

# OSNOVE TRAJNOSTNE KEMIJE

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Osnove trajnostne kemije
<b>Course title:</b>	Fundamentals of Sustainable Chemistry
<b>Članica nosilka/UL</b>	UL FKKT
<b>Member:</b>	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Kemijska tehnologija, prva stopnja, visokošolski strokovni (od študijskega leta 2023/2024 dalje)	Ni členitve (študijski program)	1. letnik	1. semester, 2. semester	izbirni

Univerzitetna koda predmeta/University course code: 0643422

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	15	20 LV			60	5

Nosilec predmeta/Lecturer: doc. dr. Lev Matoh, prof. dr. Andreja Žgajnar Gotvajn

Vrsta predmeta/Course type: izbirni splošni/Elective General

Jeziki/Languages:

Predavanja/Lectures:	Slovenščina
Vaje/Tutorial:	Slovenščina

### 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:

Osnovnih 12 principov trajnostnega razvoja in zelene kemije. Primeri uporabe principov trajnostnega razvoja v vsakdanjem življenju. Definicija in skupine onesnaževal. Viri onesnaženja. Vplivi na okolje in zdravje. Globalni in lokalni okoljski problemi. Principi trajnostne kemije pri pridelavi hrane (pesticidi, gnojila, GSO). Principi trajnostne kemije v energetiki (neobnovljivi in obnovljivi viri energije, vodik in gorivne celice, biogoriva). Principi trajnostne kemije materialov (plastika, bioplastika, kompoziti, nanomateriali). Sodobni materiali v okoljskih tehnologijah. Kemijski principi in tehnologije odstranjevanja onesnaževal iz vode, zraka in tal. Osnove recikliranja

### Content (Syllabus outline):

Basic 12 principles of sustainable development and green chemistry. Examples of the application of the principles of sustainable development in everyday life. Definition of pollutants. Groups of pollutants. Sources of pollution. Effects on the environment and health. Global and local environmental problems. Principles of sustainable chemistry in food production (pesticides, fertilizers, GMOs). Principles of sustainable chemistry in energy production and usage (non-renewable and renewable energy sources, hydrogen and fuel cells, biofuels). Principles of sustainable material chemistry (plastics, bioplastics, composites, nanomaterials). Modern materials in environmental technologies. Chemical principles and technologies of removing pollutants from water, air, and soil. Basics of recycling

<p>in ponovne uporabe. V okviru seminarja študent izbere aktualno temo in jo predstavi pred skupino. Obvezna vsebina seminarja: prikaz kemijskih osnov problema s stališča 12 principov trajnostnega razvoja, predlogi za reševanje problema. Diskusija.</p>	<p>and reuse. As part of the coursework, the student chooses an up-to-date topic and presents it to the group. Mandatory content of the coursework: presentation of the chemical background of the problem based on the 12 principles of sustainable development, proposals for solution of the problem. Discussion.</p>
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### Temeljna literatura in viri/Readings:

<p>1. M. Lancaster: Green Chemistry: An Introductory Text, 3. izdaja, The Royal Society of Chemistry, 2016; izbrana poglavja. 2. D. Drev, J. Čuvan: Okoljevarstvene tehnologije, Fit media, 2013. Dodatna literatura: 3. M. Knez, G. Lojen, N. Torelli: Materiali in okolje, Fit media, 2016.</p>
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### Cilji in kompetence:

<p>Cilj predmeta je študentom omogočiti osnovno razumevanje aktualnih tem, povezanih s trajnostno kemijo, razvijati zavedanje o pomenu vključevanja principov trajnostnega razvoja v vsa aplikativna področja kemije in sorodnih ved, razvijati zmožnosti za razumevanje kemijskih osnov aplikacij, razvijati sposobnosti za presojo vpliva različnih tehnologij in materialov na živo in neživo naravo.</p>	<p><b>Objectives and competences:</b> The objective of the course is to provide students with a basic understanding of current topics related to sustainable chemistry, to develop awareness of the importance of incorporating the principles of sustainable development into all applied fields of chemistry and related sciences, to develop the ability to understand chemical basics of applications, to develop the ability to assess the impact of various technologies and materials on nature.</p>
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### Predvideni študijski rezultati:

