



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mehanika trdne snovi
Course title:	Mechanics of solid state materials

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA, 3. stopnja		1. ali 2.	1., 2. ali 4.
PHYSICS, 3 rd cycle		1. or 2.	1., 2. or 4.

Vrsta predmeta / Course type

Izbirni za vse module

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Mentorstvo Mentorship	Samost. delo Individ. work	ECTS
15					165	6

Nosilec predmeta / Lecturer:

Milan Ambrožič

Jeziki /

Languages:

Predavanja /

Lectures:

slovenski/Slovenian

Vaje / Tutorial:

slovenski/Slovenian

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

Predznanje osnovne fizike

Prerequisites:

Preknowledge of basic physics

Vsebina:

- Osnove iz elastomehanike
- Inženirski in konstrukcijski materiali (kovine, keramika, cementi, beton...): temeljni pojmi o mehanskih lastnostih teh materialov
- Izdelava inženirskih in konstrukcijskih materialov in njihova optimizacija

Content (Syllabus outline):

- Fundamentals of elastomechanics
- Engineering and construction materials (metals, ceramics, cement, concrete...): basic facts about mechanical properties of these materials
- Fabrication of engineering and construction materials and their optimization

Temeljni literatura in viri / Readings:

1. Rogalski, M. S., & Palmer, S. B. (2000). Solid state physics. Australia [etc.]: Gordon and Breach Science Publishers. [COBISS.SI-ID 45599233] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/4559923>
2. Kittel, C. (1996). Introduction to solid state physics (7th ed.). New Brisbane: Wiley. [COBISS.SI-ID 14037799] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/1403779>
3. Ashcroft, N. W., & Mermin, N. D. (1976). Solid state physics. New York [etc.]: Holt, Rinehart and Winston. [COBISS.SI-ID 6756] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/6756>
4. Ambrožič, M., Pal, K., Kralj, S., Hölbl, A. (2021). Nanoparticle controlled nematic macroscopic properties. *Journal of Molecular Structure*, 1230, 129878, 1–7. [COBISS.SI-ID 47621891] <https://doi.org/10.1016/j.molstruc.2021.129878>

Dodatna literatura / Additional readings:

1. Hofmann, P. (2022). Solid state physics: an introduction. Wiley. [COBISS.SI-ID 223521795]
 2. Lawn, B. R. (2004). Fracture of Brittle Solids (2nd ed.). Cambridge: Cambridge University Press. [COBISS.SI-ID 18478631]
- 4)

Cilji in kompetence:

Študentje poglobijo znanje iz mehanskih lastnosti trdne snovi.

Objectives and competences:

Students acquire advanced knowledge on mechanical properties of solid state materials.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje procesov v mehaniki trdnih materialov.

Prenosljive/ključne spretnosti in drugi atributi:

Rešitev problemov z matematičnimi orodji, numeričnimi metodami, univerzalnosti v fiziki in celosten pristop k reševanju problemov.

Intended learning outcomes:

Knowledge and understanding:

Understanding of processes in solid state materials.

Transferable/Key Skills and other attributes:

Solving of problems with mathematical tools, numerical methods, universalities in physics and gained global approach on solving a problem.

Metode poučevanja in učenja:

Metodika obsega teoretičen uvod v problematiko in reševanje posameznih problemov.

Learning and teaching methods:

They are based on theoretical introduction and solving of specific problems.

Načini ocenjevanja:

~~Način (pisni izpit, ustno izpraševanje, naloge, projekt)~~
Seminarska naloga
~~Seminar~~
Ustni izpit

Delež (v %) /

Weight (in %)

Assessment:

~~Type (examination, oral, coursework, project):~~
Seminar paper
~~Seminar~~
Oral exam

50%

50%

Reference nosilca / Lecturer's references:

1. HARKAI, Saša, AMBROŽIČ, Milan, KRALJ, Samo. Impact of diffusion limited aggregates of impurities on nematic ordering. *Physica. A, Statistical mechanics and its applications*, ISSN 0378-4371. [Print ed.], 2017, vol. 467, str. 249-256, doi: [10.1016/j.physa.2016.10.001](https://doi.org/10.1016/j.physa.2016.10.001). [COBISS.SI-ID22772744]

