



UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet	Magnetizem in superprevodnost
Course name	Magnetism and superconductivity

Študijski program in stopnja Study program and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika in Astrofizika II. stopnja	Fizika trdne snovi	2	/
Physics and Astrophysics II. level	Fizika trdne snovi	2	/

Vrsta predmeta / Course type	obvezni / mandatory
Univerzitetna koda predmeta / University course code	2FTS12

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Indiv. work	ECTS
30	30	/	/	/	120	6

Nosilec predmeta / Lecturer	Izr. prof. dr. Barbara Ressel	
Jeziki / Languages	Predavanja / Lectures	slovenščina / English
	Vaje / Tutorial	slovenščina / English

Pogoji za opravljanje študijskih obveznosti

Prerequisites

Fizika trdne snovi Statistična mehanika	Solid state physics, Statistical mechanics
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Vsebina	Syllabus outline
<u>Uvod v magnetizem</u> Izvor magnetnega momenta Paramagnetizem prostih ionov Magetno urejena stanja Kristalna polja Diamagnetizem Magnetizem elektrona Merilne metode Magnetni materiali	<u>Introduction to magnetism</u> The origin of magnetic moment Paramagnetism of free ions The magnetically ordered state Crystal fields Diamagnetism Itinerant electron magnetism Measurements techniques Magnetic materials
<u>Superprevodnost</u> Empirični dokazi superprevodnosti Superprevodniki tipa I in tipa II Londonove enačbe Teorija Ginzburg-Landau BCS teorija Josephsonov efekt Nekonvencionalni superprevodniki	<u>Superconductivity</u> Empirical facts about superconductivity Type I and type II superconductors London equations The Ginzburg-Landau theory BCS theory Josephson effect Unconventional superconductors



Temeljni literatura in viri / Basic readings
K. H. J. Buschow and F. R. de Boer, Physics of Magnetism and Magnetic Materials, Kluwer Academic Publishers (2004)
J. Stohr and H.C. Siegmann, Magnetism, Springer-Verlag Berlin Heidelberg (2006)
L. P. Lévy: Magnetism and superconductivity, Springer (2000)
Neil W. Ashcroft, N. David Mermin, Solid state physics, Saunders College Publishing (1976)

Cilji in kompetence	Objectives and competences
<p>Študenti bodo spoznali magnetizem in superprevodnost. To je kolektivni fenomen, ki ga ni mogoče opisati z modelom neodvisnega elektrona.</p> <p>V okviru predmeta bodo spoznali eksperimentalna dejstva in teoretične opise magnetizma in superprevodnosti, potek raziskav v magnetizmu in magnetne materiale povezane z elektroniko, ki temelji na spinskem stanju - »spintroniko«.</p> <p>Približno 2/3 vsebine vključuje magnetizem in 1/3 superprevodnosti.</p>	<p>Students will be introduced to magnetism and superconductivity, that are collective phenomena which cannot be described by a one-electron model.</p> <p>During the course lectures about the experimental aspects and standard models for the description of magnetism and superconductivity will be given. The developments in magnetism research and magnetic materials associated with spin-based electronics or “spintronics” will be presented.</p> <p>About 2/3 of the time will be devoted to magnetism and 1/3 to superconductivity.</p>

Predvideni študijski rezultati	Intended learning outcomes
Študenti bodo pridobili znanje o fiziki magnetov in superprevodnikov. Pridobili bodo znanje od fiziki koreliranih elektronov.	Students will acquire knowledge about the physics of magnets and superconductors and an appreciation of the physics due to correlated electrons.

Metode poučevanja in učenja	Learning and teaching methods
- predavanja - seminarji	- lectures - seminar

Načini ocenjevanja	Utež / Weight (%)	Assessment
- seminar	50	- seminar
- ustni izpit	50	- oral exam



Reference nosilca / references of the course principal

Barbara Ressel je izredna profesorica za področje fizike na Univerzi v Novi Gorici.
Barbara Ressel is an associated professor of physics at the University of Nova Gorica.

Izbrane reference / Selected references:

1. GRAZIOLI, C., GAUTHIER, David, IVANOV, R., BUČAR, Bojan, MERHAR, Miran, RESSEL, Barbara, DE NINNO, Giovanni, et al. CITIUS : an infrared-extreme ultraviolet light source for fundamental and applied ultrafast science. Review of scientific instruments, ISSN 0034-6748, 2014, vol. 85, no. 2, str. 023104-1-023104-6, doi: 10.1063/1.4864298. [COBISS.SI-ID 3223291]
2. CREPALDI, A., RESSEL, Barbara, et al. Evidence of reduced surface electron-phonon scattering in the conduction band of Bi [sub] 2 Se [sub] 3 by nonequilibrium ARPES. Physical Review. B, Condensed matter and materials physics, ISSN 1098-0121, 2013, vol. 88, no. 12, str. 121404-1-121404-5, doi: 10.1103/PhysRevB.88.121404. [COBISS.SI-ID 2876667]
3. CREPALDI, A., RESSEL, Barbara, CILENTO, F., ZACCHIGNA, M., GRAZIOLI, C., BERGER, H., BUGNON, Ph., KERN, K., GRIONI, M., PARMIGIANI, Fulvio. Ultrafast photodoping and effective Fermi-Dirac distribution of the Dirac particles in Bi [sub] 2 Se [sub] 3. Physical review. B, Condensed matter and materials physics, ISSN 1098-0121, 2012, vol. 86, no. 20, str. 205133-1-205133-5, doi: 10.1103/PhysRevB.86.205133. [COBISS.SI-ID2620155]