

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Toplotni procesi
<b>Course title:</b>	Thermal processes

Študijski program Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Inženiring in avtomobilska industrija		prvi	drugi
Engineering and automotive industry		first	second

**Vrsta predmeta / Course type** Izbirni/optional

**Univerzitetna kod predmeta / University course code:** MAG\_21020

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45	-	-	45	-	150	8

**Nosilec predmeta / Lecturer:** doc. dr. Damjan Balabanič

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

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

**Prerequisites:**

- vpis v 1. letnik magistrskega študija,	- Enrolment in first study year
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**Vsebina:**

**Content (Syllabus outline):**

<ul style="list-style-type: none"> <li>- Načini prenosa toplote</li> <li>- Bilanca energije</li> <li>- Stacionarno prevajanje</li> <li>- Nestacionarni prenos toplote</li> <li>- Toplotni menjalniki</li> <li>- Molekularen prenos snovi</li> <li>- Diferencialna bilanca mase v binarnem sistemu</li> <li>- Stacionarna in nestacionarna difuzija</li> <li>- Konvektivni prenos snovi</li> <li>- Modeli snovne prestopnosti</li> <li>- Eksperimentalni podatki za snovno prestopnost</li> <li>- Dimenzioniranje naprav za snovni prenos</li> <li>- Termodinamični krožni procesi</li> <li>- Proces kogeneracije in proces trigeneracije</li> </ul>	<ul style="list-style-type: none"> <li>- Methods of heat transfer</li> <li>- Balance of energy</li> <li>- Stationary transition</li> <li>- Non-stationary heat transfer</li> <li>- Heat exchanger</li> <li>- Molecular mass transfer</li> <li>- Differential mass balance in a binary system</li> <li>- Stationary and non-stationary diffusion</li> <li>- Convective mass transfer</li> <li>- Experimental data for mass transfer</li> <li>- System design for mass transfer</li> <li>- The thermodynamic cycle processes</li> <li>- The process of cogeneration and trigeneration</li> <li>- Otto and Diesel engine process</li> </ul>
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Velja od: 1. 10. 2019

Sprejel: Senat FINI Novo mesto

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| - Proces Ottovega in Dieslovega motorja |  |
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**Temeljni literatura in viri / Readings:**

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| <ul style="list-style-type: none"> <li>- Koloini T. Prenos toplote in snovi. Fakulteta za kemijo in kemijsko tehnologijo, Univerza v Ljubljani.</li> <li>- Taylor CF. Internal combustion engine in theory and practice. MIT.</li> <li>- Bohner M. in sod. Motorno vozilo. Tehniška založba Slovenije.</li> <li>- Marčič M., Avsec J. Hladilna tehnika. Fakulteta za strojništvo, Univerza v Mariboru.</li> <li>- E-gradiva predmeta   E-Course material</li> </ul> |
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**Priporočljiva literatura / Recommended Textbooks**

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| <ul style="list-style-type: none"> <li>- Znanstveni članki s področja toplotnih procesov</li> <li>- Lefebvre D., Tezel FH. 2017. A review of energy storage technologies with a focus on adsorption thermal energy storage processes for heating applications. Renewable and Sustainable Energy Reviews, 67, 116-125.</li> </ul> |
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**Cilji in kompetence:**

**Objectives and competences:**

<p><b>Cilji</b></p> <p>Študenti spoznajo načine prenosa toplote ter snovi, splošne termodinamične krožne procese, procese kogeneracije in procese trigeneracije za proizvodnjo električne, toplotne in hladilne energije. Obvladajo procese Ottovega in Dieslovega motorja.</p> <p><b>Kompetence</b></p> <ul style="list-style-type: none"> <li>- Poznajo načine prenosa toplote in snovi</li> <li>- Poznajo principe splošnih termodinamičnih krožnih procesov</li> <li>- Razumejo procese kogeneracije in trigeneracije</li> <li>- Poznajo in uporabijo načine varčnega in ekološko sprejemljivega pridobivanja in porabe energije</li> <li>- Evidentirajo probleme v povezavi z Otto in Dieslovimi motorji</li> <li>- Poznajo procese toplotnih prenosnikov in njihovo uporabo v praksi</li> </ul>	<p><b>Objectives</b></p> <p>Students learn methods of heat and mass transfer, general thermodynamic cycle process, cogeneration and trigeneration process for the production of electricity, heat and cooling energy. Understanding processes of Diesel and Otto engine.</p> <p><b>Competences</b></p> <ul style="list-style-type: none"> <li>- Knowledge of methods of heat and mass transfer</li> <li>- Knowledge of the general principles of thermodynamic circular process</li> <li>- Understand the processes of cogeneration and trigeneration</li> <li>- Understand and apply methods of saving and environmentally friendly energy production and consumption</li> <li>- Identify problems regards to Otto and Diesel engines</li> <li>- Knowledge of the processes of heat exchangers and their use in practice</li> </ul>
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**Predvideni študijski rezultati:**

