

UČNI NAČRT PREDMETA / COURSE SYLLABUS

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|-----------------|-------------------------|
| Predmet: | KEMIJA ONESNAŽEVAL |
| EVAL | CHEMISTRY OF POLLUTANTS |

| Študijski program in stopnja Study programme and level | Študijska smer Study field | Letnik Academic year | Semester Semester |
|---|-------------------------------|-------------------------|----------------------|
| Varstvo okolja in ekotehnologije, 1. stopnja | | 3. | 1., 2. |
| Environmental Protection and Eco-technologies, 1st level | | 3rd | 1st, 2nd |

Vrsta predmeta / Course type Izbirni predmet / Optional subject

Univerzitetna koda predmeta / University course code: KON

| Predavanja Lectures | Seminar Seminar | Sem. Vaje Tutorial | Lab. vaje Laboratory work | Teren. vaje Field work | Samost. delo Individ. work | ECTS |
|------------------------|--------------------|-----------------------|---------------------------------|---------------------------|-------------------------------|------|
| 20 | 25 | / | 20 | / | / | 5 |

Nosilec predmeta / Lecturer: viš. pred. dr Goran Pipuš, viš. pred dr. Anja Bubik / Goran Pipuš,
Ph.D., Lecturer, Anja Bubik, Ph.D., Lecturer

Jeziki / Languages: **Predavanja / Lectures:** Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

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

- Opravljen izpit iz predmeta KEMIJA IN OKOLJE,

Prerequisites:

- Passed exam CHEMISTRY AND THE ENVIRONMENT,

Vsebina:

- 1) Osnovne definicije
 - nezaželjene lastnosti onesnažil
 - izvor, ponor, sprejemnik onesnažil
 - vplivno področje
 - kemijske lastnosti onesnažil
 - transport onesnažil
 - kroženje snovi in energije v okolje
- 2) Analiza onesnažil
 - vzorčevanje
 - priprava in shranjevanje vzorcev
 - klasične analitske metode
 - instrumentalne analitne metode
- 3) Kemija onesnažil v atmosferi
 - prenos snovi v atmosferi
 - fotokemijske reakcije v atmosferi

Content (Syllabus outline):

- Basic definitions
- Unwanted properties of pollutants
 - source, sink, pollutant receiver
 - influence area
 - chemical properties of pollutants
 - transport of pollutants
 - Cycles of substances and energy in the environment
- 2) Analysis of pollutants
- sampling
 - preparation and storage of samples
 - classical analytical methods
 - instrumental analytical methods
- 3) Chemical pollution in the atmosphere
- transfer of matter in the atmosphere
 - photochemical reactions in the

- globalne spremembe v atmosferi
- anorganska onesnažila v atmosferi
- organska onesnažila v atmosferi

4) Onesnažila v vodnem okolju

- vrste onesnažil v vodi
- organska onesnažila v vodi
- kemijske reakcije v vodah in oceanih

5) Kemija onesnažil v prsti

- preparevanje prsti,
- izmenjalna kapaciteta prsti
- interakcija in razgradnja onesnažil v prsti
- organska onesnažila v prsti
- fitofarmacevteska sredstva
- umetna gnojila

atmosphere

- Global changes in the atmosphere
- inorganic pollutants in the atmosphere
- Organic pollutants in the atmosphere

4) Pollutants in the aquatic environment

- types of pollutants in water
- organic pollutants in water
- chemical reactions in waters and oceans

5) Chemical pollutants in the soil

- preparation of soil
, exchange capacity of the soil
- Interaction and degradation of pollutants in the soil
- Organic pollutants in soil
- plant protection products
- artificial fertilizers

Temeljni literatura in viri / Textbooks:

Obvezna literatura:

- 1) S.E. Manahan, 2017, ENVIRONMENTAL CHEMISTRY, 10th, edition; CRC Press LLC, New York, obvezno gradivo

Priporočena literatura:

- 2) J.E. Andrews, P. Brimblecombe, T.D. Jickleis, P.S. Liss, B.J. Reid, 2004, INTRODUCTION TO ENVIRONMENTAL CHEMISTRY; 2nd edition, Blackwell publishing

Cilji in kompetence:

Predmetno specifični cilji in kompetence:

- Študente seznaniti se z osnovnimi definicijami in pojavi povezani z onesnažili v okolju
- Študente usposobiti za razumevanje poteka kemijskih reakcij v atmosferi, vodah in v prsti
- študente usposobiti za prepoznavanje nezaželenih kemijskih lastnosti onesnažil ter njihovega vpliva na okolje in na človeka,
- študente usposobiti za napovedovanje življenjskega ciklusa posameznih onesnažil v okolju,
- Študente usposobiti za uporabo in vrednotenje predpisov s področja varstva okolja
- Študente usposobiti za strokovni odvzem, shranjevanje, pripravo in analizo vzorcev

