Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

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/Compulsory
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 / Slovenian
	Vaje / Tutorial:	slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Pogojev za vključitev v delo ni. Opravljene laboratorijske vaje in izdelan dnevnik laboratorijskih vaj so pogoj za pristop k ustnemu izpitu.	There are no prerequisites for participation in the course. Completed laboratory exercises and a completed laboratory logbook are prerequisites for taking the oral exam.

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	Description of the measurement of the scalar and vector quantities Tensors and transfer function, feedback to the system, thermic noise Basic electrical circuits

Merjenje konstantnih količin in statistika, preizkušanje hipotez. Metoda najmanjših kvadratov. Odziv sistema na periodično motnjo. Merjenje frekvence in časa, fazna povratna zanka, časovni standardi. Senzorski sistemi: uporovni potenciometer, uporovni listič, diferencialni transformator, kondenzatorski senzor, piezoelektrični senzor, temperaturni senzorji na raztezek, uporovni senzorji, termočlen, bolometer, piroelektrični senzorji.	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 . Sensor systems: of displacement: potentiometer, straingauge, 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, Ljubljana, 2011).
- E. O. Doebelin: Measurement Systems, Application and Design (McGraw-Hill, New York, 1990). D. Ponikvar, J. Pahor: Elektronski praktikum za fizike (DMFA, Ljubljana, 2009).

Cilji in kompetence:	**Objectives and competences:**
Študentje so sposobni razlikovati rezultate merjenj glede na vpliv merjenega in merilnega sistema.	Students can differentiate the measurement results based on the effect of measured and measuring systems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Pripraviti in uporabiti merilni sistem vključno z digitalno merilno shemo Ovrednotiti in razločiti vpliv merilnega in merjenega sistema Obdelati in razumeti rezultate meritev in na tej podlagi optimizirati merilni sistem. **Prenesljive/ključne spretnosti in drugi atributi:** Obdelati rezultate meritev Izbrati ustrezne merilne metode in senzorske sisteme Presoditi smiselnost uporabe senzorjev v izbranih časovnih okvirih	**Knowledge and understanding:** Seting up and implementing measuring system including digital measurement scheme Evaluate and differentiate effects of measuring and measured system Undestand the results of the measurements and employ them to optimize the measuring system **Transferable/Key Skills and other attributes:** Processing of the measurement data Choosing the right measurement method and sensor systems Deciding if the selected sensors fit reasonable well to the defined time frame

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja	Lectures
Eksperimentalna predavanja	Experimental lectures
Laboratorijske vaje	Laboratory work
Problemsko učenje	Problem based learning
Uporaba programskih okolij za krmiljenje in obdelavo podatkov	Using software for control and data analysis

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
ustni izpit	**100**	oral exam

Reference nosilca / Lecturer's references:

- SEBASTIJANOVIĆ, Aleksandar, AZZURRA CAMASSA, Laura Maria, MALMBORG, Vilhelm, KRALJ, Slavko, PAGELS, Joakim, VOGEL, Ulla, ZIENOLDDINY-NARUI, Shan, URBANČIČ, Iztok, KOKLIČ, Tilen, ŠTRANCAR, Janez. Particulate matter constituents trigger the formation of extracellularamyloid ββ and tau -containing plaques and neurite shortening in vitro. *Nanotoxicology*. 2024, vol. 18, iss. 4, str. 335-353, ilustr. ISSN 1743-5404. DOI: 10.1080/17435390.2024.2362367. [COBISS.SI-ID 199841027]
- BROWN, Leanne M., HAGENSON, Ryan A., KOKLIČ, Tilen, URBANČIČ, Iztok, QIAO, Lu, ŠTRANCAR, Janez, SHELTZER, Jason M. An elevated rate of whole-genome duplications in cancers from black patients. *Nature communications*. 2024, vol. 15, article no. 8218, str. 1-18, ilustr. ISSN 2041-1723. DOI: 10.1038/s41467-024-52554-5. [COBISS.SI-ID 213092611]
- HAVRDOVÁ, Markéta, URBANČIČ, Iztok, BARTOŇ TOMÁNKOVÁ, Kateřina, MALINA, Lukáš, POLÁKOVÁ, Kateřina, ŠTRANCAR, Janez, BOURLINOS, Athanasios B. Intracellular trafficking of cationic carbon dots in cancer cell lines MCF-7 and HeLa—time lapse microscopy, concentration-dependent uptake, viability, DNA damage, and cell cycle profile. *International journal of molecular sciences*. 2022, vol. 23, no. 3, str. 1077-1-1077-13. ISSN 1661-6596. DOI: 10.3390/ijms23031077. [COBISS.SI-ID 95168003]
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