Hallov pojav, navor na tokovno zanko, magn. dipol, Biot-Savartov zakon, Amperov zakon, indukcija, Faradayev zakon, tuljave in induktanca, el. krog s tuljavo, energija magn. polja, diamagnetizem, paramagnetizem, feromagnetizem, Maxwellove enačbe.
- Izmenični tok: el. krog z izmeničnim tokom, el. krog RLC, kazalčni diagrami, transformatorji.
- Mehanična nihanja in valovanja: enostavna nihala, energija sinusnega nihanja, dušeno sinusno nihanje, vsiljeno nihanje, resonanca, 1D valovanje, transverzalno in longitudinalno valovanje, valovna dolžina in frekvenca, hitrost, energija in moč potujočih valov, interferenca, stoječe valovanje in resonanca, 2D valovanje, odboj in lom valovanja, Dopplerjev pojav, udarni val, 3D valovanje, zvočno valovanje, hitrost in jakost zvoka.
- Elektromagnetna nihanja in valovanja: el. nihajni krog (LC), dušen el. nihajni krog (RLC), potujoče EM valovanje, energija EM valov, svetlobni tlak, polarizacija, odboj in lom svetlobe, optični instrumenti, interferenca in uklon.
- Moderna fizika: osnovni pojmi relativnosti, kvantne mehanike in zgradbe snovi.
- Seminarske vaje: reševanje nalog iz obravnavane snovi.
- Laboratorijske vaje: praktično opravljanje izbranih vaj iz snovi Fizike I in II.

Content (Syllabus outline):

- Electricity: el. charge, Coulomb's law, el. fields, el. dipole, Gauss' law, el. potential, conductor in el. field, capacitor and capacitance, dielectrics, energy of el. field.
- Direct current: el. current, resistance, DC circuits, emf device, Kirchhoff's voltage and current laws, ammeter and voltmeter, RC circuits.
- Magnetism: magn. field, magn. force, Hall effect, torque on a current loop, magn. dipole, law of Biot and Savart, Ampere's law, induction, Faraday's law, inductors and inductance, RL circuits, energy of magn. field, diamagnetism, paramagnetism, ferromagnetism, Maxwell's equations.
- Alternating currents: AC circuits, RLC circuits, phasors, transformers.
- Mechanical oscillations and waves: pendulums, energy in simple harmonic motion, damped simple harmonic motion, forced oscillations, resonance, 1D waves, transverse and longitudinal waves, wavelength and frequency, speed, energy and power of travelling wave, interference, standing waves and resonance, 2D waves, reflection and refraction, Doppler effect, shock wave, 3D waves, sound waves, speed of sound, sound intensity.
- Electromagnetic oscillations and waves: LC oscillations, RLC circuit, travelling EM wave, energy of EM waves, radiation pressure, polarization, reflection and refraction, optical instruments, interference and diffraction.
- Modern physics: basic principles of relativity, quantum mechanics and atomic structure.
- Tutorial: solving problems covered by the subject.
- Laboratory work: practical work in selected areas of Physics I and II.

Temeljni literatura in viri / Readings:

- A. Stanovnik: Fizika I – zapiski predavanj, 4. izd., Fizika II – zapiski predavanj, 3. izd., Univerza v Ljubljani, Fakulteta za elektrotehniko, Ljubljana, 2006.
- D. Halliday, R. Resnick, J. Walker: Fundamentals of Physics, Sixth Edition, John Wiley & Sons, Inc., New York, 2001.
- S. Korpar, M. Bračko: Arhiv pisnih izpitov in kolokvijev iz fizike, 1998-2012, Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 01. 03. 2013. Vir je dostopen v elektronski obliki na naslovu <http://fizika.fkkt.uni-mb.si/~www/literatura/fizika>.
- S. Korpar, M. Bračko: Navodila za laboratorijske vaje iz fizike, Univerza v Mariboru, FKKT, Maribor, 01. 03. 2013. Vir je dostopen v elektronski obliki: http://fizika.fkkt.uni-mb.si/~www/literatura/fizikalni_praktikum.

Cilji in kompetence:

Cilji tega predmeta so: sistematična obravnava osnov elektromagnetizma, nihanja in valovanja ter optike z opisi izbranih poskusov in dosledno uporabo infinitezimalnega in vektorskega računa ter pridobitev osnovnih znanj za razumevanje ostalih naravoslovnih predmetov; pridobitev osnovnih spretnosti za izvedbo in obravnavo meritev.

Objectives and competences:

Objectives of this course are: to provide a systematic treatment of elementary physics (electromagnetism, oscillations, waves and optics) by description of selected experiments and usage of calculus and vectors; to acquire foundations for understanding of other natural-science courses; to acquire basic skills for conducting and evaluating measurements.

Predvideni študijski rezultati:Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- izkazati znanje in razumevanje osnovnih fizikalnih zakonitosti,
- sestaviti matematični opis fizikalnih problemov in najti ustrezne rešitve,
- izvesti meritev in ovrednotiti rezultat ter napako meritve.

Prenesljive/ključne spretnosti in drugi atributi:

- Spretnosti komuniciranja: izražanje pri pisnem in ustnem izpitu, pisanje poročil o laboratorijskih vajah in ustni zagovor teh poročil.
- Spretnosti računanja: reševanje računskih nalog pri seminarskih vajah in izpitih, izračunavanje rezultatov in ocenjevanje negotovosti pri laboratorijskih meritvah.
- Reševanje problemov: modeliranje problemov z uporabo poenostavitvev in izbiro potrebnih podatkov, interpretacija meritev.

Intended learning outcomes:Knowledge and understanding:

On completion of the course a student will be able to:

- Demonstrate knowledge and understanding of basic principles in physics.
- Mathematically formulate problems and find appropriate solutions,
- perform a measurement and evaluate its result and uncertainty.

Transferable/Key Skills and other attributes:

- Communication skills: manor of expression at both written and oral examination, writing reports on laboratory work, oral laboratory work defence.
- Calculation skills: solving numerical problems at tutorial and written examination, calculation of results and estimation of experimental uncertainties for laboratory measurements.
- Problem solving: modelling problems using simplifications and necessary data selection, interpretation of measurements.

Metode poučevanja in učenja:

- klasična predavanja,
- obravnava izbranih poskusov in
- reševanje nalog,
- laboratorijske vaje.

Learning and teaching methods:

- lectures,
- treatment of selected experiments and
- problem solving,
- laboratory work.

Načini ocenjevanja:

Pristopna pogoja za opravljanje izpita sta opravljen izpit iz predmeta Fizika I in opravljene lab. vaje.

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- pisni izpit (ali dva testa),

Delež (v %) /
Weight (in %)

Assessment:

Conditions to access the examination are successful completion of Physics I and completion of the lab. work.

Student passes the examination if s/he successfully passed all the following obligations:

- written examination (or two tests),

30%

• laboratorijske vaje (dnevnik, zagovor), • ustni izpit.	30% 40%	• laboratory work (lab reports, defence), • oral examination.
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Reference nosilca / Lecturer's references:

1. Belle Collaboration, FRATINA, Saša, BITENC, Urban, BIZJAK, Ilija, BRAČKO, Marko, GOLOB, Boštjan, GORIŠEK, Andrej, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, STARIČ, Marko, ZUPANC, Anže. Evidence for CP Violation in $B^0 \rightarrow D^+ D^-$ decays. Phys. rev. lett., 2007, vol. 98, no. 22, str. 221802-1-221802-6. [COBISS.SI-ID 20796455]
2. Belle Collaboration, STARIČ, Marko, GOLOB, Boštjan, BITENC, Urban, BRAČKO, Marko, FRATINA, Saša, GORIŠEK, Andrej, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, ZUPANC, Anže. Evidence for $D^0 - (D^0)^*$ mixing. Phys. rev. lett., 2007, vol. 98, no. 21, str. 211803-1-211803-6. [COBISS.SI-ID 20795943]
3. KORPAR, Samo, CHAGANI, Hassan, DOLENEC, Rok, KRIŽAN, Peter, PESTOTNIK, Rok, STANOVNIK, Aleš. A module of silicon photo-multipliers for detection of Cherenkov radiation. Nucl. instrum, methods phys res., Sect. A, Accel.. [Print ed.], 2010, vol. 613, no. 2, str. 195-199. [COBISS.SI-ID 23339559]
4. Belle Collaboration, LIN, S.-W., BITENC, Urban, BRAČKO, Marko, FRATINA, Saša, GOLOB, Boštjan, KORPAR, Samo, KRIŽAN, Peter, PESTOTNIK, Rok, STANIČ, Samo, STARIČ, Marko, ZUPANC, Anže. Difference in direct charge-parity violation between charged and neutral B meson decays. Nature (Lond.), 2008, vol. 452, str. 332-335. [COBISS.SI-ID 21553703]
5. KORPAR, Samo. Status and perspectives of solid state photon detectors. Nucl. instrum, methods phys res., Sect. A, Accel.. [Print ed.], 2011, vol. 639, no. 1, str. 88-93, doi: 10.1016/j.nima.2010.10.154. [COBISS.SI-ID 24868135]
6. KORPAR, Samo, DOLENEC, Rok, KRIŽAN, Peter, PESTOTNIK, Rok, STANOVNIK, Aleš. Study of TOF PET using Cherenkov light. Nucl. instrum, methods phys res., Sect. A, Accel.. [Print ed.], 2011, vol. 654, no. 1, str. 532-538, doi: 10.1016/j.nima.2011.06.035. [COBISS.SI-ID 25039655]
7. Belle Collaboration, BONDAR, A., BRAČKO, Marko, GOLOB, Boštjan, KORPAR, Samo, KRIŽAN, Peter, PETRIČ, Marko, SMERKOL, Peter, STARIČ, Marko, ZUPANC, Anže. Observation of two charged bottomoniumlike resonances in $Upsilon(5S)$ decays. Phys. rev. lett., 2012, vol. 108, no. 12, str. 122001-1-122001-6, doi: 10.1103/PhysRevLett.108.122001. [COBISS.SI-ID 25989159]
8. PROJEKT J1-9340 (D): Kombinirana metoda za identifikacijo delcev (temeljni raziskovalni projekt); VODJA: Korpar Samo (TRAJANJE: 1.1.2007 – 31.12.2009)



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Procesno računanje II
Course title:	Process Calculation II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		1.	poletni spring

Vrsta predmeta / Course type

obvezni/obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			30		60	4

Nosilec predmeta / Lecturer:

doc. dr. Majda Krajnc/Assistant Professor

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski/Slovene

slovenski/Slovene

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

Osnovno znanje iz anorganske kemije, matematike, procesnega računanja I

Prerequisites:

Basic knowledge of inorganic chemistry, mathematics, process calculation I.

Vsebina:

Content (Syllabus outline):

Predavanja:

Vsebina je prirejena osnovnemu znanju študentov visokostrokovnega programa.

- Kemijski procesi in masne bilance:
 - procesne enote, kemijski procesi, procesne sheme,
 - procesne veličine in pretvarjanje enot,
 - masne bilance procesnih enot z in brez kemijske reakcije,
 - masne bilance sistemov procesnih enot.
- Obdelava podatkov:
 - korelacija, aproksimacija
 - linearna regresija (metoda najmanjših kvadratov odstopanj),
 - interpolacija.
- Numerične metode:
 - spoznavanje numeričnih metod za reševanje algebrskih enačb z eno neznanko in sistemov enačb (metoda zaporedne substitucije, Wegsteinova in Newtonova metoda, metoda polovičnega intervala).

Računalniške vaje:

Študentje uporabljajo različne numerične metode za reševanje kemijskih problemov. S programom Excel in Polymath rešujejo nelinearne enačbe z eno neznanko ter sisteme linearnih enačb. S programom Aspen Plus rešujejo masne bilance posameznih procesnih enot in sistemov procesnih enot.

Lectures:

The content of the subject corresponds to the knowledge of the students at the higher professional program.

- Chemical processes and material balances:
 - process units, chemical processes, process schemes,
 - process variables and conversion of units,
 - material balances of process units with and without chemical reaction,
 - material balances of multiple-unit processes.
- Data processing:
 - correlation, approximation,
 - linear regression (the least-squares method),
 - interpolation.
- Numerical methods:
 - knowing numerical methods for solving a single algebraic nonlinear equations and systems of equations (successive substitution method, Wegstein and Newton methods, half-interval method).

Computational work:

Students use different numerical methods at chemical problem solving. They solve single nonlinear equations and systems of equations with Excel and Polymath programs. With Aspen Plus they solve material balances of single process units and systems of process units.

Temeljni literatura in viri / Readings:

1. A. Kovač Kralj, M. Krajnc, Procesno računanje II: zbirka nalog z rešitvami za domače delo, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2014.
2. M. Krajnc, S. Oreški, F. Purkeljc, Procesne bilance, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2012,
3. D. M. Himmelblau, J. B. Riggs, Basic Principles and Calculations in Chemical Engineering, 7th Edition, Prentice-Hall, New Jersey, 2004.
4. ASPEN PLUS, Reference Manual, Aspen Technology, Inc., Cambridge, USA, 1996.
5. M. Krajnc, Procesne bilance, zbirka rešenih nalog, zbrano gradivo, FKKT Maribor, 2011.
6. S. Oreški, Procesne bilance – računalniške vaje, 2. del, Numerične metode, snovne bilance sistemov brez in s kemijsko reakcijo, FKKT, Maribor, 2007.

Cilji in kompetence:

Sistematično reševanje masnih bilanc v kemijskih procesih, samostojna uporaba programskih paketov Aspen Plus, Excel in Polymath.

Objectives and competences:

Systematic solving of material balances in chemical processes, the use of programs Aspen Plus, Excel and Polymath.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Do rezultatov vodi sistematično reševanje masnih bilanc.

Intended learning outcomes:**Knowledge and understanding:**

Systematic work leads to the material balances results.

Metode poučevanja in učenja:

Aktivno poučevanje in učenje, skupinsko (sodelovalno) delo, e-izobraževanje, domače delo, sprotno preverjanje znanja z interaktivnim multimedijem in e-testi.

Learning and teaching methods:

Active teaching and learning, cooperative learning, e-learning, home work, formative assessment of knowledge with interactive multimedia learning material and e-tests.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Kriterij za pristop k računalniškim vajam: 35 % rešenih problemov na 1. pisnem testu. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- pisni izpit ali 2 pisna testa,
- ustno izpraševanje ali 2 e-testa,
- domača naloga,
- računalniške vaje.

30
20
20
30

The criterion for the approach to computational work: 35% of solved problems in the first written test. Student passes the examination if s(he) successfully passed all the following obligations:

- written exam or 2 written tests,
- oral examination or 2 e-tests,
- homework,
- computational work.

Reference nosilca / Lecturer's references:

1. A. Kovač Kralj, M. Krajnc, Procesno računanje II: zbirka nalog z rešitvami za domače delo, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2014.

2. LUKMAN, Rebeka, KRAJNC, Majda. Exploring non-traditional learning methods in virtual and real-world environments. *Educ. technol. soc.*, 2012, vol. 15, no. 1, str. 237-247.
http://www.ifets.info/journals/15_1/21.pdf.

3. KRAJNC, Majda. E-learning environment integration in the chemical engineering educational process.

Int. j. eng. educ., 2009, vol. 25, no. 2, str. 349-357. http://www.ijee.ie/latestissues/Vol25-2/s18_ijee2119.pdf.

4. KRAJNC, Majda, OREŠKI, Severina. Reševanje problemov v kemijski tehniki s programskim paketom POLYMATH. *Kem. šoli*, marec 2006, letn. 18, št. 1, str. 12-19

5. KRAJNC, Majda. Uvajanje e-izobraževanja v študijski proces. *Kem. šoli*, junij 2006, letn. 18, št. 2, str. 14-19.

6. KRAJNC, Majda, GORŠEK, Andreja. Vrste kemijskih procesov. *Kem. šoli*, september 2000, letn. 12, št. 3, str. 9-16, ilustr.



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UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Varnost kemijskih procesov
Subject Title:	Chemical Process Safety

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	zimski Autumn

Vrsta predmeta / Course type:

Obvezni / Obligatory

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		30			75	5

Nosilec predmeta / Lecturer:

Zorka Novak Pintarič

Jeziki /

Languages:

Predavanja/ Lecture:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Osnovno znanje matematike in splošne kemije.

Prerequisites:

Basic knowledge of mathematics and general chemistry.

Vsebina:

- Zakonodaja na področju preprečevanja nesreč z nevarnimi kemikalijami.
- Baze podatkov. Pretekle neizgode.
- Značilne nevarnosti v procesni industriji (požar, eksplozija, izpust nevarne snovi).
- Nevarnost kemijske reakcije.
- Varnost šaržnih reaktorjev.
- Metode za prepoznavanje nevarnosti.
- Modeli za ocenjevanje posledic.
- Zanesljivost in razpoložljivost.
- Modeli za ocenjevanje verjetnosti in frekvenc nevarnih dogodkov.
- Ocenjevanje tveganja.
- Človeški faktor in človeške napake.
- Osebna varnost.
- Načrtovanje inherentno varnih procesov.

Content (Syllabus outline):

- Legislation and law in the field of process safety and loss prevention.
- Incident databases. Case histories.
- Fire, explosion, toxic release.
- Chemical reaction.
- Safety of batch reactors.
- Hazard identification.
- Consequence evaluation.
- Plant availability and process reliability.
- Event probability and failure frequency estimation.
- Risk Assessment.
- Human factors and human errors.
- Personal Safety.
- Inherently safer design.

Vaje:

- Modeliranje posledic nesreč.
- Izdelava varnostnega poročila.
- Določanje temperature plamenišča.
- Sežigni testi.
- Termična dekompozicija praškastih snovi.

Labor work:

- Consequence modelling.
- Safety report preparation.
- Flash point determination.
- Combustion tests.
- Thermal decomposition of dusts.

Temeljna literatura in viri / Textbooks:

- Z. Novak Pintarič, Varnost kemijskih procesov, Zbrano gradivo. UM FKKT, Maribor, 2005/2006.
- Z. Novak Pintarič, Navodila za vaje pri predmetu Varnost dela. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2005/2006.
- AIChE/CCPS, Guideline for chemical process quantitative risk analysis, Centre for Chemical Process Safety of the American Institute of Chemical Engineers, New York, 2003.
- S. Mannan, Lees' Loss Prevention in the Process Industries. Butterworth-Heinemann, 2005.
- V. C. Marshall, S. Ruhemann, Fundamentals of Process Safety, IChemE, Rugby, UK, 2001.

Cilji:

Cilj tega predmeta je:

- biti sposoben prepoznati in razumeti nevarnosti v delovnem okolju,
- poznati ukrepe za preprečevanje nevarnih dogodkov in zmanjševanje tveganja,
- obvladati pravila za načrtovanje inherentno varnih procesov,
- spoznati in osvojiti metodologijo za kvantitativno analizo tveganja v procesni industriji.

Objectives:

The objective of this course is:

- being able to recognize the hazards in working environment,
- to acquaint with the actions for safer operation and loss prevention,
- to acquaint with the principles of inherently safer process design,
- to give knowledge of the methodology for quantitative risk assessment in process industries.

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje specifičnih nevarnosti v procesni industriji, ki izhajajo iz prisotnosti nevarnih snovi,
- prepoznavanje nevarnosti in ocena posledic,
- kritično presojanje tveganja za ljudi in okolje,
- obvladovanje osnovnih tehnik za kvantitativno analizo tveganja.

Prenesljive/ključne spretnosti in drugi atributi:

- zmanjševati tveganja v delovnih okoljih,
- načrtovati in voditi projekte,
- določati prioritete pri izpeljavi projektov,
- delati v skupini,
- pripraviti pisna poročila in drugo dokumentacijo,
- pisno in ustno komunicirati o problematiki.

Intended learning outcomes:

Knowledge and Understanding:

- recognize and understand the hazards in process industries involving dangerous substances,
- identify the sources of hazards and evaluate the consequences,
- deduce associated risk,
- perform quantitative risk assessment.

Transferable/Key Skills and other attributes:

- propose actions and solutions for reducing risk,
- plan and manage projects,
- determine priorities by executing the projects,
- work in team,
- prepare written reports,
- communicate about the problem.

Metode poučevanja in učenja:

- predavanja,
- računski in študijski primeri, domače naloge,
- uporaba računalniških programov v varnostnih analizah,
- laboratorijske vaje,

Learning and teaching methods:

- lectures,
- calculating examples and exercises, case studies, homeworks,
- use of computer tools in safety analyses,
- laboratory work,

- skupinsko delo za izdelavo varnostnega poročila.

- active team work for preparation of safety report.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: - računski del izpita ali dva testa, - teoretični del izpita, - laboratorijsko delo in poročilo.	60 30 10	Student passes the examination if s(he) successfully passed all the following obligations: - the calculus part or two tests, - the theoretical part of the exam, - laboratory work and report.

Reference nosilca / Lecturer's references:

NOVAK-PINTARIČ, Zorka. Assessment of the consequences of accident scenarios involving dangerous substances. *Process safety and environmental protection*, ISSN 0957-5820, Jan. 2007, vol. 85, b1, str. 23-38. <http://dx.doi.org/10.1205/psep06014>. [COBISS.SI-ID 10622486]

KASAŠ, Mihael, KRAVANJA, Zdravko, NOVAK-PINTARIČ, Zorka. Achieving profitably, operationally, and environmentally compromise flow-sheet designs by a single-criterion optimization. *AIChE journal*, ISSN 0001-1541. [Print ed.], July 2012, vol. 58, iss. 7, str. 2131-2141, doi: 10.1002/aic.12747. [COBISS.SI-ID 15215126]

BOGATAJ, Miloš, NOVAK-PINTARIČ, Zorka, GLAVIČ, Peter. Ekonomski, tehnološki in okoljski potencial sežiga pivskih tropin. V: KRAVANJA, Zdravko (ur.), BRODNJAK-VONČINA, Darinka (ur.), BOGATAJ, Miloš (ur.). *Slovenski kemijski dnevi 2012, Portorož, 12.-14. september 2012 = Slovenian Chemical Days 2012, Portorož, September 12-14, 2012*. Maribor: FKKT, 2012, str. 1-9. [COBISS.SI-ID 16293654]

NOVAK-PINTARIČ, Zorka. *Navodila za uporabo programa ALOHA : zbrano gradivo za vaje pri predmetu Varnost kemijskih procesov 2. letnika programa Kemijska tehnologija (VS)*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2014. [21] f., ilustr. <https://studij.um.si/mod/resource/view.php?id=20439>, <http://dkum.uni-mb.si/IzpisGradiva.php?id=44465>. [COBISS.SI-ID 17584662]

NOVAK-PINTARIČ, Zorka. *Navodila za vaje pri predmetu Varnost dela*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2005/2006. 19 f., graf. prikazi. http://atom.uni-mb.si/edu/egradiva/Varnost_dela_vaje.pdf. [COBISS.SI-ID 10597142]



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizikalna kemija
Course title:	Physical Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	zimski Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60					60	4

Nosilec predmeta / Lecturer:

Urban Bren

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

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

Osnovno znanje matematike in fizike

Prerequisites:

Basic knowledge of mathematics and physics

Vsebina:

- Plini in sile med molekulami: idealni plin, kinetična teorija plinov, interakcije med molekulami, van der Waalsov plin
- Energija: prvi zakon termodinamike, spremembe notranje energije in entalpije v fizikalno-kemijskih procesih, termokemija
- Entropija: drugi zakon termodinamike, entropija plinov in plinastih mešanic, entropijske spremembe v fizikalno-kemijskih procesih, tretji zakon termodinamike
- Gibbsova prosta energija: posebna formulacija drugega zakona, spremembe proste energije v fizikalno-kemijskih procesih, kemijski potencial, ravnotežje v fizikalno-kemijskih sistemih
- Ravnotežje čistih snovi: fazni diagram, termodinamika ravnotežnih črt, zamrzovanje, tlak tekočin in parni tlak
- Binarne mešanice: fazno pravilo, idealne mešanice, idealne razredčene mešanice, koligativne lastnosti, topnost, realni plini, fugativnost, realne raztopine, aktivnost
- Fazni diagrami: diagram parnih tlakov, vrelni diagrami, ravnotežje tekoče-tekoče, ravnotežje trdno-tekoče
- Kemijsko ravnotežje: homogeno kemijsko ravnotežje, heterogeno ravnotežje
- Ravnotežna elektrokemija: ionske raztopine, elektrode in elektrokemijski členi

Content (Syllabus outline):

- Gases and intermolecular forces : the ideal gas, kinetic theory of gases, intermolecular interactions, the van der Waals gas
- Energy: the first law of thermodynamics, changes of internal energy and enthalpy in physicochemical processes, thermochemistry
- Entropy: the second law of thermodynamics, entropy of gasses and gas mixtures, entropy changes in physicochemical processes, the third law of thermodynamics
- Gibbs free energy: specific formulations of the second law, free energy changes in physicochemical processes, the chemical potential, equilibrium in in physicochemical systems
- Equilibrium in pure substances: the phase diagram, thermodynamics of equilibrium lines, refrigeration, liquid pressure and vapour pressure
- Binary mixtures: the phase rule, ideal mixtures, ideally diluted mixtures, colligative properties, solubility, real gases, fugacity, real liquid mixtures, activity
- Phase diagrams: vapour pressure diagrams, temperature-composition diagrams, liquid-liquid phase diagrams, liquid-solid phase diagrams
- Chemical equilibrium: homogeneous chemical equilibrium, heterogeneous equilibrium
- Equilibrium electrochemistry: ionic solutions, electrodes and the electrochemical cell

Temeljni literatura in viri / Readings:

- P. W. Atkins, J. de Paula: *Physical Chemistry*, 8th Ed., Oxford University Press, 2006.
- P. W. Atkins, J. de Paula: *Physical Chemistry*, 7th Ed., Oxford University Press, 2002.
- P. W. Atkins: *Physical Chemistry*, 6th Ed., Oxford University Press, 1998.
- Aljana Petek: *Zapiski predavanj* – interno študijsko gradivo (Course notes), 2007.

Cilji in kompetence:

Razumeti fizikalni pomen fizikalno-kemijskih zakonov in formul ter povezave med njimi in to znati uporabiti pri reševanju strokovnih problemov.

Objectives and competences:

Have more insight in the physical meaning of the physicochemical principles and formulas and the links between them and apply these when solving simple scientific problems.

Predvideni študijski rezultati:Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- razumeti pojme in zakone kemijske termodinamike in njihove uporabe v fizikalnem in kemijskem ravnotežju;
- razumeti osnovne pojme v termodinamiki raztopin elektrolitov in ravnotežni elektrokemiji.

Prenesljive/ključne spretnosti in drugi atributi:

Študenti bodo razvili spretnost pisnega komuniciranja, reševanja problemov, računanja, kot tudi sposobnost samostojnega študija.

Intended learning outcomes:Knowledge and Understanding:

On completion of this course the student will be able to:

- understand the concepts, laws and ways of thinking of chemical thermodynamics and its applications to physical and chemical equilibrium;
- have insight into fundamental concepts of thermodynamics of electrolyte solutions and equilibrium electrochemistry.

Transferable/Key Skills and other attributes:

Students will develop written communication skills, problem solving, computational skills, as will the ability to study independently.

Metode poučevanja in učenja:

Predavanja, reševanje problemov, domače naloge.

Learning and teaching methods:

Classroom lectures, Classroom problem solving sessions, homework assignments.

Načini ocenjevanja:

Izpit je opravljen, če sta opravljeni obveznosti:

- računski del izpita in
- teoretični del izpita.

Računski in teoretični del tvorita celoto in se preverjata hkrati. Izpit se lahko nadomesti s sprotnimi testi.

Delež (v %) /
Weight (in %)

50
50

Assessment:

Student passes the examination if s(he) successfully passed all the following obligations:

- the calculus part and
- the theoretical part of the exam.

The calculus and the theoretical part of exam are performed simultaneously. The exam can be replaced with partial exams.

