

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Matematika 2
Course title:	Mathematics 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in spletne tehnologije, visokošolski strokovni študijski program prve stopnje	-	Prvi	Drugi
Computer Science and Web Technologies, first cycle Professional Study Programme	-	First	Second

Vrsta predmeta / Course type Obvezni / Obligatory

Univerzitetna koda predmeta / University course code: 2-RST-VS-M2-2016-10-01

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	45	-	-	105	6

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lectures:	Slovenski / Slovenian, Angleški / English
	Vaje / Tutorial:	Slovenski / Slovenian, Angleški / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:
 Pogoj za vključitev v delo je vpis v 1. letnik študija. Pogoj za pristop k izpitu so opravljene vse obveznosti na vajah.

Prerequisites:
 Enrolment into the first year of the study. Student has to pass all requirements given at the exercises before examination.

Vsebina:

- *Matrike in sistemi linearnih enačb:* definicija, računске operacije nad matrikami, determinanta in rang matrike, inverzna matrika, matrične enačbe, reševanje sistemov linearnih enačb (Gaussova metoda, Cramerjevo pravilo), pomen in uporaba v računalništvu, informatiki in družboslovju.
- *Kombinatorika:* permutacije, variacije in kombinacije.

Content (Syllabus outline):

- *Matrices and systems of linear equations:* linear matrix calculus, determinant and rank of a matrix, matrix inverse, matrix equations, methods to solve systems of linear equations (Gauss pivoting method, Cramer rule). Application in computer and social science.
- *Combinatorics:* permutations, variations and combinations.

- *Uvod v verjetnostni račun:* poskusi, dogodki, operacije nad dogodki, statistična definicija verjetnosti dogodka, pogojna verjetnost, formula o popolni verjetnosti, Bayesova formula, zaporedja neodvisnih poskusov, diskretne slučajne spremenljivke in njihove številske karakteristike (matematično upanje, varianca in standardni odklon), Binomska in Poissonova porazdelitev, zvezne slučajne spremenljivke (enakomerna, normalna, studentova, hi-kvadrat porazdelitev), korelacijski koeficient, limitni izreki, uporaba v računalništvu, informatiki in družboslovju.
- *Teorija grafov:* definicije osnovnih pojmov, osnove teorije grafov, osnovni pojmi o relacijah in omrežjih, prirejanja, pretoki, nekateri problemi na grafih (problem Hamiltonovega cikla, problem barvanja grafa, problem neodvisnega števila grafa), algoritmi za pregled grafov (pregled v širino in v globino), posebni grafi (ravninski, regularni, perfektni), omrežja (definicija, lastnosti, predstavitve, središčnost, dostopnost, pomembnost, uravnoveženost, tranzitivnost, povezanost omrežij).
- *Linearno programiranje:* zapis nekaterih standardnih optimizacijskih problemov v obliki linearnega programa, dualni problem, grafična metoda, simpleksna metoda, analiza občutljivosti optimalne rešitve in optimalne baze, uporaba računalnika.

- *Introduction to probability:* experiments, events, operations related to events, definition of event probability (statistical, classical), conditional probability, the perfect probability formula, Bayesian formula, sequence of independent experiments, discrete random variables and their characteristics (mean, variance, standard deviation), Binomial and Poisson distribution, continuous random variables (uniform, normal, student, chi-square distribution), correlation coefficient, limit theorems, application in computer and social science.
- *Graph theory:* definitions of basic notions, basics of graph theory, basic notions on relations and networks, assignments, flows, some problems on graphs (Problem of Hamiltonian cycle, Graph coloring problem, Stable set problem), algorithms for graph exploration (depth first search, breath first search), special graphs (planar, regular, perfect), networks (definition, properties, representations, degree centrality, closeness centrality, availability, importance, balance, transitivity, connectivity).
- *Linear programming:* modelling some standard optimization problems with linear programming (LP), dual problem, graphical method, simplex method, sensitivity and postoptimal analysis, solving LP using computer.

