

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	EKSPERIMENTALNE METODE V RAZISKOVALNEM DELU
Course title:	EXPERIMENTAL METHODS IN RESEARCH WORK

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Strojništvo, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code:

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
90					160	10

Nosilec predmeta/Lecturer:

Izvajalci predavanj:	<input type="text" value="Drago Bračun, Jože Kutin"/>
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:

Jeziki/Languages:	Predavanja/Lectures:	Slovenščina, Angleščina
	Vaje/Tutorial:	Slovenščina, Angleščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Veljajo splošni pogoji za doktorski študij.	General prerequisites for the third level studies.

Vsebina:	Content (Syllabus outline):
Zgradba in funkcijski opis merilnih sistemov. Temeljni elementi merilnih sistemov. Delovne značilnice instrumentov. Manipulacija, prenos in zapis merjenih vrednosti. Sistemi za zapis in prikaz merjenih vrednosti. Veliki sistemi za zajemanje in vrednotenje merjenih vrednosti. Avtomatizacija eksperimentalnega dela. Pristop k eksperimentalnemu delu. Metode in pomen načrtovanja preizkusov. Metrološka analiza izmerjenih vrednosti in prikaz rezultatov.	Structure and functional description of measurement systems. Basic elements of measurement systems. Working characteristics of instruments. Manipulation, transfer and record of measured quantities. Systems for recording and displaying measurement quantities. Large systems for acquisition and evaluation of measurement quantities. Automatisation of experimental work. Approach to experimental work. Methods and importance of experiment planning. Metrological analysis of measured quantities and display of results.

Temeljna literatura in viri/Readings:
[1] Montgomery, D.C.: Design and analysis of experiments.- 5th ed., J. Wiley., 2001. [2] Barney, George C.: Intelligent instrumentation: microprocessor applications in measurement and control.- 2nd ed.- New York: Prentice Hall, 1988 [3] Holman, J.P.: Experimental methods for engineers.- 7th ed.- Boston etc.: McGraw-Hill, cop. 2001.- (McGraw-Hill series in mechanical engineering). [4] Boyes, W.: Instrumentation Reference Book, 3rd ed., Elsevier, 2003.

[5] Dietrich, C.F.: Uncertainty, calibration and probability: the statistics of scientific and industrial measurement.- 2nd ed.- Bristol etc.: Adam Hilger, 1991.

Cilji in kompetence:

Cilji:
Vsebina učnega predmeta je usmerjena k razumevanju vloge in ciljev eksperimentalnih metod v raziskovalnem delu in k sistemskemu pristopu h gradnji, strukturiranju in meroslovno korektni uporabi merilnih sistemov v raziskovanju. V učnem predmetu je vključeno tudi načrtovanje eksperimentalnega dela predvsem na temelju metod statističnega načrtovanja preizkusov.

Kompetence:
Študent osvoji pristop k načrtovanju in izvedbi eksperimentalnega dela v raziskovanju s poudarkom na sistemskemu načrtovanju in analizi rezultatov.

Objectives and competences:

Goals:
Contents of the course is oriented to understanding the role and goals of experimental methods in experimental work and understanding the systematic approach in construction, structuring and metrological correct use of measurement systems in research work. The course includes planning of the experimental work, especially based on methods of statistical planning of experiments.

Competence:
A student will acquire knowledge how to approach and conduct the experiment in research work with emphasis on systematic planning and analysis of results.

Predvideni študijski rezultati:

Študent osvoji pristop k načrtovanju in izvedbi eksperimentalnega dela v raziskovanju s poudarkom na sistemskemu načrtovanju in analizi rezultatov.

Intended learning outcomes:

A student will acquire knowledge how to approach and conduct the experiment in research work with emphasis on systematic planning and analysis of results.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje, seminarsko delo, e-izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezuje se na področje doktorskega raziskovanja. Študij z uporabo priporočene literature.