Reference nosilca / Lecturer's references:

1. BREN, Urban, LAH, Jurij, BREN, Matevž, MARTÍNEK, Václav, FLORIÁN, Jan. DNA duplex stability : the role of preorganized electrostatics. The journal of physical chemistry. B, Condensed matter, materials, surfaces, interfaces & biophysical, ISSN 1520-6106, 2010, vol. 114, no. 8, str. 2876-2885, doi: 10.1021/jp9064246. [COBISS.SI-ID 33744645], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 22, čistih citatov (CI): 18, čistih citatov na avtorja (CIAu): 3.60, normirano št. čistih citatov (NC): 6, Scopus do 30. 7. 2014: št. citatov (TC): 22, čistih citatov (CI): 18, čistih citatov na avtorja (CIAu): 3.60, normirano št. čistih citatov (NC): 6] kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICN točke: 20, št. avtorjev: 5

2. BROWN, Kyle L., BREN, Urban, STONE, Michael P., GUENGERICH, F. Peter. Inherent stereospecificity in the reaction of aflatoxin B1 8, 9-epoxide with deoxyguanosine and efficiency of DNA catalysis. Chemical research in toxicology, ISSN 0893-228X. [Print ed.], 2009, vol. 22, no. 5, str. 913-917. [COBISS.SI-ID 4132890], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 10, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 2.00, normirano št. čistih citatov (NC): 3, Scopus do 22. 7. 2014: št. citatov (TC): 9, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1.75, normirano št. čistih citatov (NC): 3]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICN
točke: 31.32, št. avtorjev: 4

3. UDOMMANEETHANAKIT, Thanyarat, RUNGROTMONGKOL, Thanyada, BREN, Urban, FRECER, Vladimir, MIERTUS, Stanislav. Dynamic behavior of avian influenza A virus neuraminidase subtype H5N1 in complex with oseltamivir, zanamivir, peramivir, and their phosphonate analogues. Journal of chemical information and modeling, ISSN 1549-9596. [Print ed.], 2009, vol. 49, no. 10, str. 2323-2332.
<http://pubs.acs.org/doi/abs/10.1021/ci900277r>, doi: 10.1021/ci900277r. [COBISS.SI-ID 4257306], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 36, čistih citatov (CI): 35, čistih citatov na avtorja (CIAu): 7.00, normirano št. čistih citatov (NC): 24, Scopus do 22. 7. 2014: št. citatov (TC): 38, čistih citatov (CI): 37, čistih citatov na avtorja (CIAu): 7.40, normirano št. čistih citatov (NC): 103]
kategorija: 1A1 (Z1, A'', A', A1/2); uvrstitev: SCI, Scopus (d,h), MBP; tipologijo je verificiral OSICN
točke: 33.36, št. avtorjev: 5

4. ZHANG, Huidong, BREN, Urban, KOZEKOV, Ivan D., RIZZO, Carmelo J., STEC, Donald F., GUENGERICH, F. Peter. Steric and electrostatic effects at the C2 atom substituent influence replication and miscoding of the DNA deamination product deoxyxanthosine and analogs by DNA polymerases. Journal of molecular biology, ISSN 0022-2836, 2009, vol. 392, no. 2, str. 251-269. [COBISS.SI-ID 4199450], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 7, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 0.83, normirano št. čistih citatov (NC): 1, Scopus do 22. 7. 2014: št. citatov (TC): 8, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1.00, normirano št. čistih citatov (NC): 2]
kategorija: 1A2 (Z1, A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICN
točke: 16.33, št. avtorjev: 6

5. PERDIH, Andrej, BREN, Urban, ŠOLMAJER, Tomaž. Binding free energy calculations of N-sulphonyl-glutamic acid inhibitors of MurD ligase. Journal of molecular modeling, ISSN 1610-2940, 2009, vol. 15, no. 8, str. 983-996. [COBISS.SI-ID 4090650], [JCR, SNIP, WoS do 6. 10. 2014: št. citatov (TC): 30, čistih citatov (CI): 23, čistih citatov na avtorja (CIAu): 7.67, normirano št. čistih citatov (NC): 16, Scopus do 26. 8. 2014: št. citatov (TC): 32, čistih citatov (CI): 25, čistih citatov na avtorja (CIAu): 8.33, normirano št. čistih citatov (NC): 17]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICT
točke: 37.71, št. avtorjev: 3



Univerza v Mariboru

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Organska kemija I
Course title:	Organic chemistry I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	zimski Autumn

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45					75	4

Nosilec predmeta / Lecturer:

Peter Krajnc

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Znanje splošne kemije.

Prerequisites:

Knowledge of general chemistry.

Vsebina:

Uvod: definicija, področja, namen in cilji organske kemije.
Osnovni tipi organskih spojin- tvorba vezi (hibridizacija in teorija molekulskih orbital).
Osnovni tipi organskih spojin-funkcionalne skupine. IUPAC nomenklatura organskih spojin.
Izomerija, stereokemija, tautomerija.
Resonanca in vplivi substituentov.
Tipične reakcije organskih spojin-predstavitev.
Proton transfer-kislina in baze, pomen pKa, pKa lestvica.
Kaj je reakcijski mehanizem; intermediati, kinetika in termodinamika v organski kemiji.

Content (Syllabus outline):

Introduction: definition, fields, goals of organic chemistry.
Types of organic compounds-bond formation (hybridization and MO theory).
Types of organic compounds-functional groups. IUPAC nomenclature of organic compounds.
Isomery, stereochemistry, tautomerism.
Resonance and influence of substituents.
Typical organic reactions-introduction.
Proton transfer-acids and bases, pKa meaning and table.
Reaction mechanism; reaction intermediates, kinetics and thermodynamics applied to organic chemistry.

Temeljni literatura in viri / Readings:

M. Tišler, Organska kemija, DZS Ljubljana, 1982.
S. Pine, Organic chemistry, McGraw-Hill, New York, 1987.
P. Y. Bruice, Organic chemistry, Prentice Hall, 2006.

Cilji in kompetence:

Spoznati obseg in cilje organske kemije ter vpetost vede v procese žive in nežive narave.
Poznati principe povezovanja atomov v organskih molekulah ter tipe geometrije organskih molekul.
Poznati nomenklaturu organskih spojin, v skladu z IUPAC pravili znati poimenovati spojino ter narisati ustrezno formulo, razpoznati različne izomere.
Razumeti vplive skupin na reaktivnost molekule in predvidevati spremembe nastale zaradi spremenjene strukture.
Poznati osnovne tipe organskih reakcij; substitucije, adicije, eliminacije.
Razumeti pomen prenosa protona in vpliv pKa vrednosti.

Objectives and competences:

To know:
the goals and reach of organic chemistry, its role in living and non-living processes,
the principles of atom bonding in organic molecules and types of molecule geometry,
the rules of IUPAC nomenclature for organic compounds and to apply them for formulae naming,
the differences in isomeric compounds,
the basic types of organic reactions; substitutions, additions, eliminations.
To understand the influences of functional groups on the molecule stability and reactivity.
To understand the proton transfer importance and the influence of pKa value.

Predvideni študijski rezultati:

Znanje in razumevanje:
Študent pozna obseg in cilje organske kemije.
Pozna principe povezovanja atomov v organskih molekulah, tipe hibridizacij.
Zna uporabljati pravila IUPAC nomenklature za organske spojine.
Razume vplive skupin na stabilnost in reaktivnost molekul.
Pozna osnovne tipe organskih reakcij.
Razume mehanizme kemijskih reakcij priprave.
Zna razvrščati organske spojine med kisline in baze ter razume vpliv pKa vrednosti
Prenesljive/ključne spretnosti in drugi atributi:
Poznavanje ciljev in osnov organske kemije.

Intended learning outcomes:

Knowledge and Understanding:
Student knows the goals and reach of organic chemistry. Knows the principles of atom bonding in organic molecules and types of molecule geometry, types of hybridization. Student can apply the rules of IUPAC nomenclature to organic compounds thus naming them appropriately.
Understands the influences of functional groups on the molecule stability and reactivity.
Student is able to place organic compounds between bases and acids and realizes the importance of pKa value.
Transferable/Key Skills and other attributes:
Knowledge of goals and bases of organic chemistry

Metode poučevanja in učenja:

Predavanja, seminarsko delo

Learning and teaching methods:

Lectures, seminar work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: Pisni izpit Ustni izpit	60 40	Type (examination, oral, coursework, project): Student passes the examination if s(he) successfully passed all the following obligations: Written exam Oral exam

Reference nosilca / Lecturer's references:

KOVAČIČ, Sebastijan, KRAJNC, Peter, SLUGOVC, Christian. Inherently reactive polyHIPE material from dicyclopentadiene. *Chem. commun. (Lond., 1996)*, 2010, vol. 46, issue 40, str. 7504-7506, doi: [10.1039/C0CC02610G](https://doi.org/10.1039/C0CC02610G).

PULKO, Irena, WALL, Jennifer, KRAJNC, Peter, CAMERON, Neil R. Ultra-high surface area functional porous polymers by emulsion templating and hypercrosslinking : efficient nucleophilic catalyst supports. *Chemistry (Weinh., Print)*. [Print ed.], Feb. 2010, vol. 16, iss. 8, str. 2350-2354, doi: [10.1002/chem.200903043](https://doi.org/10.1002/chem.200903043).

PULKO, Irena, SANDHOLZER, Martina, KOLAR, Mitja, SLUGOVC, Christian, KRAJNC, Peter. Removal of an olefin metathesis catalyst using 4-nitrophenyl acrylate based polymer supports. *Tetrahedron lett.*. [Print ed.], 2010, vol. 51, issue 44, str. 5827-5829, doi: [10.1016/j.tetlet.2010.08.114](https://doi.org/10.1016/j.tetlet.2010.08.114).

MAJER, Janja, KRAJNC, Peter. Cross-linked porous poly(acrylic acid-co-acrylamide) from high internal phase emulsions: preparation and functionalisation. *Acta chim. slov.*. [Tiskana izd.], 2009, vol. 56, št. 3, str. 629-634, ilustr.

PULKO, Irena, KRAJNC, Peter. Open cellular reactive porous membranes from high internal phase emulsions. *Chem. commun. (Lond., 1996)*, 2008, iss. 37, str. 4481-4483.
<http://dx.doi.org/10.1039/b807095d>, doi: [10.1039/b807095d](https://doi.org/10.1039/b807095d).

TURNŠEK, Marko, KRAJNC, Peter. PolyHIPEs from divinyl adipate : preparation and degradability. *Macromol. chem. phys.*, Article first published online: 16 AUG 2013, doi: [10.1002/macp.201300390](https://doi.org/10.1002/macp.201300390).



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mehanika fluidov
Course title:	Fluid Mechanics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2. 2.	Zimski Autumn

Vrsta predmeta / Course type

Obvezni /Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30		15			75	4

Nosilec predmeta / Lecturer:

Darko Goričanec

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

- Fizikalne lastnosti tekočin
- Statika tekočin: sile na ravne in ukrivljene ploskve, vzgon in plavanje
- Dinamika tekočin: zakoni ohranitve gibalne količine, mase in energije, tokovi v ceveh kanalih, iztok iz posod
- Iztok iz posod
- Črpalke in kavitacija

Content (Syllabus outline):

- Physical fluids characteristics
- Fluids static: forces on plane and curved surfaces, buoyancy and floating stability
- Fluids dynamic: conservation laws of momentum, mass and energy, flows in pipes, pipe systems
- Outflow from the vessels
- Pumps and cavitations
- Open channel flow

- Pretok v odprtih kanalih
- Merjenje pretoka: instrumenti in postopki za merjenje hitrosti, pretokov in tlaka
- Dimenzijska analiza
- Kompresibilni tok: tok plina v ceveh, iztok iz malih odprtín, šob in posode s cevjo.

- Flow measurements: instruments and procedures for measurement of velocity, flow rate and pressure
- Dimensional analysis
- Compressible flow: flow of gases: flow through an orifice, muzzle and storage vessel with leading pipe.

Temeljni literatura in viri / Readings:

- Renata Jecl, Mehanika tekočin in hidravlika, UM Fakulteta za gradbeništvo, 2010
- Frank M. White, Fluid Mechanics 7th edition, McGraw Hill, 2010
- Yunus Cengel, John Cimbala, Fluid Mechanics :Fundamentals and Applications, McGraw Hill, 2004
- Fox R. W. McDonald A. T., Introduction to fluid mechanics, John Wiley & Sons, 1998
- Spurk J. H., Fluid mechanics, Springer – Verlag, 1997
- Munson B. Young D. F., Okiishi T. H., Fundamentals of fluid mechanics, John Wiley & Sons, 1990

Cilji:

Spoznati značilne inženirske probleme in se naučiti pristopa k njihovemu reševanju.
Pridobiti sposobnosti praktične aplikacije.

Objectives:

To get acquainted with engineering problems and learn how to approach and solve them.
Acquire the ability for the application in practice.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje soodvisnosti različnih znanj in postopkov ter pomena uporabe strokovne literature za učinkovito reševanje inženirskih problemov povezanih s pretokom fluidov.

Prenesljive/ključne spretnosti in drugi atributi:

- Kombinirana uporaba različnih osnovnih znanj za reševanje inženirskih problemov.
- Z mentorskim reševanjem konkretnih primerov se oblikuje študentova kreativnost in logično razmišljanje

Intended learning outcomes:

Knowledge and Understanding:

- Understanding of relationship between different skills and procedures and importance of professional literature for efficient solutions of engineering problems related to fluid dynamics.

Transferable/Key Skills and other attributes:

- Combined use of different fundamental skills for solution of engineering problems
- Solving examples under supervision and hence developing the student's creativity and logical thinking.

Metode poučevanja in učenja:

- predavanja
- avditorne predavitve
- reševanje študijskih primerov

Learning and teaching methods:

- lectures
- practical work at tutorials
- coursework

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Teoretični in računski del tvorita celoto in se preverjata hkrati. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • računski del • teoretični del • samostojno delo	50 30 20	The theoretical and the calculus part of exam are performed simultaneously. Student has to pass successfully the following obligations: • Calculation part • Theoretical part • Individual work

Reference nosilca / Lecturer's references:

1. DOBERŠEK, Danijela, GORIČANEC, Darko, KROPE, Jurij. Calibration of pipe networks for district heating using the nonlinear optimisation method. *Int. j. of nonlinear sci. & numer. simul.*, 2006, vol. 7, no. 2, str. 225-228. [COBISS.SI-ID [10350102](#)]
2. GORIČANEC, Darko, KROPE, Jurij, PRISTOVNIK, Andrej. Calculation of two-phase flow-pressure conditions and pipe systems. *Int. j. of nonlinear sci. & numer. simul.*, 2006, vol. 7, no. 2, str. 229-232. [COBISS.SI-ID [10341142](#)]
3. TORHAČ, Evgen, GORIČANEC, Darko, KROPE, Tina. Flow rate estimate from distinct geothermal aquifers using borehole temperature loss. *Strojarstvo*, ISSN 0562-1887, 2008, letn. 50, št. 1, str. 31-36.
4. KROPE, Jurij, TROP, Peter, GORIČANEC, Darko. Flow-pressure analysis of loop gas networks. *International journal of systems applications, engineering & development*, ISSN 2074-1308. [Online ed.], 2011, vol. 5, iss. 4, str. 477-484
5. KROPE, Jurij, DOBERŠEK, Danijela, GORIČANEC, Darko. Variation of pipe diameters and its influence on the flow-pressure conditions. *WSEAS transactions on fluid mechanics*, 2006, vol. 1, no. 1, str. 53-58.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Prenos toplote
Course title:	Heat Transfer

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	Zimski Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		15	15		75	5

Nosilec predmeta / Lecturer:

Darko Goričanec

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

- Osnove prenosa toplote, temperaturni gradient in Fourierjev zakon difuzije toplote
- Prevod toplote: stena, valj, krogla
- Prestop toplote: naravna in prisilna konvekcija, uparjanje in kondenzacija
- Sevanje toplote: procesi in lastnosti, izmenjava toplote med površinami
- Prenosniki toplote: vrste, toplotna prehodnost, temperaturna razlika dveh medijev pri različnih medsebojnih tokovih, toplotna analiza
- Izolacije: vrste, uporaba v procesnem

Content (Syllabus outline):

- Overview of heat transfer, temperature gradient and Fourier law of diffusion.
- Conduction: analytical solution of problems (plane wall, cylinder, sphere)
- Convection: free and forced convection, boiling and condensation
- Radiation: processes and properties, heat exchange between surfaces
- Heat exchangers: types, the overall heat transfer coefficient, calculation of temperature difference of both media, heat analysis

- inženirstvu, optimalna debelina
- Seminarske vaje:
reševanje primerov iz vsebine predmeta
- Laboratorijske vaje:
Prenos toplote z naravno in prisilno konvekcijo
Prenos toplote v cevem prenosniku toplote

- Insulation: types, use in the process engineering, optimal thickness.
- Tutorials:
examples from theme of the subject
- Laboratory work:
Heat transfer at the natural and forced convection
Heat transfer in pipe heat exchanger

Temeljna literatura in viri / Readings:

- J. Krope, L. Lipuš Črepinšek: Prenos toplote, Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, april 2008
- J. Krope, G. Radonjič: Prenos toplote : zbirka problemov z rešitvami. Maribor: Tehniška fakulteta, 1991
- Plawsky J. L.: Transport Phenomena Fundamentals, Marcel Dekker, 2001
- G. Sam Samdani: Heat Transfer Technologies and Practices, Chemical Eng. Staff, 1996
- D. Pitts: Heat Transfer, 2nd edition, Schaum's Outlines Series, McGraw – Hill, 1998

Cilji:

- Razumevanje dogodkov v prenosu toplote, zlasti z vidika kemijskega inženirstva.
- Razviti sposobnost samostojnega in kreativnega reševanja inženirskih problemov.

Objectives:

- Understanding of phenomena arising in heat transfer from the viewpoint of chemical engineering.
- To further develop student's capabilities of independent thinking and creative solutions of engineering problems.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje soodvisnosti različnih znanj in postopkov ter pomena uporabe strokovne literature za učinkovito reševanje inženirskih problemov povezanih s prenosom toplote.

Prenesljive/ključne spretnosti in drugi atributi:

- Z mentorskim reševanjem konkretnih primerov se oblikuje študentova kreativnost in logično razmišljanje.
- Avtonomnost v strokovnem in raziskovalnem delu.

Intended learning outcomes:

Knowledge and Understanding:

- Understanding of relationship between different skills and procedures and importance of professional literature for efficient solutions of engineering problems related to heat transfer.

Transferable/Key Skills and other attributes:

- Solving examples under supervision and hence developing the student's creativity, logical thinking.
- Autonomy in professional and research work.

Metode poučevanja in učenja:

- predavanja
- avditorne in laboratorijske vaje
- reševanje domačih nalog

Learning and teaching methods:

- lectures
- practical work at tutorials and laboratory work
- coursework

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Teoretični in računski del tvorita celoto in se preverjata hkrati. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		The theoretical and the calculus part of exam are performed simultaneously. Student has to pass successfully the following obligations:
• računski del	50	• Calculation part
• teoretični del	30	• Theoretical part
• laboratorijsko delo	20	• Laboratory work

Reference nosilca / Lecturer's references:

1. DOBERŠEK, Danijela, GORIČANEC, Darko, KROPE, Jurij. Calibration of pipe networks for district heating using the nonlinear optimisation method. *Int. j. of nonlinear sci. & numer. simul.*, 2006, vol. 7, no. 2, str. 225-228. [COBISS.SI-ID [10350102](#)]
2. GORIČANEC, Darko, POZEB, Viljem, TOMŠIČ, Ladislav, TROP, Peter. Exploitation of the waste-heat from hydro power plants. *Energy*, ISSN 0360-5442. [Print ed.], Available online 22 July 2014, str. 1-6,
3. SORŠAK, Marko, ŽEGARAC LESKOVAR, Vesna, PREMROV, Miroslav, GORIČANEC, Darko, PŠUNDER, Igor. Economical optimization of energy-efficient timber buildings: Case study for single family timber house in Slovenia. *Energy*, ISSN 0360-5442. [Print ed.], Article in Press 2014, str. 1-9
4. KROPE, Jurij, GORIČANEC, Darko. *Izdelava računskega modela za kvalitativno določanje izdatnosti ležišč v geotermalnih vrtinah na osnovi temperature karotaže : končno poročilo*. Maribor: Fakulteta za strojništvo, 2005. 29 f., graf. prikazi. [COBISS.SI-ID [9938198](#)]
5. TORHAČ, Evgen, GORIČANEC, Darko, KROPE, Jurij, TROP, Peter, SALJNIKOV, Aleksandar. *Geothermal gravity heat pipe for exploitation of geothermal energy from unproductive wells : končno poročilo = Geotermalna gravitacijska toplotna cev za izkoriščanje geotermalne energije neproduktivnih vrtin : final report*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2012. 213 str., ilustr. [COBISS.SI-ID [16626966](#)]



Univerza v Mariboru

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Industrijska analiza
Course title:	Industrial Analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS		2.	Zimski
Chemical Technology / 1 st level		2.	Autumn

Vrsta predmeta / Course type

obvezni/obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		165	8

Nosilec predmeta / Lecturer:

Mladen Franko

Jeziki /

Predavanja / Lectures: Slovenski / Slovene

Languages:

Vaje / Tutorial: Slovenski / Slovene

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

Osnovno znanje klasične analize kemije, matematike in fizike

Prerequisites:

Basic knowledge of classical analytical chemistry, mathematics and physics

Vsebina:

Predavanja
-Statistično ovrednotenje analiznih rezultatov,
Elektrokemijske metode
Potenciometrija (ionoselektivne elektrode)
- elektrode s stekleno membrano,
Voltometrija
- direktna in pulzna polarografija,
Konduktometrija
Elektrogravimetrija in kulometrija
- elektroliza pri konstantni napetosti in pri konstantnem toku,
- Spektroskopske metode
Atomska absorpcijska spektrometrija, atomska emisijska spektrometrija, molekulska

Content (Syllabus outline):

Lectures
-Statistical evaluation of analytical results,
Electrochemical methods
Potentiometry, ion-selective electrodes, glass electrodes,
Voltammetry
Direct and pulse polarography, ,
Conductometry
Electrogravimetry and coulometry
Constant cathode potential gravimetry, constant current gravimetry,
-Spectroscopic methods
Atomic absorption spectroscopy, atomic emission spectroscopy, molecular absorption spectroscopy,

spektrometrija

Separacijske metode

Ekstrakcijske metode, ekstrakcija na trdni fazi
Tankoplastna kromatografija, plinska
kromatografija, tekočinska kromatografija,
ionska kromatografija,

Laboratorijske vaje

Vaje zajemajo praktične primere izvedbe analiznih
postopkov na področjih elektrokemijskih,
spektroskopskih in separacijskih metod

-Separation methods

Extraction methods, solid phase extraction, planar
chromatography, gas liquid chromatography, high
performance liquid chromatography, ion
chromatography,

Laboratory work

Practical examples of analytical procedures in
electrometric, spectrometric and separation
methods

Temeljni literatura in viri / Readings:

- Douglas A. Skoog, F. James Holler, Stanley R. Crouch, "Principles of Instrumental Analysis, 6. Izdaja, 2006
- D. A. Skoog, F.J.Holler, T. A. Nieman: *Principles of Instrumental Analysis*, Saunders College Publishing, 5. izdaja, New York 1998,
- D.Brodnjak Vončina, Analizna kemija 2,zapiski predavanj, UM FKKT, 2010

Cilji in kompetence:

Predmet daje poglobljeno znanje teoretskih osnov
in aplikacij analiznih metod elektrokemijske
analize, spektroskopske analize in separacijskih
metod.

Podatki o sestavi materialov vodijo vsak proizvodni
proces v raznih fazah od surovin do končnih
produktov. Analiza je osnova za vrednotenje hrane,
okolja, delovanja organizmov. Predmet Industrijska
analiza obravnava zato področje kemijske analize
teoretično poglobljeno, praktično pa tako
usmerjeno, da usposobi slušatelje ne samo za
razumevanje, temveč tudi za reševanje analiznih
problemov. Predmet daje integralni pregled teorij
in metod uporabnih za identifikacijo in rešitev vrste
realnih problemov kemijske analize.

Objectives and competences:

Subject gives the complete overview of knowledge
concerning the theoretical basis and applications of
analytical methods in electrochemical, spectroscopic
and separation methods.

Data from the content of materials lead every
production process in different phases from raw
materials to final products. Analysis is the basis for
quality evaluation of food, environment and living
organisms. The analytical chemistry gives the
complete theoretical overview and during practical
work gives the knowledge not only for
understanding but also for solving analytical
problems. The subject gives the integral overview of
theories and methods used for identification and
quantitative determination of real problems of
chemical analysis.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben

- razumeti osnove kemijske analize, osnovnih instrumentalnih analiznih meritev.
- spoznati osnovne principe in zakone na katerih temeljijo instrumentalne analizne metode
- spoznati kvantitativno ovrednotenje rezultatov meritev

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will be able to

- understand the base of chemical analysis and basic instrumental analytical measurements
- recognize basic principles and laws on which instrumental analytical methods are based.
- recognize quantitative evaluation of measurements results.

Prenesljive/ključne spretnosti in drugi atributi:

Ročne spretnosti, predvsem zmožnost praktičnega dela na instrumentih. Ovrednotenje rezultatov meritev in merilne negotovosti.

Transferable/Key Skills and other attributes:

Manual skills, preferable the capability of practical work with instruments. Evaluation of analytical results and measurement uncertainty.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Lab work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Pristopni pogoji za opravljanje vaj: opravljene vaje iz Analizne kemije I in zaključni kolokvij Pristopni pogoj : opravljene vaje in zaključni kolokvij iz vaj iz Industrijske analize Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: <u>Ocenjevanje predmeta</u> • Računske naloge • Ustni izpit <u>Ocenjevanje lab. vaj</u> • Pisni kolokvij po zaključenih laboratorijskih vajah	30 40 30	Conditions to access the laboratory work: Concluded lab work of Analytical chemistry I and final written test Conditions to access the examination: Concluded laboratory work and written test of laboratory work in Industrial analysis. Student has to pass successfully the following obligations: <u>Assesment of the subject</u> • Course work, analytical calculations • Oral examination <u>Assesment of lab work</u> • Written colloquium after conclusion of lab work

Reference nosilca / Lecturer's references:

MARTELANC, Mitja, ŽIBERNA, Lovro, PASSAMONTI, Sabina, **FRANKO, Mladen**. Direct determination of free bilirubin in serum at sub-nanomolar levels. *Analytica chimica acta*, ISSN 0003-2670. [Print ed.], 2014, vol. 809, str. 174-182, doi: [10.1016/j.aca.2013.11.041](https://doi.org/10.1016/j.aca.2013.11.041). [COBISS.SI-ID [2983675](#)]

LUTEROTTI, Svjetlana, BICANIC, Dane Danijel, MARKOVIĆ, Ksenija, **FRANKO, Mladen**. Carotenes in processed tomato after thermal treatment. *Food control*, ISSN 0956-7135. [Print ed.], 2015, vol. 48, str. 67-74, doi: [10.1016/j.foodcont.2014.06.004](https://doi.org/10.1016/j.foodcont.2014.06.004). [COBISS.SI-ID [3536891](#)]

JOVANOVIĆ, Pavle, GUZSVÁNY, Valeria (pisar), **FRANKO, Mladen**, LAZIĆ, Sanja, SAKAČ, Marijana, MILOVANOVIĆ, Ivan, NEDELJKOVIĆ, Nataša. Development of multiresidue DLLME and QuEChERS based LC-MS/MS method for determination of selected neonicotinoid insecticides in honey liqueur. *Food research international*, ISSN 0963-9969, 2014, vol. 55, str. 11-19, doi: [10.1016/j.foodres.2013.10.031](https://doi.org/10.1016/j.foodres.2013.10.031). [COBISS.SI-ID [2931707](#)]

LUTEROTTI, Svjetlana, MARKOVIĆ, Ksenija, **FRANKO, Mladen**, BICANIC, Dane Danijel, MADŽGALJ, Azamela, KLJAK, Kristina. Comparison of spectrophotometric and HPLC methods for determination of carotenoids in foods. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2013, vol. 140, no 1/2, str. 390-397, doi: [10.1016/j.foodchem.2013.02.003](https://doi.org/10.1016/j.foodchem.2013.02.003). [COBISS.SI-ID [2701819](#)]

JOVANOVIĆ, Pavle, GUZSVÁNY, Valeria, **FRANKO, Mladen**, LAZIĆ, Sanja, SAKAČ, Marijana, ŠARIĆ, Bojana, BANJAC, Vojislav. Multi-residue method for determination of selected neonicotinoid insecticides in honey using optimized dispersive liquid-liquid microextraction combined with liquid chromatography-tandem mass spectrometry. *Talanta*, ISSN 0039-9140. [Print ed.], 2013, vol. 111, str. 125-133, doi: [10.1016/j.talanta.2013.02.059](https://doi.org/10.1016/j.talanta.2013.02.059). [COBISS.SI-ID [2710011](#)]



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Prenos snovi
Course title:	Mass transfer

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	Poletni Spring

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		75	5

Nosilec predmeta / Lecturer:

Mojca Škerget

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

- Molekularni prenos snovi. Fickov zakon. Metode za izračun difuzivnosti v plinih in kapljevinah. Tipi difuzije v trdnih telesih.
- Bilanca mase. Diferencialna masna bilanca za binarni sistem. Posebne oblike diferencialne masne bilance. Podobnosti med dif. enačbami za prenos toplote in snovi.
- Stacionarna difuzija. Difuzija skozi mirujočo komponento. Pseudostacionarna difuzija. Binarna ekvimolarna protidifuzija. Difuzija povezana s heterogeno in homogeno reakcijo. Difuzija v padajoči laminarni film tekočine.
- Prenos snovi s konvekcijo. Snovna prestopnost

Content (Syllabus outline):

- introduction of flux relationships (Fick's law)
- molecular diffusion in gases, liquids, solids
- formulation of diffusional mass transfer problems by the differential shell balance method
- simple steady-state diffusion models (one and two dimensional), steady-state diffusion with
- homogeneous and heterogeneous reaction
- convective mass transfer (discussion of the film theory and penetration theory, interfacial

Laboratory work:

in snovna prehodnost. • Modeli snovne prestopnosti. Filmska in penetracijska teorija snovne prestopnosti. <u>Laboratorijske vaje:</u> Praktični primeri iz posameznih poglavij.	Practical examples of some chapters.
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Temeljni literatura in viri / Readings:

1. T. Koloini, Heat and Mass Transfer, FKKT Ljubljana, SI, 1999 (in Slovenian).
2. Christie J. Geankoplis, Transport Processes and Separation Process Principles: Includes Unit Operations, Prentice Hall, New Jersey, 2003.
3. Frank P. Incropera, David P. DeWitt, Theodore L. Bergman, Adrienne S. Lavine, Fundamentals of Heat and Mass Transfer, Wiley, Denver, 2006.
4. L. Hines, R. N. Maddox, Mass Transfer, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1985.
5. R. S. Brodkey, H. C. Hershey, Transport Phenomena. A unified Approach, McGraw-Hill Book Company, New York, USA, 1988.

