



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 UN		1.	zimski
Chemical Technology / 1 st level UN			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:

Žigert Pleteršek Petra

Jeziki /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Ni

Prerequisites:

None

Vsebina:

- **Osnovni pojmi:**
množice, funkcije, algebrske strukture, števila.
- **Realne funkcije:**
definicija, osnovni pojmi, graf, pregled elementarnih funkcij in njihovih lastnosti, zaporedja in vrste (realne, kompleksne), potenčne vrste, limita funkcije, zveznost funkcij.
- **Diferencialni račun:**
definicija odvoda, diferencirabilnost, pravila za odvajanje, odvajanje eksplcitnih, implicitnih in parametričnih funkcij, izreki o srednji vrednosti, uporaba odvoda (tangenta na krivuljo, Taylorjeva formula, Taylorjeva vrsta, L'Hospitalovo pravilo, monotonost, ekstremini funkcije).

Content (Syllabus outline):

- **Basic concepts:**
sets, functions, algebraic structures, numbers.
- **Real functions:**
definition, basic concepts, graph, review of elementary functions and their properties, sequences and series (real, complex), power series, limit of the function, continuity of the function.
- **Differential calculus:**
definition of the derivative, differentiability, derivation rules, derivatives of explicit, implicit and parametric functions, mean value theorems (Rolle, Lagrange, Cauchy), use of the derivative (tangent to a [curve](#), Taylor formula, Taylor series, L'Hospital rule, monotonicity, maxima and minima of a function).

Temeljni literatura in viri / Readings:

- P. Žigert Pleteršek, M. Črepnjak, Visokošolski učbenik z rešenimi nalogami: Matematika 1, FKKT, Maribor, 2013, e-gradivo: http://www.fkkt.uni-mb.si/ukemat/Ucbenik_Matematika1.pdf.
- B. Butinar, Matematika I, naloge z rešitvami, FKKT Maribor, 2004.
- P. M. Oblak, Matematika, 1.del, FS Ljubljana, 2001.
- M. Mencinger, Zbirka nalog iz matematične analize in algebre, FG Maribor, 2006.

Cilji in kompetence:

- študent naj pridobi in utrdi znanja s področja diferencialnega računa realnih funkcij,
- študent je seznanjen z uporabo računalnika za numerično in simbolno računanje,
- študent je sposoben samostojnega študija po študijskih virih.

Objectives and competences:

- the student should gain and establish the basic mathematical knowledge of calculus,
- the student is informed about usage of computer for numerical and symbolic calculations,
- the student is capable of an individual study.

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

- študent obvlada temelje diferencialnega računa realnih funkcij,
- študent razume idejo dokazovanja v matematiki,
- študent zna uporabljati študijske vire.

Prenesljive/ključne spretnosti in drugi atributi:

- uporaba odvoda,
- samostojni študij.

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

- the student knows basic concept of differential calculus,
- the student understand the idea of a mathematical proof,
- the student knows how to use textbooks and other study resources.

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.

Delež (v %) /

Weight (in %)

Načini ocenjevanja:

Izpit je opravljen, če sta pozitivno opravljeni naslednji 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

Assessment:

Student has to pass successfully 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. [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
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Splošna kemija
Course title:	General Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		1.	zimski
Chemical Technology / 1 st level UN			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 /**Predavanja / Lectures:** slovenski / Slovene**Languages:****Vaje / Tutorial:** slovenski / Slovene**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Ni

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, electrical terms, galvanic cells)
- **Noble gass and van der Waals**(acquiring of noble gases and their properties, intermolecular

• 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.

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: <i>Splošna in anorganska kemija</i>, Fakulteta za kemijo in kemijsko tehnologijo – Univerza v Mariboru, 2003. • D. F. Shriver, P.W. Atkins: <i>Inorganic Chemistry</i>, Oxford-University Press, 1999. • J. C. Klotz, P. Traichel, Jr.: <i>Chemistry and Chemical Reactivity</i>, Saunders College Publishing, Philadelphia, 1996. • W. Oxtoby, H. B. Gillis, Norman H. Nachtrieb: <i>Principles of Modern Chemistry</i>, Saunders College Publishing, Philadelphia, 1999. • F. Lazarini in J. Brenčič: <i>Splošna in Anorganska kemija</i>, 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.
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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.
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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:

Predavanja Seminarske vaje Uporaba predstavitev s Power Point-om Uporaba interneta Uporaba »virtualne« splošne kemije Demonstracija najpomembnejših kemijskih eksperimentov
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Learning and teaching methods:

Oral lectures Desk exercises Power-Point presentation Use of internet Use of Interactive General Chemistry Demonstration of most important chemical experiments
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Načini ocenjevanja:	Delež (v %) / 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: • računski del izpita (vaje) • teoretični del izpita	50 50	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 has to pass successfully the following obligations: • 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. [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. [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. [COBISS.SI-ID 17817110]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

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
BU20 Kemijska tehnologija		1	zimski
BU20 Chemical Technology		1	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 Individual work	ECTS
45		15			90	5

Nosilec predmeta / Lecturer:

Samo Korpar

Jeziki /

Predavanja / Lectures: Samo Korpar

Languages: S

Vaje / Tutorial: Marko Bračko

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

Znanje srednješolske matematike.

Prerequisites:

Knowledge of high-school mathematics.

Vsebina:

Content (Syllabus outline):

• 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, elastične konstante, strižne deformacije. • Mehanika tekočin: tlak, hidrostatski 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.	• 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. • 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.
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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.

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.

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.	Transferable/Key Skills and other attributes: • Communication skills: manor 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.
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Metode poučevanja in učenja:

• klasična predavanja, • obravnava izbranih poskusov in • reševanje nalog.
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Learning and teaching methods:

• lectures, • treatment of selected experiments and • problem solving.
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Načini ocenjevanja:	Delež (v %) / Weight (in %)	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 $B[\text{sup}]0 \rightarrow D[\text{sup}]^+ D[\text{sup}]^-$ 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 $D[\text{sup}]0 \rightarrow D[\text{bar}]^0$ 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 $[\text{Upsilon}](4S) \rightarrow B[\text{sup}]0 B[\text{bar}]^0$ 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 $[\text{Upsilon}](5S)$ 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:	Računalništvo v kemiji
Course title:	Computer Science in Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		1.	zimski
Chemical Technology / 1 st level UN			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:

Zorka Novak Pintarič

**Jeziki /
Languages:****Predavanja / Lectures:** slovenski / Slovene**Vaje / Tutorial:** 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:**

- Elektronsko učno okolje Moodle.
- Uvod v programiranje:
 - algoritmi in diagrami poteka,
 - spremenljivke, konstante,
 - branje in pisanje podatkov,
 - matematični izrazi,
 - pogojni stavki,
 - zanke,
 - podprogrami.

Content (Syllabus outline):**Lectures:**

- E-learning environment Moodle.
- Introduction to programming:
 - algorithms and flowcharts,
 - variables, constants,
 - data reading and writing,
 - mathematical expressions,
 - conditional statements,
 - loops,
 - subprograms.

- Uporaba programa Excel:
 - obdelava in prikaz podatkov,
 - formule in funkcije,
 - regresijska analiza,
 - pogojno formatiranje in pogojni stavki.
- Uporaba programa Matlab:
 - aritmetične operacije
 - zanke in if stavki
 - funkcije in skripti,
 - solverji za reševanje (ne)linearnih enačb in sistemov (ne)linearnih enačb

Računalniške vaje:

Reševanje problemov iz kemije s programi:

- prevajalnik in urejevalnik Force za programiranje,
- Excel in Matlab za obdelavo podatkov in računanje,
- programi za risanje diagramov poteka, procesnih shem in kemijskih formul,
- Word za pisanje poročil.

- Using Excel for:
 - data processing,
 - formulas and functions,
 - regression analysis,
 - conditional formatting and if statements.
- Using Matlab:
 - arithmetic operations,
 - loops and if statements
 - scripts and functions,
 - solvers for (non)linear equations and systems of (non)linear equations.

Computational work:

Solving application problems in chemistry by using:

- the compiler and editor Force for programming,
- Excel and Matlab for data processing and computing,
- software for drawing flowcharts, process schemes, and chemical formulas,
- Word for writing reports.

Temeljni literatura in viri / Readings:

- M. Krajnc, Računalništvo v kemiji, zbrano gradivo, FKKT Univerze v Mariboru, 2014.
- S. Oreški, Računalništvo v kemiji – Navodila za računalniške vaje, 1. izdaja, FKKT Maribor, 2012.
- M. MacDonald, Excel 2010. The Missing Manual, O'Reilly Media, Inc., 2010.
- S. Oreški, Programsko okolje Force 3.0, Kratek priročnik za uporabo, 1. izdaja, FKKT Maribor, 2012.

Cilji in kompetence:

Spoznati uporabo elektronskih učnih pripomočkov. Osvojiti osnove programiranja za reševanje kemijskih problemov. Razvijati sposobnosti za reševanje kemijskih problemov s programoma Excel in Matlab.
Spoznati programe za obdelavo podatkov, reševanje numeričnih problemov, risanje in pisanje poročil.

Objectives and competences:

Adopt the usage of electronic tools. Knowing the basis of programming languages for solving chemical problems.
Build the skills for solving chemical problems by using Excel and Matlab. Knowing the basis of programs for data processing, numerical problem solving, drawing and report writing.

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

Do rezultatov vodi sistematično, ustvarjalno delo. Elektronska učna okolja omogočajo učinkovitejše učenje. Programiranje omogoča logično razmišljanje. Obstoječi programi omogočajo lažje reševanje kemijskih in tehniških problemov.

Prenesljive/ključne spretnosti in drugi atributi:

Uporaba računalniških programov za reševanje problemov v kemiji in kemijski tehnologiji, priprava pisnega poročila.

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

Systematic and creative work leads to results. E-learning environments enable efficient study. Programming makes possible logical thinking. Commercial programs facilitate chemical and engineering problem solving.

Transferable/Key Skills and other attributes:

Utilizing computer software for chemistry and chemical engineering problem solving, preparing written report.

Metode poučevanja in učenja:

Predavanja, demonstracije računalniških programov, računalniške vaje, priprava pisnih poročil.

Learning and teaching methods:

Lectures, demonstration of computer programs, computer exercises, report writing.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Pogoj za pristop k računalniškim vajam: 35 % pravilno rešenih problemov na 1. pisnem testu.		The condition of accession to computational work: 35 % of solved problems in the first written test.
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- pisni izpit ali 2 pisna testa,	75	- written exam or 2 written tests,
- računalniške vaje.	25	- computational work.

Reference nosilca / Lecturer's references:

NOVAK-PINTARIČ, Zorka, KASAŠ, Mihael, KRAVANJA, Zdravko. Sensitivity analyses for scenario reduction in flexible flow sheet design with a large number of uncertain parameters. *AIChE journal*, ISSN 0001-1541. [Print ed.], Avg. 2013, vol. 59, iss. 8, str. 2862-2871, doi: 10.1002/aic.14061. [COBISS.SI-ID 16795926]

TOKOS, Hella, NOVAK-PINTARIČ, Zorka. Development of a MINLP model for the optimization of a large industrial water system. *Optimization and engineering*, ISSN 1389-4420, 2012, vol. 13, iss. 4, str. 625-662, doi: 10.1007/s11081-011-9162-2. [COBISS.SI-ID 15125014]

NOVAK-PINTARIČ, Zorka, KRAVANJA, Zdravko. Identification of critical points for the design and synthesis of flexible processes. *Computers & chemical engineering*, ISSN 0098-1354. [Print ed.], July 2008, vol. 32, iss. 7, str. 1603-1624. <http://dx.doi.org/10.1016/j.compchemeng.2007.08.003>, doi: 10.1016/j.compchemeng.2007.08.003. [COBISS.SI-ID 11658518]

KRAVANJA, Zdravko, NOVAK-PINTARIČ, Zorka, ŠKOF, Gorazd. *Sinteza optimalnega procesa čiščenja odpadnih oljnih emulzij : programska oprema*. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, Laboratorij za procesno sistemsko tehniko in trajnostni razvoj, 2013. 1 CD-ROM. [COBISS.SI-ID 17120278]

NOVAK-PINTARIČ, Zorka, KRAVANJA, Zdravko. A novel bi-level optimization method for the identification of critical points in flow sheet synthesis under uncertainty. [S. l.: s. n.], 2012. <http://www.minlp.org/library/problem/index.php?i=143&lib=MINLP>. [COBISS.SI-ID 17231126]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		1.	zimski
Chemical Technology / 1 st level UN			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:

Darko Goričanec

Jeziki /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Ni pogojev:

Prerequisites:

None:

Vsebina:

- Pravila in standardi tehničnega risanja
- Računalniško podprto risanje
- 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)
- Cevovodi: raztezanje, kompenzatorji
- Razstavljive vijačne zveze, prirobnice, tesnilni elementi
- Nerazstavljivi zvarni spoji
- Osi in gredi
- Tlačne in reaktorske posode
- Mešala, homogenizacija tekočin, suspenzij in

Content (Syllabus outline):

- Rules and standards for technical drawing
- Computer Aided Drawing
- 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 stress)
- Pipelines: expansion, expansion joint
- Separable screw fasteners
- Inseparable welding joints
- Axles and beams
- Pressure and reactors vessels
- Mixers, homogenization of liquids, suspensions

emulzij • Seminarske vaje: Reševanje primerov iz vsebine predmeta

and emulsions • Tutorials Examples from the theme of the subject
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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 Maschineelemente: 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.
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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:

- predavanja
- avditorne vaje

Learning and teaching methods:

- lectures
- practical work at tutorials

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • teoretični del • računski del • poročilo Teoretični in računski del tvorita celoto in se preverjata hkrati.	40 50 10	Student has to pass successfully the following obligations: • Theoretical part • Calculation part • Seminar The theoretical and the calculus part of exam are performed simultaneously.
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Reference nosilca / Lecturer's references:

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.

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*

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.

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



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		1.	poletni
Chemical Technology / 1 st level UN			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			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:** sistemi linearnih enačb, Gaussova eliminacijska metoda, seštevanje in množenje matrik, množenje matrik s skalarji, algebrske strukture nad matrikami, determinanta kvadratne matrike, Cramerjev izrek.
- **Integralni račun:** definicija in osnovne lastnosti nedoločenega integrala, integracijske metode, Riemannova definicija določenega integrala, osnovni izrek integralnega računa, računanje določenega integrala (Newton-Leibnizova formula, trapezna in Simpsonova formula), nepravi določeni integral.
- **Navadne diferencialne enačbe (NDE):** uvod in osnovni pojmi, Eulerjeva numerična metoda za reševanje začetne naloge, analitično

Content (Syllabus outline):

- **Linear algebra:** systems of linear equations, Gaussian elimination, definition of matrices, adding and multiplying matrices, scalar multiplication, algebraic structure in sets of matrices, determinant of a square matrix, Cramer's rule.
- **Integral calculus:** definition and basic concepts of antiderivative, integration methods, Riemann's definition of the definite integral, fundamental theorem of calculus, calculation of definite integrals (Newton-Leibniz rule, trapezoidal and Simpson's rule), improper integrals.
- **Ordinary differential equations (ODE):** introduction and first definitions, Euler method for solving an initial value problem, some methods for solving ODE of first order, linear

reševanje nekaterih NDE enačb 1. reda, linearne NDE višjega reda, reševanje linearnih NDE s konstantnimi koeficienti, reševanje linearnih NDE s potenčnimi vrstami.

ODE of higher order, method of solving linear ODE with constant coefficients, use of power series in solving linear ODE.