Splošne kompetence:

- sposobnost razumevanja in analize pojavov v okolju ter njihovih posledic,

Objectives and competences:

Subject-specific objectives and competencies:

- Students get acquainted with basic definitions and phenomena related to pollutants in the environment
- Students should be able to understand the course of chemical reactions in the atmosphere, waters and soil
- To train students to identify unwanted chemical properties of pollutants and their impact on the environment and on human health,
- To train students to predict the life cycle of individual pollutants in the environment,
- To train students to use and evaluate regulations in the field of environmental protection
- Qualify students to take, preserve, prepare and analyze samples.

General competencies:

- the ability to understand and analyze phenomena in the environment and their consequences,

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

Študent bo ob zaključku tega predmeta sposoben:

- Razložiti kemijske reakcije v atmosferi, vodi in v prsti,
- Prepoznavanje pomembnih kemijskih lastnosti onesnažil,
- Sposobnost napovedovanja možnih posledic različnih izpustov onesnažil v okolje in njihovega obsega, ter osnovnih ukrepov za izboljšanje
- odvzem, priprava in analiza vzorcev

Prenesljive/ključne spretnosti in drugi atributi:

- Uporaba domače in tuje literature
- Uporaba domačih in tujih podatkovnih baz
- Uporaba in vrednotenje zakonskih predpisov s področja varstva okolja
- refleksija na prebrano literaturo
- samostojno poročanje – pisno in ustno

Knowledge and Understanding:

The student will be at the completion of this course able to:

- Explain the chemical reactions in the atmosphere, water and soil,
- Identification of important chemical properties of pollutants,
- Ability to forecast the possible consequences of discharges of pollutants into the environment and basic measures to improve situation
- collection, preparation and analysis of samples

Transferable/Key Skills and other attributes:

- Use of domestic and foreign literature
- Use of domestic and foreign databases
- Application and evaluation of legal regulations in the field of environmental protection
- a reflection on the reading literature
- independent reporting - written and oral

Metode poučevanja in učenja:**Oblike dela:**

- predavanja
- seminar
- samostojno delo študentov/tk
- domače naloge

Metode dela:

- razlaga
- dialog, diskusija
- aktivno skupinsko delo
- priprava in predstavitev seminarje

Learning and teaching methods:**Forms of teaching:**

- In-class lectures
- seminars
- Individual work of students
- homework assignments

Teaching methods:

- Explanation
- Discussion, debate
- preparation, presentation of a seminar paper

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:**Način (pisni izpit, ustno izpraševanje, naloge, projekt)**

- ustni izpit
- priprava, predstavitev in zagovor seminarske naloge

50

50

Type (examination, oral, coursework, project):

- oral exam
- preparation, presentation and defence of seminar paper

Ocenjevalna lestvica:

- zadostno 6: 60-67%
- dobro 7: 68-75%
- prav dobro 8: 76-83%
- prav dobro 9: 84-90%
- odlično 10: 91-100%

Grading system:

- Sufficient D (6): 60-67%
- Good C (7): 68-75%
- Very good B (8): 76-83%
- Very good B+ (9): 84-90%
- Excellent A (10): 91-100%

Materialni pogoji za izvedbo predmeta :

- Predavalnica z multimedijско opremo, (projektor,...)
- kemijski laboratorij (pH meter, merilnik motnosti, analitska tehnica, avtomatski titrator, spektrofotometer, steklovina,...

Material conditions for subject realization:

- Classroom with the multimedia equipment (head-up projector,...)
- Chemical laboratory (pH probe, turbidity meter, analytical scale, automatic titration, spectrophotometer, glassware,...

Obveznosti študentov:

- Obvezna udeležba na predavanjih in seminarjih
- Izdelana seminarska naloga

Student's commitments:

- obligatory attendance at lectures and seminars
- Seminar paper

Reference nosilca predmeta:(1) Pedagoško delo:

- nosilec in izvajalec predmetov na dodiplomskem študiju (Kemija in okolje – VŠVO velenje, Kemija Onesnaževal, - VŠVO,
- mentor diplomantom na dodiplomskem študiju

(2) Raziskovalno delo:

- potek kemijskih reakcij v mikrovalovnih reaktorjih
- modeliranje biološkega čiščenja odpadnih vod

Pomembnejša raziskovalna dela:

PLAZL, Igor, **PIPUŠ, Goran**, KOLOINI, Tine. Microwave heating of the continuous flow catalytic reactor in a nonuniform electric field. *AIChE journal*, ISSN 0001-1541. [Print ed.], 1997, vol. 43, no. 3, str. 754-760

