Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Elektromagnetizem**
Course title:	**Electromagnetism**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	**/**	**1**	**2**
Five-year master's degree program Subject Teacher	**/**		

Vrsta predmeta / Course type	Obvezni / Obligatory
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
60		**30**			**120**	**7**

Nosilec predmeta / Lecturer:	Samo Kralj

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Zaželjeno predznanje srednješolske matematike in fizike.	Secondary school level knowledge in mathematics and physics is desirable.

Vsebina:	**Content (Syllabus outline):**
Električno polje in električni tok: Električni naboj, prevodniki in izolatorji, Coulombov zakon, električno polje, električni dipol, Gaussov zakon, električni potencial in napetost, kondenzatorji, energija kondenzatorja. Električni tok in upor, Ohmov zakon, polprevodniki, superprevodniki, električni tokokrog, viri napetosti, mpermeter, voltmeter, Kirchoffova pravila.	Electric field and current: Electric charge, conductors and isolators, Coulomb law, electric field, electric dipole, Gauss law, electric potential and voltage, capacitors, electric field and energy. Electric current, Ohm law, semiconductors, superconductors, electric circuits, voltage sources, ampermeter, voltmeter, Kirchoff's rules.

Magnetno polje: gostota in jakost, Hallov pojav, sila na vodnik in navor na tokovno zanko v magnetnem polju; Amperov zakon; indukcija, Faradayev zakon, Lenzova pravila; tuljava, induktivnost, energija tuljave, transformator; Maxwellove enačbe: simetrija enačb, premikalni tok in magnetni monopol.	Magnetic field: Hall effect, force and electric current, magnetic torque; Ampere's law; induction, Faray's law, Lenz's rule; solenoid, inductance, Faraday's law, magnetic field and energy, trasformers; Maxwell equations: symmetry, displacement current, magnetic monopole.

Temeljni literatura in viri / Readings:

1. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, 5. izdaja, (John Wiley & Sons, Inc., New York, 1997).

2. J. Strnad, Fizika, 1. del, (DMFA, Ljubljana, 2002).

3. J. Strnad, Fizika, 2. del, (DMFA, Ljubljana, 1995).

4. Z. Bradač, Naloge iz fizike, (Pedagoška fakulteta Maribor, 1991).

5. M. Gros, M. Hribar, A. Kodre, J. Strnad, Naloge iz fizike, (DMFA, Ljubljana, 1991).

6. B. Majaron, M. Mikuž, A. Ramšak, Kolokvijske naloge iz fizike 1, (DMFA, Ljubljana, 1998).

Cilji in kompetence:	**Objectives and competences:**
Študenti usvojijo osnovno znanje s področja elektromagnetizma.	Students acquire elementary knowledge on electric and magnetic field phenomena.
Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje osnovnih procesov v naravi. Znajo kvalitativno in kvantitativno opisati osnovne pojave s področja elektromagnetizma. **Prenesljive/ključne spretnosti in drugi atributi:** Rešitev problemov z matematičnimi orodji in celosten pristop k reševanju problemov.	**Knowledge and understanding:** Understanding of basic processes in the nature. They are able to present phenomena related to electromagnetism on qualitative and quantitative level. **Transferable/Key Skills and other attributes:** Solving of problems with mathematical tools and gained global approach on solving a problem.
Metode poučevanja in učenja:	**Learning and teaching methods:**

Metodika obsega: teoretičen uvod v problematiko in numerično reševanje posameznih problemov, demonstracijski poskusi pri predavanjih, teoretične vaj	They are based on: theoretical introduction and numerical solving of specific problems, demonstration experiments during lectures, theoretical excercises

Načini ocenjevanja:	Delež (v %) / 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 exam
ustni izpi	**50**	oral exa

Reference nosilca / Lecturer's references:

1. 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]

2. 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]

3. 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]

4. 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]

5. 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]