| UČNI NAČRT PREDMETA / COURSE SYLLABUS | |
|---|---|
| **Predmet:** | SPLOŠNA KEMIJA |
| **Course Title:** | GENERAL CHEMISTRY |

| Študijski program in stopnja<br>Study Programme and Level | Študijska smer<br>Study Field | Letnik<br>Academic Year | Semester<br>Semester |
|---|---|---|---|
| UŠP Kemijsko inženirstvo, 1. stopnja,<br>UŠP Biokemija, 1. stopnja,<br>UŠP Kemija, 1. stopnja | / | 1. | 1. |
| USP Chemical Engineering, 1st Cycle,<br>USP Biochemistry, 1st Cycle,<br>USP Chemistry, 1st Cycle | / | 1st | 1st |

**Vrsta predmeta / Course Type:** obvezni / Mandatory

**Univerzitetna koda predmeta / University Course Code:** KE103

| Predavanja<br>Lectures | Seminar<br>Seminar | Vaje<br>Tutorial | Klinične vaje<br>Work | Druge oblike študija | Samost. delo<br>Individual Work | ECTS |
|---|---|---|---|---|---|---|
| 45 | 30 | / | / | / | 75 | 5 |

**Nosilec predmeta / Lecturer:** prof. dr. Anton Meden / Dr. Anton Meden, Full Professor , prof. dr. Iztok Turel / Dr. Iztok Turel, Full Professor

| **Jeziki / Languages:** | | |
|---|---|---|
| | **Predavanja / Lectures:** | **slovenski / Slovenian** |
| | **Vaje / Tutorial:** | **slovenski / Slovenian** |

| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | **Prerequisites:** |
|---|---|
| Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost. | The course has to be assigned to the student. |

| **Vsebina:** | **Content (Syllabus outline):** |
|---|---|
| **Uvod:** utrjevanje in nadgradnja srednješolskega znanja – osnovne kemijske zakonitosti in njihova uporaba.<br>**Zgradba atomov:** osnovni delci atoma, izotopi; model atoma vodika (kvalitativno): orbitale (kvantna števila, oblika, meje, orientiranost v prostoru); večelektronski atomi, izgradnja elektronske ovojnice ( Hundovo pravilo, Paulijev princip); periodni sistem: lastnosti elementov v periodnem sistemu | **Introduction:** consolidation and upgrade of the secondary school knowledge – basic chemical principles and application thereof.<br>**Structure of atoms:** atomic particles, isotopes; model of hydrogen atom (qualitative level): orbitals (quantum numbers, shapes, boundaries, orientation in space); multi-electron atoms, building of the electron shell (Hund rule, Pauli principle); Periodic Table, atomic properties (atomic radii, ionization energies, electron affinity). |

UL FKKT

| | |
|---|---|
| (radiji atomov in ionov, ionizacijske energije, elektronska afiniteta).<br>**Kemijska vez:** ionska vez; kovalentna vez (nepolarna, polarna vez, dipolni moment, teorija valenčne vezi: principi teorije, resonanca, hibridizacija, geometrija molekul; teorija molekulskih orbital: principi teorije, delokalizirane MO); elektronegativnost; strukture anorganskih molekul (strukturne formule in nomenklatura anorganskih spojin)<br>**Agregatna stanja snovi in medmolekulske vezi:** plini, tekočine, trdne snovi; interakcije med molekulami (Van der Waalsove in vodikove vezi, vpliv teh vezi na lastnosti snovi). Struktura amorfnih in kristaliničnih trdnih snovi: ionski, kovalentni, kovinski in molekulski kristali, polprevodniki, tekoči kristali.<br>**Disperzni sistemi:** prave in koloidne raztopine ter njihove lastnosti.<br>**Kemijske reakcije:** kemijske reakcije in kemijske enačbe; energijske spremembe pri kemijskih reakcijah (standardne tvorbene in standardne reakcijske entalpije, Hessov zakon); ravnotežje kemijskih reakcij, Le Chatelierovo načelo; vplivi na hitrost kemijske reakcije, kataliza; ionske reakcije (ionska ravnotežja, topnost, topnostni produkt); protolitske reakcije (Brønstedova teorija kislin in baz, pH, indikatorji, titracija, vpliv ionov na protolitska ravnotežja); redoks reakcije(oksidacijsko število in urejanje redoks reakcij, galvanski členi, elektroliza).<br>**Koordinacijske spojine:** stereokemijske značilnosti koordinacijskih spojin (izomerija); kemijska vez v koordinacijskih spojinah; vpliv elektronske konfiguracije na magnetne in optične lastnosti koordinacijskih ionov (kvalitativno). | **Chemical bonding:** ionic bond, covalent bond (non-polar, polar, dipolar momentum, valence bond theory: principles, resonance, hybridization, molecular geometry; molecular orbital theory: principles, delocalized MO); electronegativity, structures of inorganic compounds (structural formulas and nomenclature of inorganic compounds).<br>**States of matter and intermolecular bonds:** gases, liquids, solids, intermolecular interactions (Van der Waals and hydrogen bonds, influence of these bonds on properties of matter). Structure of amorphous and crystalline compounds: ionic, covalent and molecular crystals, semiconductors, liquid crystals.<br>**Disperse systems:** true and colloidal solutions and their properties.<br>**Chemical reactions:** chemical reactions and chemical equations: energy changes at chemical reactions (standard enthalpies of formation and standard reaction enthalpies, Hess law); chemical equilibrium, Le Chatelier`s principle; the influences on the rate of the chemical reactions, catalysis; ionic reactions (ionic equilibria, solubility, solubility product); protolytic reactions (Brønsted theory of acids and bases, pH, indicators, titration. Influence of ions on protolytic equilibria). Redox reactions (oxidation number and balancing of redox reactions, galvanic cells, electrolysis).<br>**Basics of coordination chemistry:** stereochemical properties of coordination compounds, chemical bond in coordination compounds, the influence of the electronic structure on the magnetic and optical properties of coordination ions (qualitative basis). |