Cilji in kompetence:

Uvesti študenta v razumevanje prenosa snovi ter ga seznaniti z metodami izračuna naprav za prenos snovi. Predmet je osnova termodifuzijskim operacijam in deloma reaktorskemu inženirstvu. Ob tem si študent razvija predvsem sposobnost analize in matematične formulacije konkretnega problema.

Objectives and competences:

Basic knowledge of the mass transfer enables students to understand transport phenomena in macroscopic separation processes.

Predvideni študijski rezultati:

Znanje in razumevanje:
 Zmožnost reševanja konkretnih problemov povezanih z napravami za prenos snovi.

Prenesljive/ključne spretnosti in drugi atributi:
 Vsebina predmeta je povezana z ostalimi predmeti na smeri Kemijske in biokemijske tehnike in podaja znanja potrebna za razumevanje vsebin, ki so zajeta npr. pri predmetu Termodifuzijska tehnika.

Intended learning outcomes:

Knowledge and Understanding:
 Ability to solve concrete problems connected to the mass transfer apparatus.

Transferable/Key Skills and other attributes:
 The subject is connected to other subjects on the direction Chemical and biochemical engineering and gives the knowledge which is necessary for understanding other subjects such as Thermofusional technology.

Metode poučevanja in učenja:

Predavanje, seminar, laboratorijske vaje

Learning and teaching methods:

Lectures, seminar, laboratory work.

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

Delež (v %) /
 Weight (in %)

40
 40
 20

Assessment:

Type (examination, oral, coursework, project):

Student passes the examination if s(he) successfully passed all the following obligations:

Pisni izpit (ali 2 sprotna testa) Ustni izpit Laboratorijske vaje		Written exam (or 2 tests) oral examination laboratory work
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Reference nosilca / Lecturer's references:

Izbrane znanstvene reference nosilca (monografije, izvirni znanstveni članki v JCR revijah, zaključeni znanstveni projekti):

1. ŠKERGET, Mojca, MANDŽUKA, Zoran, AIONICESEI, Elena, KNEZ, Željko, JEŠE, Robi, ZNOJ, Bogdan, VENTURINI, Peter. Solubility and diffusivity of CO₂ in carboxylated polyesters. J. supercrit. fluids. [Print ed.], Jan. 2010, vol. 51, iss. 3, str. 306-311. [COBISS.SI-ID 13799446]
2. PERKO, Tina, AIONICESEI, Elena, KNEZ, Željko, ŠKERGET, Mojca. Solubility and diffusivity of CO₂ in natural methyl cellulose and sodium carboxymethyl cellulose. J. chem. eng. data, 2011, vol. 56, no. 11, str. 4040-4044. [COBISS.SI-ID 15441430]
3. AIONICESEI, Elena, ŠKERGET, Mojca, KNEZ, Željko. Solubility and diffusivity of CO₂ in poly(l-lactide)-hydroxyapatite and poly(d, l-lactide-co-glycolide)-hydroxyapatite composite biomaterials. J. supercrit. fluids. Jan. 2011, vol. 55, iss. 3, str. 1046-1051. [COBISS.SI-ID 14677526]

Izbrane strokovne reference nosilca (strokovni članki, strokovni projekti):

1. ŠKERGET, Mojca. Formuliranje prašnih lakov z visokotlačnim postopkom : zaključno poročilo o rezultatih raziskovalnega projekta. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2011. loč. pag. [COBISS.SI-ID 14953238] (Projekt ARRS)
2. KNEZ, Željko, NOVAK, Zoran, HABULIN, Maja, ŠKERGET, Mojca, SINKOVIČ, Andreja, BRODNJAK-VONČINA, Darinka, VONČINA, Ernest, RIŽNER HRAŠ, Andreja, BERGLEZ, Tone. Superkritični fluidi : zaključno poročilo o rezultatih raziskovalnega centra odličnosti v programskem obdobju 2004-2006. Maribor: Univerza, Fakulteta za kemijo in kemijsko tehnologijo, 2008. 26 f. [COBISS.SI-ID 13084950].
3. KNEZ, Željko, HABULIN, Maja, ŠKERGET, Mojca, NOVAK, Zoran, PRIMOŽIČ, Mateja. Green/clean processing of bioactive materials = Sub Clean Probiomat : EST final activity report : Marie Curie Actions, (European Commission research DG Human Resources and Mobility). Maribor: University of Maribor, 2009. 16 f., graf. prikazi. [COBISS.SI-ID 13475862] (EU projekt)



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Organska kemija II
Course title:	Organic chemistry II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija/1. Stopnja Chemical Technology/1. Level		2.	Poletni Spring

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			60		105	7

Nosilec predmeta / Lecturer:

Peter Krajnc

Jeziki /

Languages:

Predavanja / Lectures: slovenski / Slovene

Vaje / Tutorial: slovenski / Slovene

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

Znanje splošne kemije in osnov organske kemije.

Prerequisites:

Knowledge of general chemistry and bases of organic chemistry.

Vsebina:

Organske reakcije: nukleofilne adicije na karbonilno skupino, nukleofilne substitucije in eliminacije na karbonilni skupini, nukleofilne substitucije in eliminacije na sp^3 C atomu, polarne adicije. Aromatskost; elektrofilne aromatske substitucije, vplivi substituentov na usmerjanje, radikalske reakcije. Osnove spektroskopskih metod za organske spojine: NMR, IR, masna spektroskopija. Biološko pomembne organske spojine: ogljikovi

Content (Syllabus outline):

Organic reactions: Nu additions to carbonyl group, Nu substitutions and eliminations to carbonyl group, Nu substitutions and eliminations to sp^3 C atom, Polar additions. Aromaticity; electrophilic aromatic substitutions, influence of substituents, radical (single electron transfer) reactions. Bases of spectroscopy of organic compounds: NMR, IR, mass spectroscopy. Biologically important organic compounds: carbohydrates. Biologically important organic compounds: amino acids and proteins.

hidrati. Biološko pomembne organske spojine: aminokisline in proteini. Biološko pomembne organske spojine: lipidi. Laboratorijske vaje: Sinteze različnih tipov organskih spojin, njihovo čiščenje in karakterizacija.	Biologically important organic compounds: lipids. Laboratory course: Synthesis of various types of organic compounds, their purification and characterisation.
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Temeljni literatura in viri / Readings:

1. M. Tišler, Organska kemija, DZS Ljubljana, 1982. 2. S. Pine, Organic chemistry, McGraw-Hill, New York, 1987. 3. M. A. Fox, J. K. Whitesell, Organic Chemistry, Jones and Barlett, Boston, 1997. 4. P. Y. Bruice, Organic chemistry, Prentice Hall, 2006. 5. M. B. Smith, J. March, March's Advanced Organic Chemistry, Wiley, 2007. 6. L. Stryer, Biokemija, ŠK Zagreb, 1991.

Cilji in kompetence:

Spoznati vse osnovne tipe organskih reakcij. Razumeti in poznati vplive pogojev na potek reakcij. Znati teoretsko sintetizirati enostavne organske molekule. Znati uporabljati osnovne metode spektroskopije za identifikacijo organskih spojin. Poznati pomen organskih spojin za biološke sisteme.
--

Objectives and competences:

To know: basic types of organic reactions, meaning of organic compounds for biological systems. To understand the synthetic strategies for simple organic molecules.

Predvideni študijski rezultati:

Znanje in razumevanje: Študent pozna osnovne organske reakcije. Razume mehanizme kemijskih reakcij in vplivov pogojev na potek reakcije. Pozna spektroskopske metode za karakterizacijo organskih molekul. Zna načrtovati sinteze preprostih organskih molekul. Prenesljive/ključne spretnosti in drugi atributi: Poznavanje organskih reakcij in njihovih mehanizmov. Razumevanje vplivov strukture molekule.
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Intended learning outcomes:

Knowledge and Understanding: Student knows basic organic reactions. Understands the mechanisms of organic reactions and influences of reaction conditions. Knows the spectroscopic methods for the characterisations of organic molecules. Can plan the synthesis of simple organic compounds. Transferable/Key Skills and other attributes: Knowledge of organic reactions and mechanisms. Understanding of molecule structure influences.
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Metode poučevanja in učenja:

Predavanja Laboratorijske vaje

Learning and teaching methods:

Lectures Laboratory experiments

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Za pristop k opravljanju izpita je potreben opravljen izpit iz predmeta Organska kemija 1.		Prior to exam, exam from subject Organic Chemistry 1 needs to be passed.
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Pisni izpit	80	Written exam
Laboratorijske vaje	20	Laboratory work

Reference nosilca / Lecturer's references:

KOVAČIČ, Sebastijan, KRAJNC, Peter, SLUGOVC, Christian. Inherently reactive polyHIPE material from dicyclopentadiene. *Chem. commun. (Lond., 1996)*, 2010, vol. 46, issue 40, str. 7504-7506, doi: [10.1039/C0CC02610G](https://doi.org/10.1039/C0CC02610G).

PULKO, Irena, WALL, Jennifer, KRAJNC, Peter, CAMERON, Neil R. Ultra-high surface area functional porous polymers by emulsion templating and hypercrosslinking : efficient nucleophilic catalyst supports. *Chemistry (Weinh., Print)*. [Print ed.], Feb. 2010, vol. 16, iss. 8, str. 2350-2354, doi: [10.1002/chem.200903043](https://doi.org/10.1002/chem.200903043).

PULKO, Irena, SANDHOLZER, Martina, KOLAR, Mitja, SLUGOVC, Christian, KRAJNC, Peter. Removal of an olefin metathesis catalyst using 4-nitrophenyl acrylate based polymer supports. *Tetrahedron lett.*. [Print ed.], 2010, vol. 51, issue 44, str. 5827-5829, doi: [10.1016/j.tetlet.2010.08.114](https://doi.org/10.1016/j.tetlet.2010.08.114).

MAJER, Janja, KRAJNC, Peter. Cross-linked porous poly(acrylic acid-co-acrylamide) from high internal phase emulsions: preparation and functionalisation. *Acta chim. slov.*. [Tiskana izd.], 2009, vol. 56, št. 3, str. 629-634, ilustr.

PULKO, Irena, KRAJNC, Peter. Open cellular reactive porous membranes from high internal phase emulsions. *Chem. commun. (Lond., 1996)*, 2008, iss. 37, str. 4481-4483.
<http://dx.doi.org/10.1039/b807095d>, doi: [10.1039/b807095d](https://doi.org/10.1039/b807095d).



Univerza v Mariboru

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Kinetika v kemiji
Course title:	Kinetics in Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	poletni Spring

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			60		120	7

Nosilec predmeta / Lecturer:

Urban Bren

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Osnovna znanja matematike, fizike in fizikalne kemije

Prerequisites:

Basic knowledge of mathematics, physics and physical chemistry

Vsebina:

- Molekule v gibanju: kinetičen model plina, transportne lastnosti idealnega plina, prevodnost raztopin elektrolitov, difuzija
- Kemijska kinetika: eksperimentalna kinetika, mehanizem reakcije, kinetika kompleksnih reakcij, reakcije v plinih, reakcije v tekočinah
- Procesi na trdnih površinah: adsorpcija, kataliza, reakcije na površinah
- Laboratorijske vaje: Kalorimetrija, Parni tlak in izparilna entalpija, Viskoznost, Površinska napetost, Parcialna molska prostornina, Krioskopija, Vrelni diagrami, Heterogeno

Content (Syllabus outline):

- Molecules in motion: the kinetic model of gases, transport properties of a perfect gas, the conductivities of electrolyte solutions, diffusion
- Chemical kinetics: experimental kinetics, the reaction mechanism, the kinetics of complex reactions, gas reactions, liquid phase reactions
- Processes at solid surfaces: adsorption, catalysis, reaction at surfaces
- Laboratory: Calorimetry, Vapour pressure and Enthalpy of vaporization, Viscosity, Surface tension, Partial molar volume, Cryoscopy, Temperature – composition diagrams,

ravnotežje, Galvanski členi, Prevodnost elektrolitov, Transportno število, Kemijska kinetika, Adsorpcija

Heterogeneous equilibrium, Electrochemical cells, Conductivity of electrolyte solutions, Transport number, Chemical kinetics, Adsorption

Temeljni literatura in viri / Readings:

- P. W. Atkins, J. de Paula: *Physical Chemistry*, 8th Ed., Oxford University Press, 2006.
- P. W. Atkins, J. de Paula: *Physical Chemistry*, 7th Ed., Oxford University Press, 2002.
- P. W. Atkins: *Physical Chemistry*, 6th Ed., Oxford University Press, 1998.
- Aljana Petek: *Zapiski predavanj* – interno študijsko gradivo (Course notes), 2007.
- Več avtorjev: *Laboratorijske vaje iz fizikalne kemije*, FKKT – UL Ljubljana, 2000.

Cilji in kompetence:

Razumeti fizikalni pomen fizikalno-kemijskih zakonitosti in formul ter povezave med njimi in to znati uporabiti pri reševanju strokovnih problemov. Pridobiti osnovne spretnosti za izvedbo in ovrednotenje eksperimentalnih meritev.

Objectives and competences:

Have more insight in the physical meaning of the physicochemical principles and formulas and the links between them and apply these when solving simple scientific problems. Acquiring basic skills to conduct and evaluate experimental measurements.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- določiti lastnosti idealnih plinov na osnovi kinetične molekularne teorije;
- razumeti, kako izpeljemo iz eksperimentalnih podatkov hitrostne zakone, v kakšni povezavi so hitrostni zakoni in reakcijski mehanizmi in kako teoretično razložimo reakcijsko hitrost.

Prenesljive/ključne spretnosti in drugi atributi:

Študenti bodo razvili spretnost pisnega komuniciranja, reševanja problemov, računanja, kot tudi sposobnost samostojnega študija.

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will be able to:

- determine properties of ideal gases using kinetic molecular theory;
- understand how rate equations are deduced from experimental data, how rate equations and reaction mechanisms are related and how the reaction rate is interpreted theoretically.

Transferable/Key Skills and other attributes:

Students will develop written communication skills, problem solving, computational skills, as will the ability to study independently.

Metode poučevanja in učenja:

Predavanja, reševanje problemov, domače naloge, laboratorijske vaje.

Learning and teaching methods:

Classroom lectures, Classroom problem solving sessions, homework assignments, lab work.

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Izpit je opravljen, če so opravljene obveznosti: • računski del izpita • teoretični del izpita • laboratorijske vaje Računski in teoretični del tvorita celoto in se preverjata hkrati. Izpit se lahko nadomesti s sprotnimi testi.	35 35 30	Student passes the examination if s(he) successfully passed all the following obligations: • the calculus part of the exam • the theoretical part of the exam • lab work The calculus and the theoretical part of exam are performed simultaneously. The exam can be replaced with partial exams.
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Reference nosilca / Lecturer's references:

- UDOMMANEETHANAKIT, Thanyarat, RUNGROTMONGKOL, Thanyada, FRECEER, Vladimir, SENEĆI, Pierfausto, STANISLAV, Miertus, BREN, Urban. Drugs against avian influenza A virus : design of novel sulfonate inhibitors of neuraminidase N1. *Current pharmaceutical design*, ISSN 1381-6128, 2014, vol. 20, issue 21, str. 3478-3487. <http://www.eurekaselect.com/114879/article>, doi: [10.2174/13816128113199990629](https://doi.org/10.2174/13816128113199990629). [COBISS.SI-ID 5396250], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 1, čistih citatov (CI): 1, normirano št. čistih citatov (NC): 0, Scopus do 22. 7. 2014: št. citatov (TC): 1, čistih citatov (CI): 1, normirano št. čistih citatov (NC): 0]
- GRAF, Michael, BREN, Urban, HALTRICH, Dietmar, OOSTENBRINK, Chris. Molecular dynamics simulations give insight into D-glucose dioxidation at C [sub] 2 and C [sub] 3 by Agaricus meleagris pyranose dehydrogenase. *Journal of computer-aided molecular design*, ISSN 0920-654X, 2013, vol. 27, iss. 4, str. 295-304, ilustr., doi: [10.1007/s10822-013-9645-7](https://doi.org/10.1007/s10822-013-9645-7). [COBISS.SI-ID 5218330], [JCR, SNIP, WoS do 4. 6. 2014: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2, Scopus do 28. 5. 2014: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2]
- BREN, Urban, OOSTENBRINK, Chris. Cytochrome P450 3A4 inhibition by ketoconazole : tackling the problem of ligand cooperativity using molecular dynamics simulations and free-energy calculations. *Journal of chemical information and modeling*, ISSN 1549-9596. [Print ed.], 2012, vol. 52, issue 6, str. 1573-1582. <http://pubs.acs.org/doi/abs/10.1021/ci300118x>, doi: [10.1021/ci300118x](https://doi.org/10.1021/ci300118x). [COBISS.SI-ID 4965658], [JCR, SNIP, WoS do 3. 9. 2014: št. citatov (TC): 15, čistih citatov (CI): 13, normirano št. čistih citatov (NC): 10, Scopus do 20. 8. 2014: št. citatov (TC): 15, čistih citatov (CI): 13, normirano št. čistih citatov (NC): 42]
- BREN, Urban, JANEŽIČ, Dušanka. Individual degrees of freedom and the solvation properties of water. *The Journal of chemical physics*, ISSN 0021-9606, 2012, vol. 137, iss. 2, str. 024108-1-024108-11. http://jcp.aip.org/resource/1/jcpsa6/v137/i2/p024108_s1?isAuthorized=no. [COBISS.SI-ID 5014554], [JCR, SNIP, WoS do 4. 8. 2014: št. citatov (TC): 10, čistih citatov (CI): 9, normirano št. čistih citatov (NC): 4, Scopus do 13. 8. 2014: št. citatov (TC): 12, čistih citatov (CI): 11, normirano št. čistih citatov (NC): 5]
- BREN, Matevž, JANEŽIČ, Dušanka, BREN, Urban. Microwave catalysis revisited : an analytical solution. *The journal of physical chemistry. A, Molecules, spectroscopy, kinetics, environment, & general theory*, ISSN 1089-5639, 2010, vol. 114, iss. 12, str. 4197-4202, ilustr. [COBISS.SI-ID 1851882], [JCR, SNIP, WoS do 8. 7. 2014: št. citatov (TC): 6, čistih citatov (CI): 5, normirano št. čistih citatov (NC): 3, Scopus do 12. 8. 2014: št. citatov (TC): 6, čistih citatov (CI): 5, normirano št. čistih citatov (NC): 3]



Univerza v Mariboru

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Materiali
Course title:	Materials technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	poletni Spring

Vrsta predmeta / Course type

Obvezni// Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		105	6

Nosilec predmeta / Lecturer:

Goršek Andreja

Jeziki /

Predavanja / Lectures: slovenski/Slovene

Languages:

Vaje / Tutorial: slovenski/Slovene

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

Potrebna so znanja iz splošne in anorganske kemije, fizike, organske in fizikalne kemije.

Prerequisites:

Knowledge about general and inorganic chemistry, physics, organic and physical chemistry is required.

Vsebina:Predavanja:

Zgradba **enofaznih** gradiv.

Kristalna zgradba.

Realna zgradba: točkaste, črtaste, ploskovne napake in amorfna gradiva.

Mehanske lastnosti gradiv: elastična in plastična deformacija.

Dinamične lastnosti gradiv: viskoelastičnost, prevodnost, difuzija, dielektričnost in magnetizem.

Ravnotežja v **večfaznih** gradivih.

Fazne strukture: enofazne, večfazne mikrostrukture in sestavljena gradiva.

Laboratorijske vaje:

Identifikacija plastičnih mas

Lastnosti polimerov

Izdelava stekla z nizkim tališčem

Preizkus hidrolize na steklenem drobljencu

Identifikacija jekel in določanje velikosti zrna

Content (Syllabus outline):Lectures:

Structure of **single phase** materials.

Crystal structure.

Real structure: point defects, line defects, surfaces and amorphous materials.

Mechanical properties of materials: elastic and plastic deformation.

Dynamic properties of materials: viscoelasticity, conductivity, diffusion, dielectricity, magnetization.

Multiphase equilibriums.

Phase structures: single phase, multiphase microstructures and composites.

Laboratory exercises:

Identification of plastic materials

Characteristics of polymers

Preparation of glass with low melting point

Hydrolysis of glass

Identification of steel and determination of grain size

Temeljni literatura in viri / Readings:

- P. Glavič, Gradiva, UM, FKKT, Maribor, 2006.
- A. Goršek, P. Glavič. Laboratorijske vaje iz gradiv, UM FKKT, 2005.
- W. D. Callister, Materials Science and Engineering, 7th Ed., J. Wiley, New York, 2007.
- B. S. Mitchell, An Introduction to Materials Engineering and Science, Wiley-Interscience, Hoboken, 2003.

Cilji in kompetence:

Poznavanje zgradbe in lastnosti trdnih gradiv (elementskih, spojinskih in molekulskih kristalov, amorfni snovi, kompozitov).

Pomen napak v lastnostih gradiv.

Razumevanje termodinamskih ravnotežij in kinetskih sprememb v večfaznih gradivih.

Objectives and competences:

Structure and properties of solid construction materials (elements, compounds, polymers, glasses, composites).

Defects, dislocations, boundaries in materials.

Understanding of thermodynamic equilibriums and kinetic transformations in multiphase materials.

Predvideni študijski rezultati:

Znanje in razumevanje:

- fizika, kemija in ekonomika trdnega stanja materialov za konstruiranje;
- povezava zgradbe in lastnosti snovi.;
- načrtovanje razvoja in uporaba gradiv;
- okoljski vidik in trajnostni razvoj;
- izraze na področju gradiv.

Intended learning outcomes:

Knowledge and Understanding:

- Physics, chemistry and economics of solid state construction materials
- Relations between structure and properties
- Design and usage of materials
- Environmental aspects and sustainability.
- Materials science/engineering terminology

Prenosljive/ključne spretnosti in drugi atributi:

- uporaba znanja pri načrtovanju proizvodov;
- iskanje in uporaba podatkov o gradivih;
- sposobnost reševanja praktičnih problemov;
- laboratorijske izkušnje z gradivi.

Transferable/key skills and other attributes:

- Knowledge application in design of products
- Searching and using data about materials
- Practical problem solving skills
- Hands on experience from laboratory.

Metode poučevanja in učenja:

Diskusija o težje razumljivih delih vsebine.
 Zgledi za računsko reševanje problemov.
 Pomoč pri reševanju računskih nalog.
 Pisno testiranje sposobnosti reševanja nalog.
 Brskanje po internetnih straneh iz gradiv.
 Veličine, enote, simboli, pretvorniki.

Laboratorijsko opredeljevanje gradiv in njihovih lastnosti.

Learning and teaching methods:

Discussion of more difficult parts of contents.
 Example problems and solving techniques.
 Helping students at solving numerical problems.
 Written test on problem solving skills.
 Materials science/engineering internet pages search.
 Quantities, units, symbols, conversion factors.

Identification of materials and determination of their properties in laboratory.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

- laboratorijsko delo, poročilo in ustni zagovor	20	- laboratory work, report and written test
- reševanje računskih nalog (pisni izpit),	40	- problem solving skills (written exam)
- sprotno delo in ustni izpit.	40	- every day work and oral examination

Reference nosilca / Lecturer's references:

1. LEŠER, Tadej, GORŠEK, Andreja. Study of enamel frit melting kinetics. *Glass technology*, ISSN 0017-1050, Oct. 2013, vol. 54, no. 5, str. 199-203. [COBISS.SI-ID [17385238](#)].
2. KRIŽAN, Janja, PETRINIČ, Irena, GORŠEK, Andreja, SIMONIČ, Marjana. Ultrafiltration of oil-in-water emulsion by using ceramic membrane : Taguchi experimental design approach. *Central European Journal of Chemistry*, ISSN 1895-1066, Feb. 2014, vol. 12, iss. 2, str. 242-249, ilustr., doi: [10.2478/s11532-013-0373-6](#). [COBISS.SI-ID [17373718](#)].
3. LEŠER, Tadej, GORŠEK, Andreja, ANŽEL, Ivan. Struktura in lastnosti vodno atomiziranih frit = Structure and properties of water atomized frits. V: KRAVANJA, Zdravko (ur.), BOGATAJ, Miloš (ur.), NOVAK-PINTARIČ, Zorka (ur.). *Slovenski kemijski dnevi 2014, Maribor, 11. - 12. september 2014*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2014, str. 1-5, ilustr. [COBISS.SI-ID [18082326](#)].
4. PEČAR, Darja, SLEMNIK, Mojca, GORŠEK, Andreja. Testing the corrosion resistance of stainless steels during the fermentation of probiotic drink. *Journal of the Science of Food and Agriculture*, ISSN 0022-5142, May 2011, vol. 91, iss. 7, str. 1293-1297, doi: [10.1002/jsfa.4315](#). [COBISS.SI-ID [14809622](#)].



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Praktično usposabljanje
Course title:	Practical work

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		2.	poletni Spring

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
					150	5

Nosilec predmeta / Lecturer:

Jeziki / Predavanja / Lectures:

Languages:

Vaje / Tutorial:

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

Pogojev ni.

Prerequisites:

None.

Vsebina:

Študent izvaja praktično usposabljanje s polnim delovnim časom v (industrijski) organizaciji s področja kemije, kemijske in biokemijske tehnike ali drugih procesnih panog. Izjemoma se lahko izvaja na fakulteti ali inštitutu.

Študentu sta dodeljena mentor v organizaciji in na Fakulteti za kemijo in kemijsko tehnologijo, ki je praviloma tudi mentor študentovega diplomskega dela. V času izvajanja praktičnega usposabljanja se študent seznani z organiziranostjo, obratovanjem in poslovanjem organizacije. V okviru praktičnega projekta obravnava praktični problem v organizaciji.

Študent o izvajanju in rezultatih praktičnega usposabljanja napiše poročilo.

Content (Syllabus outline):

Student works full-time in an (industrial) organization in the field of chemistry, chemical and biochemical engineering or other process related industries. The practical work could be exceptionally carried out at the Faculty or Institute.

Two mentors are appointed to student: one in the organization, and the other one at the Faculty of Chemistry and Chemical Engineering, who is, as a rule, mentor of student's Bachelor Work. Student becomes acquainted with the structure, production process and management in the organization. Within the industrial project, student deals with the practical problem in the organization.

Student prepares a written report about the execution and results of the practical project.

Temeljni literatura in viri / Readings:

Specifično literaturo bodo študentom posredovali mentorji.

Cilji:

Namen industrijskega projekta je, da študent:

- določen čas dela v (industrijski) organizaciji s področja kemijske in biokemijske tehnike ali druge procesne panoge
- spozna organiziranost, obratovanje in poslovanje neakademske organizacije
- uporabi znanje, pridobljeno med študijem, za reševanje konkretnega problema v praksi

Objectives:

The aim of the industrial project is to:

- work for the specified time period in an industrial chemical, biochemical or other process related organization
- become familiar with the structure as well as with production and management processes in non-academic organization
- apply knowledge gained during the study for solving practical problem

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje organiziranosti, obratovanja in poslovanja neakademijskih organizacij
- boljše poznavanje zaposlitvenih možnosti po zaključku študija
- poznavanje in razumevanje nalog in odgovornosti v poklicnem okolju

Prenosljive/ključne spretnosti in drugi atributi:

- prilagajanje obnašanja in ravnanja v različnih poklicnih okoljih
- pridobljene nove praktične spretnosti

Intended learning outcomes:

Knowledge and Understanding:

- to understand the structure, production and management process in non-academic organization
- to increase understanding of employment options after graduation
- to get a perception of tasks and responsibilities within a professional environment

Transferable/Key Skills and other attributes:

- to learn a different way of behavior, suitable for different professional environments
- to obtain new practical skills

Metode poučevanja in učenja:

- samostojno delo
- konzultacije z mentorjem v organizaciji
- priprava pisnega poročila

Learning and teaching methods:

- independent work
- consultations between student and mentor in the organization
- preparation of written report

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Praktično usposabljanje jenzaključeno, če so pozitivno opravljene obveznosti:		Student has to pass successfully the following obligations:
pisno poročilo	100	written report

Reference nosilca / Lecturer's references:

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Ekonomija in Ekonomika
Course title:	Fundamentals of Economics and Business

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	Zimski Autumn

Vrsta predmeta / Course type Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	-	15	-	-	75	4

Nosilec predmeta / Lecturer: Dušan Klinar

Jeziki / Languages:	Predavanja / Lectures: Slovensko Konsultacije za tuje študente v Angleščini / Consultation for foreign students in English
	Vaje / Tutorial: Slovensko / English (consultations for foreign students)

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

Pogoji za vpis v 3. letnik.
Drugi posebni pogoji za opravljanje študijskih obveznosti niso predvideni.

