

# INTERDISCIPLINARNI PROJEKT - PPLH

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Interdisciplinarni projekt - PPLH
<b>Course title:</b>	Interdisciplinary Project - PPLH
<b>Članica nosilka/UL</b>	UL FS
<b>Member:</b>	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Strojništvo - projektno aplikativni program, prva stopnja, visokošolski strokovni	Prometni pilot letala/helikopterja (smer)	3. letnik	2. semester	izbirni

<b>Univerzitetna koda predmeta/University course code:</b>	0642934
<b>Koda učne enote na članici/UL Member course code:</b>	3102-V

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15		15			45	3

<b>Nosilec predmeta/Lecturer:</b>	izr. prof. dr. Nikola Vukašinović, izr. prof. dr. Robert Kunc, Lidija Slemenik Perše, prof. dr. Andrej Kitanovski, prof. dr. Božidar Šarler, prof. dr. Edvard Govekar, prof. dr. Franci Pušavec, prof. dr. Iztok Golobič, prof. dr. Janko Slavič, prof. dr. Marko Nagode, prof. dr. Mihael Sekavčnik, prof. dr. Mitjan Kalin, prof. dr. Niko Heraković, prof. dr. Primož Podržaj, prof. dr. Rok Petkovšek, prof. dr. Roman Šturm
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<b>Izvajalci predavanj:</b>	
<b>Izvajalci seminarjev:</b>	
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

<b>Vrsta predmeta/Course type:</b>	Splošni izbirni predmet/Elective general course
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<b>Jeziki/Languages:</b>	Predavanja/Lectures:	Slovenščina
	Vaje/Tutorial:	Slovenščina

<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>	<b>Prerequisites:</b>
Izpolnjevanje pogojev za vpis v Visokošolski strokovni študijski program I. stopnje Strojništvo - Projektno aplikativni program.	Meeting the enrollment conditions for the MECHANICAL ENGINEERING - Project Oriented Applied Programme.

**Vsebina:**

Študentje bodo v manjših interdisciplinarnih skupinah, ali posamično, reševali ter analizirali aplikativne inženirske probleme v obliki projektno-seminarskega dela. Projekti se bodo nanašali na dele ali celotne sklope znanj iz posamičnih ali več področij predhodnih semestrov. Projekti bodo zahtevali integracijsko znanje in inženirske pristope, ob upoštevanju širših teoretičnih in praktičnih vidikov, tudi iter- in intra-disciplinarnih. Izzivi bodo vključevali aktualne tematike iz industrije, širše družbe, mednarodnih ali domačih študentskih tekmovanj in drugih akademskih izzivov. Pri tem bo uporabljen tematsko-problemski pristop, kjer se bo združevalo znanja z različnih področij. Zato bodo študenti spodbujeni, da se povezujejo tudi s kolegi drugih fakultet in/ali industrije in družbe, in na ta način razširijo praktične izkušnje reševanja interdisciplinarnih nalog.

*Vsebinsko bodo aktivnosti razdeljene v sledeče časovno sosledne vsebine:*

1. Kreacija skupin in oblikovanje ustrezne projektne ideje. Formalizacija projektnih ciljev.
2. Teoretične podlage ter iskanje optimalnih rešitev skozi analizo obstoječega stanja in pristopom inoviranja.
3. Razčlenitev projektne ideje v obvladljive podsklope in iskanje morebitnih kritičnih točk.
4. Razdelitev nalog in določitev časovnice. Spremljanje napredka preko predstavitve vmesnih rezultatov in praktičnega dela.
5. Predstavitev in razširjanje rezultatov.

**Content (Syllabus outline):**

The students individually or as a member of a small team analyse and solve applied engineering problems in the form of project-seminar work. The projects are related to partial or comprehensive knowledge areas from the former study semesters. Integrated knowledge and engineering approaches are inherently linked to this projects as well as application of wider theoretical and practical inter- and intra-disciplinary aspects. The content consists of concurrent industrial problems, social issues, domestic and international student's competitions and academic challenges. A contextual hands-on approach is followed when using knowledge integration from different areas of expertise. The students are encouraged to link themselves with the colleagues from the other faculties and/or industry or wider society in order to widen their professional horizon and practical experience by solving inter-disciplinary tasks.