**Intended learning outcomes:**

<p><b>Študent / študentka:</b></p> <ul style="list-style-type: none"> <li>- Natančno poznajo načine prenosa toplote in snovi</li> <li>- Natančno poznajo principe splošnih termodinamičnih krožnih procesov</li> <li>- Razumejo procese kogeneracije in trigeneracije</li> <li>- Poznajo in uporabijo načine varčnega in ekološko sprejemljivega pridobivanja in porabe energije</li> <li>- Prepoznajo probleme v povezavi z Otto in Dieslovimi motorji</li> <li>- Natančno poznajo procese toplotnih prenosnikov in njihovo uporabo v praksi</li> </ul>	<p><b>Student:</b></p> <ul style="list-style-type: none"> <li>- Detailed knowledge of methods of heat and mass transfer</li> <li>- Detailed knowledge of the general principles of thermodynamic circular process</li> <li>- Understand the processes of cogeneration and trigeneration</li> <li>- Understand and apply methods of saving and environmentally friendly energy production and consumption</li> <li>- Identify problems regards to Otto and Diesel engines</li> <li>- Detailed knowledge of the processes of heat exchangers and their use in practice</li> </ul>
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**Metode poučevanja in učenja:**

**Learning and teaching methods:**

<ul style="list-style-type: none"> <li>- Avditorna predavanja</li> <li>- <i>Kratka predavanja</i> z aktivno udeležbo študentov (razlaga snovi, pogovori, vprašanja, primeri, reševanje problemov).</li> <li>- <i>Individualne in skupinske konzultacije</i> (pogovori, dodatna razlaga, obravnava specifičnih vprašanj).</li> </ul> <p>Predmet je oblikovan na kombinirani način študija, ki vključuje aktivnosti preko elektronskega (on-line) okolja: te aktivnosti so sestavljene iz samostojnih in skupinskih aktivnosti z uporabo učnega okolja Moodle in drugih elektronskih vsebin. Praviloma vključujejo diskusije v forumih, spletne strani, ogled posnetih predavanj in vaj, preverjanje znanja, odgovori na vprašanja, iskanje po spletu (bazah) itd.</p>	<ul style="list-style-type: none"> <li>- Frontal lectures</li> <li>- <i>Short lectures</i> with active student participation (discussions, talks, questioning, cases, problem-solving).</li> <li>- <i>Individual and group consultations</i> (discussions, additional explanations, discussing specific questions).</li> </ul> <p>The course is designed as blended learning that includes online activities: Online activities consist of independent and group activities using the LMS Moodle and other electronic or online content. Activities usually include discussions in forums, websites, viewing of recorded lectures and tutorials, assessments, answering questions, searching the web (databases), etc.</p>
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**Načini ocenjevanja:**

**Delež/Weight (%)**

**Assessment:**

<ul style="list-style-type: none"> <li>• ustni izpit</li> </ul> <p>Ocenjevalna lestvica je skladna z ECTS in Pravilnikom o preverjanju in ocenjevanju znanja FINI NM.</p>	<p>100</p>	<ul style="list-style-type: none"> <li>• oral exam</li> </ul> <p>Evaluation scale in accordance with ECTS and the Rules on the Evaluation and Assessment of Knowledge FINI NM.</p>
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**Reference nosilca / Lecturer's references:**