Temeljni literatura in viri / Readings:

- B. Butinar, Matematika, 1. del, FKKT, Maribor, 2006.
- B. Butinar, Matematika 2.del, FKKT, Maribor, 2007.
- F. Brešar, Matematika 3.del, FKKT, Maribor, 1997.
- B. Butinar, Matematika I, naloge z rešitvami, FKKT Maribor, 2004
- P. M. Oblak, Matematika, 1.del, FS Ljubljana, 2001
- M. Mencinger, Zbirka nalog iz matematične analize in algebre, FG Maribor, 2006

Cilji in kompetence:

- študent naj pridobi in utrdi temeljna znanja s področja integralnega računa realnih funkcij, matričnega računa in diferencialnih enačb,
- študent je seznanjen z uporabo računalnika za numerično in simbolno računanje,
- študent je sposoben samostojnega študija po študijskih virih.

Objectives and competences:

- the student should gain and establish the basic mathematical knowledge of calculus, linear algebra and ordinary differential equations and know how to use them at other courses,
- the student is informed about usage of computer for numerical and symbolic calculations,
- the student is capable of an individual study.

Predvideni študijski rezultati:

Znanje in razumevanje:

- študent zna računati z matrikami in jih uporabljati, zna reševati navadne diferencialne enačbe,
- študent zna uporabljati računalnik za numerično in simbolno računanje,
- študent zna uporabljati študijske vire.

Prenesljive/ključne spretnosti in drugi atributi:

- uporaba določenega integrala, matričnega računa in navadnih diferencialnih enačb,
- samostojni študij.

Intended learning outcomes:

Knowledge and Understanding:

- the student has knowledge of calculus, matrix calculus and ordinary differential equations,
- the student is able to use computer for numerical and symbolic calculations,
- the student knows how to use textbooks and other study resources.

Transferable/Key Skills and other attributes:

- the use of calculus, matrices and ordinary differential equations,
- 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 symbolic calculations,
- homework.

Načini ocenjevanja:

Izpit je opravljen, če sta pozitivno opravljeni naslednji 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 %)

60
40

Assessment:

Student has to pass successfully 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. [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
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Anorganska kemija
Course title:	Inorganic Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		1.	poletni
Chemical Technology / 1 st level UN			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			60	4

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:**

Ni

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 pomembnejših prehodnih elementov: Ti, V, Cr, W, Mn, Fe, Co, Ni, Pt, Cu, Ag, Au, Zn, Hg, - Lantanoidi in Aktinoidi

Content (Syllabus outline):

The subject basic principles of inorganic chemistry - The Group VII elements: F, Cl, Br, I - The Group VI elements: S, Se, Te, Po - The Group V elements: N, P, As, Sb, Bi - The Group IV elements: C, Si, Ge, Sn, 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 representative transition elements: Ti, V, Cr, W, Mn, Fe, Co, Ni, Pt, Cu, Ag, Au, Zn, Hg, - Lantanides and Actinides

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 in kompetence:

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 and competences:

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

Information Communications Technologies
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 has to pass successfully 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.

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 I
Course title:	Analytical Chemistry I

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

- Obdelava in interpretacija rezultatov: sistematske in slučajne napake, uporaba statistike za ovrednotenje meritev.
- 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.
- Volumetrija.
- titrimetrija z vizuelnimi indikatorji: priprava standardnih raztopin, acidi in alkalimetrične titracije, redukcijsko-oksidacijske, obarjalne in kompleksometrične titracije, titracija v nevodnem mediju.
- Gravimetrija.

Content (Syllabus outline):

- Evaluation and interpretation of results, systematic and random errors, statistical methods for evaluation of measurements.
- 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 of analytical methods.
- Volumetry.
- Titrimetry using visual indicators: preparation of standard solutions, acid/base titrations, oxidation/reduction titrations, precipitation titrations, complex formation titrations, titrations in nonaqueous media.
- Gravimetry.

Laboratorijske vaje gravimetrija - titrimetrija z vizuelnimi indikatorji (priprava standardnih raztopin, acidi-in alkalimetrične titracije, redukcijsko oksidacijske, obarjalne in kompleksometrične titracije).	Laboratory work Gravimetry -Titrimetry using visual indicators (preparation of standard solutions, acid/base titrations, oxidation/reduction titrations, precipitation titrations, complex formation titrations),
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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. Primeri iz področij anorganske kemije, organske kemije in biokemije se uporabljajo za razumevanje kemijskih in fizikalnih procesov, ki spremljajo analizni postopek, z vidikov kemijskih ravnotežij in kinetike. Znanje se širi in pogloblja z računskimi pristopi baziranimi na fiziki ter z aplikacijo znanj anorganske in organske kemije.

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.
 Examples from inorganic chemistry, organic chemistry and biochemistry are used for understanding of chemical and physical processes which accompany the analytical procedure from the view of chemical equilibrium and kinetics. Knowledge is spread and improved using calculation principles based on knowledge of physics and using applications from inorganic and organic chemistry.

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

Prenesljive/ključne spretnosti in drugi atributi:

Ročne spretnosti, predvsem sposobnost praktičnega dela z laboratorijsko steklovino in opremo. Reševanje analiznih problemov, od

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.

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

enostavnejših do bolj zapletenih in reševanje računskih nalog z uporabo stehiometričnih razmerij in ravnotežnih reakcij. Računanje merilne negotovosti.

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		Conditions to access the laboratory work: Concluded lab work of Inorganic chemistry and two written tests
Pristopni pogoji za opravljanje izpita: Opravljene lab. vaje in test iz vaj Analizna kemija I. Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Conditions to access the examination: Concluded lab. work and written test of lab. work in Analytical Chemistry I. Student has to pass successfully the following obligations:
Ocenjevanje predmeta		Assesment of the subject
- Računski naloge	30	- Coursework, analytical calculations
- Ustni izpit	40	- Oral examination
Ocenjevanje lab. vaj		Assesment of lab work
- Pisni test po zaključenih laboratorijskih vajah	30	-Written test 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](https://www.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](https://www.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](https://www.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](https://www.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](https://www.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
BU20 Kemijska tehnologija		1	poletni
BU20 Chemical Technology		1	Spring

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 Individual work	ECTS
45		15	30		90	6

Nosilec predmeta / Lecturer:

Samo Korpar

Jeziki /

Predavanja / Lectures: Samo Korpar

Languages: S

Vaje / Tutorial: Marko Bračko

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

Znanje iz predmeta Fizika I.

Prerequisites:

Knowledge of Physics I.

Vsebina:

Content (Syllabus outline):

• 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, ampermeter 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.	• 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.
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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:

Objectives and competences:

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 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 poenostavitve 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),
- laboratorijske vaje (dnevnik, zagovor),
- ustni izpit.

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),
- laboratory work (lab reports, defence),
- 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. 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)

Procesne balance



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Procesne balance
Course title:	Process Balances

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		1.	poletni
Chemical Technology / 1 st level UN			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
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30			30		60	4
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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:

Osnovno znanje iz splošne kemije, matematike, računalništva v kemiji.

Prerequisites:

Basic knowledge of anorganic chemistry, mathematics, computer science in chemistry.

Vsebina:

Predavanja:

- Procesne bilance:
 - kemijski procesi,
 - pretvarjanje enot veličin,
 - masne bilance procesnih enot brez kemijske reakcije,
 - masne bilance kemijskih reaktorjev,
 - masne bilance sistemov procesnih enot.
- Obdelava podatkov:
 - transformacija koordinat,
 - linearna regresija,
 - linearna in kvadratna interpolacija.
- Numerične metode:
 - reševanje nelinearnih algebrskih enačb z numeričnimi metodami (zaporedna substitucija, Wegsteinova in Newtonova metoda, metoda polovičnega intervala),
 - reševanje sistemov linearnih enačb (Gauss-Jordanova metoda in LU razcep).

Računalniške vaje:

Na osnovi osvojene teorije študentje uporabljajo različne numerične metode pri reševanju matematičnih in kemijskih problemov. Prav tako spoznajo uporabnost programov Excel, Polymath in Aspen Plus. Osnove uporabe Aspen Plus programa spoznavajo pri preračunavanju masnih bilanc posameznih procesnih enot, ki jih nato združijo v sistem procesnih enot.

Content (Syllabus outline):

Lectures:

- Process balances:
 - chemical processes,
 - conversion of units,
 - material balances of process units without chemical reaction,
 - material balances of chemical reactors,
 - material balances of multiple-unit processes.
- Data processing:
 - transformation of coordinates,
 - linear regression,
 - linear and quadratic interpolation.
- Numerical methods:
 - solving algebraic nonlinear equations with numerical methods (successive substitution, Wegstein and Newton methods, half-interval method),
 - solving simultaneous linear equations (Gauss-Jordan method, LU decomposition).

Computational work:

On the basis of the learned theory students use different numerical methods at mathematical and chemical problem solving. They learn how to use Excel, Polymath mathematical program and Aspen Plus program. Aspen Plus is used at mass balance calculations for single process units and the system of process units.

Temeljni literatura in viri / Readings:

- D. M. Himmelblau, J. B. Riggs: *Basic Principles and Calculations in Chemical Engineering*, 7th Edition, Prentice-Hall, New Jersey, 2004.
- R. M. Felder, R. W. Rousseau: *Elementary Principles of Chemical Processes*, John Wiley & Sons, Inc., New York, 2000.
- M. Krajnc, S. Oreški, F. Purkeljc: *Procesne bilance*, FKKT, Maribor, 2012.
- M. Krajnc: *Procesne bilance*, zbirka rešenih nalog, zbrano gradivo, FKKT Maribor, 2011.
- 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, formativno preverjanje znanja z interaktivnim multimedijem učnim gradivom in e-testi.

Learning and teaching methods:

Active teaching and learning, cooperative learning, e-learning, 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:		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:
- pisni izpit ali 2 pisna testa,	40	- written exam or 2 written tests,
- ustno izpraševanje ali 2 e-testa,	20	- oral examination or 2 e-tests,
- računalniške vaje.	40	- computational work.

Reference nosilca / Lecturer's references:

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.

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.

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

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

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



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Matematika III
Course title:	Mathematics III

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		2.	zimski
Chemical Technology / 1 st level UN			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			105	6

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 iz Matematike I in Matematike II

Prerequisites:

Knowledge of Mathematics I and Mathematics II

Vsebina:

- **Diferencialni račun vektorskih funkcij:** definicija vektorskih funkcij in osnovni pojmi; skalarne funkcije vektorske spremenljivke, diferencirabilnost, gradient, odvod v smeri, Taylorjeva formula, lokalni in vezani ekstremini; vektorske funkcije vektorske spremenljivke, diferencirabilnost, Jacobijeva matrika, reševanje sistemov nelinearnih enačb, uvod v diferencialno geometrijo.
- **Laplaceova transformacija in diferencialne enačbe:** osnovni pojmi in lastnosti, uporaba tabele, reševanje linearnih NDE, reševanje sistemov linearnih NDE; uvod v parcialne diferencialne enačbe, PDE 1. reda, rešitev problemov nihanja strune in prevajanja toplote.

Content (Syllabus outline):

- **Differential calculus of vector functions:** definition of vector functions and basic concepts; scalar functions of vector variable, differentiability, gradient, directional derivative, Taylor formula, local extremas, constrained optimizing; vector functions of vector variable, differentiability, Jacobi's matrix, systems of nonlinear equations, introduction to the differential geometry.
- **Laplace transform and differential equations:** basic concepts and properties, use of table, solution of linear ODE, solution of systems of linear ODE; partial differential equations (PDE) – basic concepts, PDE of first order, wave equation

- **Linearna algebra:**
vektorski prostor kot algebrska struktura, linearna neodvisnost, baza, zamenjava baze, rang matrike, evklidski prostori, ortogonalna baza, Fourierjeva vrsta; linearne transformacije, matrika linearne transformacije, lastne vrednosti in lastni vektorji, diagonalizacija kvadratne matrike, reševanje sistemov homogenih linearnih NDE 1. reda.

and heat conduction.

- **Linear algebra:**
vector space as an algebraic structure, linear independence, base, change of basis, rank of a matrix, Euclidean spaces, orthogonal basis, Fourier series, linear transformations, matrix of a linear transformation, eigenvalues and eigenvectors, diagonalization of a square matrix, solution of a system of homogeneous linear ODE with constant coefficients

Temeljni literatura in viri / Readings:

- B. Butinar, Matematika 2.del, FKKT, Maribor, 2007.
- F. Brešar, Matematika 3.del, FKKT, Maribor, 1997.
- P. M. Oblak, Matematika, 2. del, FS, Ljubljana, 1997.
- P. M. Oblak, Matematika, 3.del, FS, Ljubljana, 1989.
- M. Mencinger, P. Šparl, B. Zalar, Zbirka rešenih nalog iz Matematike II, FG, Maribor, 2007.

Cilji in kompetence:

- študent naj pridobi in utrdi znanja s področja linearne algebre, vektorskih funkcij in diferencialnih enačb,
- študent je seznanjen z uporabo računalnika za numerično in simbolno računanje,
- študent je sposoben samostojnega študija po študijskih virih.

Objectives and competences:

- the student should gain and establish the basic mathematical knowledge of linear algebra, vector functions and differential equations,
- the student is informed about usage of computer for numerical and symbolic calculations,
- the student is capable of individual study.

Predvideni študijski rezultati:

Znanje in razumevanje:

- študent zna uporabiti elemente linearne algebre in diferencialnega računa vektorskih funkcij pri reševanju nelinearnih sistemov enačb in sistemov diferencialnih enačb,
- študent zna uporabljati računalnik za numerično in simbolno računanje,
- študent zna uporabljati študijske vire.

Prenesljive/ključne spretnosti in drugi atributi:

- uporaba linearne algebre, vektorskih funkcij in diferencialnih enačb,
- samostojni študij.

Intended learning outcomes:

Knowledge and Understanding:

- the student is able to use elements of linear algebra at solving simultaneous nonlinear equations and simultaneous differential equations,
- the student is able to use computer for numerical and symbolic calculations,
- the student knows how to use textbooks and other study resources.

Transferable/Key Skills and other attributes:

- the use of linear algebra, vector functions and differential equations,
- 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 symbolic calculations,
- homework.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če sta pozitivno opravljeni naslednji 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 has to pass successfully 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. [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
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Fizikalna kemija I
Course title:	Physical Chemistry I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		2.	zimski
Chemical Technology / 1 st level UN			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 /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**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:

- Osnovni koncepti termodinamike (prvi, drugi in tretji zakon termodinamike)
- Fizikalne pretvorbe čistih snovi: Stabilnost faz in fazni prehodi, Površinske lastnosti tekočin
- Enostavne mešanice: Idealne in realne raztopine
- Fazni diagrami večkomponentnih sistemov
- Kemijsko ravnotežje in ravnotežna elektrokemija: Elektrode in elektrokemijski členi
- Kemijska kinetika: Eksperimentalna kinetika, Reakcije v plinih

Content (Syllabus outline):

- Basic concepts of thermodynamics (the first, the second and the third law of thermodynamics)
- Physical transformations of pure substances: Phase stability and phase transitions, The physical liquid surface
- Simple mixtures: Ideal and real solutions
- Phase diagrams of multi-component systems
- Chemical equilibrium and Equilibrium electrochemistry: Electrodes and the electrochemical cell
- Chemical kinetics: Experimental kinetics, Gas reactions

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.
- R.J. Silbey, R.A. Alberty, M.G. Bawendi, *Physical Chemistry*, 4th Ed., John Wiley & Sons, Inc., 2005
- 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 enostavnih znanstvenih 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.
- razumeti, kako izpeljemo iz eksperimentalnih podatkov hitrostne zakone

Prenesljive/ključne spretnosti in drugi atributi:

Študenti bodo razvili spretnost pisnega komuniciranja, reševanja problemov, kritičnega in logičnega razmišljanja, 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.
- understand how rate equations are deduced from experimental data

Transferable/Key Skills and other attributes:

Students will develop written communication skills, problem solving, critical and logical thinking, 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:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če sta pozitivno 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.	50 50	Student has to pass successfully 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, FRECEER, 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

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		2.	zimski
Chemical Technology / 1 st level UN			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
 Prenosljive/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, laboratorijske vaje

Learning and teaching methods:

Lectures, seminar work, laboratory experiments

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
Pisni izpit	60	Written exam
Ustni izpit	40	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.

