

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	Izbrana poglavja iz matematičnih metod
<b>Course title:</b>	Selected Topics in Mathematical Methods

Študijski program <i>Study programme and level</i>	Študijska smer <i>Study field</i>	Letnik <i>Academic year</i>	Semester <i>Semester</i>
Inženiring in avtomobilska industrija Podiplomski (tretja)	Program nima smeri	prvi	drugi
Engineering and Automotive Industry Graduate – Master (third)	The program has no study fields	First	Second

<b>Vrsta predmeta / Course type</b>	Izbirni	Optional
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<b>Univerzitetna koda predmeta / University course code:</b>	31009
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Predavanja <i>Lectures</i>	Seminar <i>Seminar</i>	Sem. vaje <i>Tutorial</i>	Lab. vaje <i>Laboratory work</i>	Teren. vaje <i>Field work</i>	Samost. delo <i>Individ. work</i>	ECTS
60	-	30		-	180	10

<b>Nosilec predmeta / Lecturer:</b>	prof. ddr. Janez Usenik
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<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	<b>Vaje / Tutorial:</b>
	Slovenski	Slovenski
	Slovenian	Slovenian

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

**Prerequisites:**

Vpis v 1. letnik doktorskega študija.	Enrollment in the first year of doctoral study.
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**Vsebina:**

**Content (Syllabus outline):**

<ul style="list-style-type: none"> <li>- Diskretna analiza</li> <li>- Nekatera poglavja numerične analize</li> <li>- Mehka logika</li> <li>- Mehki sistemi, modeliranje sistemov, mehko sklepanje</li> <li>- Nevronske mreže</li> <li>- Učenje nevronske mreže</li> <li>- Matematične metode učenja inteligentnih sistemov</li> <li>- Neurofuzzy postopek učenja</li> <li>- Možnosti uporabe v tehniki</li> </ul>	<ul style="list-style-type: none"> <li>- Discrete analysis</li> <li>- Some chapters of numerical analysis</li> <li>- Fuzzy Logic</li> <li>- Fuzzy systems, modeling of the dynamic systems, fuzzy reasoning</li> <li>- Neural networks</li> <li>- Learning neural networks</li> <li>- Mathematical methods of learning intelligent systems</li> <li>- Neurofuzzy learning process</li> <li>- Application techniques</li> </ul>
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**Temeljni literatura in viri / Readings:**

- Usenik, J. (2003). *Upravljanje logističnih sistemov*. Biro 4D: Novo mesto.
- Usenik, J. (2015). *Mehka logika in nevronske mreže*. Zapiski predavanj: Novo mesto.
- Ross, T. J. (2004). *Fuzzy Logic with engineering applications*. John Wiley and sons: Hoboken.
- Wayne L. Winston: *Operations research, Applications and algorithms*, Duxbury Press, 2004.
- Erwin Kreyszig.: *Advanced engineering mathematics*, 17. izdaja, John Wiley and sons, 2000.

**Priporočljiva literatura / Recommended Textbooks**

Članki v znanstvenih revijah / Articles in scientific journals

**Cilji in kompetence:**

**Cilji**  
Usvojiti znanje o nekaterih specialnih metodah uporabne matematike,  
Nadgraditi matematičnih znanja in orodja, potrebna za razvoj in upravljanje inteligentnih (zveznih in diskretnih) sistemov v tehniki.

**Kompetence**

- Sposobnost identificiranja raziskovalnega problema, njegove analize ter možnih rešitev.
- Sposobnost obvladanja standardnih metod, postopkov in procesov raziskovalnega dela na področju tehnike.
- Sposobnost uporabe pridobljenega teoretičnega znanja v praksi.
- Avtonomnost pri raziskovalnem in strokovnem delu.
- Zavezanost profesionalni etiki.
- Sposobnost oblikovanja in implementacije izvirnih znanstvenih rešitev danih problemov in priložnosti na področju tehnike.
- Razvoj novih veščin in spretnosti v uporabi znanja na svojem konkretnem raziskovalnem področju.
- Sposobnost razvoja novih raziskovalnih empiričnih metod ter sorodnih disciplin (sistemska teorija, ekonometrično modeliranje, teorija odločanja, statistične analize, simulacije, mehko sklepanje, umetna inteligenca).
- Sposobnost predstavitve pridobljenih znanstvenih izsledkov v obliki publikacij v mednarodni znanstveni periodiki

**Objectives and competences:**

**Objectives**

To learn knowledge of certain special methods of applied mathematics.  
To upgrade mathematical knowledge and tools needed to develop and manage/control intelligent (continuous and discrete) systems in the technical sciences.

