

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Optimizacijske metode v inženirstvu
Course title: Optimization Methods in Engineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Sonaravne tehnologije in sistemi v strojništvu - 3. stopnja	/	1./2.	zimski/letni
Sustainable technologies and systems in mechanical engineering - 3 rd cycle	/	first/second	winter/summer

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

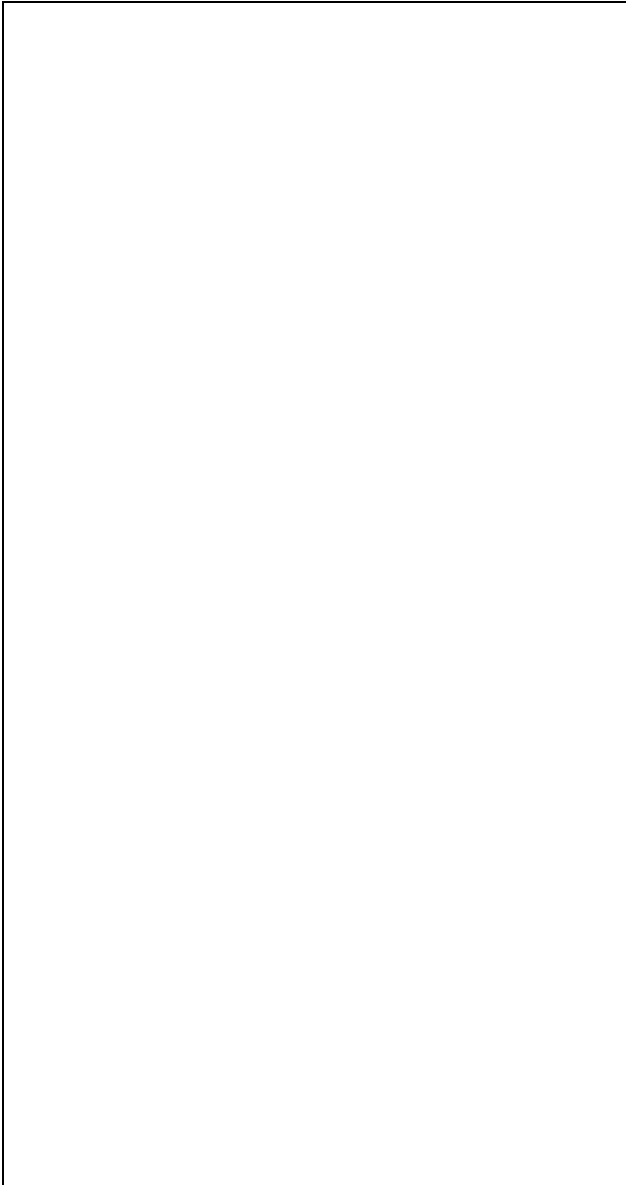
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10		30	10	/	250	10

Nosilec predmeta / Lecturer:

Jeziki / Languages:
Predavanja / Lectures: angleški/english
Vaje / Tutorial: angleški/english

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

- Vpis v doktorski študijski program.
- Dodatnih pogojev ni.

Vsebina:**Content (Syllabus outline):**

This course addresses the use of multi-objective optimization methods in engineering design. After a general introduction to the multi-objective optimization principles, the students will be exposed to design of experiment techniques, state-of-the-art optimization algorithms, assessment methods and the use of meta-models for optimization. Advanced aspects like multi-criteria decision making and robustness will also be considered. The use of a state-of-the-art optimization software tool will provide students with concrete hands-on experience. The course will be complemented with successful examples of real industrial applications.

Topics covered will include:

- General introduction: multi-objective optimization problems, Pareto front
- Design of Experiments
- Algorithms for multi-objective optimization: genetic algorithms, simulated annealing
- Response Surface Models and its use for optimization
- Assessment methods
- Robustness
- Multi-criteria decision making
- Industrial applications, practical considerations, implications.

Temeljni literatura in viri / Readings:

1. Goldberg, D. E. *Genetic Algorithms in Search, Optimization, and Machine Learning*.
2. Rao, S. S. (1996) *Engineering Optimization: Theory and Practice*, John Wiley & Sons.
3. Cavazzuti, M. (2012) *Optimization Methods: From Theory to Design Scientific and Technological Aspects in Mechanics*, Springer Science & Business Media.

Cilji in kompetence:

Učna enota prispeva k razvoju naslednjih splošnih in specifičnih kompetenc:

- pridobitev temeljnega znanja o vodnih turbinah in centrifugalnih črpalkah, razumevanje pretvarjanja energije v teh strojih,
- sposobnost evidentiranja in razumevanja energetske, kavitacijske in dinamične zakonitosti,
- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost razumevanja in reševanja konkretnih tehnoloških problemov,
- sposobnost obvladovanja razvoja,
- suverenost in avtonomnost na področju strokovnega dela,
- sposobnost za svetovalno delo in sposobnost prenosa znanja drugim.

Objectives and competences:

This course will provide the students with the ability to apply multi-objective optimization techniques in engineering design problems. Upon completion of the course, the students will:

- [1] understand the principles of multi-objective optimization,
- [2] be able to select the most appropriate optimization method to apply depending on the problem,
- [3] get a good knowledge of current applications of optimization techniques in industry and
- [4] have a practical experience with a state-of-the-art software tool for multi-objective optimization.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

Intended learning outcomes:

Knowledge and understanding:

- understand the concepts, phenomena and processes,
- to find and use appropriate scientific literature,
- ability to apply theoretical knowledge in practice,
- to find the interconnection in simple and complex technological processes,
- be able critically evaluate the weak points in the process,
- to understand links to related learning courses.

Metode poučevanja in učenja:

- *predavanja,*
- *računske in laboratorijske vaje s praktičnimi primeri iz industrije.*

Learning and teaching methods:

- *lectures,*
- *computational and laboratory exercises with practical examples from the industry.*

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Seminarska naloga	40%	Project work
Ustni izpit	60%	Oral examination