Learning and teaching methods:

Lectures, laboratory practice & seminar work, e-education, consulting. The seminar work is related, as much as possible, to the student's doctoral research field. Study on a recommended literature basis.

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt) - naloge (20%), - projektni seminar (60%), - ustno izpraševanje in zagovor (20%).

Delež/Weight

Assessment:

Method (written exam, oral examination, assignments, project) • assignments (20%) • project seminar (60%) • oral examination (20%)

Reference nosilca/Lecturer's references:

izr. prof. dr. Jože KUTIN
KUTIN. Jože, SMREČNIK, Andrej, BAJSIC, Ivan. Phase-locking control of the Coriolis meter's resonance frequency based on virtual instrumentation. Sensors and Actuators. A: Physical 104 (2003) 86-93. IF(2003).
KUTIN. Jože, BAJSIC, Ivan. Characteristics of a dynamic pressure generator based on loudspeakers. Sensors and Actuators, A: Physical 168 (2011) 149-154. IF(2011) = 1.802 (1. detrtina)
KUTIN. Jože, BOBOVNIK, Gregor, BAJSIC, Ivan. Dynamic effects in a clearance-sealed piston prover for gas flow measurements. Metologia 48 (2011) 123-132.
RUPNIK, Klemen, KUTIN. Jože, BAJSIC, Ivan. Identification and prediction of the dynamic properties of resistance temperature sensors. Sensors and Actuators. A, Physical 197 (2013) 69-75. IF(2013) : 1.943
KUTIN. Jože, BOBOVNIK, Gregor, BAJSIC, Ivan. Heat exchange effects on the performance of a clearance-sealed piston prover for gas flow measurements. Metologia 52 (2015) 857-863. IF(2015) : 2.5
SVETE, Andrej, KUTIN. Jože, BOBOVNIK, Gregor, BAJSIC, Ivan. Theoretical and experimental investigations of flow pulsation effects in Coriolis mass flowmeters. Journal of Sound and Vibration 352 (2015) 30-45. IF(2015) = 2.107
SVETE, Andrej, STEFE, Metka, MAČEK, Andraž, KUTIN. Jože, BAJSIC, Ivan. Dynamic pressure generator for dynamic calibrations at different average pressures based on a double-acting pneumatic actuator. Sensors and actuators. A, Physical 247 (2016) 136-143. IF(2016) = 2.201
BOBOVNIK, Gregor, KUTIN. Jože, BAJSIC, Ivan. Uncertainty analysis of gas flow measurements using clearance-sealed piston provers in the range from 0.00129 l/min to 609 l/min. Metologia 53 (2016) 1061-1068. IF(2016) = 2.5
doc.dr. Drago BRAČUN
BRACUN, Drago, SLUGA, Alojzij. Stereo vision based measuring system for online welding path inspection. Journal of materials processing technology, ISSN 0924-0136. 2015, vol. 223, str. 328-336. IF(2015) = 2.752

BUDAK, tgor, VUKEL1C, Djordje, BRAFUN, Drago, HODOLIC, Janko, soKovla, Mirko. Pre-processing of pointdata from contact and optical 3D digitization sensors. sensors, ISSN 1424-8220, 2012, vol' 72, no ' 7, str' 1100-1126. IFQOr2I=s.165

BRAaUN, Drago, GRUDEN, Valter, MOZINA, Janez. A method for surface quality assessment of die-castings based on laser triangulation. Measurement science & technology, ISSN 0957-0233, 2008, letn 19, 5t' 4, 8str. IF(2008)=1.74

BRAaUN, Drago, JEZERSEK, Matija, DIACI, Janez. Triangulation model taking into account light sheet curvature. Measurement Science & Technology, ISSN 0957-0233, 2006, letn.17, 5t.8, str.2191- 2196. IF(2005)=4.386

BRACUN, Drago, DIACI, Janez, MOZINA, Janez. Optodynamic measurement of a non-stationary temperature field in air by multiple laser-beam deflection. Measureme