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.

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.

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.

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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Mehanika fluidov I
Course title:	Fluid Mechanics I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		2.	Zimski
Chemical Technology / 1 st level UN			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	15		90	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:

- Lastnosti fluidov: gostota, viskoznost, kompresibilnost, površinska napetost, ne-Newtonovi in Newtonovi fluidi
- Merjenje tlaka in pretoka: manometer, U – cev, Pitotova cev, Venturi – cev, pretočna šoba, rotameter, odprti kanal
- Sile fluidov v mirovanju, sprememba hidrostaticnih sil in tlakov, sile na ravne in ukrivljene ploskve, fluid s spospeškom, vzgon in plavanje
- Pretok fluidov: laminarni in turbulentni pretok, Bernoulljeva, kontinuitetna in energijska enačba, izguba tlaka
- Iztok iz posod, vodni pretok v odprtih kanalih
- Dimenzijska analiza
- Sile fluidov v gibanju, impulzno – momentna enačba, sile na mirujočo steno, cevno koleno in premikajoče stene

Content (Syllabus outline):

- Fluid properties: density, viscosity, compressibility, surface tension, Newton and Nonnewton fluids
- Pressure and flow measurement: manometer, U tube, Pitot tube orifice meter, Venturi tube, flow nozzle, flow meter, open channel
- Forces due to static fluids: hydrostatic forces and pressure variation, forces on plane and curved surfaces, fluid under acceleration, buoyancy and stability
- Flow of fluids: laminar – turbulent flow, Bernoulli's, continuity and energy equation, loss of head
- Water flow in open channels, dimensional analysis
- Forces due to fluids in motion: forced equation, impulse – momentum equation, forces on stationary objects, bends in pipe lines and moving

• Stisljivi pretok plinov: adiabatni in izotermalni pretok v ceveh s trenjem, osnovne enačbe pretoka v ceveh, tok skozi male odprtine in šobe, posoda s cevjo • Laboratorijske vaje: Bernoulljev teorem, hidravlični udar, karakteristična krivulja vzporedno in zaporedno vezanih črpalk • Seminarske vaje: rešitev primerov iz vsebine predmeta, računalniški izračun pretočno – tlačnih razmer v pretočnem sistemu	objects flow from vessels • Compressible flow of gases: adiabatic and isothermal flow in a pipe with friction, working equations for flow in pipes, flow through an orifice or nozzle, pipe leading from a storage vessel • Laboratory work: Bernoulli theorem Hydraulics blow Characteristic curve of pumps in parallel or in series. • Tutorials: examples from the theme of the subject, computer calculation of fluid flow and pressure drop in fluid system
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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
- J. M. Coulson, J. N. Richardson: *Chemical engineering*, vol.1, Pergamon press, 1990.
- N. De Nevers: *Fluid mechanics for chemical engineering*, McGraw-Hill, 1991.
- G. K. Batchelor: *An introduction to fluid dynamics*, Cambridge University Press, 2000

Cilji:

Razumevanje principov pretokov fluidov, hidrostike in mehanizmov kadar rešujemo elementarne in praktične probleme.

Objectives:

Understanding the principles of fluid flow, hydrostatics and mechanism when solving elementary and practical 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 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 students creativity and logical thinking

Metode poučevanja in učenja:

Predavanja: študent spozna teoretične vsebine predmeta.

Avditorne in laboratorijske vaje: študent utrdi teoretično znanje in spozna aplikativne možnosti reševanja primerov iz prakse.

Learning and teaching methods:

Lectures: the student gets acquainted with theoretical content of the subject.

Practical and laboratory work: the student upgrades the theoretical knowledge with practical experience.

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

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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		2.	zimski
Chemical Technology / 1 st level UN			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:

- Mehanizmi prenosa toplote: prevod, prestop, sevanje
- Analitično reševanje zgledov prevoda toplote (stena, valj, krogla)
- Analitično reševanje zgledov prestopa toplote (stena, cev, snop, itd.)
- Sevanje toplote: Stefan – Boltzmanov zakon, sivo telo, sevanje med dvema površinama
- Prestop toplote pri kondenzaciji: kapljičasta in filmska kondenzacija.
- Prestop toplote pri uparjanju
- Nestacionarno segrevanje in hlajenje trdnih teles. Primeri: ves upor je v površini, pomembna sta upora površja in telesa, upor površja je zanemarljiv.
- Toplotni prenosniki: vrste, toplotna prevodnost, temperaturni profil sotočnega in protitočnega prenosnika, cevno plaščni prenosnik, ploščni prenosnik, prenos toplote fluidiziranih plasti.

Content (Syllabus outline):

- Mechanisms of heat transfer: conduction, convection and radiation,
- Analytical solution to conduction heat transfer problems (slab, cylinder, sphere)
- Analytical solution of convective heat transfer (wall, tube, tube bank, etc.)
- Heat radiation: Stefan – Boltzman law, grey body, radiation between two adjacent surfaces.
- Heat transfer during condensation, drop wise and film wise condensation.
- Heat transfer during boiling.
- Unsteady heating and cooling of solid objects. Examples: all resistance is at its surface, surface and internal resistance are important, surface resistance is negligible
- Heat exchangers: types, the overall heat transfer coefficient, temperature profiles in counter-current and concurrent exchangers, shell and tube exchangers, compact exchanger, fluidized

Seminarske vaje reševanje primerov iz vsebine predmeta Laboratorijske vaje: Prenos toplote z naravno in prisilno konvekcijo Izmenjava toplote v cevnem prenosniku toplote Prenos toplote skozi fluidizirane plasti	bed heat exchangers Tutorials: examples from the theme of the subject Laboratory work: Heat transfer at the natural and forced convection Heat transfer in pipe heat exchanger Heat transfer through the fluidized beds.
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Temeljni 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.
- G. Sam Samdami: *Heat Transfer Technologies and Practices*, Chemical eng. Staff, 1996.
- F. P. Incropera, D. P. DeWitt: *Fundamentals of Heat and Mass Transfer*, 4th edition, John Wiley & sons, 1996.
- J. R. Welty, C. E. Wicks, R. E. Wilson, G. L. Rorrer: *Fundamentals of Momentum, Heat and Mass Transfer*, 4th edition, John Wiley & Sons, 2000.
- D. Pitts: *Heat Transfer*, 2nd edition, Schaum's Outlines Series, McGraw – Hill, 1998.

Cilji in kompetence:

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

Objectives and competences:

- 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, 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, laboratorijske vaje, obravnava študijskih primerov

Learning and teaching methods:

Lectures, laboratory work and coursework

Načini ocenjevanja:

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

- računski del
- teoretični del
- laboratorijsko in samostojno delo

Teoretični in računski del tvorita celoto in se preverjata hkrati.

Delež (v %) /
Weight (in %)

50
30
20

Assessment:

Student has to pass successfully the following obligations:

- Calculation part
- Theoretical part
- Laboratory and individual work

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

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](#)]



Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analizna kemija II
Course title:	Analytical Chemistry II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		2.	zimski
Chemical Technology / 1 st level UN			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		105	6

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 analizne kemije, matematike in fizike

Prerequisites:

Basic knowledge of classical analytical chemistry, mathematics and physics

Vsebina:

Predavanja
-Statistično ovrednotenje analiznih rezultatov, napake v analizi kemiji, natančnost, točnost, merilna negotovost
-Elektrokemijske metode
Potenciometrija (ionoselektivne elektrode)
- elektrode s stekleno membrano, elektrode s kristalinično homogeno in heterogeno membrano, elektrode s tekočinsko membrano,
Voltometrija
- direktna in pulzna polarografija, stripping analiza, ciklična voltometrija, amperometrične titracije
Konduktometrija
Elektrogravimetrija in kulometrija
- elektroliza pri konstantni napetosti in pri konstantnem toku, elektroliza pri kontroliranem potencialu, potenciostatična kulometrija, kulometrične titracije

Content (Syllabus outline):

Lectures
-Statistical evaluation of analytical results, errors in analytical chemistry, precision, accuracy, measurement uncertainty
-Electrochemical methods
Potentiometry, ion-selective electrodes, glass electrodes, solid state crystalline homogeneous and heterogeneous membrane electrodes, liquid membrane electrodes
Voltammetry
Direct and pulse polarography, stripping analysis, cyclic voltammetry, amperometric titrations,
Conductometry
Electrogravimetry and coulometry
Constant cathode potential gravimetry, constant current gravimetry, potentiostatic coulometry, coulometric titrations
-Spectroscopic methods

- <u>Spektroskopske metode</u> Atomska absorpcijska spektrometrija, atomska emisijska spektrometrija, molekulska spektrometrija ICP spektrometrija, masna spektrometrija <u>Separacijske metode</u> Ekstrakcijske metode, ekstrakcija na trdni fazi Tankoplastna kromatografija, plinska kromatografija, tekočinska kromatografija, ionska kromatografija, sklopljene tehnike z masno spektrometrijo <u>Laboratorijske vaje</u> Vaje zajemajo praktične primere izvedbe analiznih postopkov na področjih elektrokemijskih, spektroskopskih in separacijskih metod	Atomic absorption spectroscopy, atomic emission spectroscopy, molecular absorption spectroscopy, ICP spectroscopy, mass spectrometry <u>Separation methods</u> Extraction methods, solid phase extraction, planar chromatography, gas liquid chromatography, high performance liquid chromatography, ion chromatography, hyphenated techniques with mass spectrometry <u>Laboratory work</u> Practical examples of analytical procedures in electrometric, spectrometric and separation methods
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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.

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 analizna kemija 2 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.

Primeri iz področij anorganske kemije, organske kemije in biokemije se uporabljajo za razumevanje kemijskih in fizikalnih procesov, ki spremljajo analizni postopek.

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.

Examples from inorganic chemistry, organic chemistry and biochemistry are used for understanding of chemical and physical processes which accompany analytical procedure.

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 analize 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.
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Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Lab work

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

Reference nosilca / Lecturer's references:

LIU, Mingqiang, **FRANKO, Mladen**. Thermal lens spectrometry under excitation of a divergent pump beam. *Applied physics. B, Lasers and optics*, ISSN 0946-2171. Tiskana izd., 2014, vol. 115, issue 2, str. 269-277, ilustr., doi: [10.1007/s00340-013-5601-4](https://doi.org/10.1007/s00340-013-5601-4). [COBISS.SI-ID [2827515](#)]

LIU, Mingqiang, **FRANKO, Mladen**. Progress in thermal lens spectrometry and its applications in microscale analytical devices. *Critical reviews in analytical chemistry*, ISSN 1040-8347, 2014, vol. 44, no. 4, str. 328-353, doi: [10.1080/10408347.2013.869171](https://doi.org/10.1080/10408347.2013.869171). [COBISS.SI-ID [3340539](#)]

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](#)]

RADOVANOVIĆ, Tatjana, LIU, Mingqiang, LIKAR, Polona, KLEMENC, Matjaž, **FRANKO, Mladen**. Microfluidic flow injection analysis with thermal lens microscopic detection for determination of NGAL. *International journal of thermophysics*, ISSN 0195-928X, 8 str., 2014, doi: [10.1007/s10765-014-1699-9](https://doi.org/10.1007/s10765-014-1699-9). [COBISS.SI-ID [3503099](#)]

FRANKO, Mladen. Thermal lens spectrometric detection in flow injection analysis and separation techniques. *Applied spectroscopy reviews*, ISSN 0570-4928, jul.-avg. 2008, vol. 43, no. 4, str. 358-388. [COBISS.SI-ID [915451](#)]



Fakulteta za kemijo
in kemijsko tehnologijo

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 UN		2.	poletni
Chemical Technology / 1 st level UN			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 /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

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.
- Stacionarna difuzija. Difuzija skozi mirujočo komponento. Pseudostacionarna difuzija. Binarna ekvimolarna protidifuzija. Difuzija povezana s heterogeno in homogeno reakcijo. Difuzija v padajoči laminarni film tekočine.
- Nestacionarna difuzija. Nestacionarna difuzija v polneskončni medij in v končni medij. Analitične rešitve. Uporaba Gurney-Lurijevih diagramov.
- Prenos snovi s konvekcijo. Snovna prestopnost in snovna prehodnost.
- Modeli snovne prestopnosti. Filmska in penetracijska teorija snovne prestopnosti.
- Korelacije za snovno prestopnost. Analogija

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.
- unsteady diffusion and application of graphical solutions.
- convective mass transfer (discussion of the film theory and penetration theory).
- interfacial mass transfer and the use of overall mass transfer coefficients, methods for predicting.
- convective mass transfer coefficients for various geometries).
- the analogies between heat, momentum and mass transfer are discussed.

med transportnimi pojavi. Dimenzijska analiza snovnega prenosa. Kriterijska števila. Pomembnejše korelacije za snovno prestopnost.

- Dimenzioniranje naprav za snovni prenos. Šaržni in kontinuirni snovni prenos v posodah in v bazenih. Volumetrični koeficient snovne prestopnosti. Snovni prenos v kolonah s polnili. Višina prestopne enote in število prestopnih enot. Analitični in grafični izračun števila prestopnih enot.

Vaje: iz izbranih vsebin predmeta

Laboratory work: in selected areas of subject.

Temeljni literatura in viri / Readings:

- T. Koloini, Heat and Mass Transfer, FKKT Ljubljana, SI, 1999 (in Slovenian).
- L. Hines, R. N. Maddox, Mass Transfer, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1985.
- J. Geankopolis, Transport Processes and Unit Operations, Allyn and Bacon, Inc., Boston, USA, 1983.
- 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 Thermodiffusional technology.

Metode poučevanja in učenja:

Predavanja, seminar, laboratorijske vaje

Learning and teaching methods:

Lectures, seminar, laboratory work.

Načini ocenjevanja:

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

- pisni izpit (ali 2 sprotne testa)
- ustni izpit
- laboratorijske vaje

Delež (v %) /

Weight (in %)

Assessment:

Student has to pass successfully the following obligations:

- written exam (or 2 tests)
- oral examination
- laboratory work

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)



Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Separacijska tehnika I
Course title:	Separation Processes I

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

Željko Knez

Jeziki /

Predavanja / Lectures:

slovenski / Slovene

Languages:

Vaje / Tutorial:

slovenski / Slovene

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

Ni pogojev.

Prerequisites:

None.

