UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	**Fizikalna merjenja**
Course title:	**Measurements in Physics**

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	**/**	**4**	**7**
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
30			30		30	3

Nosilec predmeta / Lecturer: Janez Štrancar

Jeziki / Languages:	Predavanja / Lectures:	slovenski / slovene
	Vaje / Tutorial:	slovenski / slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Predznanje s fizikalnih eksperimentov ter klasične fizike.	Preknowledge on lab work and classical physics.

Vsebina:	**Content (Syllabus outline):**
Opis meritve, merjenje skalarnih in vektorskih količin. Splošni opis senzorjev, prenosna funkcija, povratni vpliv na opazovani sistem, termični šum. Osnove elektronskih vezij Merjenje konstantnih količin in statistika, preizkušanje hipotez. Metoda najmanjših kvadratov. Odziv sistema na periodično otnjo. Merjenje frekvence in časa, fazna povratna zanka,	Description of the measurement of the scalar and vector quantities Tensors and transfer function, feedback to the system, thermic noise Basic electrical circuits Measurement of the constant quantity, statistics, tests Least squares method Respond of the system to the periodically disturbance Measurement of the time and frequency, feedback loop and standards Sensors of displacement: potentiometer, straingauge,

časovni standardi. Senzorji premikov: uporovni potenciometer, uporovni listič, diferencialni transformator, kondenzatorski senzor, piezoelektrični senzor. Temperaturni senzorji: na raztezek, uporovni senzorji, termočlen, bolometer, piroelektrični senzorji.	differential transformer, condensator, piezoelectrical sensor Temperature sensors: extensible sensors, resistance, thermocouple, bolometer, piroelecticaly sensors.

Temeljni literatura in viri / Readings:

- A.Likar: Osnove fizikalnih merjenj in merilnih sistemov, DMFA, Zbirka izbranih poglavij iz fizike, Ljubljana 1992
- E.O.Doebelin: Measurement Systems, Application and Design, McGraw-Hill, International, 1983
- J. Pahor: Elektronski praktikum za fizike, Ljubljana DMFA 1989.

Cilji in kompetence:	**Objectives and competences:**
Študentje pridobijo osnovna teoretična in praktična znanja s področja merjenj. Pri laboratorijskih vajah samostojno pripravijo projekt in izvedbo ene meritve. Posebno pozornost posvetimo demonstracijskim meritvam, ob katerih študentje pridobijo znanja in spretnosti pri sprotni interpretaciji rezultatov meritev.	Students get basically theoretical and practical knowledge from the field of measurements Student prepare independently one part of the laboratory work Demonstration measurements with simultaneously data interpretation are put in foreground.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: Pripraviti in uporabiti merilni sistem za snovne fizikalne količine Obdelava in razumevanje rezultatov merite. **Prenesljive/ključne spretnosti in drugi atributi:** Obdelava rezultatov meritev Izbira ustrezne merilne metod	**Knowledge and understanding:** arranging and bringing into use of easurement system for fundamental physical quantities interpretation of the result **Transferable/Key Skills and other attributes:** processing of the measurement data choosing the right measurement metho

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Laboratorijske vaje	Lectures Laboratory work

Delež (v %) /

Načini ocenjevanja:	Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
pisni izpit	**35**	written exam
ustni izpit	**35**	oral exam
opravljene lab. vaje in izdelan dnevnik lab. vaj	**30**	done experiments and logbook of laboratory wor

Reference nosilca / Lecturer's references:

OMERZU, Aleš, ANŽELAK, Bernarda, TUREL, Iztok, ŠTRANCAR, Janez, POTOČNIK, Anton, ARČON, Denis, ARČON, Iztok, MIHAILOVIĆ, Dragan, MATSUI, Hiroshi. Strong correlations in highly electron-doped Zn(II)-DNA complexes. *Phys. rev. lett.*, 16. apr. 2010, vol. 104, no. 15, str. 156804-1-156804-4. [COBISS.SI-ID 1459451]

ARSOV, Zoran, URBANČIČ, Iztok, GARVAS, Maja, BIGLINO, Daniele, LJUBETIČ, Ajasja, KOKLIČ, Tilen, ŠTRANCAR, Janez. Fluorescence microspectroscopy as a tool to study mechanism of nanoparticles delivery into living cancer cells. *Biomedical optics express*, 2011, vol. 2, no. 8, str. 2083-2095, doi: 10.1364/BOE.2.002083. [COBISS.SI-ID 24859687]

KUŻDŻAŁ, Michał, WESOŁOWSKA, Olga, ŠTRANCAR, Janez, MICHALAK, Krystyna. Fluorescence and ESR spectroscopy studies on the interaction of isoflavone genistein with biological and model membranes. *Chem. phys. lipids*. [Print ed.], 2011, vol. 164, no. 4, str. 283-291, doi: 10.1016/j.chemphyslip.2011.03.001. [COBISS.SI-ID 24927271]

MLAKAR, Jana, ŠTRANCAR, Janez. Overheating in residential passive house : solution strategies revealed and confirmed through data analysis and simulations. *Energy build.*. [Print ed.], 2011, vol. 43, no. 6, str. 1443-1451, doi: 10.1016/j.enbuild.2011.02.008. [COBISS.SI-ID 24680743]

PAJK, Stane, GARVAS, Maja, ŠTRANCAR, Janez, PEČAR, Slavko. Nitroxide-fluorophore double probes: a potential tool for studying membrane heterogeneity by ESR and fluorescence. *Organic and Biomolecular Chemistry*. [Print ed.], 2011, vol. 9, issue 11, str. 4150-4159. http://pubs.rsc.org/en/content/articlelanding/2011/ob/c0ob01173h, doi: 10.1039/C0OB01173H. [COBISS.SI-ID 3007601]