UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Elektromagnetno polje
Course title:	Electromagnetic field

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 2nd degree		1,2	2,3

Vrsta predmeta / Course type izbirni/ optional

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
45	0	15	0	0	90	5

Nosilec predmeta / Lecturer: Uroš Tkalec

Jeziki / Languages:	Predavanja / Lectures:	Slovenski/Slovenian
	Vaje / Tutorial:	Slovenski/Slovenian

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

Osnovno znanje klasične fizike in vektorske analize

Prerequisits:

Basic knowledge of classical physics and vector analysis

Vsebina:

1. Električno polje stalnih nabojev v praznem prostoru. Coulombov in Gaussov zakon, potencial in gradient potenciala, ekvipotencialne ploskve in silnice, Poissonova in Laplaceova enačba. Energija električnega polja. Tipični problemi elektrostatike.
2. Električno polje v snovi
   Polarizacija v dielektriku, mikro in makro slika, prosta energija polja.
3. Magnetno polje električnih tokov
   Lorentzova sila, vektorski potencial magnetnega polja, primerjava diferencialnih enačb za magnetno in električno polje. Indukcija.
4. Magnetno polje v snovi
   Magnetizacija v snovi, mikro in makro slika, prosta energija polja.
5. Maxwellove enačbe
6. EM valovanje
   Klasični in relativistični opis.

Content (Syllabus outline):

1. Electric field of stationary charges
   Coulomb and Gauss law, potential and gradient of potential, surfaces with constant potential and field's lines, Poisson and Laplace equations. Energy of the electric field
   Typical problems of the electrostatics
2. Electric field in matter
   Polarization in the dielectrics, micro and macro picture, free energy of the field
3. Magnetic field of the electrical currents
   Lorentz force, vector potential of magnetic field, comparison of the equations for the electric and magnetic field
4. Magnetic field in the matter
   Magnetization, micro and macro picture, free energy of the field
5. Maxwell equations
6. EM waves
   Classical and relativistic representation

Temeljni literatura in viri / Readings:

1. Di Bartolo, B: Classical Theory of Electromagnetism, World Scientific, Singapur, 2004.
2. Kovetz, A: Electromagnetic Theory, Oxford University Press, Oxford, 2000.
3. Landau L. D., Lifšič E. M.: The classical theory of fields, Butterworth-Heinemann, Oxford, 1998
4. Tamm I. E.: Fundamentals of the Theory of Electricity, Mir Publishers, Moscow,1979.
5. Feynman R.P., Leighton R.B., Sands M.: Lectures on Physics, Addison - Wesley Pub. Company, Palo Alto, 1966.

Cilji in kompetence:	**Objectives and competences:**
Študenti pridobijo poglobljena teoretična in praktična znanja s področja EM polja in jih znajo uporabiti na drugih področjih fizike.	Students get expanded theoretical and practical knowledge from the field of EM field and learn how to imply this knowledge in different fields of physics.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Opisati in razumeti električne in magnetne pojave v naravi Prenesljive/ključne spretnosti in drugi atributi: Usposobljenost za strokovno ustrezno predstavitev primerov iz EM polja	Knowledge and Understanding: interpretation and understanding electrical and magnetical phenomena in the nature Transferable/Key Skills and other attributes: Ability of professional use of selected cases in the field of Electricity.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Seminarske vaje	Lectures Seminar work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
pisni izpit	50	written exam
ustni izpit	50	oral exam

Reference nosilca / Lecturer's references:

MUŠEVIČ, Igor, ŠKARABOT, Miha, TKALEC, Uroš, RAVNIK, Miha, ŽUMER, Slobodan. Two-dimensional nematic colloidal crystals self-assembled by topological defects. *Science (Wash. D.C.)*, 2006, 313, str. 954-958. [COBISS.SI-ID 1929572]

TKALEC, Uroš, ŠKARABOT, Miha, MUŠEVIČ, Igor. Interactions of micro-rods in a thin layer of a nematic liquid crystal. *Soft matter*, 2008, vol. 4, no. 12, str. 2402-2409. [COBISS.SI-ID 22189863]

TKALEC, Uroš, RAVNIK, Miha, ŽUMER, Slobodan, MUŠEVIČ, Igor. Vortexlike topological defects in nematic colloids : chiral colloidal dimers and 2D crystals. *Phys. rev. lett.*, 2009, vol. 103, no. 12, str. 127801-1-127801-4. [COBISS.SI-ID 22895655]

SENGUPTA, Anupam, TKALEC, Uroš, BAHR, Christian. Nematic textures in microfluidic environment. *Soft matter*, 2011, vol. 7, no. 14, str. 6542-6549. [COBISS.SI-ID 25167143]

TKALEC, Uroš, RAVNIK, Miha, ČOPAR, Simon, ŽUMER, Slobodan, MUŠEVIČ, Igor. Reconfigurable knots and links in chiral nematic colloids. *Science (Wash. D.C.)*, 2011, vol. 333, issue 6038, str. 62-65. [COBISS.SI-ID 2336868]