Vsebina:

- Drobljenje, mletje in sejanje: energija pri drobljenju, Kickov, Rittingerjev in Bondov zakon, drobilniki, sejalna analiza delcev, industrijska sita.
- Magnetna separacija.
- Mešanje in Flotacija: mešalniki, načrtovanje in optimiranje mešalnika, prenos merila, flotacija.
- Filtriranje: tipi filtrov, teorija filtriranja, filtracijske enačbe, dimenzioniranje industrijskih filtrov.
- Sedimentacija, Stokesov zakon, sedimentacijski čas.
- Sedimentacija v tekočinah pod vplivom gravitacijskih sil, sedimentacijske aparature.
- Centrifuge: centrifugalna sila, hitrost sedimentacije, tipi centrifug.
- Čiščenje plinov: sedimentacija iz plinskih zmesi pod vplivom gravitacijskih sil, cikloni,

Content (Syllabus outline):

- Mechanical size reduction of solids and sieving: Energy used in grinding, Kick's law, Rittinger's law, Bond's law, grinding equipment, particle size analysis, industrial sieves.
- Separation in magnetic field.
- Mixing, Flotation: mixers, design and optimization of mixing systems, scale-up, flotation.
- Filtration: types of filtration equipment, Basic theory of filtration, filtration equations, design of industrial filters.
- Sedimentation, Stokes law, sedimentation time.
- Gravitational sedimentation in liquids: equipment for settling and sedimentation.
- Centrifugal separations: centrifugal force, rates of settling and sedimentation time, Centrifuge equipment.
- Gas cleaning: sedimentation in gas media under

hidrocikloni, elektrofiltri. Membranski separacijski procesi: prenos snovi, ultrafiltracija, reverzna osmoza, dializa, elektrodializa, permeacija in pervaporacija. Vaje: Laboratorijske vaje iz opisanih vsebin predmeta: drobljenje in sejalna analiza, filtriranje, mešanje, membranske operacije.	gravity force, gas-solid cyclone separators, hydrocyclones, electrofilters. Membrane separation processes: mass transport, ultrafiltration, reverse osmosis, dialysis, electrodialysis, permeation and pervaporation. Labor work: practical work in selected areas of subject: grinding and sieve analysis, filtration, mixing, membrane separation processes.
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Temeljni literatura in viri / Readings:

H. Schubert: <i>Handbuch der Mechanischen Verfahrenstechnik</i>, Band 2, Wiley-VCH Verlag, Weinheim, 2003. V. Ozim, Ž. Knez: <i>Mehanska tehnika (zbrano gradivo)</i>, Maribor, Fakulteta za kemijo in kemijsko tehnologijo, 1995. Ž. Knez, M. Habulin, V. Ozim: <i>Navodila za vaje iz analize procesov in mehanske tehnike (zbrano gradivo)</i>, Maribor, Fakulteta za kemijo in kemijsko tehnologijo, 1997.
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Cilji in kompetence:

Seznani študente s pomembnejšimi mehanskimi operacijami, ki se uporabljajo v kemijski in procesni industriji.

Objectives and competences:

To introduce the student to the more important unit operations (mainly physical in nature) used in the chemical and process industries.

Predvideni študijski rezultati:

Znanje in razumevanje: - poznavanje osnovnih mehanskih operacij - razumevanje industrijskih tehnoloških procesov Prenesljive/ključne spretnosti in drugi atributi: Osnovna predznanja za delo v kemijski procesni industriji
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Intended learning outcomes:

Knowledge and Understanding: - knowledge of basic mechanical operations, - understanding of industrial technological processes. Transferable/Key Skills and other attributes: Achieving basic knowledge for good praxis in chemical and process industry
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Metode poučevanja in učenja:

- Predavanja. - Računske naloge. - Laboratorijske vaje.

Learning and teaching methods:

- Lectures. - Problem solving. - 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:
- ustni izpit - pisni izpit - laboratorijske vaje	30 60 10	- Oral exam - Written exam - Lab work

Reference nosilca / Lecturer's references:

KNEZ, Željko, MARKOČIČ, Elena, LEITGEB, Maja, PRIMOŽIČ, Mateja, KNEZ HRNČIČ, Maša, ŠKERGET, Mojca. Industrial applications of supercritical fluids : a review. Energy, ISSN 0360-5442. [Print ed.], Available online 10 August 2014, str. 1-9, doi: 10.1016/j.energy.2014.07.044. [COBISS.SI-ID 18010134],

KNEZ, Željko, MARKOČIČ, Elena, KNEZ HRNČIČ, Maša, RAVBER, Matej, ŠKERGET, Mojca. High pressure water reforming of biomass for energy and chemicals : a short review. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], Available online 11 June 2014, vol. , str. 1-8, doi: 10.1016/j.supflu.2014.06.008. [COBISS.SI-ID 17952534]

TKALEC, Gabrijela, PANTIĆ, Milica, NOVAK, Zoran, KNEZ, Željko. Supercritical impregnation of drugs and supercritical fluid deposition of metals into aerogels. Journal of Materials Science, ISSN 0022-2461, Published online 02 Oct. 2014, vol. , iss. , str. 1-12, doi: 10.1007/s10853-014-8626-0. [COBISS.SI-ID 18137110]

VERONOVSKI, Anja, TKALEC, Gabrijela, KNEZ, Željko, NOVAK, Zoran. Characterisation of biodegradable pectin aerogels and their potential use as drug carriers. Carbohydrate polymers, ISSN 0144-8617. [Print ed.], 26 Nov. 2014, vol. 113, str. 272-278, doi: 10.1016/j.carbpol.2014.06.054. [COBISS.SI-ID 18000150]

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, doi: 10.1016/B978-0-444-62696-7.00002-2. [COBISS.SI-ID 17592854]

HOJNIK PODREPŠEK, Gordana, KNEZ, Željko, LEITGEB, Maja. Different preparation methods and characterization of magnetic maghemite coated with chitosan. Journal of nanoparticle research, ISSN 1388-0764, 2013, issue 6, art. no. 1751, str. 1-12, doi: 10.1007/s11051-013-1751-x. [COBISS.SI-ID 16941078]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		2.	poletni
Chemical Technology / 1 st level UN			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 /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**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 basic principles of organic chemistry.

Vsebina:

Organske reakcije: nukleofilne adicije na karbonilno skupino, nukleofilne substitucije in eliminacije na karbonilni skupini, nukleofilne substitucije in eliminacije na sp³ C atomu, polarne adicije.

Aromatskost; elektrofilne aromatske substitucije, nukleofilne aromatske substitucije, vplivi substituentov na usmerjanje, radikalske reakcije.

Sintetični in naravni polimeri; polimerizacija.

Osnove spektroskopskih metod za organske spojine: NMR, IR, masna spektroskopija.

Content (Syllabus outline):

Organic reactions: Nu additions to carbonyl group, Nu substitutions and eliminations to carbonyl group, Nu substitutions and eliminations to sp³ C atom, Polar additions.

Aromaticity; electrophilic aromatic substitutions, nucleophilic aromatic substitutions, influence of substituents, radical (single electron transfer) reactions.

Synthetic and natural polymers, polymerisations.

Basics of spectroscopy of organic compounds: NMR, IR, mass spectroscopy.

Temeljni literatura in viri / Readings:

- M. Tišler, Organska kemija, DZS Ljubljana, 1982.
- S. Pine, Organic chemistry, McGraw-Hill, New York, 1987.
- M. A. Fox, J. K. Whitesell, Organic Chemistry, Jones and Barlett, Boston, 1997.
- 4. P. Y. Bruice, Organic chemistry, Prentice Hall, 2006.

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.

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

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 I.

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

- Pisni izpit
- Laboratorijske vaje

80

20

Prior to exam, exam from subject Organic Chemistry I needs to be passed.

Student has to pass successfully the following obligations:

- Written exam
- Laboratory work

Reference nosilca / Lecturer's references:

KOVAČIČ, Sebastijan, KRAJNC, Peter, SLUGOVČ, Christian. Inherently reactive polyHIPE material from dicyclopentadiene. Chem. commun. (Lond., 1996), 2010, vol. 46, issue 40, str. 7504-7506, doi: 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.

PULKO, Irena, SANDHOLZER, Martina, KOLAR, Mitja, SLUGOVČ, 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.

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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Fizikalna kemija II
Course title:	Physical Chemistry II

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

Osnovno znanje 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 ravnotežje, Galvanski členi, Prevodnost

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,

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 enostavnih znanstvenih 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, kritičnega in logičnega razmišljanja, 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, critical and logical thinking, 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 assignment, laboratory work

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene naslednje obveznosti:

- računski del izpita
- teoretični del izpita
- laboratorijske vaje

35
35
30

Student has to pass successfully the following obligations:

- the calculus part of the exam
- the theoretical part of the exam
- lab work

Računski in teoretični del tvorita celoto in se preverjata hkrati. Izpit se lahko

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

nadomesti s sprotnimi testi.		exam can be replaced with partial exams.
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Reference nosilca / Lecturer's references:

UDOMMANEETHANAKIT, Thanyarat, RUNGROTMONGKOL, Thanyada, FRECER, 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](http://www.eurekaselect.com/114879/article). [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](http://dx.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](http://dx.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

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Gradiva
Course title:	Materials Engineering

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

Enofazne, večfazne mikrostrukture in sestavljena gradiva.

Kinetika faznih transformacij.

Utrjevanje.

Fazne strukture

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.

Single phase, multiphase microstructures and composites.

Kinetics of phase transformations.

Strengthening of materials.

Phase structures.

Laboratorijske vaje:

Identifikacija polimerov.
 Lastnosti plastičnih mas.
 Hidroliza stekla.
 Priprava stekla.
 Metalografska preiskava kovin.
 Določanje mehanskih lastnosti gradiv.

Laboratory exercises:

Identification of polymers.
 Characteristics of plastic materials.
 Hydrolysis of glass.
 Preparation of glass.
 Metallographic analysis of metals.
 Determination of mechanical characteristics of materials.

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 (elementske, spojinske in molekulske kristalov, amorfnih snovi, kompozitov).
 Pomen napak v lastnostih gradiv.
 Razumevanje termodinamskih ravnotežij in kinetske spremembe v večfaznih gradivih.
 Poznavanje mehanizmov utrjevanja in mehanskega porušanja gradiv.

Objectives and competences:

Structure and properties of solid construction materials (elements, compounds, polymers, glasses, composites).
 Defects, dislocations, boundaries in materials.
 Understanding of thermodynamic equilibria and kinetic transformations in multiphase materials.
 Understanding strengthening processes and mechanical failure in 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;
- izrazje na področju gradiv.

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.

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

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.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: - laboratorijsko delo, poročilo in pisni test - reševanje računskih nalog (pisni izpit) - sprotno delo in ustni izpit.	20 40 40	Student has to pass successfully the following obligations: - laboratory work, report and written test - problem solving skills (written exam) - every day work and oral examination

Reference nosilca / Lecturer's references:

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]

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]

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]

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].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Termodinamika
Course title:	Thermodynamics

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

Mojca Škerget

Jeziki /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Osnovno znanje matematike, fizike in fizikalne kemije

Prerequisites:

Basic knowledge of mathematics, physics and physical chemistry.

Vsebina:Predavanja

- Prvi zakon termodinamike in drugi osnovni koncepti
- Volumetrične lastnosti čistih fluidov
- Toplotni efekti
- Drugi zakon termodinamike
- Termodinamske lastnosti fluidov
- Uporaba termodinamike v pretočnih procesih
- Ravno težje para/tekoče: Uvod
- Termodinamika raztopin: Teorija
- Termodinamika raztopin: Uporaba
- Kemijsko reakcijsko ravnotežje
- Obravnava primerov iz faznih ravnotežij

Laboratorijske vaje

- Ravnotežje para/tekoče
- Ravnotežje tekoče/tekoče

Content (Syllabus outline):Lectures

- First law of thermodynamics and other basic concepts
- Volumetric properties of pure fluids
- Heat effects
- The second law of thermodynamics
- Thermodynamic properties of fluids
- Application of thermodynamics to flow processes
- Vapor/liquid equilibrium: Introduction
- Solution thermodynamics: Theory
- Solution thermodynamics: Application
- Chemical-reaction equilibria
- Topics in phase equilibria

Laboratory work

- Vapor/liquid equilibrium
- Liquid/liquid equilibrium

- Kalorimetrija
- Parcialne molske količine

- Calorimetry
- Partial molar quantitiesDetermination of mechanical characteristics of materials.

Temeljni literatura in viri / Readings:

- J. M. Smith, H. C. Van Ness, M. M. Abbott: *Introduction to Chemical Engineering Thermodynamics*, McGraw-Hill Companies, 7th ed., 2005, 6th ed., 2001, 5th ed., 1996.
- J. M. Smith, H. C. Van Ness: *Introduction to Chemical Engineering Thermodynamics*, McGraw-Hill Book Company, 4th ed., 1987.
- Petek: *Laboratorijske vaje iz termodinamike*, (skripta), Maribor, 2007

Cilji in kompetence:

Uporaba termodinamskih izračunov za industrijske procese, s poudarkom na pretočnih sistemih in faznem ravnotežju. Splošne metode, enačbe stanja, aktivnostni modeli in drugi termodinamski modeli, potrebni za kvantitativno obravnavo praktičnih fiziko-kemijskih sistemov.

Objectives and competences:

Application of thermodynamic calculation to industrial processes, with emphasis on flow systems and phase equilibria. Generalized methods, equations of state, activity models and other thermodynamic models, needed for quantitative treatment practical chemical-physical processes.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben

- razumeti osnove kemijske termodinamike: osnovnih zakonov, lastnosti realnih fluidov;
- spoznati enačbe stanja za čiste in več snovne sisteme, modele za mešanice, ugotavljanje fugativnostnih in aktivnostnih koeficientov;
- spoznati večkomponentna fazna ravnotežja in kemijska ravnotežja;
- obvladal v veliki meri termodinamske izračune za kemijske sisteme.

Prenesljive/ključne spretnosti in drugi atributi:

Spretnosti komuniciranja, predvsem sposobnost zbiranja potrebnih informacij za termodinamske izračune. Reševanje termodinamskih problemov, od enostavnejših do bolj zapletenih.

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will be able to

- understand the basic of chemical thermodynamics: basic laws, properties of real fluids;
- recognize equations of state for pure and multicomponent systems, recognize models for mixtures, determinate fugacity and activity coefficients;
- recognize multicomponent phase equilibria and chemical equilibria;
- govern in a great extent thermodynamic calculations for chemical systems.

Transferable/Key Skills and other attributes:

Communication skills, preferable the capability of collecting needed information's for thermodynamic calculations. Solution of thermodynamical problems, simple and more sophisticated.

