

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	TEHNOLOGIJE ZA ZMANJŠEVANJE ONESNAŽEVANJA OKOLJA
Course title:	TECHNOLOGIES FOR REDUCTION OF ENVIRONMENTAL POLLUTION

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

Vrsta predmeta / Course type Obvezni predmet / Obligatory course

Univerzitetna koda predmeta / University course code: TZOO

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	/	20	/	10	100	6

Nosilec predmeta / Lecturer: doc. dr. Ilja Gasan Osojnik Črnivec / Ilja Gasan Osojnik Črnivec, Ph.D., Assist. Prof.

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

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

Pogojev ni.

Prerequisites:

No formal prerequisites.

Vsebina predmeta:

Content (Syllabus outline):

Uvod: antropogeni izvori onesnažil in tveganj ter vplivi na sestavine okolja; urejanje varstva okolja, okoljske tehnologije in obvladovanje tveganj na raznih nivojih; faze industrijskega razvoja; merila za trajnostnost proizvodnje, storitev, potrošnje in navad; krožno gospodarstvo; civilno-družbeni in korporativni instrumenti za implementacijo in spremljanje učinkovitosti okoljskih ukrepov in konceptov

Preprečevanje oz. izogibanje onesnaževanja:

- družbeni pristopi k varstvu okolja: strateški, zakonodajni, organizacijski in tehnološki ukrepi; sodobni koncepti preprečevanja onesnaževanja; pristop 'Reduce-Reuse-Recycle' (»3R«)
- celostni pristop k preprečevanju emisij v proizvodnih procesih – sistemski pristopi k varstvu okolja: zmanjševanje onesnaževanja okolja in upravljanje tveganj; standardizirani sistemi varstva okolja; standardi ISO 14000; analiza življenjskega cikla izdelka; nestandardizirani (interni) sistemski pristopi: čistejša proizvodnja, učinkovita raba virov, »zelena industrija«, odgovorna raba, eko-dizajn, eko-profit; načrtovanje izvajanja sistematičnega preprečevanja onesnaževanja; nadzor nad onesnaževanjem; masna bilanca procesov (makro in mikro skali); energijska bilanca
- najboljše proizvodne prakse, IPPC/IED in Seveso direktiva; NRT/BREF dokumenti; pristop 'treh ničel'; ocena vplivov in tveganj; okolju prijazno načrtovanje procesov, storitev in izdelkov; zmanjšanje onesnaževanja iz razpršenih virov emisij; okoljski indikatorji; krožno gospodarstvo v industriji in storitvah; pametni sistemi energetske oskrbe
- zmanjševanje presežnih koncentracij onesnažil v odpadnih tokovih (čistilni postopki – 'end of pipe')

Introduction: anthropogenic sources of pollutants and risks and their impacts on environmental compartments; environmental sciences and technologies for pollution prevention – general approach; phases of industrial development; indicators of sustainable production, services, consumption, and behaviour; circular economy; public and corporate instruments to implement and measure the effectiveness of environmental measures and concepts

Pollution prevention tactics and concepts:

- public and social approach to environmental protection: strategic, legislative, organisational and technological measures; modern concepts for preventing pollution; Reduce-Reuse-Recycle (»3R«) approach
- integrated approach to pollution prevention – systemic approach to environmental protection: pollution prevention and risk management planning; standardized system of environmental protection; environmental standards ISO 14000; life cycle analysis and assessment; alternative (internally audited) systems: cleaner production, resource efficiency, "green industry", responsible care, eco-design, eco-profit; planning of systematic measures for preventing pollution; controlling over pollution; mass balance of processes (macro and micro scale); energy balance
- good manufacturing practices; IPPC/IED and Seveso directives and related documents (BAT/BREFs); "three-0" approach; impact and risk assessment; environmental-friendly design of processes, services and products; abatement of dispersed pollution sources; environmental indicators; circular production/distribution networks; smart energy supply
- end-of-pipe approach for abatement of exceeded pollutants' concentrations

Temeljna literatura in viri / Textbooks:

Obvezna:

Grilc, V., 2024. Zbirka predavanj iz predmeta »Tehnologije za preprečevanje onesnaževanja«. e-učilnica FVO

Priporočena:

- Bishop P., 2004. Pollution Prevention: Fundamentals and Practice. Waveland Press, Illinois
- Cheremisinoff N.P., 2016. Pollution Control Handbook. Wiley
- Mulholland K.L., Dyer J.A., 2010. Pollution Prevention: Methodology, Technologies and Practices. Wiley

Cilji in kompetence:

Objectives and competences:

Predmetno specifični cilji in kompetence:

- seznaniti študente z najpomembnejšimi pristopi za sistematično zmanjševanje onesnaževanja iz točkovnih in razpršenih virov ter z načini zaščite sestavin okolja za normalni razvoj živih bitij
- seznaniti študente z osnovnimi preventivnimi merami/postopki za preprečevanje/zmanjševanje onesnaževanja oz. s tehnologijami za odstranjevanje prekomernega onesnaževanja
- usposobljenost študentov za izbiro učinkovitih metod in tehnik za odstranitev/zmanjšanje onesnaženja

Splošne kompetence:

- sposobnost samostojne analize problemov, sinteze in oblikovanja rešitev za najbolj pogoste probleme

Specific competences:

- students get acquainted with systematic pollution prevention approach for point and dispersed sources, and with measures for air, water and soil prevention techniques
- students get acquainted with basic preventive measures/processes for preventing/reducing pollution, and with technologies for abatement exceeded pollution
- students get qualified to select efficient methods and techniques for pollution abatement and reduction

General competences:

- ability to analyse, synthesize, select and propose effective solutions to typically encountered problems

Predvideni študijski rezultati:**Znanje in razumevanje:**

Študent bo ob zaključku tega predmeta:

- imel znanje o izvorih in delovanju ključnih antropogenih onesnažil na osnovne sestavine okolja
- poznal in razumel principe načrtovanja trajnostnih proizvodnih postopkov
- poznal pristop k sistemskemu varstvu okolja, najboljše razpoložljive tehnologije (preventivne in kurativne)
- razumel osnovne inženirske/tehnične pristope za preprečevanje onesnaževanja oz. zmanjševanje emisijskih ali imisijskih vrednosti na sprejemljiv nivo
- razumel principe okoljskih tehnologij
- usposobljen za izbor optimalnih preventivnih pristopov za preprečevanje nastanka onesnaževanja
- poznal inženirske pristope za zmanjšanje onesnaženja na sprejemljivo mero
- sposoben predvidevanja izpolnjevanja zahtev okoljskih standardov z uporabo izbranih omilitvenih metod/tehnologij

Intended learning outcomes:**Knowledge and Understanding:**

At the end of this course, student will:

- understand sources and impacts of the most common pollutants on different environmental compartments
- know and understand principles of planning of sustainable production processes
- demonstrate knowledge about systematic approach to environmental protection, and about best available technologies (both preventive and curative)
- demonstrate knowledge about the emerging techniques for pollution prevention and abatement of pollutant concentration to admissible levels
- understand principles of abatement technologies
- be able to select environmentally optimal preventive methods/technologies for preventing pollution
- have knowledge on engineering approaches for reducing environmental pollution at accessible level
- be able to predict the fulfilment of the required environmental standards by the selected mitigation methods/techniques

Prenesljive/ključne spretnosti in drugi atributi: • sposobnost zbiranja, uporabe in interpretiranja domačih in tujih virov ekoloških in tehnoloških podatkov ter znanj • zmožnost analize in izbora optimalne rešitve za posamezen obravnavan okoljski problem v praksi • sposobnost pisnega in ustnega poročanja o zaznanih okoljskih problemih in tehnoloških rešitvah	Transferable/key skills and other attributes: • ability to collect, use and interpret domestic and international databases of ecological and technical data, and knowledge • ability to analyse and select an optimal solution for the relevant environmental issue in the practice • ability to reporting in written and oral form about the recognized environmental problems and the selected technological solutions
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Metode poučevanja in učenja: • predavanja, interaktivno poučevanje • individualna seminarska naloga s konzultacijami • predstavitve in diskusije • terenske vaje in ekskurzije v industrijska območja	Learning and teaching methods: • interactive lectures, supported by intermedia equip • individual seminar work with consultations • presentations and discussions • fieldwork and excursions to industrial sites
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Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja: Končna ocena pri predmetu je sestavljena iz: • pisnega izpita • priprave, predstavitve in zagovora seminarske naloge Ocenjevalna lestvica: ▪ zadostno 6: 60–67 % ▪ dobro 7: 68–75 % ▪ prav dobro 8: 76–83 % ▪ prav dobro 9: 84–90 % ▪ odlično 10: 91–100 %	70 % 30 %	Final evaluation consists of the mark for: • written exam • preparation, presentation and open discussion of seminar work Grading scale: ▪ 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	Material conditions for subject realization: • lecturing room with intermedia support
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Obveznosti študentov: • izbor teme, izdelava, predstavitev in zagovor seminarske naloge • aktivna udeležba na ekskurzijah in terenskih vajah • opravljen izpit	Student's commitments: • selection of an individual theme, preparation of seminar work, presentation and confrontation • active attendance on plant visits and field exercises • positive exam
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Reference nosilca predmeta:	Lecturer's references:
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Pedagoško delo: • 1996–2000: Varstvo okolja II (na FKKT, UL) • od 1999 dalje: Gospodarjenje z odpadnimi snovmi (FAGG-VKI, UL) • 2001–2012: Gospodarjenje z odpadki (Interdisciplinarni študij varstva okolja, UL) • 2002–2014: Ravnanje z odpadki (podiplomski program komunalne smeri FAGG UL) • od 2014 dalje: Tehnologije za zmanjševanje onesnaževanja zraka, vode in tal (VŠVO) • od 2017 dalje: Ravnanje z odpadki (VŠVO) Svetovalno delo: • 1995–2004: priprava in izvajanje projekta »Čista proizvodnja« (metodologija UNIDO) za >50 slovenskih podjetij	Pedagogic activities: • 1996–2000: Environmental protection techniques (FKKT, UL) • since 1999: Waste and resource management (FAGG-VKI, UL) • 2001–2012: Waste management (interdisciplinary studies of environmental protection, UL) • 2002–2014: Waste management (postgraduate studies at FAGG UL) • since 2014: Technologies for pollution prevention (VŠVO) • since 2017: Waste management (VŠVO) Consulting: • 1995–2004: leading of the consultant team on 'Cleaner production' programmes – UNIDO method (over 50 companies attended)
Izbrani znanstveni članki / Selected scientific papers: Ninčević A., Grilc V., 2012. Problems with the management of medical waste (in Slovene). <i>Environmental management</i>, 21:2-10. Cukjati N., Zupančič G., Roš M., Grilc V., 2012. Composting of anaerobic sludge: an economically feasible element of a sustainable sewage sludge management. <i>Journal of environmental management</i>, 106:48-55. Zupančič G.D., Grilc V., 2012. Anaerobic treatment and biogas production from organic waste. V: Kumar S. (ur.). <i>Management of organic waste</i>. Rijeka: InTech, str. 3-28.	