Prerequisites:

Conditions to be registered on 3rd. year of study.
Other special prerequisites are not required.

Vsebina:

- Osnovna izhodišča ekonomske teorije
- Kratek zgodovinski pregled razvoja ekonomije
- Narodno gospodarstvo in ekonomski sistem
- Ponudba povpraševanje in trg
- Ekonomija (makroekonomija) najpomembnejše spremenljivke in modeli
- Ekonomika podjetja
- Podjetje kot ekonomski in socialni sistem
- Teorije in praktična obravnava stroškov
- Kalkulacije
- Premoženje podjetja in uspešnost
- Ekonomija in ekonomika naložb
- Finančni trg, borza
- Osnove vodenja in upravljanja – managementa
- Organizacija in organizacijski modeli
- Management znanja
- Inovacije in inoviranje
- Osnove marketinga

Content (Syllabus outline):

- Fundamentals of Economics
- Short overview of Economics history
- National Economy and Economic System
- Supply, Demand and the Market Mechanism
- Macroeconomics, important variables and models
- Business Economics
- The nature of a firm as an economic and social system
- Theory and practice of Costs
- Costing
- Assets and Liabilities, Business performance
- Economics of the Investments
- Financial market, stock exchange
- Fundamentals of the Management
- Organization and organizational models
- Knowledge Management
- Innovations and Innovation Management
- Fundamentals of the Marketing

Temeljni literatura in viri / Readings:

Osnovna literatura / Essential readings:

1. Dušan Klinar, V14_1, Ekonomsko-Poslovne vede za inženirje, zapiski predavanj, Univerza v Mariboru, Fakulteta za Kemijo in Kemijsko Tehnologijo Maribor, 2014, 84 strani, vprašanja za preverjanje znanja, 15 + 14 vprašanj, e-oblika - Word.

Za izključno angleško govoreče študente je na razpolago kazalo s prikazom vsebin in napotki za uporabo

spletnih on-line vsebin iz svetovnega spleta (for only English speaking students table of the contents with

short navigation on www – online materials is available).

2. Paul A. Samuelson; William D. Nordhaus; Economics, McGraw-Hill, 19-ta izdaja, 2009, (izbrana poglavja).
3. Miroslav Rebernik; (2006); Ekonomika podjetja, Gospodarski Vestnik Ljubljana, (izbrana poglavja).
4. Philip Kotler; (1996); Marketing management- trženjsko upravljanje, Slovenska knjiga, (izbrana poglavja).

Dodatna študijska literature (Additonal textbooks):

Dodatno spletno gradivo (additional www on-line materials especially for English speaking students).

Članki in objave v različnih dnevnikih, znanstvenih ter strokovnih revijah (articles and papers), razlage in gradivo na spletu.

Cilji:

- Spoznati osnove delovanja makro in mikro ekonomije v svetovnem merilu v družbi in podjetjih
- Spoznati osnove vodenja in upravljanja – managementa v podjetjih
- Spoznati osnove ekonomske investicij
- Spoznati osnove inovacijskega managementa

Objectives:

- To gain the basic understandings of the Economics
- To gain the basic understandings of the Management
- To understand the basics of the investment economics
- To understand the basics of the Innovation Management

- Spoznati osnove ekonomije znanja - Spoznati osnove marketinga Kompetentno razumevanje dogajanj v gospodarsko/ekonomskem okolju doma in v svetu. Znati vrednotiti investicije z osnovnimi metodami. Poznavanje osnov poslovanja podjetja. Poznavanje osnov inoviranja in razvoja novih proizvodov v podjetju.	- To understand the basics of the Knowledge Management - To understand the basics of the Marketing Be competent to understand and asses domestic and international economic circumstances. Be competent to understand basic investment evaluation methods. Understand basics of business processes in the company. Understand innovations and new products development processes in the company.
Predvideni študijski rezultati: Znanje in razumevanje: - osnov delovanja ekonomije in ekonomskih sistemov - osnov poslovne ekonomike in delovanja poslovnih subjektov - osnovnih načel in metod ekonomike investicij - osnovnih načel in izhodišč inoviranja ter njegovega managementa - osnovnih načel ekonomije znanja - osnov delovanja marketinga Prenesljive/ključne spretnosti in drugi atributi: - združevanje tehničnih in družboslovnih pogledov v celoto (tehnologija = stroji in naprave + ljudje + management) - veščine sistemske – celovite (več pogledov) obravnave poslovnih in tehnoloških sistemov - obravnave ekonomskih vprašanj pri investicijah - sposobnost razpravljanja o ekonomskih vprašanjih	Intended learning outcomes: Knowledge and Understanding: - the basic principles of the Economics and Economic systems - the principles of the Business Economy and Economics - the basic principles and methods of the Economics of the investment - the basic principles and methods of the Innovation Management - the basic principles and methods of the Knowledge Management - the basic principles and methods of the Marketing Transferable/Key Skills and other attributes: - capability to unify technological and social views (technology= machines and equipment + people + management) - skills to holistically asses business and technological systems (multi views) - to asses economical questions within investments - ability to discuss about economic issues
Metode poučevanja in učenja: - predavanja - multimedijske predstavitve - obravnave primerov - obravnava aktualnih ekonomskih dogodkov - delo na internetu - seminarske vaje - priprava elaborata	Learning and teaching methods: - lectures - multimedia presentations - case studies - discussion of the actual economic affairs - online www search - seminar training - preparation of the expert's detail report

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
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Način (pisni izpit, ustno izpraševanje, naloge, projekt): - pisni izpit - elaborat – projekt - ustno izpraševanje	- 60%, - 20%, - 20%.	Type (examination, oral, coursework, project): - written examination - elaborate – project - oral examination
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Reference nosilca / Lecturer's references:

1. NAROB, Miha, GOLOB, Janvit, KLINAR, Dušan, FRANCETIČ, Vojmir, LIKOZAR, Blaž. Co-gasification of biomass and plastics: pyrolysis kinetics studies, experiments on 100 kW dual fluidized bed pilot plant and development of thermodynamic equilibrium model and balances. *Bioresource technology*, ISSN 0960-8524. [Print ed.], Jun. 2014, vol. 162, str. 21-29. <http://www.sciencedirect.com/science/article/pii/S096085241400426X>, doi: [10.1016/j.biortech.2014.03.121](https://doi.org/10.1016/j.biortech.2014.03.121). [COBISS.SI-ID [5457690](#)], [JCR, SNIP]
- 2.. LAH, Branko, KLINAR, Dušan, LIKOZAR, Blaž. Modeling, optimization and scale-up of waste tire pyrolysis. V: 6th Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems, September 25 - October 29, 2011, Dubrovnik, Croatia. *Conference proceedings*. [S. l.: s. n.], 2011, str. [1-15], ilustr. [COBISS.SI-ID [4837146](#)]
3. KLINAR, Dušan, BRENCELJ, Albin. *Metoda za ciklično vakumiranje v šaržnem reaktorju : patent št. SI 23545 A, datum objave 31. 05. 2012; patentna prijava št. P-201000369 z dne 09. 11. 2010*. Ljubljana: Urad RS za intelektualno lastnino, 2012. [5] str. [COBISS.SI-ID [16117782](#)]
4. KLINAR, Dušan. *Doseganje učinkovitosti rabe virov s kombiniranjem snovne in energetske izrabe = Resource efficiency by combination of material and energy recovery path*. V: *Strokovno posvetovanje 2014 Gospodarno in odgovorno!*, Moravske Toplice, Hotel Ajda, 20. in 21. marec 2014. Ljubljana: Zveza ekoloških gibanj Slovenije, 2014, str. 115-121, ilustr. [COBISS.SI-ID [17909014](#)]
5. HARB, Darja, SELINŠEK, Zdenka, KLINAR, Dušan, PETEK, Janez. *Okoljska ekonomika in podjetništvo : sestavina študijskega programa*. [Ljubljana: CPI, 2011]. http://www.cpi.si/files/cpi/userfiles/Datoteke/kurikulum/Programoteka/PROG-VIS/Bionika/Bionika_2011_P10_Bionska_ekonomika_in_podjetni%C5%A1tvo.doc [COBISS.SI-ID [356479](#)]



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Regulacija procesov
Course title:	Process Control

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	zimski Autumn

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		75	5

Nosilec predmeta / Lecturer:

Zdravko Kravanja

Jeziki /

Predavanja / Lectures: slovenski / Slovenian

Languages:

Vaje / Tutorial: slovenski / Slovenian

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

-

Prerequisites:

-

Vsebina:

- Potrebe po procesni regulaciji: odpravljanje vplivov zunanjih motenj, zagotavljanje stabilnosti in optimalnosti delovanja (bio)kemijskih procesov.
 - Osnove dinamičnega modeliranja.
 - Sestavni elementi regulacijskih sistemov.
 - Meritve temperature, nivoja, pretoka, tlaka in koncentracij komponent, npr. PH v (bio)kemijskih obratih.
 - Povratnozančna regulacija:
 - primeri povratnozančne temperaturne, tlačne, nivojske, pretočne in koncentracijske regulacije,
 - značilnosti povratnozančne regulacije s P, PI in PID regulatorji,
 - načrtovanje stabilne povratnozančne regulacije,
 - povratnozančna regulacija najpomembnejših naprav v kemijskih in biokemijskih procesih.
 - Osnovni koncept računalniških regulacijskih sistemov.
 - Varnostni in okoljski vidiki načrtovanja regulacije kemijskih in biokemijskih procesov.
- Laboratorijske vaje za povratnozančno temperaturno, tlačno, nivojsko, pretočno in PH regulacijo.

Content (Syllabus outline):

- Incentives for process control: removing impacts of external disturbances, enabling stable end economic performances of (bio)chemical processes.
 - Basics of dynamical modeling.
 - Hardware elements of control systems.
 - Measurements of temperature, level, flowrate, pressure and concentration, e.g. PH in (bio)chemical plants.
 - Feedback control:
 - Examples of temperature, pressure, level, flow and concentration control.
 - Responses of processes controlled with P, PI, and PID controllers.
 - Design of stable feedback control.
 - Feedback control of basic units in (bio)chemical processes.
 - Basic concept of control systems using computers.
 - Safety and environmental aspects in designing control of chemical and biochemical processes.
- Laboratory practice for feedback temperature, pressure, level, flow and PH control.

Temeljni literatura in viri / Readings:

- Zdravko Kravanja: *Dinamika procesov, Zapiski predavanj*. Zbrano gradivo. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2009.
- Shinskey, F. G., *Process Control Systems, Application, Design and Tuning* (4th ed.), McGraw-Hill, New York, 1996.
- Stephanopoulos George, *Chemical Process Control: An Introduction to Theory and Practice*, Englewood Cliffs, New Jersey, 1984.

Cilji in kompetence:

Cilj je podati osnove povratnozančne regulacije kemijskih in biokemijskih procesov.

Objectives and competences:

The aim is to give basic knowledge of feedback control in chemical and biochemical processes.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Razumeti najosnovnejši koncept procesne dinamike in regulacije.

Obvladati znanje o nekaterih praktičnih aplikacijah procesne povratnozančne regulacije.

Intended learning outcomes:**Knowledge and Understanding:**

To understand the most basic concepts of process dynamics and control.

To have knowledge of some practical applications in process feedback control.

Prenesljive/ključne spretnosti in drugi atributi:
Imeti najosnovnejše razumevanje o vplivu
regulacijskih rešitev na varno, okolju prijazno in
ekonomsko učinkovito vodenje kemijskih in
biokemijskih procesov.

Transferable/Key Skills and other attributes:
To have the most basic understanding of the impact
of control solutions on safe, environmentally benign
and economically effective control of chemical and
biochemical processes.

Metode poučevanja in učenja:

Predavanja, seminar in laboratorijske vaje.
Samostojno delo študenta.

Learning and teaching methods:

Lectures, seminar work, and laboratory practice.
Self-learning.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt) Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • teoretični del izpita • računski del izpita Računski del izpita je mogoče nadomestiti z dvema računskima testoma. Teoretični del izpita je mogoče nadomestiti z dvema testoma teorije. Teoretični in računski del izpita/testa se izvajata sočasno.	30 70	Type (examination, oral, coursework, project): Student has to pass successfully the following obligations: • Theoretical part of exam • Calculus part of exam Calculus part of the exam can be replaced by two calculus tests. Theoretical part of the exam can be replaced by two theoretical tests. Theory and calculus parts of the exam or test are performed simultaneously.
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Reference nosilca / Lecturer's references:

AHMETOVIĆ, Elvis, KRAVANJA, Zdravko. Simultaneous optimization of heat-integrated water networks involving process-to-process streams for heat integration. *Applied thermal engineering*, ISSN 1359-4311. [Print ed.], Jan. 2014, vol. 62, iss. 1, str. 302-217, doi: [10.1016/j.applthermaleng.2013.06.010](https://doi.org/10.1016/j.applthermaleng.2013.06.010).

NEMET, Andreja, KLEMEŠ, Jiri, KRAVANJA, Zdravko. Designing a Total Site for an entire lifetime under fluctuating utility prices. *Computers & chemical engineering*, ISSN 0098-1354. [Print ed.], Available online 18 July 2014, vol. , str. 1-24, doi: [10.1016/j.compchemeng.2014.07.004](https://doi.org/10.1016/j.compchemeng.2014.07.004).

ČUČEK, Lidija, MARTÍN, Mariano, GROSSMANN, Ignacio E., KRAVANJA, Zdravko. Multi-period synthesis of optimally-integrated biomass and bioenergy supply network. *Computers & chemical engineering*, ISSN 0098-1354. [Print ed.], 4 Jul. 2014, vol. 66, str. 57-70, doi: [10.1016/j.compchemeng.2014.02.020](https://doi.org/10.1016/j.compchemeng.2014.02.020).

KRAVANJA, Zdravko, ČUČEK, Lidija. Multi-objective optimisation for generating sustainable solutions considering total effects on the environment. V: DUIĆ, Neven (ur.). *Sustainable development of energy, water and environment systems*, (Applied Energy, ISSN 0306-2619, Vol. 101, (2012)). Oxford: Elsevier, cop. 2012, vol. 101, str. 67-80, doi: [10.1016/j.apenergy.2012.04.025](https://doi.org/10.1016/j.apenergy.2012.04.025).

ČUČEK, Lidija, KLEMEŠ, Jiri, KRAVANJA, Zdravko. A Review of Footprint analysis tools for monitoring impacts on sustainability. *Journal of cleaner production*, ISSN 0959-6526. [Print ed.], Oct. 2012, vol. 34, str. 9-20, doi: [10.1016/j.jclepro.2012.02.036](https://doi.org/10.1016/j.jclepro.2012.02.036).



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analiza procesov
Course title:	Process Analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija/1. stopnja		3.	zimski
Chemical Technology/1. Level		3.	Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		75	5

Nosilec predmeta / Lecturer:

Željko Knez

Jeziki /

Languages:

Predavanja / Lectures:

slovenski / Slovene

Vaje / Tutorial:

slovenski / Slovene

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

Predmet je povezan s fiziko in zahteva predznanje matematike.

Prerequisites:

The subject is connected with physics and knowledge of mathematics is needed

Vsebina:

- Mehanske operacije:
 - drobljenje in mletje, lasiranje, sortiranje
 - sejanje,
 - magnetno,
 - po gostoti,
 - v električnem polju,
 - flotacija,
 - filtracija,
 - membranske operacije,
 - mešanje.
- Termične in difuzijske operacije: uparjanje, kristalizacija, destilacija-rectifikacija, osnove

Content (Syllabus outline):

- Unit operations:
 - size reduction of solids
 - magnetic separation
 - sieving,
 - flotation,
 - filtration,
 - membrane separation,
 - centrifugation,
 - emulsifying,
 - mixing,
- Thermal separation processes:
 - evaporation,

ekstrakcijskih procesov, sušenje. • Reakcijska tehnika: uvod, vrste reaktorjev, sestavljene reakcije, vpliv temperature in tlaka, reakcije trdno-plin, reakcije tekočina-plin, katalizirane reakcije, biokemijski reaktorji, elektrolitni reaktorji <u>Laboratorijske vaje:</u> Mletje s krogličnim mlinom in določitev porazdelitve mas s sejalnimi metodami (Sejalna analiza), filtriranje s poizkusno filterno ploščo, mešanje, ultrafiltracija, ekstrakcija, kristalizacija, sušenje, destilacija z vodno paro, diferencialna destilacija, dializa poizkusno filterno ploščo, mešanje, ultrafiltracija, ekstrakcija, kristalizacija, sušenje, destilacija z vodno paro, diferencialna destilacija, dializa	- crystallization, - distillation, - extraction processes, - drying, • Reaction engineering: fundamentals, reactor types, reactions, temperature and pressure effect, solid-gas reactions, liquid-gas reactions, catalyzed reactions, biochemical reactors. <u>Laboratory work:</u> Grinding with ball-bearing mill and mass distribution determination with sowing methods, Filtration with filter plate, mixing, Ultrafiltration, Extraction, Crystallization, Drying, Distillation with water steam, Differential distillation, Dialysis Grinding with ball-bearing mill and mass distribution determination with sowing methods, Filtration with filter plate, mixing, Ultrafiltration, Extraction, Crystallization, Drying, Distillation with water steam, Differential distillation, Dialysis
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Temeljni literatura in viri / Readings:

1. Christie J. Geankoplis, Transport Processes and Separation Process Principles: Includes Unit Operations, Prentice Hall, New Jersey, 2003.
2. Richard G. Griskey, Transport Phenomena and Unit Operations: A Combined Approach, Wiley, New York, 2002.
3. Warren L. McCabe, Julian Smith, Peter Harriott, Unit Operations of Chemical Engineering, McGraw Hill, 2005.
4. V. Ozim, Ž. Knez: Mehanska procesna tehnika, FKKT (1995).
5. Ž. Knez, M. Škerget, Termodifuzijska tehnika, FKKT UM (1999).
6. Ž. Knez, M. Habulin, V. Ozim, Navodila za vaje iz analize procesov in mehanske tehnike (zbrano gradivo), FKKT, UM, 1997.

Cilji in kompetence:

Predmet obravnava uvod v kemijsko tehniko, industrijsko stehiometrijo ter materialne in energetske bilance kemijskih sistemov

Objectives and competences:

Basic knowledge of the more important unit operations (mainly physical in nature) as well as thermal separation processes used in chemical and process industries enables students to understand industrial technological processes

Predvideni študijski rezultati:

Znanje in razumevanje:
Zmožnost načrtovanja ekstrakcijskega ali drugega sistema.
Uporaba ustreznih mehanskih, termičnih in difuzijskih operacij v povezavi z analizo določenega procesa.
Prenesljive/ključne spretnosti in drugi atributi:
Vsebina predmeta je povezana z ostalimi predmeti na smeri Kemijske tehnike.

Intended learning outcomes:

Knowledge and understanding:
Design of extraction or other systems.
Application of mechanical, thermal or diffusional operation for a defined process analysis.

Transferable/Key Skills and other attributes:
The subject is connected to other subjects on the direction Chemical engineering.

Metode poučevanja in učenja:

- predavanja
- laboratorijske vaje

Learning and teaching methods:

- lectures
- laboratory work

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- pisni izpit	60	- written examination
- ustni izpit	30	- oral examination
- laboratorijske vaje	10	- laboratory work

Reference nosilca / Lecturer's references:

KRAMBERGER, Boris, MARKOČIČ, Elena, KNEZ, Željko. Phase equilibria of binary mixture of carbon monoxide and water at elevated temperatures and pressures. *Chemical Engineering Science*, ISSN 0009-2509. [Print ed.], Aug. 2013, vol. 99, str. 77-80, doi: 10.1016/j.ces.2013.05.048.

KNEZ HRNČIČ, Maša, VENDERBOSCH, Robbie H., ŠKERGET, Mojca, KNEZ, Željko. Observation of phase behavior for bio-oil + diesel + carbon dioxide and bio-oil + tail water + carbon dioxide system. *Journal of chemical and engineering data*, ISSN 0021-9568, 2013, vol. 58, no. 3, str. 648-652, doi: 10.1021/je301146g.

KNEZ, Željko, ILIĆ, Ljiljana, ŠKERGET, Mojca, KOTNIK, Petra. High-pressure solubility data for palm oil-SF6 and coconut oil-SF6 systems. *Journal of chemical and engineering data*, ISSN 0021-9568, 2010, vol. 55, no. 12, str. 5829-5833, doi: 10.1021/je100782c.

KNEZ, Željko, ŠKERGET, Mojca, MANDŽUKA, Zoran. Determination of S-L phase transitions under gas pressure. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], Dec. 2010, vol. 55, iss. 2, str. 648-652, doi: 10.1016/j.supflu.2010.09.016.

KNEZ, Željko, MARKOČIČ, Elena, NOVAK, Zoran, KNEZ HRNČIČ, Maša. Processing polymeric biomaterials using supercritical CO₂. *Chemie Ingenieur Technik*, ISSN 0009-286X, 2011, vol. 83, no. 9, str. 1371-1380.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Sinteza procesov
Course title:	Process Synthesis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	zimski autumn

Vrsta predmeta / Course type

obvezni/obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60			30		90	6

Nosilec predmeta / Lecturer:

Majda Krajnc

Jeziki /

Predavanja / Lectures: Slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski/Slovene

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

Znanje fizikalne kemije, analize procesov.

Prerequisites:

Knowledge of physical chemistry, process analysis.

Vsebina:

Uporaba e-učnega okolja Moodle:

- izdelava slovarja strokovnih izrazov.

Sinteza procesov:

- sinteza reakcijskih poti, proizvodno-porabna analiza, preliminarni ekonomski izračun,
- različni načini prikaza procesov (blokovna shema, procesna shema, ISO 10628) in izračunavanja snovnih bilanc,
- sinteza snovnih tokov,

Content (Syllabus outline):

Usage of e-learning environment Moodle:

- creating of the professional dictionary.

Process synthesis:

- reaction-path synthesis, production-consumption analysis, preliminary economic evaluation,
- different modes of representing processes (block diagram, process scheme, ISO 10628 standard) and calculating material balances,
- synthesis of material flows,

- separacijska naloga (hevristična pravila),
- integracijska naloga (toplotna integracija omrežja toplotnih prenosnikov),
- homogene reakcije v idealnih reaktorjih (šaržni, kontinuirni mešalni in cevni reaktor),
- ovrednotenje investicije in obratovalnih stroškov.

- separation task (heuristic rules),
- integration task (heat integration of heat exchanger network),
- homogeneous reactions in ideal reactors (batch, plug flow reactor, mixed flow reactor),
- investment and operating cost estimation

Temeljni literatura in viri / Readings:

1. D. F. Rudd, G. J. Powers, J. J. Sirola, Process Synthesis, Prentice-Hall, Inc., New Jersey, 1973.
2. W. D. Seider, J. D. Seader, D. R. Lewin, Process Design Principles, Synthesis, Analysis and Evaluation, John Wiley & Sons, Inc., New York, 1999.
3. M. Krajnc, Sinteza procesov, zbrano gradivo, FKKT Maribor, -2015.
4. Visual Encyclopedia of Chemical Engineering Equipment, Version 2.0, The Regents of the University of Michigan, 2000.

Cilji in kompetence:

Spoznati sistematično pot preliminarne sinteze kemijskih procesov. Vzpodbujati kreativno in ustvarjalno delo s skupinskim delom in preko e-učnih okolij.

Objectives and competences:

Knowing the systematic way of preliminary chemical process synthesis. Encouraging creative work with group work and e-environments.

Predvideni študijski rezultati:

Znanje in razumevanje:

Na osnovi osvojenega znanja in načina dela razviti sposobnost samostojnega izdelovanja domačih in seminarskih nalog s področja sinteze procesov ter izdelave slovarja strokovnih izrazov.

Intended learning outcomes:

Knowledge and understanding:

On the basis of the knowledge, learning and teaching methods, develop the ability for independent work at process synthesis and create the professional dictionary.

Metode poučevanja in učenja:

Aktivno poučevanje in učenje, skupinsko (sodelovalno) delo, e-učenje, domače delo, interaktivno preverjanje znanja, formativno preverjanje znanja z e-testi, uporaba interaktivnih multimedijjskih učnih gradiv za študij.

Learning and teaching methods:

Active teaching and learning, cooperative learning, e-learning, home work, formative electronic assessment of knowledge, the usage of interactive multimedia learning material.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: - pisni izpit ali 2 pisna testa, - ustno izpraševanje ali 7 e-testov, - domača naloga, - računalniške in laboratorijske vaje.	30 20 20 30	Student has to pass successfully the following obligations: - written exam or 2 written tests, - oral examination or 7 e-tests, - homework, - work in computational laboratory and practical work in laboratory.
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Reference nosilca / Lecturer's references:

1. PETEK, Aljana, KRAJNC, Majda. The enthalpy and entropy of activation or ethyl acetate saponification. *International journal of chemical kinetics*, 2012, vol. 44, issue 10, str. 692-698.
2. KRAJNC, Majda. E-learning usage during chemical engineering courses. V: ANDERSON, Silva (ur.). *E-learning - engineering, on-job training and interactive teaching*. Rijeka: InTech, cop. 2012, str. 123-138.
3. KRAJNC, Majda. E-learning environment integration in the chemical engineering educational process. *The international journal of engineering education*, 2009, vol. 25, no. 2, str. 349-357.
4. KRAJNC, Majda, KOVAČ KRALJ, Anita, GLAVIČ, Peter. Heat integration in a speciality product process. *Appl. therm. eng.*. [Print ed.], June 2006, vol. 26, iss 8/9, str. 881-891.
<http://dx.doi.org/10.1016/j.applthermaleng.2005.09.018>.
5. KOVAČ KRALJ, Anita, GLAVIČ, Peter, KRAJNC, Majda. Waste heat integration between processes. *Appl. therm. eng.*. [Print ed.], 2002, 22, str. 1259-1269.
6. KRAJNC, Majda, GLAVIČ, Peter, ŽBONTAR ZVER, Lea. SIST EN ISO 10628 Sheme procesnih obratov - splošna pravila. *Sporoč. - Urad Repub. Slov. stand. merosl.*, 2003, št. 5, str. 18-20.
7. KRAJNC, Majda. Določanje kinetike kemijskih reakcij. *Kem. šoli*, junij 2002, letn. 14, št. 2, str. 14-22.
8. KRAJNC, Majda, GORŠEK, Andreja. Vrste kemijskih procesov. *Kem. šoli*, september 2000, letn. 12, št. 3, str. 9-16, ilustr.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Podjetništvo
Course title:	Fundamentals of Entrepreneurship

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	poletni Spring

Vrsta predmeta / Course type

Obvezni//Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		15			90	5

Nosilec predmeta / Lecturer:

Zoran Novak

Jeziki /

Predavanja / Lectures: Slovenski/Slovene

Languages:

Vaje / Tutorial: Slovenski/Slovene

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

Posebni pogoji za opravljanje študijskih obveznosti niso predvideni.

Prerequisites:

Other special prerequisites are not required.

Vsebina:

- Novi vzorci razvoja podjetništva
- Opredelitev in pomen podjetništva
- Ekonomija in družba
- Pojem podjetništva in njegov razvoj
- Podjetništvo v ekonomski teoriji
- Motivi in nagrade za podjetništvo
- Podjetništvo in tveganje
- Vedenjske značilnosti podjetnika
- Podjetništvo in podjetniški slog menedžmenta
- Podjetniška mreža
- Etika v podjetju
- Inovacije in inoviranje
- Notranje podjetništvo
- Družisko podjetništvo

Content (Syllabus outline):

- The new Entrepreneurial paradigm
- Entrepreneurship, definitions and meaning
- Economics and society
- Entrepreneurship and development
- Entrepreneurship and economic theory
- Awards and motifs for entrepreneurship
- Entrepreneurship and risk
- Behaviour of the Entrepreneurs
- Entrepreneurship and Entrepreneurial Management
- Entrepreneurial network
- Business Ethics
- Innovations and Innovations Management
- Internal Entrepreneurship

- Organizacija in Organizacijski modeli
- Osnove marketinga
- Pravne podlage za delovanje podjetij

- Family Entrepreneurship
- Organization and Organizational models
- Basics of the Marketing
- Business Legislation

Temeljni literatura in viri / Readings:

- Miroslav Rebernik: Podjetništvo in management malih podjetij, Univerza v Mariboru, 1997.
- Viljem Pšenični in soavtorji: Podjetništvo – podjetnik, podjetniška priložnost, podjetniški proces in podjetje, Portorož, Visoka strokovna šola za podjetništvo, 2000.