Metode poučevanja in učenja:

- Predavanje
- Reševanje računskih nalog
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Problems solving
- Lab work

Načini ocenjevanja:

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

Ocenjevanje predmeta

- Računske naloge
- Pisni izpit (ali 2 sprotna testa)
- Laboratorijske vaje

Delež (v %) /

Weight (in %)

Assessment:

Student has to pass successfully the following obligations:

Assesment of the subject

- Solving problems
- Written exam (or two tests)
- Lab work

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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. KNEZ HRNČIČ, Maša, MARKOČIČ, Elena, TRUPEJ, Nina, ŠKERGET, Mojca, KNEZ, Željko. Investigation of thermodynamic properties of the binary system polyethylene glycol/CO₂ using new methods. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], Mar. 2014, vol. 87, str. 50-58, [COBISS.SI-ID 17563414].
3. ČUČEK, Denis, KNEZ, Željko, ŠKERGET, Mojca. Determination of vapor-liquid equilibria of the binary system of sub- and supercritical CO₂ and diethyl fumarate. Journal of chemical and engineering data, ISSN 0021-9568, 2014, vol. 59, no. 5, str. 1528-1532, [COBISS.SI-ID 17747222].
4. ŠKERGET, Mojca, KNEZ, Željko, KNEZ HRNČIČ, Maša. Solubility of solids in sub- and supercritical fluids : a review. Journal of chemical and engineering data, ISSN 0021-9568, 2011, vol. 56, no. 4, str. 694-719, [COBISS.SI-ID 14935830].
5. MARKOČIČ, Elena, ŠKERGET, Mojca, KNEZ, Željko. Mathematical modelling of the solubility of supercritical CO₂ in poly(l-lactide) and poly(d, l-lactide-co-glycolide). The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], okt. 2009, vol. 50, iss. 3, str. 320-326, [COBISS.SI-ID 13560342].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Separacijska tehnika II
Course title:	Separation Processes II

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

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:

Mojca Škerget

Jeziki /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Procesne bilance

Prerequisites:

Process Balances

Vsebina:

- Osnovne procesne operacije: klasifikacija, masne in toplotne bilance, heterogeni sistemi in ravnotežje.
- Ekstrakcija: ekstrakcija trdno-tekoče in tekoče-tekoče, osnovni principi in metode, primeri uporabe, hitrost ekstrakcije, prenos snovi pri ekstrakciji, vrste ekstraktorjev.
- Adsorpcija in desorpcija: osnovni princip in primeri uporabe, vrste adsorbentov in izbira adsorbenta, kinetika in ravnotežje, načrtovanje postopka in tipi adsorberjev, desorpcija in regeneracija adsorbenta.
- Absorpcija: osnovni princip in primeri uporabe, tipi absorberjev, regeneracija topila, desorpcija.
- Destilacija: ravnotežje pri destilaciji,

Content (Syllabus outline):

- Unit operations: classification, material and heat balances, heterogeneous systems and equilibrium.
- Extraction: liquid-liquid extraction and solid-liquid extraction, basic concepts and methods, process examples, rate of extraction and mass transfer, extraction apparatus.
- Adsorption and desorption: basic principles and process examples, sorbent types and selection criteria, equilibrium and kinetics, process design and adsorber types, desorption and regeneration of adsorbent.
- Absorption: basic principles and process examples, types of absorbers, regeneration of solvent, desorption.
- Distillation: equilibrium in a distillation, steam

destilacijski postopki: destilacija z vodno paro, diferencialna destilacija, ravnotežna destilacija, molekularna destilacija, rektifikacija. • Uparjanje in kristalizacija: osnove kristalizacije, kristalizacija iz raztopin, iz talin in iz parne faze, sublimacija in desublimacija. • Sušenje: mehanizem sušenja, sušilniki. • Izbira separacijskega procesa: dejavniki, ki vplivajo na izbiro, alternativni postopki, ilustrativni primeri. Vaje: Laboratorijske vaje iz opisanih vsebin predmeta: ekstrakcija, adsorpcija, destilacija, kristalizacija.	distillation, differential distillation, flash distillation, molecular distillation, rectification. • Solvent Evaporation, Crystallization: basic concept and processing modes, crystallization from a solution, from a melt, from a vapour phase, sublimation and desublimation. • Drying: mechanism of drying, dryers. • Selection of separation processes: influencing factors, generation of process alternatives, illustrative examples. Labor work: practical work in selected areas of subject: extraction, adsorption, distillation, crystallization.
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Temeljni literatura in viri / Readings:

- K. Sattler, H.J. Feindt, *Thermal Separation Processes: Principles and Design*, VCH, Weinheim, 2007.
- Paul T. Anastas, Carlos A. M. Afonso, João Pedro G. Crespo, *Green Separation Processes: Fundamentals and Applications*, VCH, Weinheim, 2005.
- Ž. Knez, M. Škerget, *Termodifuzijski separacijski procesi*, FKKT, Maribor, 1999.

Cilji in kompetence:

Seznanimi študente s separacijskimi operacijami (termični in ravnotežni procesi), ki se uporabljajo v kemijski in procesni industriji.

Objectives and competences:

Basic knowledge of separation operations (thermal and equilibrium processes) used in the chemical and process industries.

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje osnovnih separacijskih operacij
- razumevanje industrijskih separacijskih procesov

Prenesljive/ključne spretnosti in drugi atributi:
Osnovna predznanja za delo v kemijski in procesni industriji

Intended learning outcomes:

Knowledge and Understanding:

- knowledge of basic separation operations,
- understanding of industrial technological processes.

Transferable/Key Skills and other attributes:
Achieving basic knowledge for good praxis in chemical and process industry

Metode poučevanja in učenja:

- Predavanja.
- Računske naloge.
- Laboratorijske vaje.

Learning and teaching methods:

- Lectures.
- Problem solving.
- Laboratory work.

Načini ocenjevanja:

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

- ustni izpit
- pisni izpit
- laboratorijske vaje

Delež (v %) /
Weight (in %)

Assessment:

Student has to pass successfully the following obligations:

- Oral exam
- Written exam
- Lab work

Reference nosilca / Lecturer's references:

Izvirni znanstveni članki v JCR revijah:

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, doi: 10.1016/j.supflu.2009.10.013. [COBISS.SI-ID 13799446]
2. ŠKERGET, Mojca, KNEZ, Željko, KNEZ HRNČIČ, Maša. Solubility of solids in sub- and supercritical fluids : a review. J. chem. eng. data, 2011, vol. 56, no. 4, str. 694-719, doi: 10.1021/je1011373. [COBISS.SI-ID 14935830]
3. MAKOVŠEK, Katja, KNEZ, Željko, ŠKERGET, Mojca. Influence of process parameters on the extraction of flavanones from mandarin peel. Acta chim. slov.. [Tiskana izd.], 2012, vol. 59, no. 4, str. 879-887. <http://acta.chem-soc.si/59/59-4-879.pdf>. [COBISS.SI-ID 16555542]
4. 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. J. agric. food chem., 2013, vol. 61, no. 34, str. 8003-8025, doi: 10.1021/jf401008a. [COBISS.SI-ID 17077526]

Poglavje v monografski publikaciji:

5. KNEZ, Željko, ŠKERGET, Mojca, KNEZ HRNČIČ, Maša. Principles of supercritical fluid extraction and applications in the food, beverage and nutraceutical industries. V: RIZVI, Syed S. H. (ur.). Separation, extraction and concentration processes in the food, beverage and nutraceutical industries. Oxford [etc.]: Woodhead Publishing Limited, 2010, str. [3]-38. [COBISS.SI-ID 14789910]

Zaključeni projekti:

6. 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)



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Kemijska reakcijska tehnika I
Course title:	Chemical reaction engineering I

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

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 matematike, fizikalne kemije in prenosa snovi.

Prerequisites:

Knowledge about mathematics, physical chemistry and mass transfer is required.

Vsebina:**Predavanja:****Homogene reakcije.**

Kinetika homogenih reakcij.
 Uvod v načrtovanje reaktorjev.
 Idealni reaktorji za enostavne reakcije: šaržni, cevni, mešalni, obtočni, kaskadni.
 Reaktorji za sestavljene reakcije: vzporedne, zaporedne, obojesmerne, kombinirane.
 Vpliv temperature in tlaka.
 Izbira pravega reaktorja.
 Neidealnost toka, multiparametrični modeli.
 Mešanje fluidov.

Vaje:

Značilnosti idealnih reaktorjev (kinetika, vrsta toka). Določanje porazdelitve bivalnih časov in

Content (Syllabus outline):**Lectures:****Homogeneous Reactions.**

Kinetics of homogeneous reactions.
 Introduction to reactor design.
 Ideal reactors for single reactions: batch, plug-flow, mixed-flow, recycle reactors, mixed-reactors in series.
 Reactors for multiple reactions: parallel, in series, reversible, series-parallel.
 Temperature and pressure effects
 Choice of the right kind of reactor
 Non-ideal flow, compartment models.
 Mixing of fluids.

Laboratory:

Characteristics of ideal reactors (kinetics, flow

presnove.	patterns). Determination of retention time distribution and conversion.
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Temeljni literatura in viri / Readings:

- P. Glavič, Kemijska reakcijska tehnika, zbirka nalog z navodili in rešitvami, UM FKKT, Maribor, 2007.
- M. Krajnc, Reakcijska tehnika, Laboratorijske vaje : navodila za delo, UM FKKT, 2005.
- O. Levenspiel, Chemical Reaction Engineering, 3rd Ed., John Wiley and Sons, New York, 1999.
- H. Scott Fogler, Elements of Chemical Reaction Engineering, Prentice-Hall, London, 2005.
- A. Pintar, Kemijsko reakcijsko inženirstvo, Zbirka rešenih nalog, Ljubljana, Kemijski inštitut, 2012

Cilji in kompetence:

Pri predmetu študent spozna osnove kemijske tehniške kinetike in na teh temeljih osvoji tehnike načrtovanja idealnih reaktorjev in v nadaljevanju še reaktorjev za sestavljene reakcije. Seznani se z neidealnim tokom in metodami za njegovo določanje.

Na osnovi pridobljenega znanja študent zna izbrati pravi reaktor.

Objectives and competences:

The course is concerned with the fundamentals of chemical engineering kinetics together with the ideal and multiple reactions design. Basics of non-ideal flow and methods for its determination are also included.

Based on the first part of the course the student is able to choose the right reactor.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent spozna osnovni pristop k problemu: kateri so potrebni podatki za njegovo rešitev, kako jih pridobiti, kako med več možnostmi izbrati realen načrt.

Prenesljive/ključne spretnosti in drugi atributi:

Načrtovanje in primerjava osnovnih tipov reaktorjev z namenom industrijskega načrtovanja in optimiranja. Ugotavljanje neidealnosti.

Intended learning outcomes:

Knowledge and understanding:

Student learns how to face with the problem: what data are needed to attack the problem, how to obtain them and how to select a reasonable design from the many alternatives.

Transferable/key skills and other attributes:

Design and comparison of the major reactor types with the aim of industrial design and optimization. Determination of non-idealities.

Metode poučevanja in učenja:

Aktivno poučevanje in učenje.
Domače naloge iz načrtovanja reaktorjev.
Pisno testiranje sposobnosti reševanja nalog.
Skupinsko laboratorijsko delo.
Pisanje in oddaja poročila.

Laboratorijsko preučevanje reakcij, reaktorjev in neidealnega toka.

Learning and teaching methods:

Active teaching and learning.
Homework: problem solving and design.
Written test on problem solving skills.
Team work in laboratory
Writing a report.

Hands-on work in reaction kinetics, reactor operation and nonideal flow in laboratory.

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
- laboratorijske vaje	20	- laboratory
- pisni izpit (reševanje problemov)	40	- written exam (problem solving)
- sprotno delo in ustni izpit	40	- every day work and oral exam

Reference nosilca / Lecturer's references:

1. PEČAR, Darja, GORŠEK, Andreja. Oxidation of menthol : reaction-rate determination based on thermodynamic profiles. Chemical engineering communications, ISSN 0098-6445, 2014, vol. 201, iss. 11, str. 1548-1554. <http://www.tandfonline.com/doi/full/10.1080/00986445.2013.819353#.U6E-jU-KDq4>. [COBISS.SI-ID 17918998]
2. VNUČEC, Doroteja, GORŠEK, Andreja, KUTNAR, Andreja, MIKULJAN, Marica. A new method of physical modification of soy proteins for wood adhesives. V: International conference on wood adhesives : 9-11 october, 2013, Toronto, Ontario, Canada. [Madison]: Forest Products Society, 2014, str. 570-576, ilustr. [COBISS.SI-ID 1536529092]
3. 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]
4. PEČAR, Darja, KOLAR, Mitja, GORŠEK, Andreja. Kinetično modeliranje nastajanja CO₂ med fermentacijo kefirja. V: KRAVANJA, Zdravko (ur.), BRODNJAK-VONČINA, Darinka (ur.), BOGATAJ, Miloš (ur.). Slovenski kemijski dnevi 2013, Maribor, 10.-12. september 2013. Maribor: Fakulteta za kemijo in kemijsko tehnologijo, 2013, str. 1-8. [COBISS.SI-ID 17148950]
5. ZAJŠEK, Katja, GORŠEK, Andreja, KOLAR, Mitja. Cultivating conditions effects on kefir production by the mixed culture of lactic acid bacteria imbedded within kefir grains. Food chemistry, ISSN 0308-8146. [Print ed.], Jan. 2013, vol. 139, iss. 1-4, str. 970-977, doi: 10.1016/j.foodchem.2012.11.142. [COBISS.SI-ID 16645142]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Dinamika procesov
Course title:	Process Dynamics

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

Ni

Prerequisites:

None

Vsebina:

- Uvod:
 - predstavitev potreb po procesni regulaciji,
 - osnovne regulacijske strukture,
 - sestavni elementi regulacijskih sistemov.
- Matematično modeliranje in vhodno-izhodni modeli za procesno regulacijo.
- Dinamična analiza kemijskih operacij in procesov:
 - prenosne funkcije,
 - sistemi prvega, drugega in višjih redov.
- Povratnozančna regulacija:
 - koncept povratnozančne regulacije,
 - dinamika sestavnih elementov povratnozančnih regulacijskih sistemov
 - dinamične značilnosti reguliranih procesov s P, I, D, PI in PID regulatorji,
 - analiza stabilnosti,
 - načrtovanje povratnozančnih regulatorjev.
- Osnovna struktura računalniških regulacijskih

Content (Syllabus outline):

- Introduction:
 - incentives for process control,
 - basic control structures,
 - hardware elements of control systems.
- Mathematical modeling and input-output models for process control.
- Dynamic analysis of chemical processes:
 - transfer functions,
 - first, second and higher order systems.
- Feedback control:
 - concept of feedback control,
 - dynamic response of hardware elements in feedback control systems,
 - dynamic close-loop response of feedback controlled processes with P, I, D, PI, and PID controllers,
 - stability analysis,
 - design of feedback controllers.

sistemov. • Aplikacije povratnozančne regulacije v kemijskih in biokemijskih procesih. • Varnostni in okoljski vidiki pri načrtovanju regulacije kemijskih in biokemijskih procesov. <u>Laboratorijske vaje</u> za temperaturno, tlačno, nivojsko, pretočno in PH regulacijo.	• Basic structure of control systems using computers. • Applications of feedback process control in chemical and biochemical processes. • Safety and environmental aspects in designing control of chemical and biochemical processes. <u>Laboratory practice</u> for temperature, pressure, level, flowrate and PH control.
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Temeljni literatura in viri / Readings:

- Zdravko Kravanja, Dinamika procesov, Zapiski predavanj. Zbrano gradivo. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2009.
- D. E. Seborg, T. F. Edgar in D. A. Mellichamp: *Process Dynamics and Control* (2nd ed.), John Wiley & Sons, New York, 2004.
- F. G. Shinskey: *Process Control Systems, Application, Design and Tuning* (4th ed.), McGraw-Hill, New York, 1996.
- G. Stephanopoulos: *Chemical Process Control: An Introduction to Theory and Practice*, Englewood Cliffs, New Jersey, 1984.

Cilji in kompetence:

Cilj je podati

a) osnove dinamičnega obnašanja in

b) osnove povratnozančne regulacije kemijskih in biokemijskih procesov.

Objectives and competences:

The aim is to give

a) basic knowledge of dynamic behavior and

b) basic knowledge of feedback control in chemical and biochemical processes.

Predvideni študijski rezultati:

Znanje in razumevanje:
Razumeti osnovne koncepte procesne dinamike in regulacije.
Obvladati znanje o nekaterih praktičnih aplikacijah procesne povratnozančne regulacije.

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

Intended learning outcomes:

Knowledge and Understanding:
To understand the main concepts of process dynamics and control.
To have knowledge of some practical applications in process feedback control.

Transferable/Key Skills and other attributes:
To have 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.

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

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.

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.

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.

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.

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.



