UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fizikalna kemija
Course title:	Physical Chemistry

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	

Univerzitetna koda predmeta/University course code: 528

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
45	0	0	0	0	45	3

Nosilec predmeta/Lecturer: Jurij Lah

Vrsta predmeta/Course type: Izbirni / Elective

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Pogoj za vključitev v delo je vpis v tekoči letnik študija.	Matriculation into the programme.

Vsebina:	Content (Syllabus outline):
Osnovni pojmi: sistem, lastnosti sistema, stanje sistema, funkcije stanja, ravnotežje. Enačbe stanja: idealni plin, splošna plinska enačba, van der Waalsova enačba, virialna enačba, enačba stanja za plinske zmesi. Zakon termodinamike: toplota, delo, reverzibilni in ireverzibilni procesi, notranja energija, entalpija, toplotna kapaciteta, termodinamika idealnega plina; termokemija: reakcijska toplota, kalorimetrija, Hessov zakon, Kirchhoffov zakon. III. zakon termodinamike: entropija, entropija in ravnotežje; ravnotežni pogoji za zaprte sisteme: Helmholtzova in Gibbsova prosta energija, termodinamski potenciali, odvisnost termodinamskih funkcij od tlaka in temperature; III. zakon termodinamike. Fazna ravnotežja: faza, komponenta, prostostne stopnje, fazno pravilo, fazni diagrami, Clapeyronova in Clausius-Clapeyronova enačba. Raztopine: idealne in neidealne raztopine, kemijski potencial, termodinamika mešanja; koligativne lastnosti: osmozni tlak, znižanje zmrzišča, zvišanje vrelišča. Kemijsko ravnotežje: konstanta ravnotežja in njena temperaturna odvisnost, homogena in heterogena ravnotežja.	Basic concepts: system, system state and properties, state functions, equilibrium. Equations of state: ideal gas, van der Waals, virial, gas mixtures. Law of thermodynamics: heat, work, reversible and irreversible processes, internal energy, enthalpy, heat capacity, thermodynamics of ideal gas; thermochemistry: reaction heat, calorimetry, Hess law, Kirchhoff's law. III. law of thermodynamics: entropy, entropy and equilibrium; equilibrium conditions for closed systems: Helmholtz and Gibbs free energy; thermodynamic potentials, dependence of thermodynamic functions on temperature and pressure; III law of thermodynamics. Phase equilibria: phase, component, degrees of freedom, phase rule, phase diagrams, Clapeyron and Clausius-Clapeyron equation. Solutions: ideal and nonideal solutions, chemical potential, thermodynamics of mixing; colligative properties: osmotic pressure, boiling point elevation, freezing point depression. Chemical equilibrium: equilibrium constant and its temperature dependence, homogeneous and heterogeneous equilibria.

Temeljna literatura in viri/Readings:

W. J. MOORE, 1972, Physical Chemistry, Prentice-Hall, New Jersey, ISBN 0582442346, str. 1-570.
P. W. ATKINS, 1998. Physical Chemistry, Oxford University Press, Oxford., ISBN 019269068X, s 981, od str. 1-243.