Dodatna študijska literatura (Additional textbooks):

Dodatno spletno gradivo (additional www on-line materials especially for English speaking students).
Članki in objave v različnih dnevnikih, znanstvenih ter strokovnih revijah (articles and papers).

Cilji in kompetence:

- Spoznati osnove podjetništva in podjetniškega vodenja
- Spoznati osnove podjetniškega vodenja in upravljanja - menedžmenta v podjetjih
- Spoznati vedenje in druge značilnosti podjetnikov
- Spoznati delovanje podjetništva v različnih okoliščinah
- Spoznati osnove organiziranja podjetja
- Spoznati osnove zakonodaje za delovanje podjetij in podjetništva

Objectives and competences:

- To understand the basics of the Entrepreneurship
- To understand the basics of the Entrepreneurship Management
- To understand behaviour and other characteristics of the Entrepreneurs
- To understand the Entrepreneurship in different circumstances
- To understand the basics of the business organization principles
- To understand the basics of the legislation

Predvideni študijski rezultati:

Znanje in razumevanje:

- kaj je to podjetništvo in podjetniško vodenje
- kakšne so usmeritve podjetniškega vodenja v podjetju
- vedenjskih in drugih značilnosti podjetnikov
- kako delovati podjetniško v različnih okoliščinah
- kako se lahko organizira delovanje podjetij
- kaj določa zakonodaja o gospodarskih družbah

Prenesljive/ključne spretnosti in drugi atributi:

- podjetniški pogled na oblikovanje osebne kariere
- podjetniški pogled na vodenje in upravljanje – management

Intended learning outcomes:

Knowledge and understanding:

- the basics of the Entrepreneurship
- how Entrepreneurial Management work
- the behaviour of the Entrepreneurs
- the Entrepreneurial actions in different circumstances
- how companies can be organized
- the basics of the Business legislation

Transferable/Key Skills and other attributes:

- entrepreneurial view on personal career
- entrepreneurial views on leadership and management

Metode poučevanja in učenja:

Learning and teaching methods:

- predavanja - multimedijske predstavitve - obravnave primerov - obravnava tekočih ekonomskih dogodkov - delo na internetu - seminar - priprava poslovnega načrta	- lectures - multimedia presentations - case studies - discussion of the economical affairs - online www search - seminar - preparation of the business plan
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- pisni izpit - elaborat – poslovni načrt - ustno izpraševanje	- 60 - 20 - 20	- written examination - elaborate – business plan - oral examination

Reference nosilca / Lecturer's references:

- NOVAK, Zoran, KOTNIK, Petra, KNEZ, Željko. Preparation of WO₃ aerogel catalysts using supercritical CO₂. <i>J. non-cryst. solids</i>. [Print ed.], Dec. 2004, vol. 350, str. 308-313. http://dx.doi.org/10.1016/j.jnoncrysol.2004.06.046. [COBISS.SI-ID 9330966] - KNEZ, Željko, AIONICESEI, Elena, NOVAK, Zoran, KNEZ HRNČIČ, Maša. Processing polymeric biomaterials using supercritical CO₂. <i>Chemieingenieurtech.</i>, 2011, vol. 83, no. 9, str. 1371-1380. [COBISS.SI-ID 15347734] - KNEZ, Željko, HABULIN, Maja, ŠKERGET, Mojca, NOVAK, Zoran, PRIMOŽIČ, Mateja. <i>Green/clean processing of bioactive materials = Sub Clean Probiomat : EST final activity report : Marie Curie Actions</i>, (European Commission research DG Human Resources and Mobility). Maribor: University of Maribor, 2009. 16 f., graf. prikazi. [COBISS.SI-ID 13475862] - KNEZ, Željko, NOVAK, Zoran, HABULIN, Maja, ŠKERGET, Mojca, SINKOVIČ, Andreja, BRODNJAK-VONČINA, Darinka, VONČINA, Ernest, RIŽNER HRAŠ, Andreja, BERGLEZ, Tone. <i>Superkritični fluidi : zaključno poročilo o rezultatih raziskovalnega centra odličnosti v programskem obdobju 2004-2006</i>. Maribor: Univerza, Fakulteta za kemijo in kemijsko tehnologijo, 2008. 26 f. [COBISS.SI-ID 13084950] - NOVAK, Zoran. <i>Podporna raziskovalna oprema za kromatografijo s superkritičnimi fluidi na Fakulteti za kemijo in kemijsko tehnologijo Univerze v Mariboru v letu 2009 : investicijski elaborat za nakup opreme</i>. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, Laboratorij za separacijske procese, 2009. 27 f., graf. prikazi. [COBISS.SI-ID 14142742] - KRAVANJA, Zdravko, NARDIN, Blaž, KUSELJ, Boris, ŠIROK, Brane, KRT, Damjan, MILAVEC, Igor, ŽUN, Iztok, DUHOVNIK, Jože, DOLINŠEK, Slavko, STRMČNIK, Stanko, BUČAR, Bojan, GLAVIČ, Peter, GORŠEK, Andreja, JELOVČAN, Franc, JOVAN, Vladimir, KNEZ, Željko, MEDIČ, Marijan, NOVAK, Zoran, NOVAK-PINTARIČ, Zorka, POHLEVEN, Franc, SIMONIČ, Marjana, SLUGA, Alojzij, KARBA, Rihard, JURIČIČ, Đani, ŠKRJANC, Igor, MUNIH, Marko. <i>Priporočila 7. razvojne skupine za procesno tehnologijo za povečanje konkurenčnosti Slovenije : strateški dokument 7. razvojne skupine za Procesno tehnologijo</i>. Maribor: Razvojna skupina za Procesno tehnologijo, 2008. 61 str., ilustr.
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Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Uvod v biokemijsko tehniko
Course title:	Basic biochemical technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	letni Spring

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			30		90	5

Nosilec predmeta / Lecturer:

Maja Leitgeb

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Potrebno je predhodno znanje iz biokemije, organske kemije, analize kemije in fizikalne kemije.

Prerequisites:

Basic knowledge of biochemistry, organic chemistry, analytical chemistry and physical chemistry is needed.

Vsebina:

- Uvod: Osnovni pojmi-Biotehnologija, biokemijsko inženirstvo.
- Uvod v mikrobiologijo.
- Osnove strukture proteinov.
- Definicija biokatalize.
- Klasifikacija encimov.
- Osnove kinetike encimskih reakcij.
- Določevanje kinetičnih parametrov.
- Vpliv nekaterih reakcijskih parametrov hitrost encimsko kataliziranih reakcij.
- Vpliv pH na aktivnost biokatalizatorjev.
- Pregled bioreaktorjev.
- Pregled biotehnoloških procesov.

Laboratorijske vaje:

Laboratorijske vaje s področja mikrobiologije, encimsko kataliziranih reakcij...

Content (Syllabus outline):

- Introduction: Basics of biotechnology and biochemical engineering.
- Introduction to microbiology.
- Basics of cell growth.
- Basics of protein structure.
- Definition of biocatalysis.
- Enzymes classification.
- Basic kinetics of enzymatic reactions.
- Influence of some reaction parameters in the rate of enzymatic reactions.
- Influence of pH on the rate of enzymatic reactions
- Bioreactors overview.
- Overview of biotechnological processes.

Laboratory work:

Laboratory exercises from the field of microbiology, enzyme-catalyzed reactions etc.

Temeljni literatura in viri / Readings:

- D. L. Nelson, M. M. Cox, A. L. Lehninger: *Principles of Biochemistry*, W. H. Freeman, 6 th ed., 2012.
- T. D. Brock: *Biology of microorganisms*, Prentice Hall, 10th ed., London, 2002.
- A.S. Bommarius, B.R. Riebel, *Biocatalysis - Fundamentals and Applications*, Wiley-VCH, Weinheim, 2004.
- A. Illanes, *Enzyme Biocatalysis – Principles and Applications*, Springer Science, 2008

Cilji in kompetence:

Program obsega sklop osnovnih znanj s področja mikrobiologije, biokatalize in biotehnologije ter modeliranja biokemijskih reakcij.

Objectives and competences:

The programme comprehends basic knowledges in the field of microbiology, biocatalysis and biotechnology and modelling of biochemical reactions.

Predvideni študijski rezultati:

Znanje in razumevanje:
Poznavanje uporabe mikrobnih celic in delov mikrobnih celic kot biokatalizatorjev ter načrtovanje oz. modeliranje biokataliziranih reakcij.

Prenesljive/ključne spretnosti in drugi atributi:

Načrtovanje izvedbe biokataliziranih reakcij.

Intended learning outcomes:

Knowledge and Understanding:
Knowledge of the use of microbial cells and parts of microbial cells as biocatalysts, as well as modelling of biocatalytic reactions.

Transferable/Key Skills and other attributes:

Design of biocatalyzed reactions performance.

Metode poučevanja in učenja:

Predavanja v učilnici, ki je opremljena z avdio-vizualnimi pripomočki.

Individualna priprava seminarских nalog s predstavitev in diskusijo.

Laboratorijsko delo na izbranem primeru.

Learning and teaching methods:

Lectures in lecture room, equipped with audio-visual equipment

Individual preparation of seminars and their presentation with discussion.

Laboratory work on selected case.

Delež (v %) /

Weight (in %)

Načini ocenjevanja:**Assessment:**

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- laboratorijsko delo	20	- laboratory work
- pisni izpit	40	- written examination
- ustno izpraševanje	40	- oral examination

Reference nosilca / Lecturer's references:

1. LEITGEB, Maja, ČOLNIK, Maja, PRIMOŽIČ, Mateja, ZALAR, Polona, GUNDE-CIMERMAN, Nina, KNEZ, Željko. Activity of cellulase and [alpha]-amylase from *Hortaea werneckii* after cell treatment with supercritical carbon dioxide. *The Journal of supercritical fluids*, ISSN 0896-8446. 2013, 78, 143-148 [COBISS.SI-ID [16864790](#)].

2. KAVČIČ, Sabina, KNEZ, Željko, LEITGEB, Maja. Antimicrobial activity of n-butyl lactate obtained via enzymatic esterification of lactic acid with n-butanol in supercritical trifluoromethane. *The Journal of supercritical fluids*, ISSN 0896-8446. 2014, 85, 143-150, doi: [10.1016/j.supflu.2013.11.003](https://doi.org/10.1016/j.supflu.2013.11.003). [COBISS.SI-ID [17392406](#)].
3. ČOLNIK, Maja, PRIMOŽIČ, Mateja, KNEZ, Željko, LEITGEB, Maja. Use of supercritical carbon dioxide for proteins and alcohol dehydrogenase release from yeast *Saccharomyces cerevisiae*. *The Journal of supercritical fluids*, ISSN 0896-8446. 2012, 65, 11-17, doi: [10.1016/j.supflu.2012.02.018](https://doi.org/10.1016/j.supflu.2012.02.018). [COBISS.SI-ID [15901462](#).]
4. KNEZ, Željko, KAVČIČ, Sabina, GUBICZA, László, BÉLAFI-BAKÓ, Katalin, NÉMETH, Gergely, PRIMOŽIČ, Mateja, LEITGEB, Maja. Lipase-catalyzed esterification of lactic acid in supercritical carbon dioxide. *The Journal of supercritical fluids*, ISSN 0896-8446. 2012, 66, 192-197, doi: [10.1016/j.supflu.2011.11](https://doi.org/10.1016/j.supflu.2011.11). [COBISS.SI-ID [15598102](#)].
5. ŠULEK, Franja, PÉREZ FERNÁNDEZ, Daniel, KNEZ, Željko, LEITGEB, Maja, SHELDON, Roger A. Immobilization of horseradish peroxidase as crosslinked enzyme aggregates (CLEAs). *Process biochemistry*, ISSN 1359-5113, 2011, 46 (3), 765-769, doi: [10.1016/j.procbio.2010.12.001](https://doi.org/10.1016/j.procbio.2010.12.001). [COBISS.SI-ID [14712598](#)].



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Diplomsko delo
Course title:	Bachelor Work

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	poletni Spring

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
		10			290	10

Nosilec predmeta / Lecturer:

Jeziki /

Predavanja / Lectures:

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Prerequisites:

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Vsebina:

Priprava diplomskega dela je samostojno delo študenta na projektu s področja kemijske tehnologije ali kemije. Diplomsko delo je lahko tudi skupni projekt več študentov. Teme nalog za diplomska dela razpišejo mentorji v okviru raziskovalnih laboratorijev Fakultete za kemijo in kemijsko tehnologijo. Mentor študenta pri delu usmerja in mu svetuje.

Formalni postopek priprave in zagovora diplomskega dela poteka v skladu s Pravilnikom o postopku priprave in zagovora diplomskega dela na študijskem programu 1. stopnje, Univerze v Mariboru.

Predvidene aktivnosti študenta pri pripravi in zagovoru diplomskega dela so:

- formulacija problema
- pregled in analiza relevantne literature
- postavitve raziskovalnih hipotez
- definiranje metod dela
- praktično delo v enem od raziskovalnih laboratorijev fakultete
- interpretacija in ovrednotenje rezultatov
- priprava pisnega izdelka

ustna predstavitev.

Content (Syllabus outline):

The student has to work independently on a research project concerning chemical or biochemical engineering problem. Master thesis can be a common research project of several students. The research topics are issued by the mentors in the research laboratories of the Faculty of Chemistry and Chemical Engineering. Mentor guides the student through the work.

The formal procedure for Master Thesis preparation and defence is regulated by the "Pravilnik o postopku priprave in zagovora magistrskega dela na študijskem programu 1. stopnje" of the University of Maribor.

The preparation of Bachelor Work include the following activities of student:

- problem formulation
- survey and analysis of the relevant literature
- definition of research hypotheses
- definition of research methods
- practical work in one of the Faculty research laboratories
- interpretation and evaluation of the results
- written presentation of the work
- oral presentation of the work.

Temeljni literatura in viri / Readings:

- Kravanja Zdravko, Navodila za kvalitetno izvajanje diplomskega dela. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2014. <http://www.fkkt.uni-mb.si/sites/default/files/Navodila%20za%20kakovostno%20izvajanje%20diplomskega%20dela.pdf>
- Novak Pintarič Zorka, Kravanja Zdravko, Predloga z navodili za pisanje diplomskega dela. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2014. http://www.fkkt.uni-mb.si/sites/default/files/Predloga_diplome_VS_KT-2014.docx (za VS KT)
- Peter Glavič: *Navodila za izdelavo diplomskega dela*. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2008.
- Pravilnik o postopku priprave in zagovora magistrskega dela na študijskem programu 1. stopnje. Univerza v Mariboru, 2007.
- Specifično literaturo bodo študentom posredovali mentorji.

Cilji:

Cilj je, da študent doseže:

- sposobnost samostojnega strokovnega dela
- sposobnost dela v interdisciplinarni skupini strokovnjakov
- sposobnost predstavitve rezultatov dela strokovni javnosti v obliki pisnega poročila, predavanja, diskusije.

Objectives:

The student would be able to:

- work independently in a technical environment
- work in an interdisciplinary team of experts
- present the results to a professional audience by means of a written report, oral presentation and discussion.

Predvideni študijski rezultati:

Znanje in razumevanje:

- sposobnost identifikacije, formulacije in reševanja problemov s področja kemijske tehnologije

Prenesljive/ključne spretnosti in drugi atributi:

- sposobnost samostojnega strokovnega dela in reševanja strokovnih problemov
- sposobnost učinkovite komunikacije o strokovni problematiki
- sposobnost predstavitve in interpretacije rezultatov dela

Intended learning outcomes:

Knowledge and Understanding:

ability of identification, formulation and solution of problems in the field of Chemical technology

Transferable/Key Skills and other attributes:

- ability to work independently and solve the technical problems
- ability to efficiently communicate about problems
- ability to present and interpret the results of work

Metode poučevanja in učenja:

- konzultacije in diskusije študenta z mentorjem
- priprava pisnega izdelka in ustne predstavitve

Learning and teaching methods:

- consultations and discussions between student and mentor
- preparation of written report and oral presentation

Načini ocenjevanja:

Diplomsko delo je zaključeno, če so pozitivno opravljene naslednje obveznosti:

- diplomsko delo
- ustni zagovor

Delež (v %) /
Weight (in %)

50
50

Assessment:

Student has to pass successfully the following obligations:

- bachelor work
- oral presentation

Reference nosilca / Lecturer's references:

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Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Organska tehnologija
Subject Title:	Organic Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	Zimski autumn

Vrsta predmeta/Course type:

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Željko KNEZ

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Znanje iz splošne kemije, analize in fizikalne kemije.

Prerequisites:

Knowledge of general chemistry, inorganic and analytic chemistry.

Vsebina:

1. Osnovni procesi:

- halogeniranje,
- nitriranje,
- sulfoniranje,
- aminiranje,
- alkiliranje,
- hidrogeniranje,
- oksidacija.

2. Sinteza polimerov, reakcijska kinetika, fizikalno-kemijske lastnosti polimernih materialov.

3. Tehnologije rafinacije nafte, produkti.

Laboratorijske vaje:

Praktični primeri iz posameznih osnovnih procesov.

Content (Syllabus outline):

1. Unit processes:

- halogenation,
- nitration,
- sulfonation,
- amination,
- alkylation,
- hydrogenation,
- oxidation.

2. Synthesis of polymers, reaction kinetics, physico-chemical properties of polymeric materials.

3. Technologies for petroleum refining, products.

Laboratory work:

Practical examples of some unit processes.

Temeljni literatura in viri / Readings:

1. Michael B. Smith, Jerry March, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure (March's Advanced Organic Chemistry), Wiley, New Jersey, 2007.

2. P.H. Groves, Technological processes in organic synthesis, Građevinska knjiga, BG, 1967.

3. G.T. Austin, Shreve's Chemical Process Industries, McGraw-Hill Book Company, N.Y., 1984.

Cilji in kompetence:

Študij osnovnih procesov v organski kemijski tehnologiji in njihove uporabe v procesnem inženirstvu, kot tudi procesov za proizvodnjo nekaterih proizvodov organske kemijske industrije.

Objectives and competences:

Students learn the fundamental processes in organic chemical technology and their use in process engineering as well as processes by which some organic chemistry products are manufactured.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje razlik med posameznimi tehnološkimi procesi ter njihovo uporabnost v tehnologiji rafinacije nafte.

Prenosljive/ključne spretnosti in drugi atributi:

Intended learning outcomes:

Knowledge and Understanding:

Understanding the differences between particular technological processes and their applicability for petroleum refining.

Transferable/Key Skills and other attributes:

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

- predavanja
- laboratorijske vaje

- lectures
- laboratory work

Delež (v %) /
Weight (in %)

Načini ocenjevanja:

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- pisni izpit	50	- written examination
- ustni izpit	40	- oral examination
- laboratorijske vaje	10	- laboratory work

Reference nosilca / Lecturer's references:

ŠKERGET, Mojca, ČUČEK, Denis, KNEZ, Željko. Phase equilibria of the propylene glycol/CO₂ and propylene glycol/ethanol/CO₂ systems. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], Nov. 2014, vol. 95, str. 129-136, doi:[10.1016/j.supflu.2014.08.019](https://doi.org/10.1016/j.supflu.2014.08.019). [COBISS.SI-ID [18135574](#)]

KNEZ HRNČIČ, Maša, VENDERBOSCH, Robbie H., ŠKERGET, Mojca, KNEZ, Željko. Observation of phase behavior for bio-oil + diesel + carbon dioxide and bio-oil + tail water + carbon dioxide system. *Journal of chemical and engineering data*, ISSN 0021-9568, 2013, vol. 58, no. 3, str. 648-652, doi: [10.1021/jc301146g](https://doi.org/10.1021/jc301146g). [COBISS.SI-ID [16633878](#)],

ČUČEK, Denis, PERKO, Tina, ILIĆ, Ljiljana, ZNOJ, Bogdan, VENTURINI, Peter, KNEZ, Željko, ŠKERGET, Mojca. Phase equilibria[!] and diffusivity of dense gases in various polyethylenes. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], June 2013, vol. 78, str. 54-62, doi: [10.1016/j.supflu.2013.03.020](https://doi.org/10.1016/j.supflu.2013.03.020). [COBISS.SI-ID [16830998](#)]

MARKOČIČ, Elena, KRAMBERGER, Boris, VAN BENNEKOM, Joost G., HERRES, Hero Jan, VOS, John, KNEZ, Željko. Glycerol reforming in supercritical water; a short review. *Renewable & sustainable energy reviews*, ISSN 1364-0321, Jul. 2013, vol. 23, str. 40-48, doi: [10.1016/j.rser.2013.02.046](https://doi.org/10.1016/j.rser.2013.02.046). [COBISS.SI-ID [16782102](#)],



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Instrumentalna analiza
Course title:	Instrumental analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	zimski Autumn

Vrsta predmeta / Course type

izbirni predmet / elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Mitja Kolar

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Prerequisites:

Potrebno je predhodno osnovno znanje analize kemije, osnove instrumentalnih metod, fizike in matematike.

Basic knowledge of analytical chemistry, basic instrumental methods, physics and mathematics is needed.

Vsebina:

- Principi delovanja osnovnih sklopov v sodobnih instrumentalnih analiznih tehnikah.
- Osnovni principi instrumentalnih metod na področju separacije/detekcije zvrsti in pregled sklopljenih analiznih sistemov.
- Priprava vzorcev-predkoncentracija za določanje sledov.
- Kromatografski sistemi: HPLC-MS, GC-MS, HPLC-ICP-MS, LA-ICP-MS.
- Organokovinski kompleksi – njihov izvor in analitika.
- Separacija in kvantifikacija ostankov zdravil v odpadnih, površinskih in pitnih vodah z izbranimi primeri.
- Kontrola kvalitete in zagotavljanje pravilnosti določitev na področju uporabe instrumentalnih analiznih sistemov.
- Pri laboratorijskih vajah bodo študentje vzorčili, pripravili vzorce in opravili analize na sklopljenem analiznem sistemu.

Content (Syllabus outline):

- Basic operation principles of subsystems used in modern instrumental analytical approaches.
- The concepts of instrumental methods in analytical chemistry and speciation analysis with overview of hyphenated analytical systems.
- Sample preparation-preconcentration for trace analysis.
- Chromatographic systems: HPLC-MS, GC-MS, HPLC-ICP-MS, LA-ICP-MS.
- Organometalloids - occurrence and the analysis.
- Separation and quantification of drug residues in wastewaters, surface waters and tap waters with selected case-studies.
- Quality Control and assurance in instrumental analytical systems.
- At lab course students will learn about sampling and sample preparation. Details of selected hyphenated analytical system will be presented and analysis performed.

Temeljni literatura in viri / Readings:

Principles of Instrumental Analysis, Skoog, Holler Nieman, Saunders College Publishing, 2012.
Sample preparation for hyphenated analytical techniques, J.M. Rosenfeld (Editor), Blackwell Publishing, Oxford, UK, CRC Press, Boca Raton, FL, USA, 2004.

Hyphenated Techniques in Speciation Analysis, Joanna Szpunar and Ryszard Lobinski, Series editor Roger M. Smith, RSC Series Chromatography Monographs, Springer Berlin / Heidelberg, 2005.

Cilji in kompetence:

Cilj predmeta je seznaniti študente s:

- teoretskimi osnovami in principi sodobnih instrumentalnih analiznih sistemov,
- področji, na katerih je uporaba sklopljenih analiznih sistemov nenadomestljiva (metalomika, identifikacija razgradnih produktov..),
- problematiko kvantifikacije analiznih sistemov (referenčni materiali, certificirani referenčni materiali..),
- vzočenjem ter konzerviranjem vzorcev glede na kočno določitev z različnimi analiznimi sistemi.

Objectives and competences:

Knowledge and Understanding:

- understanding of basic principles of modern hyphenated analytical systems and their advantages regarding the classical ones,
- interfaces, their operational principles, examples,
- better understanding of the impact of element species on the environment, human health, food safety etc. and their reliable separation-determination.

Predvideni študijski rezultati:

Znanje in razumevanje:

Predmet se dopolnjuje s predmeti, ki vsebujejo analitske vsebine (instrumentalne metode, meroslovje, analizni aspekti celostnega razvoja (okolje, hrana, vode), (bio)sinteza spojin in materialov, itd.).

Intended learning outcomes:

Knowledge and understanding:

The subject is related to subjects that include analytical chemistry (instrumental methods, metrology, analytical aspects of sustainable development (environment, food, water), (bio)synthesis of molecules and materials etc.).

Metode poučevanja in učenja:

Predavanja v učilnici, ki je opremljena z osnovnimi audio-vizualnimi pripomočki.
Individualna priprava seminarских nalog s predstavitvijo in diskusijo.
Praktično delo na izbranem analiznem sistemu.

Learning and teaching methods:

Lectures in lecture room, equipped with basic audio-visual equipment
Individual preparation of seminars and their presentation with discussion.
Practical work using selected analytical system.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student passes the examination if s(he) successfully passed all the following obligations:
- laboratorijsko delo in poročilo	25	- laboratory work and report
- pisni izpit:	75	- written examination:

Reference nosilca / Lecturer's references:

1. BRGLEZ, Polonca, HOLOBAR, Andrej, PIVEC, Aleksandra, KOLAR, Mitja. Spin-coating for optical-oxygen-sensor preparation = Uporaba spinskega nanosa pri izdelavi optičnih senzorjev za kisik. *Materiali in tehnologije*, ISSN 1580-2949. [Tiskana izd.], 2014, letn. 48, št. 2, str. 181-188. [COBISS.SI-ID [17746454](#)]
2. JERENEC, Simona, ŠIMIĆ, Mario, SAVNIK, Aleš, PODGORNIK, Aleš, KOLAR, Mitja, TURNŠEK, Marko, KRAJNC, Peter. Glycidyl methacrylate and ethylhexyl acrylate based polyhipe monoliths : morphological, mechanical and chromatographic properties. *Reactive & functional polymers*, ISSN 1381-5148. [Print ed.], 2014, vol. 78, str. 32-37, doi: [10.1016/j.reactfunctpolym.2014.02.011](#). [COBISS.SI-ID [17661718](#)]
3. BRGLEZ, Polonca, HOLOBAR, Andrej, PIVEC, Aleksandra, BELŠAK, Nataša, KOLAR, Mitja. Determination of oxygen by means of a biogas and gas - interference study using an optical tris (4,7-diphenyl-1,10-phenanthroline) ruthenium(II) dichloride complex sensor. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2012, vol. 59, no. 1, str. 50-58, ilustr. <http://acta.chem-soc.si/59/59-1-50.pdf>. [COBISS.SI-ID [15889686](#)]
4. ZAJŠEK, Katja, KOLAR, Mitja, GORŠEK, Andreja. Characterisation of the exopolysaccharide kefiran produced by lactic acid bacteria entrapped within natural kefir grains. *International journal of dairy technology*, ISSN 1364-727X, 2011, vol. 64, issue 4, str. 544-548, doi: [10.1111/j.1471-0307.2011.00704.x](#). [COBISS.SI-ID [15278870](#)]

5. KOLAR, Mitja, DOLIŠKA, Aleš, ŠVEGL, Franc, KALCHER, Kurt. Tungsten - tungsten trioxide electrodes for the long-term monitoring of corrosion processes in highly alkaline media and concrete-based materials. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2010, vol. 57, no. 4, str. 813-820, graf. prikazi. <http://acta.chem-soc.si/57/57-4-813.pdf>. [COBISS.SI-ID 14701078]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Biokemija in molekularna biologija
Course title:	Biochemistry and Molecular biology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	Zimski Autumn

Vrsta predmeta / Course type

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Uroš Potočnik

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Ni.

Prerequisites:

None.