*The course content consists of the following:*

1. Team building and formation of a suitable project idea. Formalisation of project objectives.
2. Theoretical content for finding optimal solutions through the state-of-the-art analysis and innovation approach.
3. Segmentation of the project idea into manageable sub-tasks in identification of risks.
4. Task allocation and definition of time-sheet. Progress control through intermediate-results presentation and practical work.
5. Presentation and dissemination of results.

**Temeljna literatura in viri/Readings:**

Določena je smiselno v dogovoru s tremi nosilci predmeta za vsakega študenta posebej glede na izbrano problematiko. Literatura je dosegljiva v knjižnici laboratorija, fakultetni knjižnici ali širše. Praviloma študent študira iz člankov, ki so obravnavali podoben primer, kakor ga ima sam definiranega.

It is determined appropriately in agreement with three lecturers for each student according to the chosen topic. Literature is available at the lab library, faculty library or beyond. As a rule, a student studies from articles dealing with a similar case as he or she has defined.

**Cilji in kompetence:****Cilji:**

1. Omogočiti študentu seznanitev s temeljno in predmetno specifično literaturo na delu

**Objectives and competences:****Objectives:**

1. To enable the student to get acquainted with the basic and specific literature on the topic

<p>tematike, ki bo obravnavana v diplomski nalogi.</p> <ol style="list-style-type: none"> <li>2. Seznanitev z namensko opremo na področju eksperimentiranja in uporabe računalniških orodij. Študent tako spozna osnovno funkcionalnost opreme, ki jo lahko uporabi.</li> <li>3. Predmet se izvaja v laboratoriju (enem ali več) odvisno od dogovora z mentorjem in nosilci predmeta.</li> </ol> <p><b>Kompetence:</b></p> <p>S1-PAP: Sposobnost uporabe pridobljenega znanja v praksi.</p> <p>S2-PAP: Sposobnost samostojnega dela v okviru znanj izbrane študijske smeri.</p> <p>S4-PAP: Sposobnost razčlenitve lažjih strokovnih nalog na podnaloge.</p> <p>S5-PAP: Razvijanje sposobnosti kritičnega in samokritičnega mišljenja.</p> <p>S11-PAP: Sposobnost predstavitve strokovnih problemov in njihovih rešitev v svojem okolju in širše.</p> <p>S13-PAP: Sposobnost iskanja virov znanja, selekcija najdenih virov in uporaba tako pridobljenega znanja pri svojem delu.</p> <p>P4-PAP: Pozna osnovne merilne instrumente in merilne verige za merjenje osnovnih veličin na področju strojništva.</p> <p>P6-PAP: Obvlada samostojno projektno delo.</p> <p>P9-PAP: Diplomant je sposoben samostojno opravljati razvojno aplikativna, inženirska in strokovna organizacijska dela ter reševati posamezne dobro definirane naloge na področju strojništva.</p>	<p>that will be discussed in the Bachelor's degree thesis.</p> <ol style="list-style-type: none"> <li>2. To familiarize with the specific equipment in the field of experimentation and use of computer tools. Thus the student learns about the basic functionality of the equipment he can use.</li> <li>3. The course is carried out in the laboratory (one or more), depending on the agreement with the mentor and course lecturers.</li> </ol> <p><b>Competencies:</b></p> <p>S1-PAP: The ability to use the attained knowledge in the practice.</p> <p>S2-PAP: The ability to work autonomously in the framework of knowledge provided by the selected study module.</p> <p>S4-PAP: The ability to break down professional tasks of lesser complexity into subtasks.</p> <p>S5-PAP: Developing the ability of critical and self-critical thinking.</p> <p>S11-PAP: The ability to present professional problems and the solutions thereof in own environment and wider.</p> <p>S13-PAP: The ability to find sources of knowledge, select among the available resources and use the knowledge acquired for one's work.</p> <p>P4-PAP: Knowing the basic measuring instruments and measuring chains used to measure the basic quantities in the field of mechanical engineering.</p> <p>P6-PAP: Mastering independent project work.</p> <p>P9-PAP: The graduates are able to independently perform applied developmental, engineering and professional organisational work, and to solve well-defined individual tasks in the field of mechanical engineering.</p>
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**Predvideni študijski rezultati:**

