

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Obnovljivi viri energije
Course title:	Renewable Sources of Energy

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Tehnologije in sistemi – prva stopnja	/	tretji	peti
Technologies and Systems – 1st cycle	/	third	fifth

Vrsta predmeta / Course type obvezni/obligatory

Univerzitetna koda predmeta / University course code: TS 3 UN 1

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		10	20		95	6

Nosilec predmeta / Lecturer: prof. dr. Ivan Bajsić

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

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

- vpis v tretji letnik študija,
- znanje vsaj enega tujega jezika (angleščina, nemščina),
- študent/študentka mora imeti opravljen izpit iz termodinamike

Prerequisites:

- enrollment in the third year of study,
- knowledge of at least one foreign language (English, German),
- the student must have passed the exam in thermodynamics.

Vsebina:

- *Značilnosti in potencial OVE. Sončno sevanje. Biomasa. Veter. Voda. Planetarna energija (bibavica, geotermalna energija).*
- *Skladiščenje eksergije*
- *Nizkotemperaturni solarni sistemi in elementi. Izračun. Vgradnja.*
- *Solarne termoelektrarne in elementi.*
- *Fotovoltaične elektrarne in elementi.*

Content (Syllabus outline):

- *Characteristics and potential of RES. Solar radiation. Biomass. Wind. Water. Planetary energy (tidal, geothermal).*
- *Exergy storage*
- *Low temperature solar systems and elements. Calculation. Installation.*
- *Solar power plants and elements.*
- *Photovoltaic systems and elements.*

- *Vetrne elektrarne*. Teoretične osnove. Elementi in izračun performans. Elektrogeneratorji. Regulacija. Dinamični problemi. Elektrarne na morju.
- *Vodne elektrarne (vključno z bibavico)*. Teoretične osnove. Elementi in izračun performans. Elektrogeneratorji. Regulacija.
- *Uporaba biomase* za proizvodnjo toplote in sintetičnih goriv. Elektrarne na biomaso.
- *Geotermalne elektrarne*. Teoretične osnove. Geološke osnove in vrtine. Specifine lastnosti sestavnih delov. Regulacija. Uporaba odpadne toplote.
- *Sonaravni eksergetski sistem z OVE*.

- *Wind power plants*. Theoretical foundations. Elements and calculation of power. Electric generators. Regulation. Dynamic problems. Offshore power plants.
- *Hydroelectric power plants (including tides)*. Theoretical foundations. Elements and calculation of power. Electric generators. Regulation.
- *Use of biomass* for the production of heat and synthetic fuels. Biomass power plants.
- *Geothermal power plants*. Theoretical foundations. Geological foundations and wells. Specific properties of the components. Regulation. Utilisation of waste heat.
- Sustainable exergy system with RES.

Temeljni literatura in viri / Readings:

1. Medved, S., Novak, P.: *Varstvo okolja in obnovljivi viri energije*. 2000, Ljubljana: FS.
2. Twidell J., Weir T.: *Renewable Energy Resources*, Third ed. 2015, Routledge
3. Soerensen Bent: *Renewable Energy*, Fourth ed. AP, Elsevier, 2011
4. Lund, Henrik: *Renewable Enewrgy Systems*, Sec. ed., AP, Elsevier, 2014
5. Goswani D.Y, Kreider F., Kreith, J. F.: *Priciples of Solar Engineering*, Taylor Francis, 2000.
6. Beckman, W. A., Klein, S. A., Duffie, J. A.: *Solar engineering of thermal processes*. New York: John Wiley, 1989
7. Rosa A.V.: *Fundamentals of Renewable Energy Proceses*, AP, Elsevier, 2013
8. Gash, R., Twele, J. (2002) *Wind power plants*. London: James & James.
9. MacKay D. trajnostna energija brez razgretega ozračja, Energetika net, 2015 (www.en-lite.si; www.withouthotair.com)

Cilji in kompetence:

Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:

- sposobnost obvladanja standardnih razvojnih metod, postopkov in procesov,
- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost obvladovanja razvoja in napredka,
- kooperativnost, usposobljenost za timsko delo,
- sposobnost razumevanja in uporabe sodobnih teorij s področja tehniških, tehnoloških in naravoslovnih ved,
- sposobnost interdisciplinarnega povezovanja znanja,

Objectives and competences:

The learning unit mainly contributes to the development of the following general and specific competences:

- the ability to master standard development methods, procedures and processes,
- the ability to use acquired theoretical knowledge in practice,
- the ability to manage development and progress,
- willingness to cooperate and work in a team,
- the ability to understand and apply modern theories in the field of technical, technological and natural sciences,

- sposobnost reševanja konkretnih delovnih problemov na področju tehnologij in sistemov z uporabo standardnih strokovnih metod in postopkov.

- the ability to integrate knowledge in an interdisciplinary manner,
- the ability to solve concrete work problems in the field of technologies and systems using standard professional methods and procedures.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- spozna možnosti, ki jih nudijo obnovljivi viri energije na Zemlji in doume pomen njihove uporabe,
- pridobi znanje o metodah pretvarjanje OVE v praktično uporabne oblike eksergije
- seznaneni se z metodami matematične analize nestacionarnega prenosa toplote v napravah za uporabo OVE
- spozna pravno regulativo (standarde), ki ureja to področje in je osnova za projektno delo,
- doume vpliv posameznih virov na okolje
- spozna druge tehnične discipline povezane s pretvarjanjem OVE – kemijo, materiali, elektrotehniko, arhitekturo, IoT
- pridobi osnovno znanje za uporabo različnih simulacijskih metod.

Intended learning outcomes:

Knowledge and understanding:

Student:

- learns about the possibilities of renewable energy sources on Earth and understands the importance of using them,
- acquires knowledge of the methods of converting RES into practically usable forms of energy
- becomes familiar with the methods of mathematical analysis of non-stationary heat transfer in devices for the use of RES
- becomes familiar with the legal regulations (standards) that govern this area and are the basis for project work,
- understands the impact of individual sources on the environment
- learns about other technical disciplines related to the conversion of RES – chemistry, materials, electrical engineering, architecture, IoT
- acquires basic knowledge for the application of various simulation methods.

Metode poučevanja in učenja:

- *predavanja* z aktivno udeležbo študentov (razlaga, diskusija o problemih, razvijanje ustvarjalnosti),
- *vodeni individualni študij* za uporabo simulacijskih metod,
- *projekt* za utrjevanje znanja in njegovo praktično uporabo,
- *seznanjanje z merilnimi instrumenti*, uporabnimi za meritve OVE,
- *uporaba spletnih virov* in seznanjanje s široko strokovno literaturo ter praktična

Learning and teaching methods:

- *lectures with* active participation of students (explanation, discussion of problems, development of creativity),
- *guided individual study* for the use of simulation methods,
- *a project* for consolidating knowledge and its practical application,
- *familiarization with measuring instruments* useful for RES measurements,
- *use of online resources* and familiarization with a wide range of professional literature

uporaba dosegljive dokumentacije (knjig, revij, arhivov itd.), • <i>strokovne ekskurzije</i> in ogledi izbranih pomembnih objektov z uporabo OVE.	and practical use of available documentation (books, magazines, archives, etc.), • <i>professional excursions</i> and tours of selected important facilities using RES.
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		Delež (v %) / Weight (in %)	
Načini ocenjevanja:			Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): <ul style="list-style-type: none"> • pisni izpit • ustni izpit • projektno in seminarsko delo Ocenjevalna lestvica: ECTS.	25% ocene 30% ocene 45% ocene	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • written exam • verbal exam • project and seminar work Grading scale: ECTS.	