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 UN		3.	zimski Autumn
Chemical Technology / 1 st level UN			

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:

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
- Osnove kemične zgradbe in termodinamika bioloških molekul, biološke molekule v vodi
- Proteini: aminokisline, peptidi, tridimenzionalna zgradba, biološka vloga, Encimi
- Ogljikovi hidrati: zgradba in biološka vloga
- Lipidi: zgradba in biološka vloga, biološke membrane, transport
- Vitamini, Hormoni
- Temelji celičnega metabolizma in bioenergetika, Povezovanje, usklajevanje ter posebnosti metabolizma organov
- DNA struktura in lastnosti, replikacija (prokarioti, eukarioti), rekombinacija DNA, DNA popravljalni mehanizmi, DNA mutacije,

Content (Syllabus outline):

- Cell structure
- 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
- Vitamines; Hormones
- Basic Concepts of Cellular Metabolism and Bioenergetics, Integration, Specialization, and Hormonal Control of Metabolism
- DNA structure and characteristics, replication (prokaryotes, eukaryotes), recombination, repair

struktura kromosomov • RNA struktura in lastnosti, vrste RNA molekul in funkcije, transkripcija (prokarionti, eukarionti), postranskripcijske modifikacije • Struktura proteinov, sinteza proteinov, posttranslacijske modifikacije proteinov, zvižanje proteinov, transport proteinov, Regulacija proteinske sinteze: • Embrionalni razvoj ,Celična delitev (mejoza, mitoza), Celični cikel, proliferacija, diferenciacija celic, apoptoza • Povezovanje celic v tkiva, komunikacija med celicami, signalne poti, receptorji, hormoni • Osnove dedovanja in molekularne genetike <u>Laboratorijsko delo:</u> • Izolacija DNA, RNA in proteinov iz celičnih kultur in tkivnih vzorcev • Verižno pomnoževanje DNA (reakcija PCR) in analiza produktov PCR reakcije z elektroforezo na agaroznem gelu	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 • Embryonic development, Cell division (meiosis, mitosis), Cell cycle: proliferation, differentiation, apoptosis • Integration of cells into tissues, communication between cells, signal transduction, receptors, hormone signaling • Basics of heredity and molecular genetics <u>Laboratory work:</u> • DNA, RNA and protein isolation from cell lines and tissue samples • DNA amplification using PCR and agarose gel electrophoresis
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Temeljni literatura in viri / Readings:

- Boyer, Rodney F.: Concepts in biochemistry, 3rd ed., J. Wiley & Sons, Hoboken , 2006
- B. ALBERTS et al.: Molecular biology of the cell., 5th Ed., Garland Publish, Inc., New York, 2007
- 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 molekularne procese v celici

Prenesljive/ključne spretnosti in drugi atributi:

Intended learning outcomes:

Knowledge and Understanding:

- basic molecular processes in the cell

Transferable/Key Skills and other attributes:

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory work

Načini ocenjevanja:

Izpit je opravljen, če so pozitivno opravljene naslednje obveznosti:

- pisni izpit
- ustni izpit
- laboratorijske vaje

Delež (v %) /
Weight (in %)

60
30
10

Assessment:

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. LIU, Jimmy Z, MITROVIČ, Mitja, POTOČNIK, Uroš. Dense genotyping of immune-related disease regions identifies nine new risk loci for primary sclerosing cholangitis. *Nat Genet*, 2013, 79 str., ilustr. <http://www.nature.com/ng/journal/vaop/ncurrent/full/ng.2616.html>, doi: 10.1038/ng.2616. [COBISS.SI-ID 512280376],
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
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Organska tehnologija
Course title:	Organic Technology

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

Vrsta predmeta / Course type:

Izbirni / Optional

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 /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

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:

- Osnovni procesi: halogeniranje, nitriranje, sulfoniranje, aminiranje, alkaliziranje, ariliranje, hidrogeniranje, oksidacija.
- Sinteza polimerov, reakcijska kinetika, fizikalno-kemijske lastnosti polimernih materialov.
- Tehnologije rafinacije nafte, produkti.

Laboratorijske vaje: Praktični primeri iz posameznih osnovnih procesov.

Content (Syllabus outline):

- Unit processes: halogenation, nitration, sulfonation, amination, alkylation, hydrogenation, oxidation.
- Synthesis of polymers, reaction kinetics, physico-chemical properties of polymeric materials.
- Technologies for petroleum refining, products.

Laboratory work: Practical examples referring selected unit operations.

Temeljni literatura in viri / Readings:

- M. B. Smith, J. March: March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure (March's Advanced Organic Chemistry), Wiley, New Jersey, 2007.
- P.H. Groves: Technological processes in organic synthesis, Građevinska knjiga, BG, 1967.
- G.T. Austin: Shreve's Chemical Process Industries, McGraw-Hill Book Company, N.Y., 1984.
- H.-J. Arpe, S. Hawkins, Industrial Organic Chemistry, 5th Edition, Wiley-VCH, Weinheim, 2010.
- A. Jess, P. Wasserscheid, Chemical Technology: An Integral Textbook, Wiley-VCH, Weinheim, 2013.
- H.A. Wittcoff, B. G. Reuben, J. S. Plotkin, Industrial Organic Chemicals, 3rd Edition, Wiley, New Jersey, 2013.
- Kirk-Othmer, Encyclopedia of Chemical Technology, 27 Volume Set, 5th Edition, Wiley, New Jersey, 2007.

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.

Prenesljive/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:

- predavanja
- laboratorijske vaje

Learning and teaching methods:

- lectures
- laboratory work

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

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

- pisni izpit
- ustni izpit
- vaje

50
40
10

Student has to pass successfully the following obligations:

- written examination
- oral examination
- laboratory work

Reference nosilca / Lecturer's references:

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. J. chem. eng. data, 2013, 58, 3, 648-652, doi: 10.1021/je301146g.

ČUČEK, Denis, PERKO, Tina, ILIĆ, Ljiljana, ZNOJ, Bogdan, VENTURINI, Peter, KNEZ, Željko, ŠKERGET, Mojca. Phase equilibria and diffusivity of dense gases in various polyethylenes. J. supercrit. fluids, 2013, 78, 54-62, doi: 10.1016/j.supflu.2013.03.020.

KNEZ HRNČIČ, Maša, VENDERBOSCH, Robbie H., ŠKERGET, Mojca, ILIĆ, Ljiljana, KNEZ, Željko. Phase equilibrium data of hydrogen in pyrolysis oil and hydrogenated pyrolysis oil at elevated pressures. J. supercrit. fluids, 2013, 80, 86-89, doi: 10.1016/j.supflu.2013.04.015.

MARKOČIČ, 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, 2011, 55, 3, 1046-1051.

KNEZ, Željko, MARKOČIČ, Elena, NOVAK, Zoran, KNEZ HRNČIČ, Maša. Processing polymeric biomaterials using supercritical CO₂. Chemieingenieurtech., 2011, 83, 9, 1371-1380.

ŠKERGET, Mojca, MANDŽUKA, Zoran, MARKOČIČ, Elena, KNEZ, Željko, JEŠE, Robi, ZNOJ, Bogdan, VENTURINI, Peter. Solubility and diffusivity of CO₂ in carboxylated polyesters. J. supercrit. fluids, 2010, 51, 3, 306-311, doi: 10.1016/j.supflu.2009.10.013.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Ekonomika in podjetništvo
Course title:	Fundamentals of Economics and Entrepreneurship

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

Dušan Klinar

**Jeziki /
Languages:**

**Predavanja / Lectures:
Vaje / Tutorial:**

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

Ni

Prerequisites:

None

Vsebina:

- Osnovni pojmi gospodarjenja in ekonomskih ved
- Narodno gospodarstvo, ekonomski sistem, globalizacija
- Ekonomija, makroekonomski sistemi in modeli
- Mikroekonomske osnove ekonomike podjetja
- Ravnanje podjetja v družbenem in ekonomskem okolju
- Viri, prvine poslovnih procesov, stroški, kalkulacije
- Premoženje podjetja in uspešnost
- Ekonomija in ekonomika naložb
- Finančni trg, borza
- Osnove vodenja in upravljanja – managementa
- Podjetništvo in podjetniški slog managementa
- Management znanja
- Inovacije, inoviranje, management razvoja
- Osnove marketinga

Content (Syllabus outline):

- The Fundamentals of Economics
- National Economy, Economic System and globalization
- Macroeconomics, important variables and models
- Microeconomic framework of Business Economics
- Firm behaviour in a social and economical environment
- Resources and Cost theory, Costing
- Assets and Liabilities, Business performance
- Economics of Investments
- Financial market, stock exchange
- Fundamentals of the Management
- Entrepreneurship and Entrepreneurial Management
- Knowledge Management
- Innovations and Innovation Management
- Fundamentals of the Marketing

Temeljni literatura in viri / Readings:

- 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.
- P. A. Samuelson, W. D. Nordhaus: *Economics*, McGraw-Hill, 19-ta izdaja, 2009, (izbrana poglavja).
- M. Rebernik: *Ekonomika podjetja*, Gospodarski Vestnik Ljubljana, izbrana poglavja, 1997.
- D. Uršič: *Osnove organizacije in managementa*, UM, Ekonomsko-poslovna fakulteta Maribor, izbrana poglavja, 2004.
- M. Rebernik: *Podjetništvo in management malih podjetij*, Univerza v Mariboru, EPF in FS, izbrana poglavja, 1997.

Cilji in kompetence:

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

Objectives and competences:

- To gain the basic understandings of the Economics
- To gain the basic understandings of the Management
- To understand the basics of the Entrepreneurship
- To understand the basics of the investment Economics
- To understand the basics of the Innovation Management
- To understand the basics of the Knowledge Management
- To understand the basics of the Marketing

Predvideni študijski rezultati:

- Znanje in razumevanje:
- osnov delovanja ekonomije in ekonomskih sistemov
 - osnov poslovne ekonomike in delovanja poslovnih subjektov
 - osnovnih načel in metod ekonomske investicij
 - podjetništva in podjetniškega vodenja
 - 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
 - podjetniški pogled na vodenje
 - 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 basics of the Entrepreneurship,
 - 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 assess business and technological systems (multi views)
 - entrepreneurial views on leadership
 - assess economical questions within the investments
 - ability to discuss about the economic issues

Metode poučevanja in učenja:

- predavanja - multimedijske predstavitve - obravnave primerov - obravnava tekočih ekonomskih dogodkov - delo na internetu - seminar - priprava poslovnega načrta

Learning and teaching methods:

- lectures - multimedia presentations - case studies - discussion of the economical affairs - online www search - seminar - preparation of the business plan
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Načini ocenjevanja:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:
• 2 testa ali pisni izpit • elaborat - poslovni načrt • ustni izpit

Delež (v %) /
Weight (in %)

70
20
10

Assessment:

Student has to pass successfully the following obligations:
• 2 tests or written examination • elaborate - business plan • oral examination

Reference nosilca / Lecturer's references:

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. [COBISS.SI-ID 5457690], [JCR, SNIP]

ŠOŠTARIČ, Maja, KLINAR, Dušan, BRICELJ, Mihael, GOLOB, Janvit, BEROVIČ, Marin, LIKOZAR, Blaž. Growth, lipid extraction and thermal degradation of the microalga *Chlorella vulgaris*. New biotechnology, ISSN 1871-6784, 2012, vol. 29, iss. 3, str. 325-331, doi: 10.1016/j.nbt.2011.12.002. [COBISS.SI-ID 35597317], [JCR, SNIP]

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]

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]

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]



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Biokemijska tehnika
Course title:	Biochemical Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		3.	poletni
Chemical Technology / 1 st level UN			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:**Prerequisites:**

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

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

Vsebina:

- Uvod: Biotehnologija, biokemijsko inženirstvo.
- Uvod v mikrobiologijo.
- Gojenje celic.
- Kinetika rasti celic.
- Podrobnejša struktura proteinov.
- Biokataliza.
- Encimi in njihovo delovanje.
- Kinetika in mehanizmi encimskih reakcij.
- Določevanje kinetičnih parametrov.
- Vpliv reakcijskih parametrov na hitrost encimsko kataliziranih reakcij.
- Vpliv pH na aktivnost biokatalizatorjev.
- Bioreaktorji in njihovo delovanje.
- Biotehnološki procesi.

Content (Syllabus outline):

- Introduction: Biotechnology, Biochemical engineering.
- Introduction to microbiology.
- Cell growth.
- Cell-growth kinetics
- Detailed protein structure.
- Biocatalysis.
- Enzymes and their action.
- Kinetics and mechanisms of enzymatic reactions.
- Influence of reaction parameters on the rate of enzymatic reactions.
- Influence of pH on the rate of enzymatic reactions
- Bioreactors and their operation.

Vaje: Laboratorijske vaje s področja mikrobiologije, encimsko kataliziranih reakcij ...	• Biotechnological processes. Labor work: Laboratory exercises from the field of microbiology, enzyme-catalyzed reactions etc.
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Temeljni literatura in viri / Readings:

- D. L. Nelson, M. M. Cox, A. L. Lehninger: *Principles of Biochemistry*, W. H. Freeman, 6th 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 seminarskih nalog s predstavitvijo 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.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	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. [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. [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. [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. [COBISS.SI-ID 14712598].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS****Predmet:** Optimiranje procesov**Course title:** Process Optimization

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

Zdravko Kravanja

Jeziki /**Predavanja / Lectures:**

slovenski / Slovenian

Languages:**Vaje / Tutorial:**

slovenski / Slovenian

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

Ni

Prerequisites:

None

Vsebina:

- Uvod: definiranje sistemskih mej, optimizacijski kriteriji, struktura optimizacijskih modelov, pregled uporabe v tehniki.
- Zvezno optimiranje:
 - Teorija: lastnosti funkcij z eno spremenljivko, optimalnostni kriteriji in optimizacijske metode, optimalnostni kriteriji in metode za reševanje funkcij z več spremenljivkami.
 - Linearno programiranje (LP): standardna formulacija in metoda simpleks.
 - Nelinearno programiranje (NLP): Lagrangejevi množitelji, Karush-Kuhn-Tuckerjevi pogoji optimalnosti, metoda aktivnih množic.
 - Direktne iskalne metode, npr. kompleksni algoritem.
- Celoštevilsko in celoštevilsko/zvezno optimiranje

Content (Syllabus outline):

- Introduction: definition of system border, optimization criteria, structure of models, overview of applications in engineering.
- Continuous optimization:
 - Theory: properties of single-variable functions, optimality criteria and solution methods, optimality criteria and methods for solving functions of several variables.
 - Linear programming (LP): standard formulation and simplex method.
 - Nonlinear programming (NLP): Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, active set method.
 - Direct search methods, e.g. the complex method.
- Discrete and discrete/continuous optimization (IP, MILP): fundamentals of mixed-integer linear

(IP, MILP): osnove mešano-celoštevilskega linearnega programiranja (MILP), algoritem vejanja in omejevanja. Seminar in računalniške vaje: minimiranje zalog, transportni problemi, planiranje in obratovanje, obdelava podatkov, projektno planiranje, optimiranje z računalniškim paketom GAMS.	programming, branch-and-bound algorithm with depth-first and bread-first branching. Seminar work and computer exercises: optimization of inventories, transportation problems, operation and planing, data reduction, project planning, optimization with GAMS.
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Temeljni literatura in viri / Readings:

- Zdravko Kravanja in Zorka Novak Pintarič: Optimiranje procesov, Zapiski predavanj. Zbrano gradivo. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2006.
- Ravidran A., K. M. Ragsdell in G.V. Reklaitis, Engineering Optimization, Methods and Application (2nd ed.), John Wiley and Sons, New York, 2006.
- Edgar T.F., D.M.Himmelblau in L. S. Lasdon, Optimization of Chemical Processes (2nd ed.), McGraw-Hill, New York, 2001.
- 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 teorije matematičnega programiranja in uporabnost metod optimiranja v tehniki (načrtovanje procesov, planiranje proizvodnje, obratovanje in obdelava inženirskih podatkov).

