

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Tehnika za trajnostni razvoj
Course title:	Sustainable Engineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekotehnologije, 2. stopnja		1	1
Ecotechnologies, 2 nd cycle		1	1

Vrsta predmeta / Course type Izbirni / Elective

Univerzitetna koda predmeta / University course code: EKO2-866

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	30			30	210	10

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

Nosilec predmeta / Lecturer: Prof. dr. Peter Glavič

Jeziki / Predavanja / Lectures: slovenščina, angleščina
Languages: Slovenian, English
Vaje / Tutorial:

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

Vpis v 1. semester 2. stopnje.
 Znanje, ki je ekvivalentno izobrazbi prve stopnje ali visoki strokovni izobrazbi s področja naravoslovja ali tehnologije.

Prerequisites:

Inscription into the 1st semester of the master degree.
 Knowledge, which is equivalent to a first level or professional degree from a natural science, engineering or technology.

Vsebina:

- Cilji trajnostnega razvoja
- 12 načel trajnostne tehnike
- Ekonomski in družbeni temelj trajnosti
- Minimiranje odpadkov, ničelni odpadki
Termodinamska metoda minimiranja porabe energije, snovi in voda (analiza uščipa, učinkovitost virov)
- Virsko učinkovita in čistejša proizvodnja
- Kritične surovine, industrijska ekologija, krožno gospodarstvo
- Poznavanje in uveljavljanje ekotehnoloških zahtev za izbrane procese in opremo

Content (Syllabus outline):

- Sustainable development goals
- 12 principles of sustainable engineering
- Economic and social pillar of sustainability
- Minimizing wastes, zero Thermodynamic method of minimizing the consumption of energy, materials and water (pinch analysis, resource efficiency)
- Resource efficient and cleaner production
- Critical raw materials, Industrial ecology, circular economy
- Knowledge and enforcement of ecotechnological requirements for the

- Zasnova in kritična analiza masnih in energijskih bilanc procesov
- Primerjalna analiza parametrov za ekonomsko oceno procesov, merjenje trajnostnega razvoja

- selected processes and equipment
- Concept and critical analysis of the mass and energy balances of processes
- Comparative analysis of parameters for economic assessment of processes, sustainability metrics

Temeljni literatura in viri / Readings:

- D. T. Allen, D. R. Shonnard, Sustainable Engineering: Concepts, Design and Case Studies, Prentice Hall, 223 str., 2012
- T. E. Graedel, B. R. Allenby, Industrial Ecology and Sustainable Engineering, Pearson, 2010
- R. Constanza et al., An Introduction to Ecological Economics, CRC Press, Taylor & Francis, 356 str., 2014
- Towards the Circular Economy, 1–3, Ellen McArthur Foundation, 2013–2014, glej/see: <https://www.ellenmacarthurfoundation.org/publications>.
- D. F. X. Mathaisel, J. M. Manary, N. H. Criscimagna, Engineering for Sustainability, 518 str., 2012
- J. Kauffman, K. M. Lee (Eds), Handbook of Sustainable Engineering, Springe Reference, 1285 str., 2013
- Kubiszewski et al., Beyond GDP: Measuring and achieving global genuine progress, Ecological Economics, 93 (2013) 57–68
- J. Fresner e tal., Promoting resource efficiency in small and medium sized enterprises, UNEP, 2010
- Ad hoc Working Group, Report on critical raw materials for the EU, European Commission, 2014.

Cilji in kompetence:

Splošne kompetence:

- obvladanje izbranih raziskovalnih metod, postopkov in procesov
- razvoj kritične in samokritične presoje
- sposobnost uporabe znanja v praksi
- kooperativnost, delo v skupini
- industrijska relevantnost

Objectives and competences:

General Competences:

- Master selected research methods, procedures and processes
- Develop critical thinking and self-assessment
- Knowledge transfer into practice
- Cooperation and group work ability
- Industrial relevance

Predvideni študijski rezultati:

- Razumevanje predmetnega področja
- Predmet pripravlja študente za delo na predmetnem področju.

Intended learning outcomes:

- The student will understand this field of research
- The course prepares students to work in this field of work.

Metode poučevanja in učenja:

Predstavitev seminarske naloge in ustni izpit, v katerem kandidat dokaže poznavanje in razumevanje temeljnih vsebin predmeta ter predstavi njihovo vključevanje v svoj nabor drugih predmetov. K predstavitvi seminarske naloge so vabljeni vsi sodelavci pri predmetu.

Learning and teaching methods:

Seminar and oral exam, in which the candidate demonstrates his/her knowledge and understanding of the essential course content, and presents how this new knowledge can be included in his/her selection of courses – in front of the course students.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Predstavitev seminarske naloge	60 %	Seminar work presentation
Ustni zagovor	40 %	Oral exam

Reference nosilca / Lecturer's references:

- J. Dlouha, P. Glavič, A. Barton, Higher education in Central European countries – Critical factor for sustainability transition, *J. Clean. Prod.*, 151, 670-684, 2017, ISSN 0959-6526.
- J. Petek, P. Glavič, A. Kostevšek, Comprehensive approach to increase energy efficiency based on versatile industrial practice, *J Clean Prod*, 2016, 112, 2813–2821, ISSN 0959-6526.
- R. Kovačič Lukman, P. Glavič, A. Carpenter, P. Vrtič, Sustainable consumption and production - Research, experience, and development – The Europe we want, *J Clean Prod*, 2016, 138, 139–147, ISSN 0959-6526.
- P. Glavič, Chemical and Process Industries beyond Gross Domestic Product, *Chemical Engineering Transactions*, 45, 1801–1806, 2015, ISSN 2283-9216.
- L. Somakos, E. R. Chasapidi-Mavroeidi, K. Aravossis, S. Tzovaras, P. Glavič, B. Stejskal, A. Szilagy, N. Papapastamatiou in T. Doukoulos, Innovative 3D Training Platform for Recycling of Waste coming from Electric and Electronic Devices, *Computer Aided Chemical Engineering* 12/2016; 38, 2259-2264. Elsevier B.V., 2259–2264, ISBN: 9780444634283.