UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Obnovljivi viri energije
Course title:	Renevable 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:	**Prerequisits:**
• vpis v tretji letnik študija, • znanje vsaj enega tujega jezika (angleščina, nemščina), • študent/študentka mora imeti opravljen izpit iz termodinamike	• 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:	**Content (Syllabus outline):**
• *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*.	• *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:

Temeljna literatura/Basic literature

1. Medved, S., Novak, P.:*Varstvo okolja in obnovljivi viri energije*. 2000, Ljubljana: FS.
2. Twidell J., Weir T.:Renewable Energy Resources, Third ed. 2022, Routledge
3. MacKay D. trajnostna energija brez razgretega ozračja, Energetika net, 2013 (www.en-lite.si; www.withouthotair.com)

Priporočljiva literatura/Recommended literature

1. Soerensen Bent: Renewable Energy, Fourth ed. AP, Elsivier, 2011
2. Lund, Henrik: Renewable Enewrgy Systems, Sec. ed., AP, Elsivier, 2014
3. Goswani D.Y, Kreider F., Kreith, J. F.: Priciples of Solar Engineering, Taylor¸Francis, 2000.
4. Beckman, W. A., Klein, S. A., Duffie, J. A.: *Solar engineering of thermal processes.* New York: John Wiley, 1989
5. Rosa A.V.:Fundamentals of Renewable Energy Proceses, AP,Elsivier, 2013
6. Gash, R., Twele, J. (2002) *Wind power plants.* London: James & James.

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,

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,

• sposobnost interdisciplinarnega povezovanja znanja, • sposobnost reševanja konkretnih delovnih problemov na področju tehnologij in sistemov z uporabo standardnih strokovnih metod in postopkov.	• the ability to understand and apply modern theories in the field of technical, technological and natural sciences, • 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:	**Intended learning outcomes:**
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 • seznani 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.	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:	**Learning and teaching methods:**
• *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,	• *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,

• *uporaba spletnih virov* in seznanjanje s široko strokovno literaturo ter praktična uporaba dosegljive dokumentacije (knjig, revij, arhivov itd.), • *strokovne ekskurzije* in ogledi izbranih pomembnih objektov z uporabo OVE.	• *use of online resources* and familiarization with a wide range of professional literature and practical use of available documentation (books, magazines, archives, etc.), • *professional excursions* and tours of selected important facilities using RES.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): • pisni izpit • ustni izpit • projektno in seminarsko delo Ocenjevalna lestvica: ECTS.	 25% ocene 30% ocene 45% ocene	Type (examination, oral, coursework, project): • written exam • verbal exam • project and seminar work Grading scale: ECTS.