Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Fizikalna kemija 2**
Course title:	**Physical Chemistry 2**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	3.	poletni Spring
Five-year master's degree program Subject Teacher	/		

Vrsta predmeta / Course type	Obvezni / Obligatory
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30	15		60		135	8

Nosilec predmeta / Lecturer:	Urban Bren

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Osnovno znanje splošne in anorganske kemije, matematike in fizike.	Basic knowledge of general and inorganic chemistry, mathematics and physics.

Vsebina:

- Ravnotežna elektrokemija: ionske raztopine, electrode in elektrokemijski členi
- Molekule v gibanju: Kinetični model plina, Transportne lastnosti idelanega 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 elektrolitov, Transportno število, Kemijska kinetika, Adsorpcija

Content (Syllabus outline):

- Equilibrium electrochemistry: Ionic solutions, Electrodes and the electrochemical cell
- 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, Cryoskopy, Temperature – composition diagrams, 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

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

problemov. Pridobiti osnovne spretnosti za izvedbo in ovrednotenje eksperimentalnih meritev.	simple scientific problems. Acquiring basic skills to conduct and evaluate experimental measurements.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • določiti lastnosti idelanih 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.	**Knowledge and understanding:** • 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 logicall thinking, as will the ability to study independently.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Reševanje problemov • Domače naloge • Laboratorijske vaje	• Classroom lectures • Classroom problem solving sessions, • Homework assigments • Laboratory work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Pisni izpit, • Ustni izpit • Laboratorijske vaje	35 35 30	• Written examination, • Oral examination • Lab work

Reference nosilca / Lecturer's references:

1. UDOMMANEETHANAKIT, Thanyarat, RUNGROTMONGKOL, Thanyada, FRECER, Vladimir, SENECI, 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. [COBISS.SI-ID 5396250]

2. 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. [COBISS.SI-ID 5218330]

3. 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. [COBISS.SI-ID 4965658]

4. 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]

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]