Temeljni literatura in viri / Readings:

- JAMNIK, RAJKO (1990) Matematika, Ljubljana, Društvo matematikov, fizikov in astronomov, Ljubljana.
- USENIK, JANEZ (2006) Matematične metode v logistiki, Valvasorjev raziskovalni center, Krško.
- ŽEROVNIK, JANEZ (2003) Osnove teorije grafov in diskretne optimizacije, Univerza v Mariboru, Maribor.
- HVALICA, DUŠAN (2005) Linearno programiranje in njegova uporaba, Univerza v Ljubljani, Ekonomska fakulteta.
- PUSTAVRH, SIMONA, POVH, JANEZ in MEDIC, VINKO (2010) *Zbirka rešenih nalog iz Matematike 2*. Ljubljana: Vega.
- POVH, JANEZ, PUSTAVRH, SIMONA, FOŠNER, MAJA, GORŠE PIHLER, MELITA in ZALAR, BOJANA (2010) *Matematične metode v uporabi*. Ljubljana: Društvo matematikov, fizikov in astronomov Slovenije.

Cilji in kompetence:

Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:

Splošne kompetence:

- poznavanje osnov računalništva in informacijske tehnologije
- poznavanje pomena kakovosti in prizadevanje za kakovost strokovnega dela skozi avtonomnost, samoiniciativnost, (samo)kritičnost, (samo)refleksivnost in (samo)evalviranje v strokovnem delu
- sposobnost fleksibilne uporabe znanja v praksi
- sposobnost logičnega sklepanja, ocenjevanja velikostnega reda rezultata, natančnosti izražanja, pisanja in razmišljanja

Predmetno-specifične kompetence:

- poznavanje temeljnih matematičnih metod iz področja linearne algebre, verjetnosti, matematične optimizacije in teorije grafov
- sposobnost pretvorbe matematičnih metod v algoritem in izvajanje tega algoritma v primernem računalniškem okolju

Objectives and competences:

The instructional unit contributes to the development of the following general and subject-specific competences:

General competences:

- familiarity with the basics of computer science and information technology
- familiarity with the importance of quality, striving to maintain the quality of professional work through practicing autonomous behaviour, showing initiative, as well as through (self-)criticism, (self-)reflection and (self-)evaluation
- ability to use the acquired knowledge in practice in a flexible manner
- ability to make logical conclusions, to estimate the order of magnitude of the results well as the ability to express oneself, write and think in an accurate manner

Subject-specific competences:

- familiarity with the fundamental mathematical methods from linear algebra, probability, mathematical optimization and graph theory
- ability to transform a mathematical method into an algorithm and coding this algorithm within an appropriate software framework

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- usvoji pojme iz linearne algebre, verjetnosti, teorije grafov in linearne optimizacije
- se navadi logičnega sklepanja, nauči se oceniti velikostni red rezultata, natančnosti izražanja, pisanja in razmišljanja
- se usposobi za uporabo matematike kot teoretičnega orodja v računalništvu in družboslovju

Intended learning outcomes:

Knowledge and understanding:

The student:

- is informed with theoretical foundations of mathematical analysis and linear algebra
- gets used to logical deduction, learns how to determine the size of the result set, accuracy of expression, writing and thinking
- is trained for the usage of mathematics as a theoretical tool in computer and social sciences

Metode poučevanja in učenja:

- predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov)
- vaje, kjer bodo študentje na konkretnih problemih ponovili, utrdili in dodatno osvetlili pojme in metode spoznane na predavanjih
- domače naloge, s katerimi bodo študentje sproti ponavljali in utrjevali snov
- kolokviji - z njimi bodo študentje stimulirani, da sproti študirajo snov, ki bo obravnavana na predavanjih in vajah

Learning and teaching methods:

- lectures with active student participation (explanation, discussion, questions, examples, problem solving)
- tutorials where students will rehearse, revise and lit up notions and methods encountered during lectures
- homeworks forcing students to study and consolidate knowledge continuously
- mid-term examinations, which will stimulate students to study the matter dealt with at lectures and tutorials simultaneously

Delež (v %) /

Weight (in %) /

Načini ocenjevanja:**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
<ul style="list-style-type: none"> • ustni izpit in • pisni izpit ali sprotno delo: kolokviji, kvizi, domače naloge 	30 70	<ul style="list-style-type: none"> • oral exam • written exam or intermediate work: mid-term examinations, quizzes, homeworks
<p>Za pristop k ustnemu izpitu je potrebno s pisnim izpitom ali s sprotnim delom zbrati vsaj 51% možnih točk.</p>		<p>As a prerequisite for the oral examination student must gain at least 51 % of possible points with intermediate work or with written exam.</p>
<p>Ustnega izpita ni potrebno opravljati, kadar študent s pisnim izpitom ali sprotnim delom zbere vsaj 70% točk in je bil vsaj 50% na predavanjih.</p>		<p>Students who have gained at least 70 % with intermediate work or written exam and have participated at least 50 % of lectures are exempt from the oral examination.</p>