Vsebina:

- Zgradba celice: razlike med prokarionti in evkarionti Osnove kemične zgradbe in termodinamika bioloških molekul, biološke molekule v vodi
- Pomen sekvenciranja humanega genoma in genomov ostalih organizmov
- Proteini: aminokisline, peptidi, tridimenzionalna zgradba, biološka vloga, Encimi
- Ogljikovi hidrati: zgradba in biološka vloga
- Lipidi: zgradba in biološka vloga, biološke membrane, transport
- Temelji celičnega metabolizma in bioenergetika,
- Osnove mikrobiologije
- DNA struktura in lastnosti, replikacija (prokarionti, evkarionti), rekombinacija DNA, DNA popravljalni mehanizmi, DNA mutacije, struktura kromosomov
- RNA struktura in lastnosti, vrste RNA molekul in funkcije, transkripcija (prokarionti, evkarionti), postranskripcijske modifikacije
- Struktura proteinov, sinteza proteinov, posttranslacijske modifikacije proteinov, zvijanje proteinov, transport proteinov, Regulacija proteinske sinteze:
- Osnove dedovanja in molekularne genetike

Laboratorijsko delo:

- Kvalitativno določanje ogljikovih hidratov
- Kolorimetrične reakcije za določanje prisotnosti sladkorjev, Molisheva reakcija, Antronska reakcija, Benedictova reakcija. Inverzija saharoze.
- Ekstrakcija lipidov in dokaz prisotnosti holesterola
- Homogenizacija, ekstrakcija, Lieberman Buchardova reakcija za določanje prisotnosti holesterola. Ločevanje proteinov z gelsko filtracijo

Content (Syllabus outline):

- Cell structure: difference between prokaryotes and eukaryotes
- Impact of sequencing of human genome and other genomes
- Biochemistry: From Atoms to Molecules to Cells, Biomolecules in Water
- Proteins: Amino Acids, Peptides, and Proteins, : Protein Architecture and Biological Function, Enzymes
- Carbohydrates: Structure and Biological Function
- Lipids: Structure and Biological Function, Biological Membranes and Cellular Transport
- Basic Concepts of Cellular Metabolism and Bioenergetics,
- Basics of microbiology
- DNA structure and characteristics, replication (prokaryotes, eukaryotes), recombination, repair and mutations,, structure and function of genes and chromosomes,
- RNA structure characteristics: role of different types of RNA, transcription (prokaryotes, eukaryotes), post transcription modification
- Protein structures, synthesis of proteins, translation, posttranslational modifications, protein folding, protein trafficking, Regulation of protein synthesis
- Basics of heredity and molecular genetics

Laboratory work:

- Determination of carbohydrates.
- Colorimetric reactions for determination of carbohydrate. Molisch, Anthrone, Benedict's. Sucrose Inversion.
- Lipid extraction and determination of cholesterol.
- Homogenisation, extraction. Lieberman Buchard reaction for cholesterol determination

Temeljni literatura in viri / Readings:

1. Boyer, Rodney F.: Concepts in biochemistry, 3rd ed., J. Wiley & Sons, Hoboken , 2006
2. D.E. Nelson, M.M. Cox, Lehninger Principles of Biochemistry, 6th Ed. W.H. Freeman & Co., New York, 2013.
3. B. ALBERTS et al.: Molecular biology of the cell., 5th Ed., Garland Publish, Inc., New York, 2007
4. LODISH H., Baltimore D., Berk A., Zipursky S.L., Matsudaira P., Darnell J.: Molecular Cell Biology, 7th Ed., Scientific American Books, Freeman and Co., New York, 2012

Cilji in kompetence:

Predmet bo nudil študentom osnovno razumevanje in celostni pristop k osnovnim molekularnim procesom v celici, tkivih, organih in celotnem organizmu. Povdarek bo na prenosu DNA informacije za sintezo proteinov.

Objectives and competences:

Students will understand basic molecular mechanisms in the cell, how cells are organized in tissues, organs and whole organisms. The focus will be on transfer of genomic information to synthesis of proteins.

Predvideni študijski rezultati:

Znanje in razumevanje:

- osnovne biokemijske in molekularne procese v celici

Intended learning outcomes:

Knowledge and understanding:

- basic biochemical and molecular processes in the cell

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory work

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)
Izpit je opravljen, če sta pozitivno opravljeni naslednji obveznosti:

pisni izpit
ustni izpit
laboratorijske vaje

Delež (v %) /
Weight (in %)

60
30
10

Assessment:

Type (examination, oral, coursework, project):
Student has to pass successfully the following obligations:

written examination
oral examination
laboratory work

Reference nosilca / Lecturer's references:

1. JOSTINS, Luke, MITROVIČ, Mitja, POTOČNIK, Uroš. Host-microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature (Lond.)*, 2012, vol. 491, no. 7422, str. 119-124, doi: 10.1038/nature11582. [COBISS.SI-ID 512230968],
2. PERIN, Petra, POTOČNIK, Uroš. Polymorphisms in recent GWA identified asthma genes CA10, SGK493, and CTNNA3 are associated with disease severity and treatment response in childhood asthma. *Immunogenetics*, ISSN 0093-7711, 2014, vol. 66, issue 3, str. 143-151, doi: 10.1007/s00251-013-0755-0. [COBISS.SI-ID 17472790]
3. RIVAS, Manuel A, MITROVIČ, Mitja, POTOČNIK, Uroš. Deep resequencing of GWAS loci identifies

independent rare variants associated with inflammatory bowel disease. Nat Genet, 2011, vol. 43, no. 11, str. 1066-1073, doi: 10.1038/ng.952. [COBISS.SI-ID 15421974],

4. BERCE, Vojko, PINTO KOZMUS, Carina, POTOČNIK, Uroš. Association among ORMDL3 gene expression, 17q21 polymorphism and response to treatment with inhaled corticosteroids in children with asthma. Pharmacogenomics j. (Print), Dec. 2013, vol. 13, iss. 6.
<http://www.nature.com/tpj/journal/vaop/ncurrent/full/tpj201236a.html>, doi: 10.1038/tpj.2012.36. [COBISS.SI-ID 4406079].

5. REPNIK, Katja, POTOČNIK, Uroš. Haplotype in the IBD5 region is associated with refractory Crohn's disease in Slovenian patients and modulates expression of the SLC22A5 gene. J Gastroenterol, 2011, vol. 46, no. 9, str. 1081-1091, doi: 10.1007/s00535-011-0426-6. [COBISS.SI-ID 15110422].



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Energetski management
Course title:	Energy management

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	Poletni Spring

Vrsta predmeta / Course type

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Darko Goričanec

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

Content (Syllabus outline):

- Uvod v energetske management
- Energija in okolje
- Obnovljivi viri
- Ogrevanje in ventilacija
- Vračanje odpadne toplote
- Izolirani cevni sistemi in posode
- Toplotne črpalke in hlajenje
- Ekonomika in finance:
Ekonomska analiza:
Ocena vračila investicije
- Seminarske vaje:
Projekti iz vsebine predmeta

- Introduction to energy management
- Energy and environment
- Renewable energy sources
- Heating and ventilating
- Rejecting heat recovery
- Insulated pipe work systems and vessels
- Heat pumps and refrigeration
- Economics and finance:
Economic analysis
Life cycle costing
- Tutorials:
Projects from the thematic of the subject

Temeljni literatura in viri / Readings:

- Wayne C. Turner, Energy management handbook, Other, 5th edition, September 22m, 2004
- Barney L. Capehart, Guide to energy management, other, 4th Edition, October 16, 2002
- Klaus Dieter E. Pawlik, Guide to energy management (Solutions manual), Marcel Dekker, 4th Sol Ma edition, September 1, 2002
- Turner W., Energy management handbook, Fairmont press, Liburn, 2001
- Paul O'Callaghan, Energy management, McGraw – Hill book company, 1993

Cilji:

- Razvoj učinkovitega in gospodarno uspešnega načrtovanja energetske oskrbe objektov
- Aplikacija tehno – ekonomskih optimizacijskih metod v cilju vrednotenja rentabilnosti investicije v energetske sisteme
- Razvoj logičnega razmišljanja, skupinsko delo in ustvarjalen pristop k raziskovalno – aplikativnemu delu.

Objectives:

- To develop efficient and economically successful designing of energy supply of the buildings
- Application of technical and economic optimization methods with the aim to evaluate rentability of investment into energy systems
- Development of logical thinking, team work and a creative approach towards research work

Predvideni študijski rezultati:

Znanje in razumevanje:

- Sposobnost načrtovanja in dimenzioniranja ekonomsko varčnih sistemov in ekonomskega vrednotenja vračila naložbe.
- Energetsko učinkovitega načrtovanja objektov
- Standardnih metod in vključevanje postopkov optimizacije pri reševanju aplikativnih projektov
- Sposobnost uporabe ustrezne programske opreme

Prenesljive/ključne spretnosti in drugi atributi:

- Z mentorskim reševanjem konkretnih primerov se oblikuje študentova kreativnost, logično razmišljanje, ekološko osveščanje in ekonomsko sprejemljivo načrtovanje.

Intended learning outcomes:

Knowledge and Understanding:

- Ability to design and dimension economical systems and evaluating the return of investment.
- Of energy efficient design of the buildings
- Of standard methods and integration of the process of optimization when solving applicable projects
- The ability to use appropriate programme equipment

Transferable/Key Skills and other attributes:

- Solving examples under supervision and hence developing the student's creativity, logical thinking, ecological awareness and economically acceptable designing.

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Metode poučevanja in učenja:

- predavanja
- obravnava študijskih primerov
- aktivno skupinsko delo

Learning and teaching methods:

- lectures
- field work
- active team work

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Teoretični in računski del tvorita celoto in se preverjata hkrati. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		The theoretical and the calculus part of exam are performed simultaneously. Student has to pass successfully the following obligations:
• teoretični del	20	• Theoretical part
• računski del	50	• Calculation part
• samostojno delo	30	• Individual work

Reference nosilca / Lecturer's references:

1. TROP, Peter, ANIČIĆ, Božidar, GORIČANEC, Darko. Production of methanol from a mixture of torrefied biomass and coal. *Energy*, ISSN 0360-5442. [Print ed.], Available online 13 June 2014, str. 1-8,
2. DOBERŠEK, Danijela, GORIČANEC, Darko, KROPE, Jurij. Calibration of pipe networks for district heating using the nonlinear optimisation method. *Int. j. of nonlinear sci. & numer. simul.*, 2006, vol. 7, no. 2, str. 225-228.
3. KULČAR, Bojan, GORIČANEC, Darko, KROPE, Jurij. Economy of replacing a refrigerant in a cooling system for preparing chilled water = Remplacement du frigorigene dans un systeme utilisé pour préparer de l'eau glacée : impact financier. *International journal of refrigeration*
4. ŽLAK, Janez, AGREŽ, Marko, DOBERŠEK, Danijela, GORIČANEC, Darko, KROPE, Jurij. Rentability of rotary heat regenerator use in ventilating systems = Rentabilnost upotrebe regeneratorske topline u ventilacijskom sustavu. *Strojarstvo*, ISSN 0562-1887, 2010, vol. 52,
5. JAMŠEK, Miran, DOBERŠEK, Danijela, GORIČANEC, Darko, KROPE, Jurij. Determination of optimal district heating pipe network configuration. *WSEAS transactions on fluid mechanics*, Jul. 2010, vol. 5, iss. 3, str. 165-174



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Okoljska tehnologija
Course title:	Environmental Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	Poletni Spring

Vrsta predmeta / Course type

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15		15			120	5

Nosilec predmeta / Lecturer:

Darko Goričanec

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Znanje iz računalništva v kemiji in procesnih bilanc

Prerequisites:

Knowledge of computer in chemistry and process balances

Vsebina:

Sonaravni razvoj

Preventivne tehnike varstva okolja:

- čistejša proizvodnja;
- integralno preprečevanje in kontrola onesnaževanja (IPPC);
- analiza življenjskega kroga proizvoda;
- okoljsko načrtovanje proizvodov.

Sistemi kakovosti in ravnanja z okoljem:

- sistem kakovosti po ISO 9000:2000;
- sistem ravnanja z okoljem po ISO 14000
- shema ravnanja z okoljem in presojanja (EMAS);

Racionalna raba energije in obnovljivi energetski viri:

- energetski pregled podjetja;
- obnovljivi energetski viri in njihova uporaba v industriji.

Ravnanje z odpadki po procesu:

- ravnanje s trdnimi odpadki;
- ravnanje s tekočimi odpadki;
- ravnanje s plinastimi odpadki.

Študent bo pripravil seminarsko nalogo od ene od najnovejših metodologij čistejše proizvodnje oz. zniževanja in/ali preprečevanja odpadkov ali tehnike ravnanja z odpadki vključno z oceno možnosti uporabe (BAT).

Študent bo rešil nalogo s področja preprečevanja odpadkov iz literature ali iz prakse.

Content (Syllabus outline):

Sustainable development

Pollution prevention techniques and methodologies:

- cleaner production;
- integrated pollution and prevention control (IPPC);
- life cycle analysis;
- eco-design;

Total quality management and environmental management systems:

- total quality management system ISO9000:2000;
- environmental management system ISO14000;
- environmental management and audit scheme (EMAS).

Rational energy consumption and renewable energy sources:

- energy auditing of production processes;
- renewable energy sources.

End-of-pipe processes:

- solid waste management;
- liquid waste management;
- gaseous waste management³

A student is obliged to prepare a seminar work from one of the best available techniques (BAT) in area of cleaner production and/or pollution prevention or waste treatment. The possibility of its implementation is also discussed.

The student solves one of the proposed literature or problem from the industry in area of pollution prevention.

Temeljni literatura in viri / Readings:

1. J. Petek: Okoljska tehnologija. Zapiski predavanj. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2006.
2. Centre for Cleaner Production. 2000. MOED: Minimisation Opportunities Environmental Diagnosis. Autonomous Government of Catalonia, Ministry of Environment. Barcelona.
3. Bezet H., Van Hemel C. 1997. Ecodesign, a Promising Approach to Sustainable Production and Consumption. Delft University of Technology. Delft.
4. Noyea R. 1994. Unit Operations in Environmental Engineering. Noyes Publications, New Jersey.

Cilji:**Objectives:**

Razumevanje omejenosti virov in prostora glede na rast prebivalstva in s tem povezanega izčrpavanja surovinskih in energetskih obnovljivih ter neobnovljivih virov, razumevanje pojma sonaravnosti in sonaravnih okoljskih tehnik, poznavanje in uporaba spoznanih okoljskih tehnik vključno z načini racionalne rabe energije, bodisi v okviru projektne skupine ali samostojno, poznavanje osnovnih tehnik ravnanja s trdnimi, tekočimi in plinastimi odpadki.

Understanding of correlation between limited resources and increasing population, understanding of the sustainability and sustainable techniques. Basic knowledge of the various sustainable techniques, methodologies and their application including rational energy consumption (within the team work or independent). Review of the end-of-pipe techniques (basic principles of the solid, liquid and gaseous waste management).

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent mora biti sposoben izvesti preliminarno analizo stanja v podjetju ter poiskati in ovrednotiti (tehniško, okoljsko in ekonomsko) predlagane ukrepe racionalne rabe energije, zmanjševanja proizvodnje odpadkov, emisij, preprečevanja onesnaževanja, najboljših razpoložljivih tehnik recikliranja in sodelovati pri okoljskih izboljšanjih procesov in proizvodov z vidika zmanjševanja vplivov na okolje v celotnem življenjskem krogu. Prav tako mora poznati in razumeti osnovne tehnike ravnanja s vsemi vrstami odpadkov.

Prenesljive/ključne spretnosti in drugi atributi:

Celostni pristop k okoljskemu problemu.

Poznavanje metodologij.

Uporaba osnovnih preventivnih in kurativnih okoljskih tehnik.

Intended learning outcomes:

Knowledge and Understanding:

The student should be able to implement preliminary environmental analysis in a company, to find and assess pollution prevention measures, rational energy consumption, waste minimisation and cleaner production, best available techniques, recycling (technical, economical and environmental assessment). He/she has to understand basic principle of the LCA and eco-design and be able to contribute to the possibilities of decreasing the environmental impact of the product assessed in its entirely life cycle. Basic understanding of the waste management techniques is also included.

Transferable/Key Skills and other attributes:

Integral approach to the environmental problem.

Knowledge of the methodology to be used.

Application of the basic environmental preventive and end-of-pipe techniques.

Metode poučevanja in učenja:

Predavanja z diskusijo in reševanjem praktičnih problemov, reševanje realnih problemov iz prakse, izdelava posamičnega ali skupinskega seminarskega dela.

Learning and teaching methods:

Lectures with discussion of practical problems, solving problems in industry, carrying out an individual or team seminar work.

Delež (v %) /

Weight (in %)

Načini ocenjevanja:

Assessment:

Teoretični in računski del tvorita celoto in se preverjata hkrati.

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- Teoretični del

20

50

30

The theoretical and the calculus part of exam are performed simultaneously.

Student has to pass successfully the following obligations:

- Theoretical part

• Računski del • Seminarska naloga		• Calculation part • Seminar
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Reference nosilca / Lecturer's references:

1. DOBERŠEK, Danijela, GORIČANEC, Darko. An experimentally evaluated magnetic device's efficiency for water-scale reduction on electric heaters. *Energy*, ISSN 0360-5442. [Print ed.], Available online 27 September 2014, str. 1-8, doi: [10.1016/j.energy.2014.09.024](https://doi.org/10.1016/j.energy.2014.09.024).
2. ZORKO, Jerneja, GORIČANEC, Darko, KROPE, Jurij. Process of oxygen transfer and power requirements in activated sludge wastewater treatment plant. *Res. J. Chem. Environ.*, 2011, vol. 15, no. 2, str. 1-3, graf. prikazi. [COBISS.SI-ID 15168534], [JCR, Scopus do 28. 9. 2011: št. citatov (TC): 0, čistih citatov
3. TROP, Peter, MURSICS, József, GORIČANEC, Darko, KROPE, Jurij. Simulation of methanol production from biogas and natural gas. *Res. J. Chem. Environ.*, 2011, vol. 15, no. 2, str. 1-6, graf. prikazi. [COBISS.SI-ID 15168278], [JCR, Scopus do 28. 9. 2011: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0] (CI): 0, normirano št. čistih citatov (NC): 0]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SPECIFICATION

Predmet:	Anorganska tehnologija
Subject Title:	Inorganic Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1 st level VS		3.	poletni Spring

Vrsta predmeta / Course type:

Izbirni / Elective

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Mihael Drofenik

Jeziki / sloven.
Languages: en.

Predavanja / Lecture: slovenski / Slovene
Vaje / Tutorial: slovenski / Slovene

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

Splošna in anorganska kemija
Fizikalna kemija I

Prerequisites:

General & Inorganic chemistry
Physical chemistry I

Vsebina:

- Uvod.
- Voda in vodikov peroksid.
- Tehnični plini (dušik, kisik, CO₂, aceten, vodik).
- Halogeni (fluor, klor, kloralkalna elektroliza).
- Kisline (žveplova, dušikova, fosforjeva, klorovodikova).
- Gnojila (osnovna, mešana, kompleksna, tekoča).
- Pigmenti (titanov dioksid, cinkov oksid in sulfid)
- Elektrokemija (karbid, ferozlitine, železo, aluminij).
- Abrazivi (glinica, korund, silicijev karbid, brusi).
- Nekovine (steklo, emajl, opeka, keramika, refraktarji).
- Veziva (cement, apno, gips, zeoliti).

Content (Syllabus outline):

- Introduction.
- Water & hydrogen peroxide.
- Industrial gases (Nitrogen, oxygen, hydrogen, CO₂).
- Halogens (fluorine, chlorine, electrolysis).
- Acids (sulphuric, nitric, phosphoric, hydrochloric).
- Fertilizers (basic, mixed, complex, liquid).
- Pigments (titanium dioxide, zinc oxide and sulphide).
- Electrochemistry (carbide, ferroalloys, iron, aluminium).
- Abrasives (alumina, corundum, Si carbide, grinders).
- Oxides (gas, enamel, brick, ceramics,

- Vlakna (steklena, ogljikova, mineralna).

Laboratorijske vaje:

Produkt, izbira procesa, surovine, procesna shema.
Množinska in entalpijska bilanca.
Ekonomika, okoljevarstvo, varnost.
Kemijska sinteza/analiza produkta/procesa.

refractories).

- Binders (cement, lime, gypsum, zeolites) .
- Fibres (glass, carbon, mineral).

Laboratory work:

Product, process, raw materials, process flow sheet.
Amount & enthalpy balances.
Economics, environment, safety.
Chemical synthesis/analysis of the product/process.

Temeljni literatura in viri / Textbooks:

- P. Glavič: *Anorganska tehnologija*, Univerza v Mariboru, FKKT, Maribor, 2008.
- K. H. Büchel, H.-H. Moretto, P. Woditsch: *Industrielle Anorganische Chemie*, Wiley-VCH, Weinheim, 1999.
- Winnacker-Küchler: *Chemische Technologie*, Band 2, 3, 4, Carl Hanser Verlag, München, 1997.
- J. A. Kent (Ed.): *Riegel's Handbook of Industrial Chemistry*, Chapman & Hall, New York, 2001.
- McKetta: *Encyclopedia of Chemical Processing and Design*, Marcel Dekker, New York, 1976–1999.

Cilji:

Spoznavanje področja anorganske tehnologije, iz katerega bo študent opravljal diplomsko nalogo ali ima štipendijo oz. se namerava v njem zaposliti ali ga področje posebej zanima.

Podrobnejši študij ene od anorganskih procesnih tehnologij, ki jo izbereta študent in predavatelj.

Objectives:

Understanding the part of inorganic technology field which will be the topic of the student's thesis, or will be his employment after graduation, or is of special interest to him.

Detailed study of the inorganic process technology, selected by the student together with the lecturer.

Predvideni študijski rezultati:

Znanje in razumevanje:

- izbrane kemijske tehnologije
- problematika surovin, energije, okolja
- iskanja informacij v monografijah in enciklopedijah

Prenesljive/ključne spretnosti in drugi atributi:

- uporaba znanja pri razvoju tehnologij;
- iskanje in uporaba podatkov o procesih;
- sposobnost pisnega komuniciranja.

Intended learning outcomes:

Knowledge and Understanding of:

- Chemical technology selected
- Raw materials, energy, environment related considerations
- Information-retrieval skills

Transferable/Key Skills and other attributes:

- Knowledge application in technology development
- Searching and using data about processes
- Ability to communicate in writing.

Metode poučevanja in učenja:

Študent izbere v dogovoru z učiteljem tri poglavja, ki so najbližja tematiki diplomske naloge ali predvidene zaposlitve oz. zanimanja študenta.

Podrobneje obdela eno od poglavij/tehnologij. Samostojen študij v angleščini in nemščini kot primer in izkušnja iz vseživljenjska učenja.

Learning and teaching methods:

Together with the instructor the student makes a choice of three chapters most close to the thesis topics, or student's future employment, or his interest.

Detailed consideration of one field/technology. Individual study using English and German language as a way and experience to lifelong learning.

Načini ocenjevanja:**Weight (in %)****Assessment:**

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • seminarska naloga, • ustni izpit.	50 50	Student passes the examination if s(he) successfully passed all the following obligations: • Seminar work • Oral examination
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Reference nosilca / Lecturer's references:

ZAJC, Igor, DROFENIK, Mihael. PTCT anomaly in barium-titanate-based composites. *Ceramics international*, 2014, vol. 40, no. 6, str. 8033-8036.

JENUŠ, Petra, LISJAK, Darja, KUŠČER, Danjela, MAKOVEC, Darko, DROFENIK, Mihael. The low-temperature cosintering of cobalt ferrite and lead zirconate titanate ceramic composites. *Journal of the American Ceramic Society*, , 2014, vol. 97, no. 1, str. 74-80.

MUŠIČ, Branka, DROFENIK, Mihael, VENTURINI, Peter, ŽNIDARŠIČ, Andrej. Electromagnetic wave absorption by an organic resin solution based on ferrite particles with a spinel crystal structure. *Ceramics international*, 2012, vol. 34, issue 4, str. 2693-2699.

DRMOTA, Ana, DROFENIK, Mihael, ŽNIDARŠIČ, Andrej. Synthesis and characterization of nano-crystalline strontium hexaferrite using the co-precipitation and microemulsion methods with nitrate precursors. *Ceramics international*, 2012, vol. 38, issue 2, str. 973-979.

OVTAR, Simona, LISJAK, Darja, DROFENIK, Mihael. Preparation of oriented barium hexaferrite films by electrophoretic deposition. *Journal of the American Ceramic Society*, 2011, vol. 94, no. 10, str. 3373-3379.

LISJAK, Darja, DROFENIK, Mihael, et al. Magnetic phase formation in coti-substituted ba hexaferrite coatings prepared with atmospheric plasma spraying. *Journal of the American Ceramic Society*, , 2010, vol. 93, no. 9, str. 2579-2584.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Uvod v biotehnologijo
Course title:	Basic biotechnology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija/ 1. Stopnja VS Chemical Technology/ 1 st level VS		3.	letni Spring

Vrsta predmeta / Course type

Izbirni predmet/ Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Maja Leitgeb

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Potrebno je predhodno znanje organske kemije, biokemijske tehnike in separacijske tehnike.

Prerequisites:

Basic knowledge of organic chemistry, biochemical engineering and separation processes is needed.

Vsebina:

Content (Syllabus outline):

- Biotehnologija – definicija.
- Pripravljalni procesi v biotehnologiji.
- Osnovna znanja v povezavi z načrtovanjem potencialne farmacevtske učinkovine.
- Bioreaktorji.
- Biotehnološki procesi za proizvodnjo živil in krme.
- Poznavanje zakonskih predpisov in patentiranja.
- Proizvodnja antibiotikov.

Laboratorijsko delo:

Laboratorijske vaje s področja biotehnologije.

- Biotechnology – definition.
- Preparative processes in biotechnology.
- Basic knowledge in connection with designing of potential pharmaceutical active substance.
- Bioreactors.
- Biotechnological processes for food and feed production.
- Law regulations and taking out a patent knowledge.
- Production of antibiotics.

Laboratory work:

Laboratory exercises from the field of biotechnology.

Temeljni literatura in viri / Readings:

- 1 Wiley-VCH (ed.): *Ullmann's Biotechnology and Biochemical Engineering*, 2 Volume Set, Wiley-VCH, 1.edition, 2007.
- Gad, Shayne Cox (ed.), *Handbook of Pharmaceutical Biotechnology and Pharmaceutical Development*, Wiley-VCH, 1.edition, 2007.
- R.H. Baltz, A.L. Demain, J.E. Davies, *Manual of Industrial Microbiology and Biotechnology*, 3rd. Ed., ASM Press, Washington, 2010.
- R. Sherlock, J.D. Morrey, *Ethical Issues in Biotechnology*, Rowman & Littlefield Publishers, Inc., Oxford, 2002.

Cilji in kompetence:

Študent pridobi osnovna znanja s področja biotehnologije.

Seznanjen bo z uporabno orientiranim znanjem iz mikrobiologije in biokemije, ki je tesno povezano s kemijskim inženirstvom.

Objectives and competences:

The basic knowledge of biotechnology is given to the students.

They will learn about application-oriented science of microbiology and biochemistry that is very closely connected with chemical engineering.

Predvideni študijski rezultati:

Znanje in razumevanje:

Usvojeno bo osnovno znanje in razumevanje proizvodnje biomase z organizmi oz. deli organizmov ter osnovna znanja, potrebna za načrtovanje biotehnološkega procesa.

Intended learning outcomes:

Knowledge and Understanding:

The basic knowledge and understanding about biomass production from organisms and parts of organisms will be adopted, as well as basic knowledge, required for design of biotechnology process.

Prenesljive/ključne spretnosti in drugi atributi:	Transferable/Key Skills and other attributes:
Predmet se dopolnjuje s predmeti, ki obravnavajo vsebine iz biokemijske tehnike (mikrobiologija, biokemija, biokemijska tehnika).	The subject is related to the subjects which discuss topics in the connection with biochemical engineering (microbiology, biochemistry, biochemical engineering).

Metode poučevanja in učenja:

Predavanja v učilnici, ki je opremljena z avdio-vizualnimi pripomočki.
Individualna priprava seminarских nalog s predstavitevijo in diskusijo.
Laboratorijsko delo na izbranem primeru.

