

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	Fizika materialov
<b>Course title:</b>	Physics of materials

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika 2. st.		1,2	2,3
Physics 2 <sup>nd</sup> degree		1,2	2,3

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	0	30	0	0	90	5

**Nosilec predmeta / Lecturer:**

<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	Slovenski/Slovene
	<b>Vaje / Tutorial:</b>	Slovenski/Slovene

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

Predznanje Mehanike, Elektromagnetizma, Matematične fizike, Moderne fizike in Trdne snovi.

**Prerequisites:**

Preknowledge in Mechanics, Electromagnetism, Mathematical physics, Modern Physics and Solid State.

**Vsebina:**

- Kristali in simetrije
- Interakcije v trdni snovi
- Blochovi elektroni, prevodnost, specifična toplota
- Mrežna nihanja, specifična toplota (eno dimenzionalni (1D), 3D, 1D sistemi in nečistoče)
- Kvantizacija mrežnih nihanj, fononi
- Termično raztezanje
- Elektronska in ionska polarizabilnost
- Fazni in strukturni prehodi, spinski valovi, mehke in Goldstonove fluktuacije, teorija superprevodnosti, kritični pojavi, skaliranje

**Content (Syllabus outline):**

- Crystals and symmetries
- Interactions in solid state systems
- Bloch electrons, conductivity, specific heat
- Lattice oscillations, specific heat (one dimensional (1D), 3D, 1D system and impurities)
- Quantization of oscillations, phonons
- Thermal expansion
- Electron and ion polarizability
- Phase and structural transitions, spin waves, soft and Goldstone modes, theory of superconductivity, critical phenomena, scaling

**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. C. Kittel, Introduction to Solid State Physics, John Wiley&Sons, New York, 1986 in kasnejše izdaje.
3. P. M. Chaikin, T. C. Lubensky, Principles of Condensed Matter Physics, Cambridge University Press, Cambridge, England, 1995
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:**

Študenti poglobijo znanje na področju fizike trdne snovi.

**Objectives and competences:**

Students acquire advanced knowledge on physics of solid state physics.

**Predvideni študijski rezultati:**

Znanje in razumevanje:  
Razumevanje procesov v trdni snovi.

Prenesljive/ključne spretnosti in drugi atributi:  
Predmet da temeljna znanja za razumevanje specifičnih področij v biofiziki, fiziki mehke snovi, okoljski fiziki in aplikativni fiziki.

**Intended learning outcomes:**

Knowledge and Understanding:  
Understanding of processes in solid states.

Transferable/Key Skills and other attributes:  
The subject gives basic knowledge necessary to study specific fields in biophysics, soft matter physics, environmental physics and physics application.

**Metode poučevanja in učenja:**

Metodika obsega: teoretičen uvod v problematiko in numerično reševanje posameznih problemov.

**Learning and teaching methods:**

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

**Načini ocenjevanja:**

2 pisna kolokvija ali pisni izpit  
ustni izpit

Delež (v %) /  
Weight (in %)

**Assessment:**

2 written tests or written or exam  
oral exam

**Reference nosilca / Lecturer's references:**

DOJER, Brina, PEVEC, Andrej, JAGODIČ, Marko, KRISTL, Matjaž, DROFENIK, Mihael. Three new cobalt(II) carboxylates with 2-, 3- and 4-aminopyridine : syntheses, structures and magnetic properties. *Inorg. Chim. Acta*. [Print ed.], 2012, vol. 383, str. 98-104, doi: [10.1016/j.ica.2011.10.056](https://doi.org/10.1016/j.ica.2011.10.056). [COBISS.SI-ID [15502614](https://www.cobiss.si/id/15502614)]

JAGLIČIĆ, Zvonko, ZENTKOVÁ, Mária, MIHALIK, Marián, ARNOLD, Zdeněk, DROFENIK, Mihael, KRISTL, Matjaž, DOJER, Brina, KASUNIČ, Marta, GOLOBIČ, Amalija, JAGODIČ, Marko. Exchange bias in bulk layered hydroxylammonium fluorocobaltate (NH [sub] 3 OH) [sub] 2 CoF [sub] 4. *J. phys., Condens. matter*, 2012, vol. 24, no. 5, 056002 (7 str.). <http://dx.doi.org/10.1088/0953-8984/24/5/056002>, <http://dx.doi.org/10.1088/0953-8984/24/5/056002>. [COBISS.SI-ID [16218201](https://www.cobiss.si/id/16218201)]

ROŽIČ, Brigita, JAGODIČ, Marko, GYERGYEK, Sašo, DROFENIK, Mihael, KRALJ, Samo, LAHAJNAR, Gojmir, JAGLIČIĆ, Zvonko, KUTNJAK, Zdravko. Orientational order-magnetization coupling in mixtures of magnetic nanoparticles and the ferroelectric liquid crystal. *Ferroelectrics*, 2011, vol. 410, no. 1, str. 37-41. [COBISS.SI-ID [24415271](https://www.cobiss.si/id/24415271)]

NAJAFPOUR, Mohammad Mahdi, KOZLEVČAR, Bojan, MCKEE, Vickie, JAGLIČIĆ, Zvonko, JAGODIČ, Marko. The first pentanuclear heterobimetallic coordination cation with Ce[sup]III, Ce[sup]IV and Mn[sup]II. *Inorg. chem. commun.*. [Print ed.], 2011, vol. 14, no. 1, str. 125-127, doi: [10.1016/j.inoche.2010.10.002](https://doi.org/10.1016/j.inoche.2010.10.002). [COBISS.SI-ID [34709509](https://www.cobiss.si/id/34709509)]

MARINKOVIĆ STANOJEVIĆ, Zorica, BRANKOVIĆ, Zorica, JAGLIČIĆ, Zvonko, JAGODIČ, Marko, MANČIĆ, L., BERNIK, Slavko, REČNIK, Aleksander, BRANKOVIĆ, Goran. Structural and magnetic properties of nanocrystalline bismuth manganite obtained by mechanochemical synthesis. *J. nanopart. res.*, 2011, vol. 13, issue 8, str. 3431-3439, doi: [10.1007/s11051-011-0265-7](https://doi.org/10.1007/s11051-011-0265-7). [COBISS.SI-ID [24478247](https://www.cobiss.si/id/24478247)]