PIPUŠ, Goran, PLAZL, Igor, KOLOINI, Tine. Esterification of benzoic acid with 2-ethylhexanol in a microwave stirred-tank reactor. *Industrial & engineering chemistry research*, ISSN 0888-5885. [Print ed.], 2002, vol. 41, no. 5,

PIPUŠ, Goran, PLAZL, Igor, KOLOINI, Tine. Esterification of benzoic acid in microwave tubular flow reactor. *The chemical engineering journal*, ISSN 1385-8947. [Print ed.], 2000, vol. 76, no. 3,

PLAZL, Igor, **PIPUŠ, Goran**, DROLKA, Maja, KOLOINI, Tine. Parametric sensitivity and evaluation of a dynamic model for single-stage wastewater treatment plant = Parametrična občutljivost in določitev parametrov dinamičnega modela enostopenjske čistilne naprave. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 1999, vol. 46, št. 2,

PLAZL, Igor, **PIPUŠ, Goran**, KOLOINI, Tine.

Lecturer's references:(1) Teaching:

- Lecturer of subjects at undergraduate level (Chemistry and Environment VŠVO Velenje, Chemistry of pollutants, VŠVO)
- Mentor to graduate students

(2) Research work:

- chemical reactions in microwave reactors
- mathematical model of biological treatment of wastewaters

Selected research publications:

PLAZL, Igor, **PIPUŠ, Goran**, KOLOINI, Tine. Microwave heating of the continuous flow catalytic reactor in a nonuniform electric field. *AIChE journal*, ISSN 0001-1541. [Print ed.], 1997, vol. 43, no. 3, str. 754-760

PIPUŠ, Goran, PLAZL, Igor, KOLOINI, Tine. Esterification of benzoic acid with 2-ethylhexanol in a microwave stirred-tank reactor. *Industrial & engineering chemistry research*, ISSN 0888-5885. [Print ed.], 2002, vol. 41, no. 5,

PIPUŠ, Goran, PLAZL, Igor, KOLOINI, Tine. Esterification of benzoic acid in microwave tubular flow reactor. *The chemical engineering journal*, ISSN 1385-8947. [Print ed.], 2000, vol. 76, no. 3,

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PLAZL, Igor, **PIPUŠ, Goran**, KOLOINI, Tine. Parametric sensitivity of a dynamic model for single-stage wastewater treatment plant. V: AGATHOS, Spyridon Nicholas (ur.), REINEKE,

Parametric sensitivity of a dynamic model for single-stage wastewater treatment plant. V: AGATHOS, Spyridon Nicholas (ur.), REINEKE, Walter (ur.). *Biotechnology for the environment: wastewater treatment and modeling, waste gas handling*, (Focus on biotechnology, Vol. 3C). Dordrecht; Boston; London: Kluwer Academic, cop. 2003.

PIPUŠ Goran, Applying new technologies in wastewater treatment to meet strict demands for effluent discharge in sensitive areas EREF-2006, Building Knowledge Society through Regional Innovation Support, Nova Gorica 2006., zbornik referatov

PIPUŠ Goran, Problematika končne oskrbe odpadkov, iz komunalnih čistilnih naprav, ZTI, 2008 zbornik referatov,

PIPUŠ Goran, Sanacija vodnih virov Segovci in Podgrad, Vodni dnevni 2017, Slovensko društvo za zaščito voda, simpozij z mednarodno udeležbo.

(3) Strokovno delo:

-vodja laboratorija za odpadne vode in odgovorni projektant za tehnološke načrte s področja priprave pitne vode, čiščenja odpadnih vod in obdelave odpadkov.

- izdelal več kot 50 tehnoloških načrtov in sanacijskih programov s področja priprave pitne vode, čiščenja odpadnih vod in obdelave odpadkov.

Walter (ur.). *Biotechnology for the environment: wastewater treatment and modeling, waste gas handling*, (Focus on biotechnology, Vol. 3C). Dordrecht; Boston; London: Kluwer Academic, cop. 2003

PIPUŠ Goran, Applying new technologies in wastewater treatment to meet strict demands for effluent discharge in sensitive areas EREF-2006, Building Knowledge Society through Regional Innovation Support, Nova Gorica 2006.,

PIPUŠ Goran, Problems with final disposal of wastes from municipal wastewater treatment plants, ZTI, 2008,

PIPUŠ Goran, Rehabilitation of water sources Segovci and Podgrad, Vodni dnevni 2017, Slovensko društvo za zaščito voda,

(3) Professional work:

– head of laboratory for wastewater analysis and senior process designer for drinking water treatment plants, wastewater treatment plant and waste treatment facilities.

more than 50 process designs and rehabilitation programs for design for drinking water treatment plants, wastewater treatment plant and waste treatment facilities.