



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Meritve in obdelava podatkov
Course title:	Measurements and data processing

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program Predmetni učitelj 2. stopnje	Izobraževalna tehnika	3	6
Five-year master's degree program Subject teacher	Technical education	3	6

Vrsta predmeta / Course type

Izbirni / elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		15			45	3

Nosilec predmeta / Lecturer:

doc.dr. Boštjan Kovačič

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski / slovene

slovenski / slovene

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

Ni posebnih pogojev.

Prerequisites:

No special prerequisites.

Vsebina:

Content (Syllabus outline):

<u>Predavanja:</u> Študent bo osvojil znanje iz meroslovja, ki je nujno za delo v raziskovalnih laboratorijih in v različnem okolju. Znal bo izbrati ustrezno merilno metodo in opremo, izvesti meritve ter interpretirati rezultate meritev. Osnovna poglavja predmeta so: uvod v meroslovje in merski standardi, merska oprema, merilne metode, pogreški pri merjenju in merilna negotovost, meritve konstrukcij in merski monitoring, obdelava in primerjava podatkov, distribucija in razumevanje rezultatov. <u>Seminar:</u> Samostojna izvedba meritev na različnih preizkušancih, obdelava in prezentacija rezultatov <u>Vaje:</u> Spoznavanje merskih inštrumentov in metod merjenja Priprava preizkušancev Izračun predvidenih rezultatov Izvedba meritev Primerjava izmerjenih vrednosti Izris rezultatov	<u>Lectures:</u> The student will gain knowledge of metrology, which is necessary for work in research laboratories and in a different environment. He/she will be able to choose the appropriate measurement method and equipment, perform measurements and interpret the measurement results. The basic chapters of the course are: introduction to metrology and measurement standards, measurement equipment, measurement methods, measurement errors and measurement uncertainty, construction measurements and measurement monitoring, data processing and comparison, distribution and understanding of results. <u>Seminar:</u> Independent performance of measurements on various subjects, processing and presentation of results <u>Exercises:</u> Learning about measuring instruments and measurement methods Preparation of subjects Calculation of predicted results Performance of measurements Comparison of measured values Plotting the results

Temeljni literatura in viri / Readings:

- Kamnik, R., & Kovačič, B. (2009). Praktična geodezija v gradbeništvu (str. VIII, 219). Fakulteta za gradbeništvo.
- Dobovišek A. (2021). Osnovna merjenja : Uvod v merske napake in kvantitativno analizo fizikalnih meritev (str. 79). Fakulteta za naravoslovje in matematiko.
- Hribernik A. (2017). Tehniške meritve: zbrano gradivo. Fakulteta za strojništvo.

Dodatni viri / additional readings:

- Rabinovich, S. G. (2005). Measurement errors and uncertainties: theory and practice (3rd ed., str. XII, 308). AIP Press; Springer Science+Business Media.
- Springer handbook of materials measurement methods (str. XXVI, 1208). (2006). Springer.

Cilji in kompetence:

Študentje bodo:

- znali pojasniti pojme iz meroslovja
- ponazorili in interpretirali rezultate meritev
- uporabili pridobljena znanja v praksi
- analizirali, klasificirali in primerjali rezultate meritev

Študentje bodo pridobili:

- kompetence usmerjene v razvoj sposobnosti uporabe merskih metod;
- kompetence usmerjene v razvoj sposobnosti reševanja problemov iz področja meroslovja;
- kompetence usmerjene v razvoj sposobnosti za izvedbo samostojnih meritev

Objectives and competences:

Students will:

- were able to explain concepts from metrology
- illustrated and interpreted the measurement results
- used the acquired knowledge in practice
- analyzed, classified and compared the measurement results

Students will acquire:

- competences aimed at developing the ability to use measurement methods;
- competences aimed at developing the ability to solve problems in the field of metrology;
- competences aimed at developing the ability to perform independent measurements

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- izkazati znanje in razumevanje iz področja meroslovja
- pokazati sposobnost kritičnega vrednotenja rezultatov meritev;
- pokazati sposobnost samostojne izvedbe zahtevnih meritev ...;

Intended learning outcomes:

Knowledge and understanding:

After completing this course, the student will be able to:

- demonstrate knowledge and understanding in the field of metrology
- demonstrate the ability to critically evaluate measurement results;
- demonstrate the ability to independently perform demanding measurements...;

- izkazati razumevanje uporabe merske opreme;
- identificirati in rešiti probleme povezane z merskimi napakami in negotovostjo

- demonstrate an understanding of the use of measuring equipment;
- identify and solve problems related to measurement errors and uncertainty

Metode poučevanja in učenja:

- visokošolsko predavanje,
- metoda razgovora,
- metoda raziskovanja,
- metoda primera,
- metoda reševanja problemov,
- kooperativno učenje, individualno učenje,
- e-učenje.

Learning and teaching methods:

- university lecture,
- interview method,
- research method,
- case method,
- problem solving method,
- cooperative learning, individual learning,
- e-learning.

Načini ocenjevanja:

- pisni izpit;
- seminarska naloga

Delež (v %) /

Weight (in %)

Assessment:

- written exam;
- seminar paper

Reference nosilca / Lecturer's references:

- KOVAČIČ, Boštjan, DOLER, Damjan, SEVER, Drago. The innovative model of runway sustainable management on smaller regional airports. *Sustainability*. 12 Jan. 2021, vol. 13, iss. 2 (652), str. [1]-20. ISSN 2071-1050.
- KOVAČIČ, Boštjan, MURŠEC, Luka, LUBEJ, Samo. Synchronisation of contactless vibration monitoring methods. *International journal of simulation modelling*. Mar. 2022, vol. 21, no. 1, str. 113-123. ISSN 1726-4529
- KOVAČIČ, Boštjan, ŽELODEC, Damjan, DOLER, Damjan. Prototype of the runway monitoring process at smaller airports: Edvard Rusjan Airport Maribor. *Processes*. [Online ed.]. 21 Dec. 2020, vol. 8, iss. 12, str. 1-20, ilustr. ISSN 2227-9717.
- KOVAČIČ, Boštjan, ŠTRAUS, Luka, DRŽEČNIK, Mateja, PUČKO, Zoran. Applicability and analysis of the results of non-contact methods in determining the vertical displacements of timber beams. *Applied sciences*. Sep. 2021, vol. 11, iss. 19 (8936), str. 1-19, ilustr. ISSN 2076-3417.
- PEROŠ, Josip, PAAR, Rinaldo, DIVIĆ, Vladimir, KOVAČIČ, Boštjan. Fusion of laser scans and image data—RGB+D for structural health monitoring of engineering structures. *Applied sciences*. 2022, vol. 12, no. 12, str. 1-23. ISSN 2076-3417.
- KOVAČIČ, Boštjan, TOPLAK, Sebastian, PAAR, Rinaldo, LUBEJ, Samo. Application and comparison of non-contact vibration monitoring methods for concrete railway sleepers. *Applied sciences*. 2022, issue 24, vol. 12, str. 1-19. ISSN 2076-3417.
- DOLER, Damjan, KOVAČIČ, Boštjan. Improved decision-making geo-information system for continuous monitoring of deformations on airport infrastructure. *ISPRS international journal of geo-information*. Jan. 2019, vol. 8, iss. 1, str. 1-16, ilustr. ISSN 2220-9964.
- KOVAČIČ, Boštjan, KAMNIK, Rok, PREMROV, Miroslav. Deformation measurement of a structure with calculation of intermediate load phases. *Survey review*. [Print ed.]. Apr. 2011, vol. 43, no. 320, str. 150-161. ISSN 0039-6265.