**Temeljna literatura in viri / Readings:**

UL FKKT

**Osnovni učbenik:**
- F. Lazarini, J. Brenčič, Splošna in anorganska kemija, Založba FKKT, Ljubljana 2004, str. 1-261.

**Dodatna literatura:**
- R.H. Petrucci, W.S.Harwood, F.G. Herring, General Chemistry, Principles and modern applications, osma izdaja, Prentice Hall New Jersey, 2002, 1150 str. (40%) glede na interes študenta
- Erwin Riedel, Allgemeine und Anorganische Chemie, osma izdaja,Walter de Gruyter, Berlin, 2004, 380 str. (60%) glede na interes študenta
- A. Burrows, J. Holman, A. Parsons, G. Pilling, G. Price, Chemistry³: Introducing inorganic, organic and physical chemistry (Second Edition ), Oxford University Press, Oxford, 2013 (1440 pages). (20 %).

| **Cilji in kompetence:** | **Objectives and Competences:** |
|---|---|
| **Cilji:** Poglobiti in nadgraditi znanje splošne in anorganske kemije, pridobljeno na srednji šoli, ki je potrebno za nadaljnji študij. Poudarek je na poznavanju in pravilnim razumevanjem osnovnih kemijskih zakonitosti ter poznavanju zgradbe snovi in njenega vpliva na kemijske lastnosti snovi.<br>**Kompetence:** Študent pozna in razume osnovne kemijske zakonitosti, principe in teorije ter jih zna uporabiti pri reševanju preprostih problemov (kvalitativno ali kvantitativno). Je sposoben poiskati in ovrednotiti določene podatke o snoveh in jih zna povezati z njihovimi lastnostmi. | **Objectives:** Deepening and upgrading the knowledge of general and inorganic chemistry, ackquired in the secondary school, which is necessary for further study. Emphasis is given to knowledge and correct understanding basic chemical principles and knowledge on the constitution of matter and its influence on chemical properties of matter.<br>**Competences:** student knows and understands basic chemical principles and theories and knows how to use them for solving simple problems (qualitative or quantitative).He is able to find and evaluate given data about substances and is able to relate them to the properties of the substances. |

| **Predvideni študijski rezultati:** | **Intended Learning Outcomes:** |
|---|---|
| <u>Znanje in razumevanje</u><br>Študent pozna in razume osnovne kemijske zakonitosti ter jih zna povezati z zgradbo in lastnostmi snovi in kemijskimi reakcijami. | <u>Knowledge and Comprehension</u><br>Student knows and understands basic chemical principles and is able to relate them to the structure and properties of matter and chemical reactions. |
| <u>Uporaba</u><br>Znanje in razumevanje osnovnih kemijskih zakonitosti so temelji predmetom pri nadaljnjem študiju. | <u>Application</u><br>Knowledge and understanding of basic chemical principles are the basis of subjects for further study. |
| <u>Refleksija</u><br>Študent je sposoben oceniti pomen osnovnih kemijskih zakonitosti in teoretskega znanja za razlago eksperimentalnih dejstev in lastnosti snovi. | <u>Analysis</u><br>Student is able to asses the meaning of basic chemical principles and theoretical knowledge for an explanation of experimental facts and properties of compounds. |