<p><b>Znanje in razumevanje</b> Predmet omogoči osnovno razumevanje nekaterih materialov in kemijskih procesov, povezanih z zaščito okolja. Študent spozna osnovne principe trajnostne kemije ter osnove škodljivih vplivov na človeka in okolje.</p> <p><b>Uporaba</b> Študent zna uporabiti pridobljeno znanje pri vrednotenju vplivov na človeka in okolje. Na primerih uporabe v praksi se nauči vrednotiti omenjene vplive ter iskati ustrezne rešitve.</p> <p><b>Refleksija</b> Študent bo na seminarjih analiziral izbrano temo, pri čemer bo uporabil principe trajnostne kemije za iskanje rešitev konkretnih problemov.</p> <p><b>Prenosljive spretnosti</b> Sposobnost uporabe domačih in tujih virov literature, interpretacije in prikaza podatkov, kritična presoja. Pisanje poročil, priprava predstavitve seminarja.</p>	<p><b>Intended learning outcomes:</b></p> <p><b>Knowledge and Understanding</b> The course provides a basic understanding of some materials and chemical processes related to protection of the environment. The student learns the basic principles of sustainable chemistry and the basics of harmful effects on humans and the environment.</p> <p><b>Application</b> The student knows how to use the acquired knowledge in evaluating the impacts on people and the environment. Using practical examples, he learns to evaluate the mentioned impacts and to look for suitable solutions.</p> <p><b>Reflection</b> In the seminars, the student will analyse the chosen topic, using the principles of sustainable chemistry to find solutions to concrete problems.</p> <p><b>Skill-Transference Ability</b> Ability to use domestic and foreign sources of literature, interpretation and presentation of data, critical judgment. Writing reports, preparing presentations.</p>
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### Metode poučevanja in učenja:

<p>Predavanja, seminar, laboratorijske vaje.</p>	<p><b>Learning and teaching methods:</b> Lectures, seminar, laboratory work.</p>
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

Načini ocenjevanja:	Delež/Weight	Assessment:
Seminarska naloga	20,00 %	Seminar coursework
Laboratorijske vaje	10,00 %	Lab work
Pisni izpit	70,00 %	Written exam

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

1. **MATOH, Lev**, ŽENER, Boštjan, KOVAČIĆ, Marin, KUŠIĆ, Hrvoje, ARČON, Iztok, LEVSTEK, Meta, LAVRENČIČ ŠTANGAR, Urška. Photocatalytic sol-gel/P25 TiO<sub>2</sub> coatings for water treatment: degradation of 7 selected pharmaceuticals. *Ceramics international*, 2022, 1-39.
2. **MATOH, Lev**, KOZJEK-ŠKOFIČ, Irena, ČEH, Miran, BUKOVEC, Nataša. A novel method for preparation of a platinum catalyst at low temperatures. *Journal of materials chemistry. A, Materials for energy and sustainability*, 2013, 1065-1069.
3. KUMAR, Praveen, **MATOH, Lev**, KAUR, Ramanpreet, LAVRENČIČ ŠTANGAR, Urška. Synergic effect of manganese oxide on ceria based catalyst for direct conversion of CO<sub>2</sub> to green fuel additive : catalyst activity and thermodynamics study. *Fuel*, Feb. 2021, vol. 285, 119083.
4. **ŽGAJNAR GOTVAJN, Andreja**, KALČIKOVÁ, Gabriela. Delamination of plastic-coated waste paper by enzymes of the white rot fungus *Dichomitus squalens*. *Journal of environmental management*, Dec. 2018, vol. 228, 165-168.
5. KORICA, Predrag, CIRMAN, Andreja, **ŽGAJNAR GOTVAJN, Andreja**. Comparison of end-of-life vehicles management in 31 European countries: a LMDI analysis. *Waste management & research*, 2022, vol. 40, 1156-1166.
6. LEKŠE, Nina, GRIESSLER BULC, Tjaša, KUKOVIČIČ, Nina, ČERNIC, Taja, **ŽGAJNAR GOTVAJN, Andreja**. Impact of preozonation on biogas potential of PVC microplastics-containing waste sludge. *Global NEST journal*, 2023, vol. 25, 13-19.