Learning and teaching methods:

Lectures in lecture room, equipped with audio-visual equipment
Individual preparation of seminars and their presentation with discussion.
Laboratory work on selected case.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit je opravljen, če sta pozitivno opravljeni naslednji obveznosti:		Student has to pass successfully the following obligations:
- seminarska naloga	40	- seminary work
- ustni izpit	60	- oral examination

Reference nosilca / Lecturer's references:

1. KAVČIČ, Sabina, KNEZ, Željko, LEITGEB, Maja. Antimicrobial activity of n-butyl lactate obtained via enzymatic esterification of lactic acid with n-butanol in supercritical trifluoromethane. *The Journal of supercritical fluids*, ISSN 0896-8446. 2014, 85, 143-150, doi: [10.1016/j.supflu.2013.11.003](https://doi.org/10.1016/j.supflu.2013.11.003). [COBISS.SI-ID [17392406](https://cobiss.si/17392406)]
2. LEITGEB, Maja, ČOLNIK, Maja, PRIMOŽIČ, Mateja, ZALAR, Polona, GUNDE-CIMERMAN, Nina, KNEZ, Željko. Activity of cellulase and [alpha]-amylase from *Hortaea werneckii* after cell treatment with supercritical carbon dioxide. *The Journal of supercritical fluids*, ISSN 0896-8446. 2013, 78, 143-148, doi: [10.1016/j.supflu.2013.03.029](https://doi.org/10.1016/j.supflu.2013.03.029). [COBISS.SI-ID [16864790](https://cobiss.si/16864790)]
3. ČOLNIK, Maja, PRIMOŽIČ, Mateja, KNEZ, Željko, LEITGEB, Maja. Use of supercritical carbon dioxide for proteins and alcohol dehydrogenase release from yeast *Saccharomyces cerevisiae*. *The Journal of supercritical fluids*, ISSN 0896-8446. 2012, 65, 11-17, doi: [10.1016/j.supflu.2012.02.018](https://doi.org/10.1016/j.supflu.2012.02.018). [COBISS.SI-ID [15901462](https://cobiss.si/15901462)]
4. ŠALIĆ, Anita, PINDRIĆ, Katarina, HOJNIK PODREPŠEK, Gordana, LEITGEB, Maja, ZELIĆ, Bruno. NADH oxidation in a microreactor catalyzed by ADH immobilized on γ -Fe₂O₃ nanoparticles. V: ŽNIDARŠIČ PLAZL, Polona (ur.). *The 2nd international conference Implementation of microreactor technology in biotechnology (IMTB 2013)*, May 5-8, 2013, Cavtat, Croatia, (Green Processing and Synthesis, ISSN 2191-9550, 2 (6), 2013). [S. l.: s. n.], 2013, 2 (6), 569-578, doi: [10.1515/gps-2013-0084](https://doi.org/10.1515/gps-2013-0084). [COBISS.SI-ID ...]

[17312022](#)]

5. THOREY, Paul, KNEZ, Željko, LEITGEB, Maja. Alcohol dehydrogenase in non-aqueous media using high-pressure technologies : reaction set-up and deactivation determination. *Journal of chemical technology and biotechnology*, ISSN 0268-2575. 2010, 85, 1011-1016. [COBISS.SI-ID [14291222](#)]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Tehnologija vod
Course title:	Water technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3	Poletni Spring

Vrsta predmeta / Course type

Izbirni/ Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Marjana Simonič

Jeziki /

Predavanja / Lectures:

Slovenski/Slovene

Languages:

Vaje / Tutorial:

Slovenski/Slovene

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

Analizna kemija

Prerequisites:

Analytical Chemistry

Vsebina:

1. Karakteristike pitnih vod
2. Pravilnik o kvaliteti pitnih vod
3. Kemijske analize pitnih vod
4. Filtracija, mehčanje vode, ionska izmenjava, koagulacija, adsorpcija
5. Glavni onesnaževalci vod in njihovo prečiščevanje
6. Karbonatno ravnotežje v vodah
7. Pregled standardnih postopkov prečiščevanja vod
8. Čiščenje odpadne vode

Ekskurzija na čistilno napravo

Laboratorijsko delo: preučevanje karbonatnega ravnotežja

Content (Syllabus outline):

1. Drinking Water Characteristics
2. Drinking water legislation
3. Chemical water analyses
4. Filtration, softening, ion exchange, coagulation, adsorption
5. Main Water Pollutants
6. Carbonic equilibria in Water
7. Standard methods for water treatment
8. Wastewater Treatment

Excursion to the wastewater treatment plant

Laboratory work: carbonic equilibria

Temeljni literatura in viri / Readings:

Roš M., Simonič M., Šostar-Turk S., *Priprava in čiščenje vod*, Tiskarna tehniških fakultet, 2005

2. *Wastewater Engineering, Treatment and Reuse*, 4th edition. Mc Graw Hill Co, 2003.

3. *Water quality and treatment, a handbook of community Water Supplies*, 4th edition. American Water Works Association, Mc Graw Hill Co, 1990.

4. Manahan S.E., *Environmental Chemistry*, 8th edition, CRC Press USA, 2005

Cilji:

Osnovno znanje o pripravi vod
Osnovne tehnike čiščenja vod
Problematika čiščenja vod
Definirati problem umazane vode in predlagati rešitev

Objectives:

Introduction to water treatment
Principal techniques of water treatment
Problems in water treatment
Recognize the water pollution and propose the solution

Predvideni študijski rezultati:

Znanje in razumevanje:
Osnove tehnologije vod
Spoznati osnovne principe čiščenja vod
Spoznati osnovne parametre pri čiščenju vod
Glavne kemijske reakcije, ki se odvijajo v vodi pri kemijskem čiščenju vod
Prenesljive/ključne spretnosti in drugi atributi:
- osvojiti predznanje za dobro delo v praksi
- pripraviti pisna poročila in drugo dokumentacijo,
- pisno in ustno komunicirati o problematiki.

Intended learning outcomes:

Knowledge and Understanding:
Basic knowledge of Water Treatment
Basic principles of water treatment
Basic water analyses
Principles of water chemical reactions

Transferable/Key Skills and other attributes:

- Achieving knowledge for good practice in industry
- work in team,
- prepare written reports.

Metode poučevanja in učenja:

Predavanja,
laboratorijske vaje,
ekskurzija.

Learning and teaching methods:

Lectures,
Laboratory work,
Excursion.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Usni izpit	60	Oral examination
Seminarska naloga	30	Seminar work
Aktivno delo na predavanjih	10	Active work during lectures

Reference nosilca / Lecturer's references:

VINDER, Aleksandra, SIMONIČ, Marjana, NOVAK-PINTARIČ, Zorka. Influence of surfactants on the removal of AOX using micellar-enhanced ultrafiltration. *International journal of environmental research*, ISSN 1735-6865, Winter 2014, vol. 8, no. 1, str. 204-212.

SIMONIČ, Marjana, BAN, Irena. The influence of electrogalvanic device on scaling. *Central European Journal of Chemistry*, ISSN 1895-1066, 2013, vol. 11, no. 5, str. 698-705.

SIMONIČ, Marjana, VNUČEC, Doroteja. Coagulation and UF treatment of pulp and paper mill wastewater in comparison. *Central European Journal of Chemistry*, ISSN 1895-1066, 2012, vol. 10, no. 1, str. 127-136

PETROVIČ, Aleksandra, SIMONIČ, Marjana. Adsorption of nitrate on activated carbon cloth. V: X. susret mladih kemijskih inženjera, Zagreb, 20. - 21. 02. 2014. FINDRIK, Zvezdana (ur.). *Knjiga sažetaka = Book of abstracts*. Zagreb, 2014: Hrvatsko društvo kemijskih inženjera i tehnologa, str. 115.



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Računalniško projektiranje procesov
Course title:	Computer Aided Process Design

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3.	poletni Spring

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Zdravko Kravanja

Jeziki /

Predavanja / Lectures:

slovenski / Slovenian

Languages:

Vaje / Tutorial:

slovenski / Slovenian

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

-

Prerequisites:

-

Vsebina:

Content (Syllabus outline):

• Uvod:

- pregled uporabe računalniško podprtega načrtovanja, sinteze, planiranja in obratovanja procesov,
- različne tehnike za analizo in optimiranje procesov.
- Osnovno koncepti in računalniška orodja računalniško podprtega načrtovanja procesov:
 - računalniško modeliranje osnovnih procesnih operacij,
 - simulacija procesov: splošni principi simuliranja procesnih shem, stacionarna simuliranje s procesnim simulatorjem ASPEN PLUS ali drugim simulatorjem,
 - optimiranje procesnih shem z uporabo sekvenčnih in enačbenih modularnih simulatorjev,
 - osnove procesne sinteze, predstavitev mešano-celoštevilskega procesnega sintetizerja MIPSYN,

Računalniške vaje: inštaliranje, spoznavanje in uporaba enega od računalniških programov za načrtovanje procesov, poročilo z navodili za uporabo, ilustracijskim primerom in rešeno nalogo.

• Introduction:

- Overview of the use of computer aided process design, synthesis, planning and operations.
- Different techniques for process analysis and optimization.
- Basic concepts and computer tools for computer aided process design:
 - Computer modeling of basic unit operations.
 - Process simulation: general concepts of simulation of process flowsheets, steady state simulation with ASPEN PLUS or other simulator.
 - Optimization of process flowsheets by the use of sequential and equation-oriented modular simulators.
 - Basic concept of process synthesis, Mixed-Integer Process SYNthesizer MIPSYN.
- Computer exercises: installation, study and use of a given computer design tool for process design, report with user's guide, illustrative example, and solved example problem.

Temeljni literatura in viri / Readings:

- Biegler L.T., I.E.Grossmann and A.W.Westerberg, Systematic Methods of Chemical Process Design, Prentice Hall, New Jersey, 1997.
- Braunschweig B., GaniRafiqul, Software Architectures and Tools for Computer Aided Process Engineering, Elsevier, 2002.
- A. Brooke, D. Kendrick, A. Meeraus, R. Raman, GAMS - A user Guide, Scientific Press, GAMS Development Corporation, 2005.

Cilji in kompetence:

Cilj je spoznati osnove računalniško podprte analize, sinteze, načrtovanja, planiranja in obratovanja kemijskih in biokemijskih procesov.

Objectives and competences:

The aim is to give basic overview and knowledge in the computer aided design, synthesis, planning and operation of chemical and biochemical processes.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumeti osnovne koncepte pri računalniško podprtem načrtovanju procesov.

Intended learning outcomes:

Knowledge and Understanding:

To understand basic concepts of computer aided process design.

Prenesljive/ključne spretnosti in drugi atributi:

Imeti razumevanje za pomembnost in učinkovitost uporabe informacijske tehnologije pri načrtovanju, planiranju in obratovanju kemijskih in biokemijskih procesov.

Transferable/Key Skills and other attributes:

To have an understanding of the importance and efficiency of the use of information technology in designing, planning and operating chemical and biochemical processes.

Metode poučevanja in učenja:

Konzultacije, seminar in računalniške vaje.
Samostojno delo študenta.

Learning and teaching methods:

Consultations, seminar work, and computer practice.
Self-learning.

Delež (v %) /

Weight (in %)

Načini ocenjevanja:**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt) Izpit je opravljen, če sta pozitivno opravljeni obe naslednji obveznosti: • seminarska naloga • ustni izpit – predstavitev seminarske naloge	70 30	Type (examination, oral, coursework, project): Student has to pass successfully the following obligations: • Seminar work • Oral exam – presentation of the seminar work
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Reference nosilca / Lecturer's references:

AHMETOVIĆ, Elvis, KRAVANJA, Zdravko. Simultaneous optimization of heat-integrated water networks involving process-to-process streams for heat integration. *Applied thermal engineering*, ISSN 1359-4311. [Print ed.], Jan. 2014, vol. 62, iss. 1, str. 302-217, doi: [10.1016/j.applthermaleng.2013.06.010](https://doi.org/10.1016/j.applthermaleng.2013.06.010).

NEMET, Andreja, KLEMEŠ, Jiri, KRAVANJA, Zdravko. Designing a Total Site for an entire lifetime under fluctuating utility prices. *Computers & chemical engineering*, ISSN 0098-1354. [Print ed.], Available online 18 July 2014, vol. , str. 1-24, doi: [10.1016/j.compchemeng.2014.07.004](https://doi.org/10.1016/j.compchemeng.2014.07.004).

ČUČEK, Lidija, MARTÍN, Mariano, GROSSMANN, Ignacio E., KRAVANJA, Zdravko. Multi-period synthesis of optimally-integrated biomass and bioenergy supply network. *Computers & chemical engineering*, ISSN 0098-1354. [Print ed.], 4 Jul. 2014, vol. 66, str. 57-70, doi: [10.1016/j.compchemeng.2014.02.020](https://doi.org/10.1016/j.compchemeng.2014.02.020).

KRAVANJA, Zdravko, ČUČEK, Lidija. Multi-objective optimisation for generating sustainable solutions considering total effects on the environment. V: DUIĆ, Neven (ur.). *Sustainable development of energy, water and environment systems*, (Applied Energy, ISSN 0306-2619, Vol. 101, (2012)). Oxford: Elsevier, cop. 2012, vol. 101, str. 67-80, doi: [10.1016/j.apenergy.2012.04.025](https://doi.org/10.1016/j.apenergy.2012.04.025).

ČUČEK, Lidija, KLEMEŠ, Jiri, KRAVANJA, Zdravko. A Review of Footprint analysis tools for monitoring impacts on sustainability. *Journal of cleaner production*, ISSN 0959-6526. [Print ed.], Oct. 2012, vol. 34, str. 9-20, doi: [10.1016/j.jclepro.2012.02.036](https://doi.org/10.1016/j.jclepro.2012.02.036).



Univerza v Mariboru

Fakulteta za kemijo
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Premazi
Course title:	Coatings

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	Poletni Spring

Vrsta predmeta / Course type:

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			7,5	7,5	120	5

Nosilec predmeta / Lecturer:

Mojca Škerget

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Osnovna znanja iz organske kemije, polimerov in mehanskih operacij

Prerequisites:

Basic knowledge in organic chemistry, polymers and mechanical operations

Vsebina:

- Surovine za premaze: veziva, topila, pigmenti in polnila, aditivi.
- Premazni sistemi, formulacija, tvorba filma: Osnovni parametri formuliranja; Premazi na osnovi topil; Premazi na vodni osnovi; Radikalno zamrežljivi premazi; Praškasti premazi; Tvorba filma, sušenje in zamreženje.
- Procesne stopnje v proizvodnji premazov: Oprema za proizvodnjo premazov, mešanje in raztapljanje, dispergiranje, drobljenje in gnetenje, filtracija, dispergiranje efektnih pigmentov.
- Substrati in predobdelava.
- Lastnosti in obstojnost premazov in premaznih sistemov.

Vaje s področja premaznih sistemov, formulacije, sušenja, zamreženja premazov in analize lastnosti premaza.

Content (Syllabus outline):

- Raw materials for coatings: Film formers, Solvents, Pigments and fillers, Additives.
- Paint systems, formulation, film-forming: Basic formulating parameters; Solvent-based paints; Waterborne paints; Radically-curing coating materials; Coating powders; Film-forming, drying and curing (crosslinking).
- Process stages in the manufacture of coatings: Configuration of equipment for the manufacture of coatings, mixing and dissolving, dispersion, dispersing units, grinding and kneading, filtration, dispersing effect pigments.
- Substrates and pretreatment.
- Properties and durability of coatings and coating systems.

Labor work: on paint systems, formulation, film-forming (drying and curing, crosslinking) and analysis of coatings properties.

Temeljni literatura in viri / Textbooks:

- B. Müller, U. Poth: *Coatings Formulation*, ISBN: 3-87870-177-2, published May 2006.
- P. Nanetti: *Coatings from A to Z, An alphabetical glossary*, ISBN: 3-87870-173-X, March 2006.
- T. Brock, M. Groteklaes, P. Mischke: *European Coatings Handbook*, ISBN: 3-87870-559-X, March 2000.
- A. Goldschmidt, H.-J. Streitberger: *BASF-Handbuch Lackiertechnik*, Vincentz: Hannover, 2003.

Cilji in kompetence:

Osvojiti osnovna znanja o formuliranju premaznih sistemov in njihovih lastnostih ter procesnih stopnjah v proizvodnji premazov.

Objectives and competences:

Basic knowledge of the formulation of coating systems and their properties, and process stages in the manufacture of coatings.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Osnovne sestave in formuliranja premaznih sistemov,
- Osnovnih procesnih stopenj v proizvodnji premazov,
- tipov premaznih materialov in njihovih lastnosti.

Intended learning outcomes:

Knowledge and Understanding:

- Basics of composition and formulations of paints,
- Process stages in the manufacture of coatings,
- Types of coating materials and their properties.

Prenesljive/ključne spretnosti in drugi atributi: — osnovna predznanja za delo v industriji barv in lakov oz. na področjih njihove uporabe.	Transferable/Key Skills and other attributes: Achieving basic knowledge for praxis in the industry of paints and coatings and areas of their application.
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Metode poučevanja in učenja:

Predavanja
Strokovna ekskurzija v industrijo
Laboratorijske vaje na izbranem primeru in priprava seminarske naloge.

Learning and teaching methods:

Lectures
Visits to the industry
Laboratory work on selected case and preparation of seminars.

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- Seminarska naloga
- Ustni izpit

40**60**

Student passes the examination if s(he) successfully passed all the following obligations:

- Seminar work
- Oral examination

Reference nosilca / Lecturer's references:

1. ŠKERGET, Mojca, ČUČEK, Denis, KNEZ, Željko. Phase equilibria of the propylene glycol/CO₂ and propylene glycol/ethanol/CO₂ systems. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], Nov. 2014, vol. 95, str. 129-136, [COBISS.SI-ID [18135574](#)].
2. ČUČEK, Denis, PERKO, Tina, ILIĆ, Ljiljana, ZNOJ, Bogdan, VENTURINI, Peter, KNEZ, Željko, ŠKERGET, Mojca. Phase equilibria[!] and diffusivity of dense gases in various polyethylenes. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], June 2013, vol. 78, str. 54-62, [COBISS.SI-ID [16830998](#)].
3. ŠKERGET, Mojca, MANDŽUKA, Zoran, MARKOČIČ, Elena, KNEZ, Željko, JEŠE, Robi, ZNOJ, Bogdan, VENTURINI, Peter. Solubility and diffusivity of CO₂ in carboxylated polyesters. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], Jan. 2010, vol. 51, iss. 3, str. 306-311, [COBISS.SI-ID [13799446](#)].
4. KNEZ, Željko, ŠKERGET, Mojca, KNEZ HRNČIČ, Maša, ČUČEK, Denis. Particle formation using sub- and supercritical fluids. V: ANIKEEV, Vladimir (ur.), FAN, Maohong (ur.). *Supercritical fluid technology for energy and environmental applications*. Amsterdam: Elsevier, 2014, str. 31-67, [COBISS.SI-ID [17592854](#)].
5. ŠKERGET, Mojca. *Formuliranje prašnih lakov z visokotlačnim postopkom : zaključno poročilo o rezultatih raziskovalnega projekta*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2011. loč. pag. [COBISS.SI-ID [14953238](#)].



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Živilska tehnologija
Course title:	Food Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3	poletni Spring

Vrsta predmeta / Course type

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Mojca Škerget

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Osnovno znanje prenosnih pojavov (prenos toplote in snovi) in osnovnih procesnih operacij.

Prerequisites:

Basic knowledge on transport phenomena (heat and mass transfer) and unit operations.

Vsebina:

- Sestava živil (ogljikovi hidrati, lipidi, proteini, encimi, vitamini, minerali, barvila, arome) in skupine živil.
- Osnovne operacije in principi procesiranja živil.
- Termični postopki konzerviranja: pasterizacija, sterilizacija, hlajenje, zamrzovanje,....
- Netermični postopki konzerviranja.
- Inovativne metode konzerviranja.
- vpliv procesiranja na kvaliteto prehrabnenih izdelkov: kemijske spremembe in ocena trajnosti produkta.
- Pakiranje prehrabnenih idelkov.

Content (Syllabus outline):

- Food composition (Carbohydrates, lipids, proteins, enzymes, vitamins, minerals, colorants, flavors) and food categories.
- Unit operations and basic principles of food processing.
- Thermal processing for food preservation: pasteurization, sterilization, refrigeration, chilling, freezing,....
- Nonthermal Processing for food preservation.
- Innovative methods for food preservation.
- Effects of food processing on quality of foods: chemical changes during processing and storage

- Proizvodne tehnologije izbranih skupin živilskih izdelkov.

Vaje:

iz izbranih vsebin predmeta: študij procesnih parametrov izbranih tehnoloških postopkov za predelavo živilskih izdelkov in vpliv na kvaliteto produkta.

and Shelf-Life Modeling.

- Food packing.
- Processing technology of selected food product groups.

Labor work:

in selected areas of subject: process parameters study of selected operations in food processing and influence on quality of products.

Temeljni literatura in viri / Textbooks:

- K.J. Valentas, E. Rotstein, R.P. Singh, *Handbook of Food Engineering Practice*, CRC Press, Boca Raton, New York, 1997.
- P. Fellows: *Food Processing Technology: Principles and Practice*, Horwood, New York, 1990.
- P.S Murano, *Understanding Food Science and Technology*, Thomson Learning Wadsworth, Belmont, 2003.

Cilji:

Seznani študente z osnovnimi procesnimi operacijami in principi, ki se uporabljajo za živilske izdelke in njihovo konzerviranje. Študent mora poznati uporabnost različnih metod za različne skupine izdelkov in vpliv procesiranja na kvaliteto izdelka.

Objectives:

The objective is to introduce the student to the unit operations and basic principles of food processing and preservation. The student should be able to evaluate different types of unit operations in connection with treatment of different types of foods and the effects of processing on quality of foods.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Osnovnih operacij in principov procesiranja in konzerviranja prehrabnenih izdelkov
- Vplivov procesiranja in pakiranja na kvaliteto izdelkov

Prenesljive/ključne spretnosti in drugi atributi:
- osnovna predznanja za delo v živilski industriji.

Intended learning outcomes:

Knowledge and Understanding:

- Unit operations and basic principles of food processing and preservation
- effects of processing and packing on quality of foods

Transferable/Key Skills and other attributes:

- Achieving basic knowledge for good praxis in food industry.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje na izbranem primeru in priprava seminarske naloge.
- Ekскурzija v industrijo

Learning and teaching methods:

- Lectures
- Laboratory work on selected case and preparation of seminars.
- Visit to the industry

Načini ocenjevanja:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- Seminarska naloga

Delež (v %) /

Weight (in %)

Assessment:

Student passes the examination if s(he) successfully passed all the following obligations:

- Seminar work

• Usni izpit		• Oral examination
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Reference nosilca / Lecturer's references:

1. RAVBER, Matej, KNEZ, Željko, ŠKERGET, Mojca. Simultaneous extraction of oil- and water-soluble phase from sunflower seeds with subcritical water. Food chemistry, ISSN 0308-8146. [Print ed.], Jan. 2015, vol. 166, str. 316-323, [COBISS.SI-ID 17908502].
2. PAVLOVIČ, Irena, KNEZ, Željko, ŠKERGET, Mojca. Hydrothermal reactions of agricultural and food processing wastes in sub- and supercritical water : a review of fundamentals, mechanisms, and state of research. Journal of agricultural and food chemistry, ISSN 0021-8561, 2013, vol. 61, no. 34, str. 8003-8025, [COBISS.SI-ID 17077526].
3. RUŽIĆ, Iva, ŠKERGET, Mojca, KNEZ, Željko, RUNJE, Mislav. Phenolic content and antioxidant potential of macerated white wines. European Food Research and Technology. A, Zeitschrift für Lebensmittel-Untersuchung und -Forschung, ISSN 1438-2377. [Print ed.], 2011, vol. 233, no. 3, str. 465-472, [COBISS.SI-ID 15174422].
4. MAKOVŠEK, Katja, KNEZ, Željko, ŠKERGET, Mojca. Influence of process parameters on the extraction of flavanones from mandarin peel. Acta chimica slovenica, ISSN 1318-0207. [Tiskana izd.], 2012, vol. 59, no. 4, str. 879-887. [COBISS.SI-ID 16555542].
5. ŠKERGET, Mojca, BEZJAK, Miran, MAKOVŠEK, Katja, KNEZ, Željko. Extraction of lutein diesters from tagetes erecta using supercritical CO₂ and liquid propane. Acta chimica slovenica, ISSN 1318-0207. [Tiskana izd.], 2010, vol. 57, št. 1, str. 60-65, ilustr. [COBISS.SI-ID 14011158].
6. VATAI, Tünde, ŠKERGET, Mojca, KNEZ, Željko, KARETH, Sabine, WEHOWSKI, Manuel, WEIDNER, Eckhard. Extraction and formulation of anthocyanin-concentrates from grape residues. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], May 2008, vol. 45, iss. 1, str. 32-36. [COBISS.SI-ID 12228630].



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Polimeri
Course Title:	Polymers

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3.	poletni Spring

Vrsta predmeta / Course type::

Izbirni / Elective

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Peter Krajnc

Jeziki /

Languages:

Predavanja / Lecture:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Znanje o prenosu toplote in snovi, znanje o osnovni organski ter polimerni kemiji.

Prerequisites:

Knowledge of mass and heat transfer; basic knowledge of organic and polymer chemistry.

Vsebina:

- Metode polimerizacije, ki se uporabljajo v večjem merilu.
- Razdelitev polimerov glede na termične lastnosti.
- Razdelitev polimerov glede na mehanske lastnosti.
- Osnove priprave kompozitnih materialov polimer in..
- Metode karakterizacije polimerov za določanje termičnih in mehanskih lastnosti.
- Laboratorijske vaje: radikalska polimerizacija v masi, radikalska polimerizacija v heterogenem mediju, priprava poliuretanske pene.

Content (Syllabus outline):

- Methods of large scale polymerisations.
- Overview of polymeric materials with regards to thermal properties.
- Overview of polymeric materials with regards to mechanical properties.
- Bases of composite material preparation (polymer and..)
- Methods for the characterisation of thermal and mechanical properties.
- Experimental course: radical polymerisation in bulk, in heterogeneous medium, preparation of polyurethane foam.

Temeljni literatura in viri / Textbooks:

- G. Odian: *Principles of polymerization*, Wiley, 4th Edition, 2004.
- J. Navodnik: *Plastik-orodjar*, Velenje 1998.
- D. Braun, H. Cherdrone, H. Ritter: *Polymer Synthesis: Theory and Practice*, Springer, Berlin, 2001

Cilji:

Spoznati metode polimerizacije, ki se uporabljajo v večjem merilu v industriji.
 Poznati tipe polimernih materialov glede na termične in mehanske lastnosti.
 Spoznati osnove priprave kompozitnih materialov polimer in..
 Poznati metode karakterizacije polimerov za določanje termičnih in mehanskih lastnosti.

Objectives:

To know:
 methods of large scale polymerisations.
 the types of polymeric materials with regards to thermal properties.
 the types of polymeric materials with regards to mechanical properties.
 Bases of composite material preparation (polymer and..)
 Methods for the characterisation of thermal and mechanical properties.

Predvideni študijski rezultati:

Znanje in razumevanje:
 Študent pozna metode polimerizacije, ki se uporabljajo v večjem merilu v industriji.
 Pozna tipe polimernih materialov glede na termične in mehanske lastnosti.
 Študent zna načrtovati primeren polimerni material za potrebno aplikacijo.
 Pozna metode karakterizacije polimerov za določanje mehanskih in termičnih lastnosti in zna interpretirati rezultate teh metod.
 Prenosljive/ključne spretnosti in drugi atributi:
 Poznavanje metod polimerizacije, tipov polimernih materialov, metod karakterizacije.

Intended learning outcomes:

Knowledge and Understanding:
 Student knows the methods of large scale polymerisations. Knows the types of polymeric materials with regards to mechanical properties.
 Student is able to plan the applications of appropriate polymeric material with regards to the characteristics.
 Knows the methods for the characterisation of thermal and mechanical properties.

Transferable/Key Skills and other attributes:
 Knowledge of the methods of polymerisation, types of polymeric materials, methods for characterisation.

Metode poučevanja in učenja:

Predavanje, seminarsko delo, laboratorijske vaje

Learning and teaching methods:

Lectures, seminar work, laboratory experiments

Načini ocenjevanja:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- Pisni izpit
- Seminarska naloga

Delež (v %) /

Weight (in %)

Assessment:

Student passes the examination if s(he) successfully passed all the following obligations:

- Written exam
- Seminar work

Reference nosilca / Lecturer's references:

SUŠEC, Maja, LISKA, Robert, RUSSMÜLLER, Günther, KOTEK, Jiří, KRAJNC, Peter. Microcellular open porous monoliths for cell growth by thiol-ene polymerization of low-toxicity monomers in high internal phase emulsions. *Macromolecular bioscience*, ISSN 1616-5187. doi: 10.1002/mabi.201400219.

HUŠ, Sebastjan, KOLAR, Mitja, KRAJNC, Peter. Microcellular open-porous polystyrene-based composites

from emulsions = Mikrocelični odprtoporozni polistirenski kompoziti iz emulzij. *Materiali in tehnologije*, ISSN 1580-2949.

SEVŠEK, Urška, BRUS, Jiří, JEŘÁBEK, Karel, KRAJNC, Peter. Post polymerisation hypercrosslinking of styrene/divinylbenzene poly(HIPE)s : creating micropores within macroporous polymer. *Polymer*, ISSN 0032-3861. [Print ed.], Jan. 2014, vol. 55, iss. 1, str. 410-415, doi: 10.1016/j.polymer.2013.09.026.

HUŠ, Sebastjan, KRAJNC, Peter. PolyHIPEs from methyl methacrylate : hierarchically structured microcellular polymers with exceptional mechanical properties. *Polymer*, ISSN 0032-3861. [Print ed.], Avg. 2014, vol. 55, iss. 17, str. 4420-4424, doi: 10.1016/j.polymer.2014.07.007.

