

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

|                      |                     |
|----------------------|---------------------|
| <b>Predmet:</b>      | ANORGANSKA SINTEZA  |
| <b>Course Title:</b> | INORGANIC SYNTHESIS |

| Študijski program in stopnja<br>Study Programme and Level | Študijska smer<br>Study Field | Letnik<br>Academic Year | Semester<br>Semester |
|-----------------------------------------------------------|-------------------------------|-------------------------|----------------------|
| UŠP Kemija, 1. stopnja                                    | /                             | 2.                      | 4.                   |
| USP Chemistry, 1 <sup>st</sup> Cycle                      | /                             | 2 <sup>nd</sup>         | 4 <sup>th</sup>      |

**Vrsta predmeta / Course Type:**

izbirni strokovni / Elective Professional

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

KESI1

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

**Nosilec predmeta / Lecturer:**

prof. dr. Franc Perdih / Dr. Franc Perdih, Full Professor

**Jeziki / Languages:**

**Predavanja / Lectures:** slovenski / Slovenian

**Vaje / Tutorial:** slovenski / Slovenian

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

**Prerequisites:**

The course has to be assigned to the student.

**Vsebina:**

Vsebina seminarjev in vaj: Študenti bodo pri predmetu sintetizirali anorganske snovi z različnimi sintezniimi tehnikami in dobljene snovi preiskali. Spoznali bodo metode sinteze: hidrotermalna sinteza, sol-gel tehnika, enostavne načine dela v inertni atmosferi, reakcije v trdnem stanju, sinteza koordinacijske spojine. Metode karakterizacije pa so predznanju študentov prirejena uporaba rentgenske praškovne analize, termične analize in infrardeče spektroskopije. Študenti bodo sintetizirali bazični bakrov(II) sulfat, zemeljskoalkalijske oksalate hidrate, polimerno snov silikon, fluorooksovanadate(IV), titanov dioksid po sol-gel postopku, itrij-barij-bakrov superprevodnik in do dve snovi, ki se

**Content (Syllabus outline):**

Syntheses and characterizations of inorganic compounds. Different methods of syntheses are applied: hydrothermal synthesis, sol-gel technique, syntheses of unstable compounds, simple experiments in an inert atmosphere, solid state reactions, syntheses of coordination compounds. Basic copper(II) sulphate, alkaline earth oxalates hydrates, a polymeric silicone, fluoridooxidovanadate(IV), titanium dioxide (sol-gel method), Y-Ba-Cu-superconductor and some new complexes which are subject of current research at the department of Inorganic chemistry are prepared and characterized. Infrared spectroscopy, UV-vis spectroscopy, thermal analysis and X-ray powder diffraction analysis are used to

uporabljata pri tekočem raziskovalnem delu nosilca predmeta ali njegovih sodelavcev. Pri seminarju bodo študenti dobili potrebno teoretsko osnovo in navodila za sintezo.

characterize prepared compounds. The characterization methods are adapted to the knowledge level of these students. Theoretical background is explained in seminars.

#### Temeljna literatura in viri / Readings:

S. Petriček, F. Perdih in A. Demšar, Vaje iz anorganske kemije, FKKT UL, Ljubljana, 2010, 25-30, 47-68, 75-115.

Articles published in scientific journals.

#### Cilji in kompetence:

Cilj predmeta je nadgraditi znanje študentov iz predmetov Splošna kemija in Anorganska kemija.

Kompetence: Praktične laboratorijske veščine in izkušnje s področja sinteze in karakterizacije anorganskih snovi.

#### Objectives and Competences:

Expanding a basic knowledge of syntheses and characterization of inorganic compounds obtained in courses of General and Inorganic Chemistry.

Practical skills in comprehensive inorganic syntheses and characterization of inorganic compounds.

#### Predvideni študijski rezultati:

##### Znanje in razumevanje

Predmet predstavlja dopolnitev predmeta Splošna in anorganska kemija s praktičnim delom in izkušnjami.

##### Uporaba

Študent spozna, da je osnovno znanje prvega letnika dobra podlaga za zanimivo laboratorijsko delo in daje študentu vznemirljivo možnost iz reaktantov sintetizirati (»ustvariti«) novo snov.

##### Refleksija

Kemija je eksperimentalna veda, zato se je študentom lažje motivirati pri osvajanju teoretskega znanja, če spoznajo, da je to znanje potrebno pri eksperimentiranju.

##### Prenosljive spretnosti

Laboratorijske veščine, izkušnje in prijemi pri načrtovanju sintez so pomembni pri drugih kemijskih predmetih in pri osebnemu strokovnemu razvoju.

#### Intended Learning Outcomes:

##### Knowledge and Comprehension

The subject adds practical skills and experience to the previous courses of General and Inorganic Chemistry.

##### Application

Students find out that basic knowledge obtained during the first year study could be applied in challenging syntheses of new compounds.

##### Analysis

Applications of a theoretical background in practicals enhance motivation of the students for a comprehensive theoretical studies.

##### Skill-transference Ability

Practical skills and experience in planning of syntheses are useful also in other courses and important for a professional development.

**Metode poučevanja in učenja:**

Predmet se izvaja v obliki seminarjev in samostojnih laboratorijskih vaj. Na seminarju se tematiko vsake vaje umesti v širši kontekst anorganske kemije.

**Learning and Teaching Methods:**

A broad background of each experiment performed by students in practicals is explained in seminars.

**Načini ocenjevanja:**

Delež (v %) /

Weight (in %)

**Assessment:**

|                                                                             |     |                                                                                   |
|-----------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------|
| Poročila vaj<br>(pozitivno 6-10; negativno 5)                               | 20% | Laboratory reports<br>(positive 6-10; negative 5)                                 |
| Študent ustno predstavi seminar na temo sodobne anorganske sinteze kolegom; | 20% | Oral presentation of a selected topic in advanced inorganic syntheses in a class: |
| Pisni izpit (pozitivno 6-10; negativno 5);                                  | 60% | Written exam (positive 6-10; negative 5)                                          |
| Delni oceni za vaje in izpit morata biti pozitivni.                         |     | Laboratory reports and written exam must be positive.                             |

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

1. D. Sanna, J. Palomba, G. Lubinu, P. Buglyó, S. Nagy, **F. Perdih**, E. Garribba: Role of ligands in the uptake and reduction of V(V) complexes in red blood cells. *J. Med. Chem.* 2019, 62, 654–664.
2. T. Koleša Dobravec, K. Maejima, Y. Yoshikawa, A. Meden, H. Yasui, **F. Perdih**: Bis(picolinato) complexes of vanadium and zinc as potential antidiabetic agents: synthesis, structural elucidation and in vitro insulin-mimetic activity study. *New J. Chem.* 2018, 42, 3619–3632.
3. T. Koleša Dobravec, E. Lodyga-Chruscinska, M. Symonowicz, D. Sanna, A. Meden, **F. Perdih**, E. Garribba: Synthesis and characterization of VIVO complexes of picolinate and pyrazine derivatives. Behavior in the solid state and aqueous solution and biotransformation in the presence of blood plasma proteins. *Inorg. Chem.* 2014, 53, 7960–7976.