UL FKKT

| Prenosljive spretnosti | Skill-transference Ability |
|---|---|
| Študent zna poiskati podatke iz strokovne literature, podatke iz virov medmrežja pa zna kritično oceniti; zna uporabljati strokovni jezik (pisno in ustno). | Student is able to find data from professional literature and is able to critically evaluate the data from the internet; he is able to use the professional language (written and spoken). |

| **Metode poučevanja in učenja:** | **Learning and Teaching Methods:** |
|---|---|
| Eksperimentalna predavanja z uporabo IKT; seminarji: sodelovalno učenje/ poučevanje ter problemsko delo; sprotno preverjanje znanja s testi. | Experimental lectures using the ICT; seminars: cooperative learning/teaching and problem work; regular knowledge assessment using tests. |

| **Načini ocenjevanja:** | Delež (v %) / Weight (in %) | **Assessment:** |
|---|---|---|
| 2 testa za sprotno preverjanje znanja in pisni izpit. Če študent na vsakem od obeh testov zbere najmanj 51 % točk je lahko oproščen opravljanja izpita. Ocenjevalna lestvica v skladu z enotno lestvico na Univerzi v Ljubljani:<br>6 – 10 opravil izpit,<br>1 – 5 ni opravil izpita. | | 2 test for during the semester and written exam. If the student collects at least 51 % of points at each of the tests, he can be excused from the exam. Grades according to the standard levels of the University of Ljubljana:<br>6-10 passed,<br>1-5 insufficient. |

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

- ZUPANIČ, Franc, MARKOLI, Boštjan, NAGLIČ, Iztok, WEINGÄRTNER, Tobias, **MEDEN, Anton**, BONČINA, Tonica. Phases in the Al-corner of the Al-Mn-Be system. *Microscopy and microanalysis*, ISSN 1431-9276. [Print ed.], FirstView Article, online: 18 June 2013, doi: 10.1017/S1431927613001852. [COBISS.SI-ID 16956694]
- IPAVEC, Andrej, GABROVŠEK, Roman, VUK, Tomaž, KAUČIČ, Venčeslav, MAČEK, Jadran, **MEDEN, Anton**. Carboaluminate phases formation during the hydration of calcite-containing Portland cement. *Journal of the American Ceramic Society*, ISSN 0002-7820, 2011, vol. 94, no. 3, str. 1238-1242, doi: 10.1111/j.1551-2916.2010.04201.x. [COBISS.SI-ID 34764037]
- MALI, Gregor, **MEDEN, Anton**, DOMINKO, Robert. [sup] 6 Li MAS NMR spectroscopy and first-principles calculations as a combined tool for the investigation of Li [sub] 2 MnSiO [sub] 4 polymorphs. *Chemical communications*, ISSN 1359-7345, 2010, issue 19, str.3306-8, doi: 10.1039/c003065a. [COBISS.SI-ID 4386074]

1. P. Živec, F. Perdih, **I. Turel**, G. Giester, G. Psomas, Different types of copper complexes with the quinolone antimicrobial drugs ofloxacin and norfloxacin: Structure, DNA- and albumin-binding, J. Inorg. Biochem., 117, 35–47 (2012).
2. D. Čurman, P. Živec, I. Leban, **I. Turel**, A. Polishchuk, K. D. Klika, E. Karaseva, V. Karasev, Spectral properties of Eu(III) compounds with antibacterial agent ciprofloxacin (cfqH). Crystal structure of $[Eu(cfqH)(cfq)(H_2O)_4]Cl_2.4.55\ H_2O$, Polyhedron, 27, 1489-1496 (2008).
3. P. Drevenšek, J. Košmrlj, G. Giester, T. Skauge, E. Sletten, K. Sepčić, **I. Turel**, X-Ray Crystallographic, NMR and Antimicrobial Activity Studies of Magnesium Complexes of Fluoroquinolones - Racemic Ofloxacin and Its S-form, Levofloxacin, J. Inorg. Biochem., 100, 1755-1763 (2006).

UL FKKT