JERENEC, Simona, ŠIMIĆ, Mario, SAVNIK, Aleš, PODGORNIK, Aleš, KOLAR, Mitja, TURNŠEK, Marko, KRAJNC, Peter. Glycidyl methacrylate and ethylhexyl acrylate based polyhipe monoliths : morphological, mechanical and chromatographic properties. *Reactive & functional polymers*, ISSN 1381-5148. [Print ed.], 2014, vol. 78, str. 32-37, doi: 10.1016/j.reactfunctpolym.2014.02.011.

PODGORNIK, Aleš, SMREKAR, Vida, KRAJNC, Peter, ŠTRANCAR, Aleš. Estimation of methacrylate monolith binding capacity from pressure drop data. *Journal of chromatography. A*, ISSN 0021-9673, 11. Jan. 2013, vol. 1272, str. 50-55, doi: 10.1016/j.chroma.2012.11.057.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Keramika
Course title:	Ceramic

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3.	poletni Spring

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Mihael Drofenik

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Znanje splošne kemije, znanje anorganske kemije in poznavanje materialov.

Prerequisites:

Knowledge of general and inorganic chemistry and materials.

Vsebina:

Content (Syllabus outline):

Predmet zajema osnove keramične tehnologije tradicionalne in tehnične keramiko Keramične surovine Osnove sintranja in razvoja mikrostrukture v keramičnih materialih Tradicionalna keramika (silikatne) Oksidna in neoksidna keramika Elektronska in inženirska keramika Elektronska in tehnična keramika Biokeramika (zobje, sklepi, ...) Cement (beton) in steklo	The subject comprehends elements of ceramic technology for the traditional and technical ceramic Ceramic raw materials Introduction of sintering and microstructure development in ceramic materials Traditional ceramics Oxide and nonoxide ceramics Electronic and Engineering ceramics Bioceramics (dental and joints) Cement (concrete) and Glass
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Temeljni literatura in viri / Readings:

D. Kolar, Keramika I in II, Mladinska Knjiga (1989)

A. Žnidaršič, *Tehnologija keramike*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2009

W. D. Kingery, »Introduction to Ceramics«, John Wilay & Sons, Inc, New York (1963)

J. S. Reed, »Introduction to the Principles of Ceramics Processing«, John Wilay & Sons, Inc, New York (1988)

Cilji in kompetence:

Kandidat bo seznanjen z osnovami keramične tehnologije. Znanje mu bo pomagalo pri razvoju in proizvodnji tradicionalne keramike, elektronske keramike, tehnične keramike in proizvodnji stekla ter cementa.

Kandidat se bo lahko vključil v tehnološki proces izdelave keramičnih materialov.

Objectives and competences:

The candidate will be acquainted with elements of ceramic technology. The skills obtained will assist him during the development and production of traditional ceramics, electronic ceramic, cement and glass product. The candidate will be able to join the development and fabrication process of ceramic and glass production.

Predvideni študijski rezultati:

Znanje in razumevanje:

Samostojno načrtovanje osnovnih tehnoloških procesov povezanih s keramično tehnologijo

Prenesljive / ključne spretnosti in druge sposobnosti:

Pridobitev tehnoloških znanj potrebnih za razumevanje predmetov povezanih z

Intended learning outcomes:

Knowledge and Understanding:

Self-sufficient planning of basic technological processing of ceramic

Transferable/Key Skills and other abilities:

Gaining of technological knowledge needed for attendance of other courses associated with inorganic materials.

anorganskimi materiali. Pridobitev splošnega tehnološkega znanja za sodelovanje pri ostalih tehnoloških predmetih.	Achievement of general technological knowledge required for teamwork with other technological subjects.
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Metode poučevanja in učenja:

• Predavanja • Seminarji • Laboratorijsko delo (izjemoma)
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Learning and teaching methods:

• Lectures • Seminar work • Laboratory work (exceptionally)

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način preverjanja znanja (pisni izpit, ustno izpraševanje, naloge, projekt):		Type of examination (oral, coursework, project):
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student passes the examination if s(he) successfully passed all the following obligations:
• seminar • ustni izpit	50	• seminar • oral exam
	50	

Reference nosilca / Lecturer's references:

1. ZAJC, Igor, DROFENIK, Mihael. PTCR anomaly in barium-titanate-based composites. <i>Ceramics international</i>, 2014, vol. 40, no. 6, str. 8033-8036, 2. JENUŠ, Petra, LISJAK, Darja, KUŠČER, Danjela, MAKOVEC, Darko, DROFENIK, Mihael. The low-temperature cosintering of cobalt ferrite and lead zirconate titanate ceramic composites. <i>Journal of the American Ceramic Society</i>, , 2014, vol. 97, no. 1, str. 74-80, 3. MUŠIČ, Branka, DROFENIK, Mihael, VENTURINI, Peter, ŽNIDARŠIČ, Andrej. Electromagnetic wave absorption by an organic resin solution based on ferrite particles with a spinel crystal structure. <i>Ceramics international</i>, 2012, vol. 34, issue 4, str. 2693-2699, 4. DRMOTA, Ana, DROFENIK, Mihael, ŽNIDARŠIČ, Andrej. Synthesis and characterization of nano-crystalline strontium hexaferrite using the co-precipitation and microemulsion methods with nitrate precursors. <i>Ceramics international</i>, 2012, vol. 38, issue 2, str. 973-979, 5. OVTAR, Simona, LISJAK, Darja, DROFENIK, Mihael. Preparation of oriented barium hexaferrite films by electrophoretic deposition. <i>Journal of the American Ceramic Society</i>, 2011, vol. 94, no. 10, str. 3373-3379, 6. LISJAK, Darja, DROFENIK, Mihael, et al. Magnetic phase formation in coti-substituted ba hexaferrite coatings prepared with atmospheric plasma spraying. <i>Journal of the American Ceramic Society</i>, , 2010, vol. 93, no. 9, str. 2579-2584,
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Univerza v Mariboru

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Pojavi na površinah
Course title:	Processes at Surfaces

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3.	poletni Spring

Vrsta predmeta / Course type

izbirni /elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Regina Fuchs-Godec

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Znanje matematike, fizike in fizikalne kemije

Prerequisites:

Knowledge of mathematics, physics and physical chemistry

Vsebina:

- Splošne lastnosti površin: medfazne meje tekoče-plin, tekoče- tekoče, trdno-tekoče
- Termodinamika površin: površinska napetost in površinska prosta energija
- Metode za proučevanje trdnih površin,
- Interakcije trdno-plin, adsorpcija
- Kemijska adsorpcija, fizikalna adsorpcija, adsorpcijske izoterme
- Filmi na površinah: spontano in kontrolirano nastali filmi na površini
- Površine kovin, oksidov, medfazna površina trdno-trdno in trdno-tekoče
- Dinamika prenosov elektronov
- Laboratorijske vaje: Praktični primeri iz posameznih pojavov na površinah.

Content (Syllabus outline):

- General properties of surfaces: interphases liquid-gas, liquid-liquid, solid-liquid
- Thermodynamics of surfaces: surface tension and surface free energy
- Methods of studying solid surfaces,
- Solid-gas interactions, adsorption
- Chemical adsorption, physical adsorption, adsorption isotherms
- Surface films: spontaneously generated films and films formed under controlled conditions
- Surfaces of metals, oxides, solid-solid and solid liquid interfaces
- Dynamics of electron transfer
- Lab work: Practical examples of some specific topics in surface phenomena.

Temeljni literatura in viri / Readings:

- P. W. Atkins, J. de Paula : *Physical Chemistry*, 8th Ed., Oxford University Press, 2006.
- P. W. Atkins, J. de Paula: *Physical Chemistry*, 7th Ed., Oxford University Press, 2002.
- W. Andeson, A. Gast: *Physical Chemistry of Surfaces*, Willey, New York, 1997.
- J.O. Bockris, S.U.M. Khan: *Surface Electrochemistry, A Molecular Level Approach*, Plenum Press, New York and London, 1993.

Cilji:

Seznaiti z osnovnimi zakonitostmi kemijskega obnašanja površin, s poudarkom na strukturi površin, vezeh, termokemiji in dinamiki obnašanja.

Objectives:

Introduces the student to the basic principles of the chemical behavior of surfaces with emphasis on the fundamental aspects, including surface structure, bonding, thermochemistry and dynamical behavior.

Predvideni študijski rezultati:

Znanje in razumevanje:

Pojavi na površinah so ključnega pomena v mnogih tehnoloških in naravnih procesih in razumevanje le teh je odločilno npr. za: katalizo, korozijo, transport polutantov v zemlji.

Intended learning outcomes:

Knowledge and Understanding:

Surface phenomena are at the heart of many technological and natural processes and understanding of surface event is crucial to: catalysis, corrosion and wear, pollutant transport in soils.

Prenesljive/ključne spretnosti in drugi atributi:	Transferable/Key Skills and other attributes:
Študenti bodo razvili spretnost pisnega komuniciranja, reševanja problemov in uporabljanja znanja pri različnih procesih.	Students will develop written communication skills, problem solving and knowledge application in different processes.

Metode poučevanja in učenja:

Predavanja, reševanje problemov, seminarska naloga, laboratorijske vaje.

Learning and teaching methods:

Lectures, problem sessions, seminar work, lab work.

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:

- Ustni izpit
- Seminarska naloga

Delež (v %) /
Weight (in %)

60
40

Assessment:

Type (examination, oral, coursework, project):
Student passes the examination if s(he) successfully passed all the following obligations:

- Oral examination
- Seminar work

Reference nosilca / Lecturer's references:

1. FUCHS-GODEC, Regina, PAVLOVIĆ, Miomir, TOMIĆ, Milorad V. The inhibitive effect of vitamin-C on the corrosive performance of steel in HCl solutions. *International Journal of Electrochemical Science*, ISSN 1452-3981, 2013, vol. 8, str. 1551-1519. <http://www.electrochemsci.org/papers/vol8/80101511.pdf>. [COBISS.SI-ID [16562966](#)], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 27. 2. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]
2. FUCHS-GODEC, Regina, PAVLOVIĆ, Miomir. Synergistic effect between non-ionic surfactant and halide ions in the forms of inorganic or organic salts for the corrosion inhibition of stainless-steel X4Cr13 in sulphuric acid. *Corrosion science*, ISSN 0010-938X. [Print ed.], May 2012, vol. 58, str. 192-201, doi: [10.1016/j.corsci.2012.01.027](https://doi.org/10.1016/j.corsci.2012.01.027). [COBISS.SI-ID [15809558](#)], [JCR, SNIP, WoS do 6. 8. 2014: št. citatov (TC): 13, čistih citatov (CI): 13, normirano št. čistih citatov (NC): 16, Scopus do 17. 9. 2014: št. citatov (TC): 13, čistih citatov (CI): 13, normirano št. čistih citatov (NC): 16]
3. FUCHS-GODEC, Regina. The erosion-corrosion inhibition of AISI 431 martensitic stainless steel in 2.0 M H₂SO₄ solution using N-alkyl quaternary ammonium salts as inhibitors. *Industrial & engineering chemistry research*, ISSN 0888-5885. [Print ed.], 2010, vol. 49, no. 14, str. 6407-6415, doi: [10.1021/ie100275a](https://doi.org/10.1021/ie100275a). [COBISS.SI-ID [14191894](#)], [JCR,
4. FUCHS-GODEC, Regina, DOLEČEK, Valter. Determination of the critical pitting temperature and the critical ion (Cl⁻) concentration inducing pitting of AISI 304L stainless steel in 0.5 M H₂SO₄. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2004, 51, 3, str. 495-506. [COBISS.SI-ID [9011734](#)], [JCR, SNIP, WoS do 12. 7. 2014: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2, Scopus do 3. 5.

2014: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2]



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Organska analiza
Course title:	Organic analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3.	poletni Spring

Vrsta predmeta / Course type

Izbirni/elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15		15			120	5

Nosilec predmeta / Lecturer:

Jernej Iskra

Jeziki /

Predavanja / Lectures: slovenski / Slovene

Languages:

Vaje / Tutorial: slovenski / Slovene

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

Znanje splošne in organske kemije. Znanje osnovne analizne kemije.

Prerequisites:

Knowledge of general, organic chemistry. Basics of analytical chemistry.

Vsebina:

Content (Syllabus outline):

Kemijske metode določanja organskih spojin.
Uvod v tehniko nuklearne magnetne resonance.
Protionska NMR tehnika. Metode reševanja spektrov.
Infrardeča spektroskopija- teoretske osnove.
Masna spektroskopija organskih spojin- teorija
Masna spektroskopija organskih spojin- fragmentacije.
Kombinacije NMR, IR in MS metod za določitev strukture organske spojine.

Chemical methods of organic compounds structure determination.
Introduction into nuclear magnetic resonance.
Proton NMR technique. Methods for spectra representation.
Infrared spectroscopy- theory behind it.
Mass spectroscopy of organic compounds- theory.
Mass spectroscopy of organic compounds- fragmentations.
Combinations of NMR, IR and MS methods for the determination of structure of organic compounds.

Temeljni literatura in viri / Readings:

R. M. Silverstein, F. X. Webster, D. Kiemle, Spectrometric Identification of Organic Compounds, 7th Ed., Wiley, 2005.
L. D. Field, S. Sternhell, J. R. Kalman, Organic Structures from Spectra, 5th Ed., Wiley, 2013.

Cilji in kompetence:

Spoznati klasične kemijske metode za določanje strukture organskih spojin.
Spoznati metodo protionske NMR spektroskopije; znati rešiti preproste spektre organskih spojin.
Razumeti pojem kemijske ekvivalence, kemijskega premika in sklopitve.
Poznati princip infrardeče spektroskopije. Znati interpretirati infrardeči spekter organske spojine s pomočjo tabel za energijske absorpcije.

Poznati metodo masne spektroskopije in osnovne fragmentacije organskih spojin.

Objectives and competences:

To know:
classical chemical methods for organic compounds structure determination.
The method of proton NMR spectroscopy.
The principle of infrared spectroscopy.
The method of mass spectroscopy of organic compounds.
To understand:
how to interpret simple H NMR spectra.
The meaning of chemical equivalency, chemical shift and coupling.
To interpret infrared spectra of organic compounds with the aid of energy absorption tables.

Predvideni študijski rezultati:

Znanje in razumevanje:
Študent pozna klasične in spektroskopske metode za določanje strukture organskih spojin: NMR, IR, MS.
Zna razlagati NMR, IR in MS spektre organskih spojin in na osnovi teh spektrov določiti strukturo spojine.
Prenesljive/ključne spretnosti in drugi atributi:
Poznavanje metod NMR, IR, MS za določanje strukture organskih spojin

Intended learning outcomes:

Knowledge and Understanding:
Student knows the classical and spectroscopic methods for the determination of the structure of organic compounds: NMR, IR, MS.
Student is able to interpret these spectra and is able to conclude the compound structure.

Transferable/Key Skills and other attributes:
Knowledge of the methods NMR, IR, MS for the determination of structure of organic compounds.

Metode poučevanja in učenja:

Predavanja, seminarske vaje

Learning and teaching methods:

Lectures, seminar tutorial

Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja:		
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Type (examination, oral, coursework, project): Student passes the examination if s(he) successfully passed all the following obligations:
Pisni izpit	100	Written exam

Reference nosilca / Lecturer's references:

Leon Bedrač, **Jernej Iskra**, *Iodine(I) reagents in hydrochloric acid-catalyzed oxidative iodination of aromatic compounds by hydrogen peroxide and iodine*, **Adv. Synth. Catal.**, **2013**, 355, 1243-1248.

Ajda Podgoršek, Marko Zupan, Jernej Iskra, *Oxidative halogenation with "green" oxidants : oxygen and hydrogen peroxide*, **Angew. Chem. Int. Ed.**, **2009**, 48, 8424-8450.

Ajda Podgoršek, Marco Eissen, Jens Fleckenstein, Stojan Stavber, Marko Zupan, **Jernej Iskra**, *Selective aerobic oxidative dibromination of alkenes with aqueous HBr and sodium nitrite as a catalyst*, **Green Chem.**, **2009**, 11, 120-126.

Katja Žmitek, Stojan Stavber, Marko Zupan, **Jernej Iskra**, *The effect of iodine on the peroxidation of carbonyl compounds*, **J. Org. Chem.**, **2007**, 72, 6534-6540.

Katja Žmitek, Stojan Stavber, Marko Zupan, Daniele Bonnet-Delpon, Sebastien Charneau, Phillipe Grellier, **Jernej Iskra**, *Synthesis and antimalarial activities of novel 3,3,6-tetraalkyl-1,2,4,5-tetraoxanes*, **Bioorg. Med. Chem.**, **2006**, 14, 7790-7795.



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Bioinformatika in genomika
Course title:	Bioinformatics and genomics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. Stopnja VS Chemical Technology / 1st level VS		3	poletni Spring

Vrsta predmeta / Course type

Izbirni /Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Uroš Potočnik

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Ni.

Prerequisites:

None.

Vsebina:

Content (Syllabus outline):

Podatkovne zbirke v molekularni biologiji in genomiki:

- indeksiranje in iskalni profili
- Bibliografske podatkovne zbirke (PubMed),
- tekstovne podatkovne zbirke (OMIM)
- faktografske podatkovne zbirke (DNA sekvence (Genbank), genomov, proteinske sekvence (SwissProt), proteinske strukture, ekspresije, metabolne poti
- Integrirani sistemi za dostop do podatkovnih zbirk: Entrez (NCBI), ExPASy, Ensembl

Sekvenčne poravnave in konstrukcija filogenetskih dreves: merila sekvenčne podobnosti, poravnava dveh zaporedij, poravnava večih zaporedij, iskanje podobnih zaporedij v podatkovnih zbirkah (skriti modeli Markov, PSI-Blast, profile), filogenetska drevesa (metoda klastrov, klad, problem različnih stopenj evolucije)

Proteinske strukture in odkrivanje novih zdravil: zvižanje in stabilnost proteinske strukture, superpozicija struktur in strukturne poravnave, klasifikacija proteinskih struktur, predikcija strukture in modeliranje, povezava proteinske strukture z genomom, predikcija funkcije proteinov (ortologi, paralogi), računalniško načrtovanje novih zdravil spojin

Laboratorijske vaje:

Genska tipizacija polimorfizmov v kandidatnih genih izbranih z orodji bioinformatike

Databases in molecular biology and genomics:

- database indexing and search profiles
- bibliographic databases (PubMed)
- text databases (OMIM)
- surveys of molecular biology databases and servers: nucleotide acid sequence databases (GenBank), genome databases, protein sequence databases (Swiss Prot), databases of structures, expression databases, databases of metabolic pathways

Integrated systems for data retrieving: ENTREZ (NCBI), ExPASy, Ensembl

Sequence alignments and phylogenetic trees: measures of similarity, computing the alignment of two sequences, multiple sequence alignments (profiles, PSI-BLAST, Hidden Markov Models), phylogenetic trees (clustering methods, cladistic method, the problem of varying rates of evolution)

Protein structure and drug discovery: protein stability and folding, superposition of structures and structural alignments, evolution of protein structures, classification of protein structures, protein prediction and modeling, assignment of protein structures to genomes, drug discovery and development, computer-assisted drug design

Laboratory work:

- Design and evaluation of assays for genotyping of DNA polymorphisms: transfer of target DNA sequences from databases into DNA sequence analysis tools, PCR primer design, RFLP test

Temeljni literatura in viri / Readings:

1. Lesk A: (2005) Introduction to Bioinformatics. 2nd Ed, Oxford University Press, Oxford, UK
2. Barnes MR, Gray IC: Bioinformatics for geneticist. John Wiley&Sons, R.J.M, West Sussex, 2003.
3. Kanehisa M (2002) Post-genome Informatics. Oxford University Press, Oxford, United Kingdom

Cilji in kompetence:

Študent bo znal uporabljati glavne podatkovne zbirke in programska orodja s področja biokemije, molekularne biologije in genomike

Objectives and competences:

Students will be able to use relevant databases and bioinformatic tools in the fields of biochemistry, molecular biology and genomics.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje: vrste in struktura podatkovnih zbirk pomen in interpretacija molekularno bioloških in genomskih podatkov Prenesljive/ključne spretnosti in drugi atributi: študenti bodo znali uporabljati programska orodja za dostop do relevantnih podatkov iz podatkovnih zbirk s področja molekularne biologije in genomike	Knowledge and Understanding: type and structure of databases meaning and interpretation of molecular biology and genomic data Transferable/Key Skills and other attributes: students will be able to access and retrieve most relevant data from available databases in the field of molecular biology and genomics
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Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory work

Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja:		Type (examination, oral, coursework, project): Student has to pass successfully the following obligations:
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Izpit je opravljen, če sta pozitivno opravljeni naslednji obveznosti:		
pisni izpit	60	written examination
seminar	30	seminar
laboratorijske vaje	10	laboratory work

Reference nosilca / Lecturer's references:

1. JOSTINS, Luke, MITROVIČ, Mitja, POTOČNIK, Uroš. Host-microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature* (Lond.), 2012, vol. 491, no. 7422, str. 119-124, doi: 10.1038/nature11582. [COBISS.SI-ID 512230968],
2. PERIN, Petra, POTOČNIK, Uroš. Polymorphisms in recent GWA identified asthma genes CA10, SGK493, and CTNNA3 are associated with disease severity and treatment response in childhood asthma. *Immunogenetics*, ISSN 0093-7711, 2014, vol. 66, issue 3, str. 143-151, doi: 10.1007/s00251-013-0755-0. [COBISS.SI-ID 17472790]
3. RIVAS, Manuel A, MITROVIČ, Mitja, POTOČNIK, Uroš. Deep resequencing of GWAS loci identifies independent rare variants associated with inflammatory bowel disease. *Nat Genet*, 2011, vol. 43, no. 11, str. 1066-1073, doi: 10.1038/ng.952. [COBISS.SI-ID 15421974],
4. ALMOUZNI, Geneviève, GRGUREVIČ, Neža, MAJDIČ, Gregor, POTOČNIK, Uroš, ILAŠ, Janez, et al. Relationship between genome and epigenome - challenges and requirements for future research. *BMC genomics*, ISSN 1471-2164, 2014, vol. 15, no. 487, str. 1-7. <http://www.biomedcentral.com/1471-2164/15/487>, doi: 10.1186/1471-2164-15-487. [COBISS.SI-ID 512412216]
5. REPNIK, Katja, POTOČNIK, Uroš. Haplotype in the IBD5 region is associated with refractory Crohn's disease in Slovenian patients and modulates expression of the SLC22A5 gene. *J Gastroenterol*, 2011, vol. 46, no. 9, str. 1081-1091, doi: 10.1007/s00535-011-0426-6. [COBISS.SI-ID 15110422].



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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Biokemija in Mikrobiologija
Course title:	Biochemistry and Microbiology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja VS Chemical Technology / 1. Level VS		3	poletni Spring

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15			15		120	5

Nosilec predmeta / Lecturer:

Uroš Potočnik

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / Slovene

slovenski / Slovene

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

Ni.

Prerequisites:

None.

Vsebina:

- Osnove mikrobiologije
- Ogljikovi hidrati: zgradba in biološka vloga
- Lipidi: zgradba in biološka vloga, biološke membrane, transport
- Nukleinske kisline: DNA, RNA, zgradba in biokemijske lastnosti
- Vitamini
- Hormoni
- Temelji celičnega metabolizma in bioenergetika
- Metabolizem ogljikovih hidratov
- Nastanek NADH in NADPH: citratni cikel, glioksilatni cikel in fosfoglukonatna pot
- Verige za prenos elektronov in nastanek ATP
- Metabolizem maščobnih kislin in lipidov
- Metabolizem aminokislin in drugih dušikovih spojin
- Povezovanje, usklajevanje ter posebnosti metabolizma organov
- Osnove molekularne genetike: DNA struktura in lastnosti, replikacija (prokarioti, eukarioti), rekombinacija DNA, DNA popravilni, mehanizmi, mehanizem nastanka DNA mutacij, organizacija, struktura in funkcija genov, struktura genoma (rastlinski, živalski in človeški), transkripcija, translacija, regulacija genske ekspresije
- Osnove dedovanja, kromosomska teorija dednosti, Mendlovo dedovanje, poligensko dedovanje
- Imunski sistem
- Uporaba mikroorganizmov v raziskavah in industriji

Laboratorijske vaje:

- Osnovne mikrobiološke tehnike: priprava gojišč, barvanje po gramu

Content (Syllabus outline):

- Basic microbiology
- Carbohydrates: Structure and Biological Function
- Lipids: Structure and Biological Function, Biological Membranes and Cellular Transport
- Nucleic acids; DNA and RNA: Structure and Function
- Vitamins; Hormones
- Basic Concepts of Cellular Metabolism and Bioenergetics
- Metabolism of Carbohydrates
- Production of NADH and NADPH: The Citric Acid Cycle
- ATP Formation by Electron-Transport Chains
- Metabolism of Fatty Acids and Lipids
- Metabolism of Amino Acids and Other Nitrogenous Compounds
- Integration, Specialization, and Hormonal Control of Metabolism
- Immune system
- Viruses :HIV, SARS, Avian influenza, DNA diagnostics and infection diseases
- Basic molecular genetics: DNA structure and characteristics, replication (prokaryotes, eukaryotes), recombination, repair and mutations, organization, structure and function of genes and chromosomes, genome structure (plant, animal, human) transcription (prokaryotes, eukaryotes), translation, regulation of gene expression
- Chromosomal basis of heredity, Mendelian inheritance, polygenic inheritance
- Immune system
- Microorganisms as tools for research and industry

Laboratory work:

- Basic microbiology techniques: grow medium preparation, bacterial staining according to Gram

Temeljni literatura in viri / Readings:

1. Madigan, T.M., Martinko, J.M., Parker, J.: Brock Biology of Microorganisms, 11th Ed., Prentice Hall, Inc., New Jersey, 2006.
2. Boyer, Rodney F.: Concepts in biochemistry, 3rd ed., J. Wiley & Sons, Hoboken , 2006
3. D.E. Nelson, M.M. Cox, Lehninger Principles of Biochemistry, 6th Ed. W.H. Freeman & Co., New York, 2013.
4. B. ALBERTS et al.: Molecular biology of the cell., 5th Ed., Garland Publish, Inc., New York, 2007

Cilji in kompetence:

Študenti bodo razumeli strukturne značilnosti in lastnosti glavnih skupin biomolekul ter njihovo vlogo v metabolizmu in ostalih bioloških procesih.

Objectives and competences:

Students will understand structural characteristics of major groups of biomolecules and their role in cell metabolism and other important biological processes

Predvideni študijski rezultati:

Znanje in razumevanje:

- osnovne biokemijske in molekularne procese v celici
- osnovne značilnosti, struktura in uporaba mikroorganizmov

Intended learning outcomes:

Knowledge and understanding:

- basic biochemical and molecular processes in the cell
- Basic characteristics, structure and use of microorganisms as tools in biotechnology and research

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory work

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

Izpit je opravljen, če sta pozitivno opravljeni naslednji obveznosti:

pisni izpit

ustni izpit

laboratorijske vaje

Delež (v %) /

Weight (in %)

60

30

10

Assessment:

Type (examination, oral, coursework, project):

Student has to pass successfully the following obligations:

written examination

oral examination

laboratory work

Reference nosilca / Lecturer's references:

1. JOSTINS, Luke, MITROVIČ, Mitja, POTOČNIK, Uroš. Host-microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature (Lond.)*, 2012, vol. 491, no. 7422, str. 119-124, doi: 10.1038/nature11582. [COBISS.SI-ID 512230968],
2. ŠIMENC, Janez, POTOČNIK, Uroš. Rapid differentiation of bacterial species by high resolution melting curve analysis. *Applied biochemistry and microbiology*, ISSN 0003-6838, 2011, vol. 47, no. 3, str. 256-263, doi: 10.1134/S0003683811030136. [COBISS.SI-ID 14937622],
3. RIVAS, Manuel A, MITROVIČ, Mitja, POTOČNIK, Uroš. Deep resequencing of GWAS loci identifies

independent rare variants associated with inflammatory bowel disease. Nat Genet, 2011, vol. 43, no. 11, str. 1066-1073, doi: 10.1038/ng.952. [COBISS.SI-ID 15421974],

4. BERCE, Vojko, PINTO KOZMUS, Carina, POTOČNIK, Uroš. Association among ORMDL3 gene expression, 17q21 polymorphism and response to treatment with inhaled corticosteroids in children with asthma. Pharmacogenomics j. (Print), Dec. 2013, vol. 13, iss. 6.
<http://www.nature.com/tpj/journal/vaop/ncurrent/full/tpj201236a.html>, doi: 10.1038/tpj.2012.36. [COBISS.SI-ID 4406079].

5. REPNIK, Katja, POTOČNIK, Uroš. Haplotype in the IBD5 region is associated with refractory Crohn's disease in Slovenian patients and modulates expression of the SLC22A5 gene. J Gastroenterol, 2011, vol. 46, no. 9, str. 1081-1091, doi: 10.1007/s00535-011-0426-6. [COBISS.SI-ID 15110422].