**Competences**

- The ability to identify a given research problem, its analysis and possible solutions.
- The ability to apply and use standard methods, procedures and processes of research to the field of technics.
- Ability to use theoretical knowledge in practice.
- Autonomy in research and professional work.
- Commitment to professional ethics.
- Ability to design and implement original scientific answers to problems and opportunities in the area of technics.
- Development of new skills and expertise in the application of knowledge in a specific field of research.
- Ability to develop new empirical research methods and its related disciplines (system theory, econometric modelling, decision theory, empirical, statistical analysis, simulations, fuzzy reasoning, artificial intelligence)
- The ability to present obtained scientific research results in the form of publications in international scientific journals.

**Predvideni študijski rezultati:**

**Intended learning outcomes:**

<p><b>Znanje in razumevanje:</b> <b>Študent/študentka:</b></p> <ul style="list-style-type: none"> <li>- usvoji nekatere specialne metode uporabne matematike</li> <li>- usvoji pojem mehke logike in nevronske mreže</li> <li>- spozna osnovne principe umetne inteligence</li> </ul>	<p><b>Knowledge and understanding:</b> <b>Student:</b></p> <ul style="list-style-type: none"> <li>- grasp some special methods of applied mathematics</li> <li>- grasp the concept of fuzzy logic and neural networks</li> <li>- learn the basic principles of artificial intelligence</li> </ul>
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**Metode poučevanja in učenja:**

**Learning and teaching methods:**

<p>Avditorna predavanja.</p> <ul style="list-style-type: none"> <li>- individualno in skupinsko delo s študenti v obliki konzultacij,</li> <li>- projektna naloga s praktičnim primerom implementacije inteligentnega (pod)sistema</li> </ul>	<p>Lectures.</p> <ul style="list-style-type: none"> <li>- individual and group work with students in the form of consultations</li> <li>- project work with a practical example of optimizing the technical - business (sub)system</li> </ul>
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**Načini ocenjevanja:**

**Delež (v %) /  
Weight (in%)**

**Assessment:**

<ul style="list-style-type: none"> <li>- projektna naloga</li> <li>- pisni in ustni izpit</li> <li>- končna ocena izpita je povprečje vsote ocen posameznih deležev z upoštevanjem uteži</li> </ul>	<p>60 40</p>	<ul style="list-style-type: none"> <li>- project work</li> <li>- written and oral examination</li> <li>- the final grade of the exam is the average of both grades</li> </ul>
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**Reference nosilca / Lecturer's references:**