Objectives and competences:

The aim is to give basic overview and knowledge in theory of mathematical programming and application in engineering (process design, planning, operation and handling engineering data).

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumeti osnovne optimiranja kemijskih in biokemijskih procesov.
Obvladati znanje o nekaterih praktičnih aplikacijah optimiranja kemijskih in biokemijskih procesov.
Imeti nekaj izkušenj o uporabi ustrezne optimizacijske programske opreme.

Prenesljive/ključne spretnosti in drugi atributi:

Imeti razumevanje o vplivu optimizacijskih rezultatov na trajnostni razvoj.

Intended learning outcomes:

Knowledge and Understanding:

To understand basic optimization concepts in optimization of chemical and biochemical processes.
To have knowledge of some practical applications in optimization of chemical and biochemical processes.
To have some experience in using appropriate optimization software.

Transferable/Key Skills and other attributes:

To have an understanding of the impact of optimization solutions in sustainable development.

Metode poučevanja in učenja:

Predavanja, seminar in računalniške vaje.
Samostojno delo študenta.

Learning and teaching methods:

Lectures, seminar work, and work with computer.
Self-learning.

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

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.

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.

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.

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.

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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		3.	poletni
Chemical Technology / 1 st level UN			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:

Zahtevano predhodno znanje iz predmetov:

- Prenos toplote
- Mehanika fluidov
- in poznavanje osnovnih procesnih naprav

Prerequisites:

Zahtevano predhodno znanje iz predmetov:

- Prenos toplote
- Mehanika fluidov
- in poznavanje osnovnih procesnih naprav

Vsebina:

- Uvod v energetski management
- Energija in proizvodnja
- Energetske tehnologije
- Razumevanje energetskih izračunov
- Ekonomske analize in življenjski tok stroškov
- Izolacije
- Ogrevanje in prezračevanje
- Energetski management procesov
- Preteklost je naša prihodnost

Seminarske vaje:

reševanje primerov iz vsebine predmeta, študij vprašanj in problemov

Content (Syllabus outline):

- Introduction to energy management
- Energy and manufacture
- Energy technologies
- Understanding energy bills
- Economic analysis and life cycle costing
- Insulation
- Heating and ventilating
- Process energy management
- The past is our future

Tutorials:

examples from the theme of the subject, study question and problems

Temeljni literatura in viri / Readings:

- J. Krope, D. Goričanec. Smotrna raba energije. Maribor: CIŠ Fakultete za strojništvo, 1997.
- Wayne C. Turner: *Energy management handbook*, Other, 5th edition, September 22m, 2004 ISBN: 0824748123
- Barney L. Capehart, *Guide to energy management*, other, 4th Edition, October 16, 2002, ISBN:082474120X
- Klaus Dieter E. Pawlik, *Guide to energy management (Solutions manual)*, Marcel Dekker, 4th Sol Ma edition, September 1, 2002, ISBN: 0824741218
- Turner W., *Energy management handbook*, Fairmont press, Liburn, 2001

Cilji

- Znanja o možnostih minimalnega koriščenja klasičnih goriv na osnovi boljših izolacij in optimiranja porabnikov energije.
- Znanja o ekonomskih metodah, ki omogočajo primerjavo rentabilnosti investicij v različne energetske sisteme in varovanje okolja.

Objectives

- Knowledge about the possibilities of minimal exploitation of classic fuels based on better insulation and optimization of energy consumers.
- Knowledge about economic methods, which enable a comparison of investments in different energy systems and environmental protection.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Sposobnost načrtovanja in dimenzioniranja ekonomsko varčnih sistemov in ekonomskega vrednotenja vračila naložbe.

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.

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.

Metode poučevanja in učenja:

Predavanja: študent spozna teoretične vsebine predmeta.
Avditorne vaje: študent utrdi teoretično znanje in spozna aplikativne možnosti reševanja primerov iz prakse.

Learning and teaching methods:

Lectures: the student gets acquainted with theoretical content of the subject.
Tutorial: the student upgrades the theoretical knowledge with practical experience.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

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

- teoretični del
- računski del
- samostojno delo

Teoretični in računski del tvorita celoto in se preverjata hkrati.

20
50
30

Student has to pass successfully the following obligations:

- theoretical part
- calculation part
- individual work

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

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:	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 UN		3.	poletni
Chemical Technology / 1 st level UN			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:

- Karakteristike pitnih vod
- Pravilnik o kvaliteti pitnih vod
- Kemijske analize pitnih vod
- Filtracija, mehčanje vode, ionska izmenjava, koagulacija, adsorpcija
- Glavni onesnaževalci vod in njihovo prečiščevanje
- Karbonatno ravnotežje v vodah
- Pregled standardnih postopkov prečiščevanja vod
- Čiščenje odpadne vode

Ekskurzija na čistilno napravo

Laboratorijsko delo: preučevanje karbonatnega ravnotežja

Content (Syllabus outline):

- Drinking Water Characteristics
- Drinking water legislation
- Chemical water analyses
- Filtration, softening, ion exchange, coagulation, adsorption
- Main Water Pollutants
- Carbonic equilibria in Water
- Standard methods for water treatment
- 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
- *Wastewater Engineering, Treatment and Reuse*, 4th edition. Mc Graw Hill Co, 2003.
- *Water quality and treatment, a handbook of community Water Supplies*, 4th edition. American Water Works Association, Mc Graw Hill Co, 1990.
- Manahan S.E., *Environmental Chemistry*, 8th edition, CRC Press USA, 2005

Cilji in kompetence:

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

Objectives and competences:

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:

Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:
• Ustni izpit
• Seminarska naloga
• Aktivno delo na predavanjih

Delež (v %) /

Weight (in %)

Assessment:

Student has to pass successfully the following obligations:
• Oral examination
• Seminar work
• 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
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 UN		3.	poletni
Chemical Technology / 1 st level UN			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.**Predavanja / Lecture:**

slovenski / Slovene

Languages: en.**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 (žveplove, 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).
- Vlakna (steklena, ogljikova, mineralna).

Laboratorijske vaje:

Produkt, izbira procesa, surovine, procesna shema.

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

Množinska in entalpijska bilanca. Ekonomika, okoljevarstvo, varnost. Kemijska sinteza/analiza produkta/procesa.	<u>Laboratory work:</u> Product, process, raw materials, process flow sheet. Amount & enthalpy balances. Economics, environment, safety. Chemical synthesis/analysis of the product/process.
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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:

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

- seminarska naloga,
- ustni izpit.

Delež (v %) /

Weight (in %)

Assessment:

Student has to pass successfully the following obligations:

- Seminar work
- Oral examination

Reference nosilca / Lecturer's references:

ZAJC, Igor, DROFENIK, Mihael. PTCR 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:	Biotehnologija
Course title:	Biotechnology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		3.	poletni
Chemical Technology / 1 st level UN			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 /
Languages:****Predavanja / Lectures:** slovenski / Slovene**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:

- Biotehnologija – zgodovina, produkti in procesi.
- Pripravljalni procesi v biotehnologiji.
- Pridobitev osnovnih znanj v povezavi z načrtovanjem potencialne farmacevtske učinkovine.
- Bioreaktorji.
- Biotehnološki procesi za proizvodnjo živil in krme.
- Pridobitev poglobljenega znanja iz disciplin, uporabnih za načrtovanje biotehnoloških procesov ter tudi iz poznavanja zakonskih predpisov in patentiranja.
- Antibiotiki in drugi sekundarni metaboliti.

Laboratorijsko delo:

Content (Syllabus outline):

- Biotechnology – history, products and processes.
- Preparative processes in biotechnology.
- Acquirement of basic knowledge in connection with designing of potential pharmaceutical active substance.
- Bioreactors.
- Biotechnological processes for food and feed production.
- Acquirement of deep knowledge from disciplines applied for design of biotechnology processes and acquirement of law regulations and taking out a patent knowledge.
- Antibiotics and other secondary metabolites.

Laboratory work:

Laboratorijske vaje s področja biotehnologije-	Laboratory exercises from the field of biotechnology.
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Temeljni literatura in viri / Readings:

- 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 znanje in razumevanje proizvodnje biomase z organizmi oz. deli organizmov ter znanja, potrebna za načrtovanje biotehnološkega procesa.

Prenesljive/ključne spretnosti in drugi atributi:
Predmet se dopolnjuje s predmeti, ki obravnavajo vsebine iz biokemijske tehnike (mikrobiologija, biokemija, biokemijska tehnika).

Intended learning outcomes:

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

Transferable/Key Skills and other attributes:
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.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: - seminarska naloga - ustni izpit	40 60	Student has to pass successfully the following obligations: - seminary work - 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. [COBISS.SI-ID 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. [COBISS.SI-ID 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. [COBISS.SI-ID 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. [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:	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 UN		3.	poletni
Chemical Technology / 1 st level UN			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 / Slovene**Languages:****Vaje / Tutorial:** slovenski / Slovene**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Ni

Prerequisites:

None

Vsebina:

- Uvod:
 - pregled uporabe računalniško podprtega načrtovanja, sinteze, planiranja in obratovanja procesov,
 - različne tehnike za analizo in optimiranje procesov.
- Osnovni 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,

Content (Syllabus outline):

- 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

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.	a given computer design tool for process design, report with user's guide, illustrative example, and solved example problem.
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Temeljna 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.

Prenesljive/ključne spretnosti in drugi atributi:

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

Intended learning outcomes:

Knowledge and Understanding:

To understand basic concepts of computer aided process design.

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:
Izpit je opravljen, če sta pozitivno opravljeni obe naslednji obveznosti:		Student has to pass successfully the following obligations:
seminarska naloga	70	Seminar work
ustni izpit – predstavitev seminarske naloge	30	Oral exam – presentation of the seminar work

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.

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.

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.

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.

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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Prehrambena 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 UN		3.	poletni
Chemical Technology / 1 st level UN			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 /**Predavanja / Lectures:** slovenski / Slovene**Languages:****Vaje / Tutorial:** 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, membranske operacije, uparjanje in pridobivanje arom, sušenje.
- 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 izdelkov.
- Proizvodne tehnologije izbranih skupin prehrabnenih izdelkov od surovin do končnega produkta.

Content (Syllabus outline):

- Food composition (Carbohydrates, lipids, proteins, enzymes, vitamins, minerals, colorants, flavors) and food categories.
- Unit operations and basic principles of food processing: Heat processing, Membrane processes, evaporation and aroma recovery, drying.
- Thermal processing for food preservation.
- pasteurization, sterilization, refrigeration, chilling, freezing,....
- Nonthermal Processing for food preservation.
- Inovative methods for food preservation.
- Effects of food processing on quality of foods: chemical changes during processing and storage and Shelf-Life Modeling.
- Food packing.
- Processing technology of selected food product

Vaje: iz izbranih vsebin predmeta: študij procesnih parametrov izbranih tehnoloških postopkov za predelavo živilskih izdelkov in vpliv na kvaliteto produkta.	groups from raw material to end product. Labor work: in selected areas of subject: process parameters study of selected operations in food processing and influence on quality of products.
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Temeljni literatura in viri / Readings:

- 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
- O.R. Fennema: *Food Chemistry*, 3rd ed., Marcel Dekker, Inc., New York, 1996.

Cilji in kompetence:

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

Objectives and competences:

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 prehrabnih izdelkov.
- Načrtovanje procesnih operacij.
- Vplivov procesiranja in pakiranja na kvaliteto izdelkov.

Prenesljive/ključne spretnosti in drugi atributi:

- osnovna predznanja za delo v prehrabni industriji

Intended learning outcomes:

Knowledge and Understanding:

- Unit operations and basic principles of food processing and preservation.
- design of process operations.
- 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.
- Ekskurzija 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:

- ustni izpit
- seminarska naloga

Delež (v %) /
Weight (in %)

Assessment:

Student has to pass successfully the following obligations:

- Oral examination
- Seminar work

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].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		3.	poletni Spring
Chemical Technology / 1 st level UN			

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 /**Predavanja / Lecture:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

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 heterogenous 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. Cherdron, 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:

Predavanja, seminarsko delo, laboratorijske vaje

Learning and teaching methods:

Lectures, seminar work, laboratory experiments

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

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

- Pisni izpit
- Seminarska naloga

80

20

Student has to pass successfully 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.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Tehnologija premazov
Course title:	Coatings Technology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		3.	poletni
Chemical Technology / 1 st level UN			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 /**Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Osnovna znanja iz organske in analize kemije.

Prerequisites:

Basic knowledge in organic and analytical chemistry.

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.
- Specifične lastnosti proizvodnje vodnih lakov.
- Proizvodnja praškastih premazov.
- Obstojnost premazov in premaznih sistemov.

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.
 - Production of waterborne enamels.
 - Manufacture of coating powders.
 - Durability of coatings and coating systems.
- Labor work: on paint systems, formulation, film-forming (drying and curing, crosslinking) and

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

analysis of coatings properties.

Temeljni literatura in viri / Readings:

- 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,
- tipov premaznih materialov in njihovih lastnosti,
- kemije in tehnologije sušenja in zamreženja,
- mešanja in dispergiranja v laboratorijskem in industrijskem merilu

Prenesljive/ključne spretnosti in drugi atributi:

- osnovna predznanja za delo v industriji barv in lakov

Intended learning outcomes:

Knowledge and Understanding:

- Basics of composition and formulations of paints.
- Types of coating materials and their properties
- Chemistry and technology of drying and curing
- Mixing and grinding (dispersing) in the lab and in production scale

Transferable/Key Skills and other attributes:

- Achieving basic knowledge for praxis in the industry of paints and coatings.

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.

Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja:		
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student has to pass successfully the following obligations:
• ustni izpit	60	• Oral examination
• seminarska naloga	40	• Seminar work

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].



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 UN		3.	poletni
Chemical Technology / 1 st level UN			Spring

Vrsta predmeta / Course type:

Izbirni / Optional

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:

- 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:

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:

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

- energy auditing of production processes;
- renewable energy sources.
- End-of-pipe processes:
 - solid waste management;
 - liquid waste management;
 - gaseous waste management

Temeljni literatura in viri / Readings:

- J. Petek: *Okoljska tehnologija*. Zapiski predavanj. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2006.
- Centre for Cleaner Production: *MOED: Minimisation Opportunities Environmental Diagnosis*. Autonomous Government of Catalonia, Ministry of Environment. Barcelona, 2000.
- N. Wrisberg, H. A. Udo de Haes: *Analytical Tools for Environmental Design and Management in a Systems Perspective*. Kluwer Academic Publishers, 2002.
- H. Bezet, C. Van Hemel: *Ecodesign, a Promising Approach to Sustainable Production and Consumption*. Delft University of Technology. Delft, 1997.
- R. Noyea: *Unit Operations in Environmental Engineering*. Noyes Publications, New Jersey, 1994.

Cilji

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.

Objectives

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.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

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

- Računski del
- Teoretični del
- Seminarska naloga

50
20
30

Student has to pass successfully the following obligations:

- Calculation part
- Theoretical part
- Seminar

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.
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 SYLLABUS**

Predmet:	Osnove membranskih transportov
Course title:	Fundamentals of membrane transport

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

Vrsta predmeta / Course type: Izbirni / Optional

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: Irena Petrinić

Jeziki / Predavanja / Lectures: slovenski / Slovene
Languages: Vaje / Tutorial: slovenščina / Slovene

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

Splošno znanje fizike, kemije in matematike.