Dopolnilni viri / Additional readings:
M. BEŠTER ROGAČ: 100 rešenih problemov iz fizikalne kemije za študente geologije, NTF, Oddelek za geologijo, september 1999.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent(ka) bo osvojil(a) znanje o osnovnih fizikalno-kemijskih količinah, s katerimi popisujemo stanja in lastnosti sistemov. KOMPETENCE: Osvojil(a) bo znanje o zakonitostih, ki povezujejo posamične lastnosti sistemov, kot tudi zakonitosti, ki določajo smer spontanih sprememb. Z vključevanjem primerov iz geologije se bo naučil(a) tudi nekaterih osnovnih fizikalno-kemijskih principov, ki igrajo pomembno vlogo pri mnogih procesih v našem okolju.	OBJECTIVES: Students will obtain knowledge on basic physico-chemical quantities needed for description of state and system properties. COMPETENCES: Students will obtain knowledge on features connecting individual properties of systems as well as with laws that determine direction of spontaneous changes. By incorporating examples from geology students will learn some basic physico-chemical principals playing an important role in many processes in our environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet daje študentu teoretično (predavanja) in praktično (laboratorijske vaje) znanje iz osnov fizikalne kemije. Pridobljeno znanje bo študentu koristilo pri razumevanju zakonitosti in uporabe kemijskih in fizikalnih procesov. Pridobljeno teoretično in praktično znanje je potrebno za uspešen študij drugih predmetov in za razumevanje in obvladovanje različnih problemov v geologiji. Predmet daje znanja, ki bodo omogočila študentu samostojnost pri kvantitativni obravnavi opazovanih naravnih procesov. Študent se nauči nekaterih teoretičnih principov, ki so osnova pri spremljanju procesov v geologiji.	Student will get theoretical (lectures) and practical (tutorial-lab exercises) knowledge of basic physical chemistry. With the acquired knowledge student will better understand various phenomena in chemistry and physics. The obtained theoretical and practical knowledge is required for successful study of other subjects in the programme and for understanding and solving various problems in geology. The presented physical chemistry course gives knowledge that will enable student independence in quantitative analysis of studied systems. Students will learn some theoretical principles which may represent solid basis for monitoring geological processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja: z uporabo različnih učnih pripomočkov (Power Point, prosojnice, kreda in tabla).	Lectures: performed by using various tools (Power Point, transparencies, chalk and board).

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
računske naloge	50,00 %	calculating tasks
teoretična vprašanja	50,00 %	theoretical questions
Pisni izpit v dveh delih: računske naloge (50%) in teoretična vprašanja (50%). Za pozitivno oceno mora biti pravilno rešenih najmanj 50% računskih nalog in hkrati najmanj 50% teoretičnih vprašanj. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Written exam in two parts: calculating tasks (50%) and theoretical questions (50%). Needed condition for passing the exam: 50% of calculating tasks and 50 % theoretical questions have to be answered correctly. Scale of giving marks: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) with consideration of UL and faculty rules.

Reference nosilca/Lecturer's references:

DROBNAK, Igor, DE JONGE, Natalie, HAESAERTS, Sarah, VESNAVER, Gorazd, LORIS, Remy, LAH, Jurij. Energetic basis of uncoupling folding from binding for an intrinsically disordered protein. J. Am. Chem. Soc., 2013, 135, no. 4, str. 1288–1294.
BONČINA, Matjaž, LAH, Jurij, PRISLAN, Iztok, VESNAVER, Gorazd. Energetic basis of human telomeric DNK folding into G-quadruplex structures. J. Am. Chem. Soc., 2012, 134, no. 23, str. 9657-9663.

LAH, Jurij, BEŠTER-ROGAČ, Marija, PERGER, Tine Martin, VESNAVER, Gorazd. Energetics in correlation with structural features : the case of micellization. J. Phys. Chem., B Condens. mater. surf. interfaces biophys., 2006, vol. 110, no. 46, str. 23279-23291.
PRISLAN, Iztok, LAH, Jurij, VESNAVER, Gorazd. Diverse polymorphism of G-quadruplexes as a kinetic phenomenon. J. Am. Chem. Soc. 2008, 130, 14161–14169.
LAH, Jurij, DROBNAK, Igor, DOLINAR, Marko, VESNAVER, Gorazd. What drives the binding of minor groove-directed ligands to DNA hairpins?. Nucleic Acids Res. 2008, 36, 897-904.
BUTS, Lieven, LAH, Jurij, DAO-THI, Minh-Hoa, WYNS, Lode, LORIS, Remy. Toxin-antitoxin modules as bacterial metabolic stress managers. Trends Biochem. Sci. 2005, 30, 672-679.