**Sestavljalec učnega načrta/author of the curriculum: prof. ddr. Janez Usenik**

**Ključne reference nosilca/ key lecturer's references:**

- BATISTA, Milan, USENIK, Janez. Stresses in a circular ring under two forces acting along a diameter. *Journal of strain analysis for engineering design*, ISSN 0309-3247, 1996, let. 31, št. 1, str. 75-78. [COBISS.SI-ID [23395](#)], [JCR, SNIP, WoS do 21. 1. 2016: št. citatov (TC): 7, čistih citatov (CI): 7, normirano št. čistih citatov (NC): 17, Scopus do 20. 10. 2015: št. citatov (TC): 8, čistih citatov (CI): 7, normirano št. čistih citatov (NC): 17]
- BOGATAJ, Marija, USENIK, Janez. Fuzzy approach to the spatial games in the total market area. *International journal of production economics*, ISSN 0925-5273. [Print ed.], 8 January 2005, vol. 93-94, str. 493-503. [COBISS.SI-ID [15011302](#)], [JCR, SNIP, WoS do 12. 4. 2016: št. citatov (TC): 7, čistih citatov (CI): 7, normirano št. čistih citatov (NC): 12, Scopus do 12. 5. 2016: št. citatov (TC): 13, čistih citatov (CI): 12, normirano št. čistih citatov (NC): 85]
- KOVAČIĆ, Danijel, USENIK, Janez, BOGATAJ, Marija. Optimal decisions on investments in urban energy cogeneration plants - extended MRP and fuzzy approach to the stochastic systems. *International journal of production economics*, ISSN 0925-5273. [Print ed.], feb. 2016, vol. , iss. , [13] str., ilustr. <http://www.sciencedirect.com/science/article/pii/S0925527316000608>, doi: [10.1016/j.ijpe.2016.02.016](https://doi.org/10.1016/j.ijpe.2016.02.016). [COBISS.SI-ID [1024225372](#)], [JCR, SNIP, Scopus do 7. 6. 2016: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]
- USENIK, Janez, BOGATAJ, Marija. A fuzzy set approach for a location-inventory model. *Transportation planning and technology*, ISSN 0308-1060, 2005, vol. 28, no. 6, pp. 447-464. [COBISS.SI-ID [9626785](#)], [JCR, SNIP, WoS do 12. 2. 2016: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 5, Scopus do 11. 8. 2015: št. citatov (TC): 6, čistih citatov (CI): 5, normirano št. čistih citatov (NC): 35]
- USENIK, Janez, TURNŠEK, Tit. Modeling conflict dynamics : system dynamic approach. *Sustainable logistics and strategic transportation planning*, (Advances in logistics, operations, and management science book series (Print), ISSN 2327-350X). Hershey: IGI Global, cop. 2016, str. 273-294, ilustr. <http://www.igi->

[global.com/book/sustainable-logistics-strategic-transportation-planning/141939](http://global.com/book/sustainable-logistics-strategic-transportation-planning/141939), doi: [10.4018/978-1-5225-0001-8.ch013](https://doi.org/10.4018/978-1-5225-0001-8.ch013). [COBISS.SI-ID [512762941](#)]

- USENIK, Janez, TURNŠEK, Tit. Modeling conflict dynamics with fuzzy logic inference. *Mei Zhong gong gong guan li*, ISSN 1548-6591, may 2013, vol. 10, no. 5, str. [457]-474, tabele, graf. prikazi. [COBISS.SI-ID [2048206338](#)]
- USENIK, Janez. A fuzzy model of power supply system control = Mehki model upravljanja energetskega sistema. *Journal of energy technology*, ISSN 1855-5748. [Tiskana izd.], aug. 2012, vol. 5, iss. 3, str. 23-37, ilustr. [http://www.fe.uni-mb.si/images/stories/jet/e-jet/revija\\_jet\\_-\\_volume\\_5\\_-\\_issue\\_3\\_-\\_avgust\\_-\\_internet.pdf](http://www.fe.uni-mb.si/images/stories/jet/e-jet/revija_jet_-_volume_5_-_issue_3_-_avgust_-_internet.pdf). [COBISS.SI-ID [1024110428](#)]
- USENIK, Janez. Control of traffic system in conditions of random or fuzzy input processes. *Promet*, ISSN 0353-5320, 2001, vol. 13, no. 1, str. 1-8. [COBISS.SI-ID [925283](#)], [[Scopus](#) do 15. 8. 2015: št. citatov (TC): 3, čistih citatov (CI): 1, normirano št. čistih citatov (NC): 1]
- USENIK, Janez. *Matematične metode I*. 1. izd. Krško: Fakulteta za energetiko, 2009. 321 str., ilustr. ISBN 978-961-6800-01-3. [COBISS.SI-ID [63496193](#)]
- USENIK, Janez. *Matematične metode II*. 1. izd. Krško: Fakulteta za energetiko, 2010. 344 str., ilustr. ISBN 978-961-6800-02-0. [COBISS.SI-ID [63496449](#)]
- USENIK, Janez. System control in conditions of fuzzy dynamic processes = Upravljanje sistema v pogojih mehkih dinamičnih procesov. *Journal of energy technology*, ISSN 1855-5748. [Tiskana izd.], sep. 2015, vol. 8, iss. 1, str. 35-50, ilustr. [http://www.fe.um.si/images/jet/JET\\_november\\_2015-splet.pdf](http://www.fe.um.si/images/jet/JET_november_2015-splet.pdf). [COBISS.SI-ID [84579841](#)]