Prerequisites:

General knowledge of chemistry, physics and mathematics

Vsebina:

Stabilnost koloidnih sistemov: definicija in klasifikacija; osnove DLVO sil (elektrostatične in Van der Waalove interakcije); NON-DLVO interakcije (solvatacijske/hidracijske sile; hidrofobne interakcije, sterična oviranja). Elektrokinetika koloidnih disperzij (naboj na površini koloidnih delcev in električni dvosloj; elektrokinetični efekti).

Teorija membranskega transporta (uvod, modeli membranskega transporta, koncentracijska polarizacija in zamašitev membran; Nadzor nad zamašitvijo membran in koncentracijsko polarizacijo).

Lastnosti membran (površinska napetost in kontaktni kot; zeta potencial na ravnih površinah).

Membranske nanotehnologije za obdelavo vod (zeolitske, katalitske in nanokompozitne

Content (Syllabus outline):

Colloid Stability: classification and definition of colloids, fundamental DLVO forces (electrostatic and Van der Waal interaction); Non-DLVO forces (solvation/hydration forces, hydrophobic interaction, steric hindrance).

Electrokinetics of colloidal dispersion (charged surface and the electrical double layer / charge on the surface of colloidal particles).

Membrane transport theory (introduction, Models of membrane transport, Concentration and pressure gradient in membranes; Membrane fouling; Control of fouling and Concentration Polarization).

Membrane properties (surface tension and contact angle, the zeta potential of the flat surfaces).

Water Treatment Membrane Nanotechnologies (zeolite, catalytic, mix matrix membrane, nanocomposite membrane, thin film nanocomposite membrane, aligned carbon tube,

membrane, blok kopolimeri, ogljikove nano cevke, biomimetične membrane)
Osmoza in osmotski tlak, napredna osmoza

Seminarske in laboratorijske vaje:
Vaje se navezujejo na tematiko predmeta.
Študent samostojno reši nekaj praktičnih primerov

block copolymer, biomimetic membrane)
Osmosis and osmotic pressure; Forward osmosis processes

Tutorials and laboratory work will be based on chosen topic regarding the theme of the subject.
Students individually solve several practical examples.

Temeljni literatura in viri / Readings:

- Kogej Ksenija; Površinska in koloidna kemija, Fakulteta za kemijo in kemijsko tehnologijo, Univerza v Ljubljani; Ljubljana 2010.
- Luxbacher Thomas; The ZETA Guide – Principles of the streaming potential technique; Anton Paar GmbH; Austria 2014.
- Baker R.W.; Membrane technology and applications, 2nd ed., John Wiley 2004
- Mulder Marcel; Basic Principles of Membrane Technology, Kluwer Academic Publishers, 1991; Dordrecht, Netherlands.
- Judd, S. Jefferson, B. (2003) Membranes for Industrial Wastewater Recovery
- Primarna literatura (npr. članki) s tematiko glede na študentovo področje raziskovanja /Primary literature (e.g. papers) corresponding to the student's research interest.

Cilji in kompetence:

Cilj predmeta je, da študentje pridobijo znanja in veščine:
Zagotoviti razumevanje splošnih načel koloidnih sistemov, teorije membranskih sistemov in membranskih tehnologij za obdelavo vod, da študent obravnava možnosti na dejanskih primerih le-teh.

Objectives and competences:

This course aims to give students
To provide an understanding of general knowledge of colloidal systems, Membrane transport theory and Water Treatment Membrane Nanotechnologies to allow students to make sensible options given in real cases.

Predvideni študijski rezultati:

Znanje in razumevanje:

- S pridobitvijo znanja teorije, mehanizma delovanja in tehnološkega razvoja, bo študentom dalo orodje za uporabo omenjenih tehnologij tekom svojih raziskovanj in tudi na njihovih prihodnjih delovnih mestih.

Prenesljive/ključne spretnosti in drugi atributi:

- Pridobljena znanja bodo študentje sposobni uporabiti pri reševanju posameznih praktičnih primerov in problemov v industrijskih kemijsko-tehnoloških procesih.

Intended learning outcomes:

Knowledge and understanding:

- By getting knowledge on the theory, mechanism and technology development, this will give the students tools in using this technology in their research and also in their future jobs.

Transferable/Key Skills and other attributes:

- Students will be able to use the acquired knowledge in solving particular practical cases and problems from chemical process technology on industrial scale.

Metode poučevanja in učenja:

Pristop temelji na samostojnem delu študenta ob sodelovanju učiteljev (konzultacije z učitelji, priprava na izpit in izpit).

Learning and teaching methods:

The approach is based on the student's own work in cooperation with teachers (consultations with teachers, preparing for the exam and the exam).

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti: • seminarska naloga • pisni izpit in • ustni izpit.	30 40 30	Student has to pass successfully the following obligations: • individual paper • written examination and • oral examination

Reference nosilca / Lecturer's references:

1. LUXBACHER, Thomas, ČURLIN, Mirjana, PETRINIĆ, Irena, BUKŠEK, Hermina, PUŠIĆ, Tanja. Assessing the quality of raw cotton knitted fabrics by their streaming potential coefficients. Cellulose, ISSN 0969-0239, Aug. 2014, vol. , iss. , str. 1-11, ilustr., doi: 10.1007/s10570-014-0388-y.
2. MURIĆ, Arnela, PETRINIĆ, Irena, LYKKEGAARD CHRISTTENSEN, Morten. Comparison of ceramic and polymeric ultrafiltration membranes for treating wastewater from metalworking industry. The chemical engineering journal, ISSN 1385-8947. [Print ed.], 1 Nov. 2014, vol. 255, str. 403-410, doi: 10.1016/j.cej.2014.06.009.
3. BAUMAN, Maja, KOŠAK, Aljoša, LOBNIK, Aleksandra, PETRINIĆ, Irena, LUXBACHER, Thomas. Nanofiltration membranes modified with alkoxysilanes : surface characterization using zeta-potential. Colloids and surfaces. A, Physicochemical and Engineering Aspects, ISSN 0927-7757. [Print ed.], 5. Apr. 2013, vol. 422, str. 110-117
4. VERLIEFDE, A. R. D., CORNELISSEN, E. R., HEIJMAN, S. G. J., PETRINIĆ, Irena, LUXBACHER, Thomas, AMY, Gary L., BRUGEN, B. van der, DIJK, J. C. van. Influence of membrane fouling by (pretreated) surface water on rejection of pharmaceutically active compounds (PhACs) by nanofiltration membranes. Journal of membrane science, ISSN 0376-7388. [Print ed.], Mar. 2009, vol. 330, iss. 1/2, str. 90-103
5. LUXBACHER, Thomas, BUKŠEK, Hermina, PETRINIĆ, Irena, PUŠIĆ, Tanja. Zeta potential determination of flat solid surfaces using a SurPASS electrokinetic analyzer = Mjerjenje zeta potencijala ravnih čvrstih površina pomoću elektrokinetičkog analizatora SurPASS. Tekstil, ISSN 0492-5882, aug. 2009, vol. 58, no. 8, str. 393-400.
6. BUKŠEK, Hermina, PETRINIĆ, Irena, LUXBACHER, Thomas, BRODNJAK-VONČINA, Darinka. Določanje potenciala zeta ravnih, trdnih površin z elektrokinetičnim analizatorjem. Kemija v šoli, ISSN 0353-4928, okt. 2009, letn. 21, št. 3, str. 23-29.



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		3.	poletni
Chemical Technology / 1 st level UN			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:

- 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 fosfogluconatna pot
- Verige za prenos elektronov in nastanek ATP

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

• 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	• 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
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Temeljni literatura in viri / Readings:

• Madigan, T.M., Martinko, J.M., Parker, J.: Brock Biology of Microorganisms, 11th Ed., Prentice Hall, Inc., New Jersey, 2006. • Boyer, Rodney F.: Concepts in biochemistry, 3rd ed., J. Wiley & Sons, Hoboken , 2006 • D.E. Nelson, M.M. Cox, Lehninger Principles of Biochemistry, 6th Ed. W.H. Freeman & Co., New York, 2013. • 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.
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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
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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
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Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory work

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Izpit je opravljen, če sta pozitivno opravljeni naslednji 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:

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].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**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 UN		3.	poletni
Chemical Technology / 1 st level UN			Spring

Vrsta predmeta / Course type	Izbirni / Elective
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Univerzitetna koda predmeta / University course code:	
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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
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Jeziki /	Predavanja / Lectures:	slovenski / Slovene
Languages:	Vaje / Tutorial:	slovenski / Slovene

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

Ni.

Prerequisites:

None.

Vsebina:

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 structure, ekspresije, metabolne poti - Integrirani sistemi za dostop do podatkovnih zbirk: Entrez (NCBI), ExPASy, Ensembl. Sekvenčne poravnave in konstrukcija filogenetskih

Content (Syllabus outline):

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:

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: zvijanje 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

Laboratorijske vaje:

Izdelava in evalvacija testov za gensko tipizacijo DNA polimorfizmov: prenos tarčnih sekvenc iz podatkovnih zbirk v orodja za analizo DNA sekvenc, načrtovanje oligonukleotidov za PCR, RFLP test

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:

- Lesk A: (2005) Introduction to Bioinformatics. 2nd Ed, Oxford University Press, Oxford, UK
- Barnes MR, Gray IC: Bioinformatics for geneticist. John Wiley&Sons, R.J.M , West Sussex, 2003.
- Attwood TK, Parry-Smith DJ (1999) Introduction to Bioinformatics. Prentice Hall, Harlow, England.
- Baxevanis AD, Francis Ouellette BF (1998) Bioinformatics A Practical Guide to the Analysis of Genes and Proteins. Wiley-Interscience, A John Wiley & Sons Inc., Publication, New York, USA.
- Higgins D, Taylor W (2000) Bioinformatics. Sequence, Structure and Databanks. Oxford University Press, Oxford, UK.
- 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:

Znanje in razumevanje:

vrste in struktura podatkovnih zbirk

pomen in interpretacija molekularno bioloških in genomske 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

Intended learning outcomes:

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

Metode poučevanja in učenja:

• Predavanja • Laboratorijske vaje

Learning and teaching methods:

• Lectures • Laboratory work

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit je opravljen, če so pozitivno opravljene naslednje obveznosti:		Student has to pass successfully the following obligations:
• 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].



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	Diplomsko delo
Course title:	Bachelor's Thesis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Kemijska tehnologija / 1. stopnja UN		3.	poletni
Chemical Technology / 1 st level UN			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
		10			140	5

Nosilec predmeta / Lecturer:**Jeziki /****Predavanja / Lectures:**

slovenski / Slovene

Languages:**Vaje / Tutorial:**

slovenski / Slovene

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

Opravljenе vse vaje (prisotnost in študijske obveznosti vaj) predzadnjega semestra, večina opravljenih izpitov in soglasje mentorja.

Prerequisites:

Completion of experimental work (presence and study obligations) for the semester before last, completion of majority of required courses and consent of mentor.

Vsebina:

Priprava diplomskega dela poteka kot samostojno delo študenta na raziskovalnem projektu s področja kemijske tehnike. Diplomsko delo je lahko tudi skupni raziskovalni projekt več študentov. Teme projektov za diplomska dela razpišejo mentorji v okviru raziskovalnih laboratorijev Fakultete za kemijo in kemijsko tehnologijo ali predlagajo študentje. Študent pridobi soglasje predvidenega mentorja, ki ga usmerja in svetuje pri izvedbi diplomskega dela.

Formalni postopek priprave in zagovora diplomskega dela poteka v skladu z veljavnim

Content (Syllabus outline):

The student has to work independently on a research project concerning chemical engineering problem. Bachelor's 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 or could be initiated by students. Consent of mentor is required. Mentor guides the student through the research work of Bachelor's Thesis.

The formal procedure for Bachelor's Thesis preparation and defence is regulated by the

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 naslednje:

- formulacija problema
- pregled in analiza dosedanjih raziskav in relevantne literature
- postavitve raziskovalnih hipotez
- definiranje metod dela
- časovni načrt izvedbe projekta
- praktično delo v enem od raziskovalnih laboratorijev fakultete
- interpretacija in kritična presoja rezultatov
- priprava pisnega izdelka
- ustna predstavitev.

“pravilnik o postopku priprave in zagovora diplomskega dela na študijskem programu 1. stopnje” of the University of Maribor.

The preparation and defence of Bachelor’s Thesis usually include the following activities of student:

- problem formulation
- state-of-the-art in the proposed field of research and survey of the relevant literature
- definition of research hypotheses
- definition of research methods
- time plan of project
- 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_UNI_KT-2014.docx
- Peter Glavič: *Navodila za izdelavo diplomskega dela*. Univerza v Mariboru, Fakulteta za kemijo in kemijsko tehnologijo, Maribor, 2008.
- Veljavni pravilnik o postopku priprave in zagovora diplomskega dela za univerzitetni na študijskem programu 1. stopnje, Univerze v Mariboru.
- Specifično literaturo bodo študentom posredovali mentorji.

Cilji in kompetence:

Študent je sposoben:

- izbrati ter uporabiti domačo in tujo strokovno literaturo za potrebe rešitve izbranega problema.
- reševanja inženirskih problemov z uporabo teoretičnih znanj in v praksi pridobljenih izkušenj.
- predstavitve rezultatov dela strokovni javnosti v obliki pisnega poročila, predavanja, diskusije

Objectives and competences:

The student would be able to:

- to choose and use national and international professional literature in order to solve the chosen problem.
- to solve engineering problems by using the theoretical knowledge and in his practical experiences.
- present the results to a professional audience by means of a written report, oral presentation and discussion.

Predvideni študijski rezultati:

Znanje in razumevanje:

- obvladanje znanj širšega strokovnega področja, v katerega sodi diplomska naloga in ožje znanje ter razumevanje izrazoslovja, ki ga zajema tema diplomskega dela. Poudarek je na praktičnih znanjih in enostavnejših metodologijah zajemanja, obdelovanja in prikazovanja podatkov.
- poznavanje sistematike, metod in pristopov raziskovalnega dela

Intended learning outcomes:

Knowledge and Understanding:

- present the knowledge of the broader professional field to which belongs the thesis and special knowledge of the glossary concerned by the degree’s work theme. The emphasis is on the practical skills and relatively more simple methodologies of collecting, processing and presenting data.
- knowledge of systematics, methods and approaches of research work,

• sposobnost reševanja inženirskih problemov s področja kemijske tehnike Prenesljive/ključne spretnosti in drugi atributi: • sposobnost reševanja strokovnih problemov, kritičnega razmišljanja in razumevanja strokovne literature • sposobnost učinkovite komunikacije o strokovni problematiki • sposobnost učinkovite predstavitve in interpretacije rezultatov dela	• ability of solution of engineering problems in the field of Chemical Engineering Transferable/Key Skills and other attributes: • ability to solve the professional problems, understand the literature and to think critically • ability to efficiently communicate about problematics, • ability to efficiently present and interpret the results of work
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Metode poučevanja in učenja:

Mentor na konzultacijah preverja:

- vsebinski in strukturni vidik naloge.
- pripravo pisnega izdelka in ustne predstavitve

Learning and teaching methods:

Consultations between student and mentor about:

- The content and the structural aspect of the work
- preparation of written report and oral presentation

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Diplomsko delo je zaključeno, če so pozitivno opravljene naslednje obveznosti:		Student has to pass successfully the following obligations:
• diplomsko delo • ustni zagovor	50	• Bachelor's Thesis work • oral presentation
	50	

Reference nosilca / Lecturer's references:

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