<p><b>Znanja:</b></p> <p>Z1: Poglobljeno strokovno teoretično in praktično znanje na določenem področju, podprto s širšo teoretično in metodološko osnovo.</p> <p><b>Spretnosti:</b></p> <p>S1.1 Izvajanje kompleksnih operativno-strokovnih opravil, ki vključujejo tudi uporabo metodoloških orodij.</p>
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**Intended learning outcomes:**

<p><b>Knowledge:</b></p> <p>Z1: Thorough professional theoretical and practical knowledge in a selected field of expertise that is supported with a broad theoretical and methodological basis.</p> <p><b>Skills:</b></p>
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<p>S1.2 Obvladovanje zahtevnih, kompleksnih delovnih procesov ob samostojni uporabi znanja v novih delovnih situacijah.</p> <p>S1.3 Diagnosticiranje in reševanje problemov v različnih specifičnih delovnih okoljih, povezanih s področjem izobraževanja in usposabljanja.</p> <p>S1.4 Osnova za izvirna dognanja/ stvaritve in kritično refleksijo.</p>	<p>S1.1 Executing complex operational-professional tasks that incorporate usage of methodological tools.</p> <p>S1.2 Mastering demanding and complex work processes by independent usage of knowledge in new working situations.</p> <p>S1.3 Problem diagnostics and solving in different and specific working environments that are linked to the teaching and training content.</p> <p>S1.4 Basis for unique innovations and critical reflections.</p>
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#### Metode poučevanja in učenja:

#### Learning and teaching methods:

<p><b>Klasične oblike poučevanja:</b></p> <p>P1 Avditorna predavanja z reševanjem izbranih - za področje značilnih - teoretičnih in praktično uporabnih primerov.</p> <p>P2 Obravnava snovi po urejeni in vnaprej razloženi sistematiki.</p> <p>P5 Uporaba študijskega gradiva v obliki (knjiga, skripta, e-knjiga, tiskana verzija predstavitve predavanj).</p> <p><b>Moderne in prožne oblike poučevanja:</b></p> <p>P6 Interaktivna predavanja.</p> <p>P7 Študij literature in razprava (timsko delo, viharjenje možgan, organizacija in/ali udeležba tekmovanj, organizacija in/ali udeležba delavnic).</p> <p>P8 Izdelava in predstavitev aplikativnih seminarskih nalog</p> <p>P14 Virtualni eksperimenti</p>	<p><b>Conventional teaching methods:</b></p> <p>P1 Auditorial lectures with solving selected field-specific theoretical and applied use cases.</p> <p>P2 Presenting the content according to the explained system.</p> <p>P5 Application of study material (textbook, e-book, printed lecture presentations, etc.).</p> <p><b>Contemporary and flexible teaching methods:</b></p> <p>P6 Interactive lectures.</p> <p>P7 Literature study and discussion (teamwork, brainstorming, organisation- and/or participation at student's competitions or workshops).</p> <p>P8 Making and presenting applied seminar exercises.</p> <p>P14 Virtual experiments.</p>
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#### Načini ocenjevanja:

#### Delež/Weight Assessment:

Ocena končnega poročila.	50,00 %	Final report.
Ocena končnih predstavitev rezultatov.	50,00 %	Presentation of final results.

#### Ocenjevalna lestvica:

#### Grading system:

5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10
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#### Reference nosilca/Lecturer's references:

##### Iztok Golobič:

- GREGORČIČ, Peter, ZUPANČIČ, Matevž, **GOLOBIČ, Iztok**. Scalable surface microstructuring by a fiber laser for controlled nucleate boiling performance of high- and low-surface-tension fluids. *Scientific reports*. May 2018, vol. 8, f. 1-8, ilustr. ISSN 2045-2322. <https://www.nature.com/articles/s41598-018-25843-5.pdf>, DOI: [10.1038/s41598-018-25843-5](https://doi.org/10.1038/s41598-018-25843-5). [COBISS.SI-ID [16034331](https://www.cobiss.si/id/16034331)]

