Univerza v Mariboru

FAKULTETA ZA NARAVOSLOVJE IN MATEMATIKO
Koroška cesta 160
2000 Maribor, Slovenija
www.fnm.um.si

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	**Trdna snov**
Course title:	**Solid state**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika		**3**	**5**
Physics			

Vrsta predmeta / Course type	izbirni
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
45		**30**			**105**	**6**

Nosilec predmeta / Lecturer:	Samo Kralj

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski/Slovene
	Vaje / Tutorial:	slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Predznanje iz klasične in moderne fizike	Preknowledge of classical and modern physics.

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

Osnove kristalografije, Bravaisova in recipročna mreža. Mrežna nihanja: harmonski približek, specifična toplota trdnih teles, anharmonični pojavi (termično raztezanje, toplotna prevodnost). Kolektivni pojavi: dielektrične lastnosti dielektrikov, paraelektriki, feroelektriki, antiferoelektriki, paramagnetizem, feromagnetizem. Landauova teorija faznih prehodov, metoda molekularnega polja.	Basics of crystallography, Bravais lattices. Lattice oscillations: harmonic approximation, specific heat of solids, anharmonic effects (thermal expansion, heat conductivity) Collective phenomena: dielectric, paraelectric, ferroelectric, diamagnetic, paramagnetic, ferromagnetic behaviour. Landau theory of phase transitions, mean field approximation.

Temeljni literatura in viri / Readings:

1. N.W. Ashcroft, N.D. Mermin, Solid state physics, (Rinehart and Winston, New York, 1976 in kasnejše izdaje).
2. M. P. Marder, Condensed Matter Physics, John Wiley & Sons, New York 2000.
3. C. Kittel, A. Zettl, Introduction to Solid State Physics, John Wiley & Sons, New York 2004.
4. http://solidstate.physics.sunysb.edu/teach/intlearn/
5. http://www.ruph.cornell.edu/sss/sss.html
6. http://solidstate.physics.sunysb.edu/book/

Cilji in kompetence:	**Objectives and competences:**
Študenti usvojijo osnovno znanje s področja fizike trdne snovi.	Students acquire elemental knowledge on solid state physics.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje osnovnih procesov v trdni snovi.	**Knowledge and understanding:** Understanding of basic processes in solid materials.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Metodika obsega: teoretičen uvod v problematiko in numerično reševanje posameznih problemov.	They are based on: theoretical introduction and numerical solving of specific problems.

Delež (v %) /

Načini ocenjevanja:	Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
2 pisna kolokvija ali pisni izpit	**50**	2 written tests or written or exam
ustni izpit	**50**	oral exam

Reference nosilca / Lecturer's references:

KRALJ, Samo, ROSSO, Riccardo, VIRGA, Epifanio G. Curvature control of valence on nematic shells. *Soft matter*, 2011, vol. 7, issue 2, str. 670-683, ilustr., doi: 10.1039/C0SM00378F. [COBISS.SI-ID 17960200]

BRADAČ, Zlatko, KRALJ, Samo, ŽUMER, Slobodan. Early stage domain coarsening of the isotropic-nematic phase transition. *J. chem. phys.*, 2011, vol. 135, no. 2, str. 024506-1-024506-9, ilustr., doi:10.1063/1.3609102. [COBISS.SI-ID 18553864]

SCHOOT, Paul van der, POPA-NITA, Vlad Dumitru, KRALJ, Samo. Alignment of carbon nanotubes in nematic liquid crystals. *J. phys. chem., B Condens. mater. surf. interfaces biophys.*, 2008, 112, iss. 15, str. 4512-4518. http://dx.doi.org/10.1021/jp712173n, doi: 10.1021/jp712173n. [COBISS.SI-ID 15940616]

KRALJ, Samo, ROSSO, Riccardo, VIRGA, Epifanio G. Fingered core structure of nematic boojums. *Phys. rev., E Stat. nonlinear soft matter phys. (Print)*, 2008, vol. 78, no. 3, str. 031701-1-031701-4, ilustr.http://dx.doi.org/10.1103/PhysRevE.78.031701, doi: 10.1103/PhysRevE.78.031701. [COBISS.SI-ID16177416]

KRALJ, Samo, CORDOYIANNIS, George, JESENEK, Dalija, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, NOVAK, Nikola, AMENITSCH, Heinz, KUTNJAK, Zdravko. Dimensional crossover and scaling behavior of a smectic liquid crystal confined to controlled-pore glass matrices. *Soft matter*, 2012, vol. 8, issue 8, str. 2460-2470, doi: 10.1039/C1SM06884A. [COBISS.SI-ID 25534759]