**1.01 Izvirni znanstveni članek**

1. BALABANIČ, Damjan, FILIPIČ, Metka, KRIVOGRAD-KLEMENČIČ, Aleksandra, ŽEGURA, Bojana. Raw and biologically treated paper mill wastewater effluents and the recipient surface waters: cytotoxic and genotoxic activity and the presence of endocrine disrupting compounds. *Science of the total environment*, 2017, vol. 574, str. 78-89

2. KRIVOGRAD-KLEMENČIČ, Aleksandra, KRZYK, Mario, DREV, Darko, BALABANIČ, Damjan, KOMPARE, Boris. Recycling of textile wastewaters treated with various combinations of advanced oxidation processes (AOP) = Recikliranje tekstilnih odpadnih voda očiščenih z različnimi kombinacijami naprednih oksidacijskih postopkov (AOP). *Acta hydrotechnica*, 2012, 25, 42, str. 31-39

3. BALABANIČ, Damjan, HERMOSILLA, Daphne, MERAYO, Noemi, KRIVOGRAD-KLEMENČIČ, Aleksandra, BLANCO, Angeles. Comparison of different wastewater treatments for removal of selected endocrine-disruptors from paper mill wastewaters. *Journal of environmental science and health. Part A, Toxic/hazardous substances & environmental engineering*, 2012, vol. 47, no. 10, str. 1350-1363

4. BALABANIČ, Damjan, KRIVOGRAD-KLEMENČIČ, Aleksandra. Presence of phthalates, bisphenol A, and nonylphenol in paper mill wastewaters in Slovenia and efficiency of aerobic and combined aerobic-anaerobic biological wastewater treatment plants for their removal. *Fresenius environmental bulletin*, 2011, vol. 20, no. 1, str. 86-92

5. KRIVOGRAD-KLEMENČIČ, Aleksandra, GRIESSLER BULC, Tjaša, BALABANIČ, Damjan. The effectiveness of chemical-free water treatment system combining fibre filters, ultrasound, and UV for fish farming on algal control. *Periodicum biologorum : an interdisciplinary international journal of the Societas Scientiarum Naturalium Croatica established 1885*, 2010, vol. 112, no. 2, str. 211-217

**1.02 Pregledni znanstveni članek**

6. BALABANIČ, Damjan. Ocena življenjskega cikla (LCA) papirnih izdelkov = Life cycle assessment (LCA) of paper products. *Papir : revija Društva inženirjev in tehnikov papirništva*, nov. 2013, letn. 41, št. 10, str. 30-32

7. BALABANIČ, Damjan, RUPNIK, Marjan, KRIVOGRAD-KLEMENČIČ, Aleksandra. Negative impact of endocrine-disrupting compounds on human reproductive health. *Reproduction, fertility and development*, 2011, vol. 23, no. 3, str. 403-416

**1.08 Objavljeni znanstveni prispevek na konferenci**

8. BALABANIČ, Damjan, ŠUŠTARŠIČ, Matej, MRAOVIĆ, Matija, VREČKO, Alen, KAPUN, Tea, MUCK, Deja. Environmental assessment of paper products. V: URBAS, Raša (ur.). *Proceedings, 7th Symposium of Information and Graphic Arts Technology*, sigt, 5.-6. June 2014, Ljubljana. Ljubljana: Faculty of Natural Sciences and Engineering, Department of Textiles, Chair of Information and Graphic Art Technology. 2014, str. 24-29

9. KAPUN, Tea, MRAOVIĆ, Matija, BALABANIČ, Damjan, ŠUŠTARŠIČ, Matej, VREČKO, Alen, MUCK, Deja. Use of ultrasound on hardwood pulp. V: URBAS, Raša (ur.). *Proceedings, 7th Symposium of Information and Graphic Arts Technology*, sigt, 5.-6. June 2014, Ljubljana. Ljubljana: Faculty of Natural Sciences and Engineering, Department of Textiles, Chair of Information and Graphic Art Technology. 2014, str. 30-36

10. KAPUN, Tea, MRAOVIĆ, Matija, RAVNJAK, David, BALABANIČ, Damjan, MUCK, Deja. Effect of different pre-treatments to a novel method for cellulose fibers treatment. V: *TAPPI proceedings*. [S. l.: s. n. 2014], str. 705-716