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#### Edvard Govekar:

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2. POTOČNIK, Primož, **GOVEKAR, Edvard**. Semi-supervised vibration-based classification and condition monitoring of compressors. *Mechanical systems and signal processing*. Sep. 2017, vol. 93, str. 51-65, ilustr. ISSN 0888-3270. <http://www.sciencedirect.com/science/article/pii/S088832701730047X>, DOI: [10.1016/j.ymsp.2017.01.048](https://doi.org/10.1016/j.ymsp.2017.01.048). [COBISS.SI-ID [15296539](https://www.cobiss.si/id/15296539)]
3. KUZNETSOV, Alexander, JEROMEN, Andrej, **GOVEKAR, Edvard**. Droplet detachment regimes in annular laser beam droplet generation from a metal wire. *CIRP annals*. 2014, vol. 63, iss. 1, str. 225-228, ilustr. ISSN 0007-8506. DOI: [10.1016/j.cirp.2014.0051](https://doi.org/10.1016/j.cirp.2014.0051). [COBISS.SI-ID [13402651](https://www.cobiss.si/id/13402651)]

#### Niko Herakovič:

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2. DEBEVEC, Mihael, ŠIMIC, Marko, **HERAKOVIČ, Niko**. Virtual factory as an advanced approach for production process optimization. *International journal of simulation modelling*. Mar. 2014, vol. 13, no. 1, str. 66-78, ilustr. ISSN 1726-4529. DOI: [10.2507/IJSIMM13\(1\)6.260](https://doi.org/10.2507/IJSIMM13(1)6.260). [COBISS.SI-ID [13367835](https://www.cobiss.si/id/13367835)]
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#### Mitjan Kalin:

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#### Andrej Kitanovski:

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booster for an ultra-low-temperature district-heating substation. *Applied energy*. May 2024, vol. 361, [article no.] 122899, str. 1-14, ilustr. ISSN 1872-9118. <https://www.sciencedirect.com/science/article/pii/S0306261924002824>, [Repozitorij Univerze v Ljubljani – RUI](#), DOI: [10.1016/j.apenergy.2024.122899](https://doi.org/10.1016/j.apenergy.2024.122899). [COBISS.SI ID [186961923](#)].

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#### Robert Kunc:

1. BASAN, Robert, FRANULOVIC, Marina, PREBIL, Ivan, **KUNC, Robert**. Study on Ramberg-Osgood and Chaboche models for 42CrMo4 steel and some approximations. *Journal of constructional steel research*. [Print ed.]. sep. 2017, vol. 136, str. 65-74, ilustr. ISSN 0143-974X. <http://www.sciencedirect.com/science/article/pii/S0143974X17302341>, DOI: [10.1016/j.jcsr.2017.05.010](https://doi.org/10.1016/j.jcsr.2017.05.010). [COBISS.SI-ID [15531035](#)]
2. BIČEK, Matej, **KUNC, Robert**, ZUPAN, Samo. Mechanical impact on in-wheel motor's performance. *Journal of mechanics*. [Print ed.]. Oct. 2017, vol. 33, iss. 5, str. 607-618, ilustr. ISSN 1727-7191. <https://www.cambridge.org/core/journals/journal-of-mechanics/article/div-classtitlemechanical-impact-on-in-wheel-motorandaposs-performancediv/A4D5DB17B7102D3897C02AAAC07A32A7>, DOI: [10.1017/jmech.2016.95](https://doi.org/10.1017/jmech.2016.95). [COBISS.SI-ID [15295259](#)]
3. ŽEROVNIK, Andrej, PEPEL, Vili, PREBIL, Ivan, **KUNC, Robert**. The yield-point phenomenon and cyclic plasticity of the uniaxially loaded specimens. *Materials & design*. Feb. 2016, vol. 92, str. 971-977, ilustr. ISSN 0264-1275. DOI: [10.1016/j.matdes.2015.12.111](https://doi.org/10.1016/j.matdes.2015.12.111). [COBISS.SI-ID [14442011](#)]

#### Marko Nagode:

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