2. CVETKO, Matej, LAHAJNAR, Gojmir, AMBROŽIČ, Milan, ABINA, Andreja, PUC, Uroš, CORDOYIANNIS, George, KRALJ, Samo, KUTNJAK, Zdravko, ZIDANŠEK, Aleksander. Random nematic structures in the absence of inherent frustrations. *Liquid crystals*, ISSN 0267-8292, 2015, vol. 42, no. 12, str. 1674-1683, doi: [10.1080/02678292.2015.1048484](https://doi.org/10.1080/02678292.2015.1048484). [COBISS.SI ID 28711207]

3. RANJKESH SIAHKAL, Amid, AMBROŽIČ, Milan, KRALJ, Samo, SLUCKIN, T. J. Field induced memory effects in random nematics. *Advances in condensed matter physics*, ISSN 1687-8108, 2014, vol. 2014, str. 423693-1-423693-10. <http://dx.doi.org/10.1155/2014/423693>, doi: [10.1155/2014/423693](https://doi.org/10.1155/2014/423693). [COBISS.SI ID 21004552]

4. SLAVINEC, Mitja, KLEMENČIČ, Eva, AMBROŽIČ, Milan, KRAŠNA, Marjan. Impact of nanoparticles on nematic ordering in square wells. *Advances in condensed matter physics*, ISSN 1687-8108, 2015, vol. 2015, art. ID 532745, str. 1-11, ilustr., doi: [10.1155/2015/532745](https://doi.org/10.1155/2015/532745). [COBISS.SI-ID21186312]

5. AMBROŽIČ, Milan, GORJAN, Lovro, GOMILŠEK, Maša. Bend strength variation of ceramics in serial fabrication. *Journal of the European ceramic society*, ISSN 0955-2219. [Print ed.], 2014, vol. 34, iss. 7, str. 1873-1879. <http://dx.doi.org/10.1016/j.jeurceramsoc.2013.12.045>. [COBISS.SI-ID20422664]

6. KOCJAN, Andraž, AMBROŽIČ, Milan, KOSMAČ, Tomaž. Stereometric analysis of nanostructured boehmite coatings synthesized by aluminum nitride powder hydrolysis. *Ceramics international*, ISSN 0272-8842. [Print ed.], 2012, vol. 38, no. 6, str. 4853-4859, doi: [10.1016/j.ceramint.2012.02.075](https://doi.org/10.1016/j.ceramint.2012.02.075). [COBISS.SI-ID 25633063]

- AMBROŽIČ, Milan, PAL, Kaushik, KRALJ, Samo, HÖLBL, Arbresha. Nanoparticle controlled nematic macroscopic properties. *Journal of molecular structure*. 2021, vol. 1230, str. 1-7. ISSN 0022-2860. DOI: [10.1016/j.molstruc.2021.129878](https://doi.org/10.1016/j.molstruc.2021.129878). [COBISS.SI-ID 47621891]
- AMBROŽIČ, Milan, GUDIMALLA, Apparao, ROSENBLATT, Charles, KRALJ, Samo. Multiple twisted chiral nematic structures in cylindrical confinement. *Crystals*. Jul. 2020, vol. 10, no. 7, str. 1-15. ISSN 2073-4352. Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: [10.3390/cryst10070576](https://doi.org/10.3390/cryst10070576). [COBISS.SI-ID 29663747],

AMBROŽIČ, Milan, LAZAR, A., KOCJAN, Andraž. Percolation threshold in ceramic composites with isotropic conducting nanoparticles. *Journal of the European ceramic society*. [Print ed.]. Apr. 2020, vol. 40, iss. 4, str. 1684-1691, graf. prikazi. ISSN 0955-2219. DOI: [10.1016/j.jeurceramsoc.2019.12.006](https://doi.org/10.1016/j.jeurceramsoc.2019.12.006). [COBISS.SI-ID 32931623],