

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	Trdna snov
<b>Course title:</b>	Solid state

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:**

**Prerequisites:**

**Vsebina:**

- 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.

**Content (Syllabus outline):**

- 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 znanje s področja fizike trdne snovi.

Students acquire knowledge on solid state physics.

**Predvideni študijski rezultati:**

Znanje in razumevanje:  
Razumevanje osnovnih procesov v trdni snovi.

Prenesljive/ključne spretnosti in drugi atributi:  
Razumevanje procesov v trdni snovi je osnova za razumevanje procesov v fiziki materialov (tehnična aplikacija), mehki snovi in biofiziki.

**Intended learning outcomes:**

Knowledge and Understanding:  
Understanding of basic processes in solid materials.

Transferable/Key Skills and other attributes:  
Understanding of processes in solid state is the basic knowledge necessary to understand processes in physics of materials (technical application), soft matter and biophysics.

**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:	Delež (v %) / Weight (in %)	Assessment:
2 pisna kolokvija ali pisni izpit	50	2 written tests or written or exam
ustni izpit	50	oral exam

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

**Samo Krajc:**

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](https://doi.org/10.1039/C0SM00378F). [COBISS.SI-ID [17960200](https://www.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](https://doi.org/10.1063/1.3609102). [COBISS.SI-ID [18553864](https://www.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](https://doi.org/10.1021/jp712173n). [COBISS.SI-ID [15940616](https://www.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](https://doi.org/10.1103/PhysRevE.78.031701). [COBISS.SI-ID [16177416](https://www.cobiss.si/id/16177416)]

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](https://doi.org/10.1039/C1SM06884A). [COBISS.SI-ID [25534759](https://www.cobiss.si/id/25534759)]

**Aleksander Zidanšek:**

KABASHI, Skender, BEKTESHI, Sadik, AHMETAJ, Skender, KABASHI, Gazmed, NAJDOVSKI, Dimitrij, ZIDANŠEK, Aleksander, ŠLAUS, Ivo. Effects of Kosovo's energy use scenarios and associated gas emissions on its climate change and sustainable development. *Appl. energy*. [Print ed.], 2010, vol. 88, no. 2, str. 473-478. [COBISS.SI-ID [24118823](https://www.cobiss.si/id/24118823)] tipologija 1.08 -> 1.01

ZIDANŠEK, Aleksander, AMBROŽIČ, Milan, MILFELNER, Maja, BLINC, Robert, LIOR, Noam. Solar orbital power : sustainability analysis. *Energy (Oxford)*. [Print ed.], 2011, vol. 36, no. 4, str. 1986-1995. [COBISS.SI-ID [24602919](https://www.cobiss.si/id/24602919)] tipologija 1.08 -> 1.01

GREGORIČ, Asta, ZIDANŠEK, Aleksander, VAUPOTIČ, Janja. Dependence of radon levels in the Postojna

Cave on outdoor air temperature. *Nat. hazards earth syst. sci. (Print)*, 2011, vol. 11, no. 5, str. 1523-1528. [COBISS.SI-ID [24764199](#)]

MILFELNER, Maja, AMBROŽIČ, Milan, KRAŠNA, Marjan, CVETKO, Matej, ZIDANŠEK, Aleksander, REPNIK, Robert. Visualization of nematic director field with the RGB color system. *Mol. cryst. liq. cryst. (Phila. Pa. : 2003)*, str. 50-57, doi: [10.1080/15421406.2011.609370](#). [COBISS.SI-ID [18901000](#)]  
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