

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Tehniška termodinamika
<b>Course title:</b>	Technical Thermodynamics

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

**Vrsta predmeta / Course type** obvezni/obligatory

**Univerzitetna koda predmeta / University course code:** TS 2 UN 2

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		20	10	30	135	7

**Nosilec predmeta / Lecturer:** doc. dr. Matjaž Depolli

<b>Jeziki / Languages:</b> slovenski/ Slovenian	<b>Predavanja / Lectures:</b>	Slovenski/Slovenian
	<b>Vaje / Tutorial:</b>	Slovenski/Slovenian

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

- vpis v drugi letnik študija.

**Prerequisites:**

- enrollment in the second year of study

**Vsebina:**

- *Osnovni pojmi:* velikosti stanja, termodinamični procesi, energijske preobrazbe in okolje.
- *Prvi glavni zakon:* zakon o ohranitvi energije, toplota in mehansko delo, krožni procesi.
- *Drugi glavni zakon:* entropija, energijske bilance, izkoristki.
- *Lastnosti fluidov:* opis, diagrami p-V, T-s in h-s.
- *Viri toplote:* zgorevanje in kurilnost, dimni plini in okolje.

**Content (Syllabus outline):**

- *Basic concepts:* state quantities, *Basic concepts:* state quantities, thermodynamic processes, energy transformations and the environment.
- *First law:* law of conservation of energy, heat and mechanical work, circular processes.
- *Second law:* entropy, energy balances, efficiencies.
- *Fluid properties:* description, p-V, T-s and h-s diagrams.
- *Heat sources:* combustion and calorific value, flue gases and the environment.

- *Toplotni procesi*: mehansko delo, izkoristek, izgube, vplivi na okolje
- *Prenos toplote*: načini prenosa toplote.
- *Vlažni zrak*: absolutna in relativna vlažnost, diagram h-x za vlažni zrak, mešanje in sušenje.

- *Thermal processes*: mechanical work, efficiency, losses, environmental impacts
- *Heat transfer*: methods of heat transfer.
- *Moist air*: absolute and relative humidity, h-x diagram for moist air, mixing and drying.
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- *Heat transfer*: methods of heat transfer.
- *Moist air*: absolute and relative humidity, h-x diagram for moist air, mixing and drying.

### Temeljna literatura in viri / Readings:

#### Temeljna literatura/Basic literature

Muhič, S., Blagojevič, B. (2016) *Tehniška termodinamika*. Novo mesto: Fakulteta za tehnologije in sisteme.

Rant, Z. (2011) *Termodinamika – knjiga za uk in prakso*. Ljubljana: Fakulteta za strojništvo, UL.

#### Priporočljiva literatura/Recommended

Moran, M. J., Shapiro, H. N. (2009) *Fundamentals of engineering thermodynamics*. New York etc.: John Wiley and Sons Ltd.

Cerge, G., Wilhelms, G. (2010) *Technische Thermodynamik – Theoretische Grundlagen und praktische Anwendungen*. München: Hanser Fachbuchverlag.

Langeheinecke, K. (2006) *Thermodynamik für Ingenieure – ein Lehr-und Arbeitsbuch für das Studium*. Wiesbaden: Vieweg.

### Cilji in kompetence:

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

- sposobnost evidentiranja problema in njegove analize ter predvidevanja operativnih rešitev v tehnološkem smislu,
- sposobnost obvladovanja standardnih razvojnih metod, postopkov in procesov,
- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost obvladovanja razvoja in napredka na področju obdelovalnih strojev in naprav,
- razumevanje raznolikosti in globalnega ter socialnega vpliva tehnologij na okolje,
- 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 The learning unit mainly contributes to the development of the following general and specific competences:*

- the ability to identify the problem and analyze it, as well as anticipate operational solutions in a technological sense,
- 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 in the fields of machine tools and devices,
- understanding the diversity and global and social impact of technologies on the environment,
- the ability to understand and apply modern theories in the field of technical, technological and natural sciences,

razvoj strokovnih veščin in spretnosti na področju tehnologij in sistemov.

- the ability to integrate knowledge in an interdisciplinary manner,
- development of professional skills and abilities in the field of technologies and systems.

**Predvideni študijski rezultati:**

Znanje in razumevanje:

*Študent/študentka:*

- pridobi temeljno znanje o energijah, razumevanje zakonitosti pretvarjanja ene vrste energije v drugo, predvsem pretvarjanja v toploto in mehansko oz. električno delo,
- pridobi sposobnost evidentiranja in razumevanja termodinamičnih zakonitosti,
- pridobi sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- pridobi sposobnost reševanja konkretnih termodinamičnih problemov,
- sposobnost obvladovanja razvoja na področju energetike,
- zna poiskati in uporabiti ustrezno strokovno literaturo ter oceniti primernost razpoložljivih tehnologij in rešitev glede na potrebe in zahteve,
- pridobi suverenost in avtonomnost na področju strokovnega dela,
- pridobi sposobnost za svetovalno delo in sposobnost prenosa znanja drugim.

**Intended learning outcomes:**

Knowledge and understanding:

*Student:*

- acquires fundamental knowledge of energies and understands the laws of conversion of one type of energy to another, especially conversion to heat and mechanical or electrical work,
- acquires the ability to record and understand thermodynamic laws,
- acquires the ability to apply the acquired theoretical knowledge in practice,
- acquires the ability to solve concrete thermodynamic problems,
- acquires the ability to control developments in the field of energy,
- knows how to find and use relevant professional literature and assess the suitability of available technologies and solutions in relation to needs and requirements,
- acquires sovereignty and autonomy in the field of professional activity,
- acquires the ability to perform consulting activities and transfer knowledge to others.

**Metode poučevanja in učenja:**

- *predavanja,*
- *vaje s praktičnimi primeri.*

**Learning and teaching methods:**

- *lectures,*
- *tutorials* with practical examples.

Delež (v %) /

Weight (in %)

**Načini ocenjevanja:**

**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Assessment:
<ul style="list-style-type: none"> <li>• pisni del izpita (pozitivna ocena je pogoj za opravljanje ustnega dela izpita),</li> <li>• ustni del izpita.</li> </ul>	50 % ocene	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> <li>• the written part of the exam (a positive grade is a condition for attending the oral part of the exam),</li> <li>• the oral part of the exam.</li> </ul> Grading scale: ECTS.
Ocenjevalna lestvica: ECTS.	50 % ocene	

