

	UČNI NAČRT PREDMETA/COURSE SYLLABUS
Predmet	Uporabna matematika
Course title	Applied Mathematics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Upravljanje z okoljem/ 1. Stopnja	Ni smeri študija	1. letnik	1.
Environmental Management/ 1 st Cycle	No study field	1 st year	1 st

Vrsta predmeta/Course type

obvezni/obligatory

Univerzitetna koda predmeta/University course code

1_UO_1_UN3

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30		45			100	7

Nosilec predmeta/Lecturer:

doc. dr. Srečko Devjak
Učni načrt pripravila doc. dr. Jelena Klisara

Jeziki/ Languages:
Predavanja/Lectures:

slovenski/Slovenian

Vaje/Tutorial:

slovenski/Slovenian

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

Prerequisites:

- Vpis v prvi letnik študijskega programa.
- Študent mora pred pristopom k izpitu pravočasno oddati vse domače naloge in biti ustrezno prisoten na seminarskih vajah in predavanjih.

- A prerequisite for inclusion is enrolment in the first year of study.
- Students have to submit all their homework before the examination and be adequately present at the tutorials and lectures.

Vsebina:

Content (Syllabus outline):

Predavanja

- *Uvod:*
osnovni pojmi o množicah in operacije nad množicami, naravna števila in matematična indukcija, realna števila in operacije, kompleksna števila in operacije, kompleksna ravnina, polarni zapis kompleksnega števila, Eulerjeva formula, de Moivreova formula.
- *Vektorji in matrike:*

Lectures

- *Introduction:*
basic concepts of set theory and operations, natural numbers and mathematical induction, real numbers and operations, complex numbers and operations, complex plane, polar form of a complex number, Euler's formula, de Moivre's formula.
- *Vectors and matrices:*

<p>osnovni pojmi povezani z vektorji in osnovne operacije nad njimi, vektorji v prostoru, skalarni, vektorski in mešani produkt, osnovni pojmi povezani z matrikami in osnovne operacije nad njimi, determinanta matrike, inverzna matrika, sistemi linearnih enačb in neenačb, Gaussova eliminacijska metoda, lastni vektorji in lastne vrednosti, prostorska geometrija.</p> <ul style="list-style-type: none"> • <i>Realne funkcije:</i> pregled elementarnih funkcij, osnovne lastnosti, graf, kompozitum, inverzna funkcija, zveznost in limita. • <i>Odводи:</i> definicija in geometrijski pomen odvoda, odvodi elementarnih funkcij, pravila za odvajanje, odvodi višjega reda, uporaba odvoda – lokalni ekstrema, konveksnost, konkavnost, L'Hospitalovo pravilo. • <i>Integrali:</i> nedoločeni in določeni integral, zveza med njima, geometrijski pomen določenega integrala, elementarni integrali, pravila za računanje integralov, uporaba integral. • <i>Funkcije več spremenljivk:</i> osnovni pojmi in definicije, graf, nivojnice, parcialni odvodi, gradient in diferencial, lokalni ekstrema, vezani ekstrema. <p>Seminarske vaje Vaje so avditorne. Namenjene so skupinskemu utrjevanju obravnavane snovi z računskimi primeri s pomočjo asistenta.</p> <p>Domače naloge Predvideni sta dve ali štiri domače naloge. Osnovni namen je pripraviti študenta k sprotnemu študiju predmeta. Vsebine domačih nalog praviloma sledijo vsebinam obravnavanim na predavanjih in vajah.</p>	<p>basic concepts associated with vectors and basic operations, vectors in space, scalar, cross and mixed product, basic concepts associated with matrices and basic operations, determinant of a matrix, inverse matrix, systems of linear equations and inequalities, Gaussian elimination, eigenvectors and eigenvalues, spatial geometry.</p> <ul style="list-style-type: none"> • <i>Real functions:</i> elementary functions, basic properties, graph, composite, inverse function, continuity and limits. • <i>Derivatives:</i> definition and geometric interpretation of derivative, derivatives of elementary functions, rules for differentiation, higher order derivatives, use of derivatives – local extrema, convexity, concavity, L'Hospital's rule. • <i>Integrals:</i> indefinite and definite integrals, connection between them, geometric interpretation of definite integral, elementary integrals, techniques of integration, use of integrals. • <i>Functions of more than one variable:</i> basic concepts and definitions, graph, level curves, partial derivatives, gradient and differential, local extrema, method of Lagrange multipliers. <p>Tutorials Tutorial time is devoted to the classical blackboard approach. The students solve computational problems with some help of teaching assistant.</p> <p>Homeworks There are two or four homework assignments. The main purpose is to prepare the students for continuously working on the topics under consideration and help them to understand the ideas and concepts of the course.</p>
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Temeljna literatura in viri/Readings:

Temeljna literatura/Basic literature

- Tomšič, G., Mramor-Kosta, N. in Orel, B. (2004). *Matematika I*, Fakulteta za elektrotehniko in računalništvo, Ljubljana. *Strani:* 1 – 30, 63 – 184. Dostopno na

https://ucilnica.fri.uni-lj.si/pluginfile.php/5303/mod_page/content/126/mat1%20%282%29.pdf.

- Tomšič, G., Mramor-Kosta, N. in Orel, B. (2004). *Matematika II*, Fakulteta za elektrotehniko in računalništvo, Ljubljana. *Poglavje o funkcijah več spremenljivk 38 strani*. Dostopno na https://ucilnica.fri.uni-lj.si/pluginfile.php/5303/mod_page/content/126/mat2fvs.pdf.

Priporočljiva literatura/Recommended literature

- Orel, B. (2010). *Linearna algebra*, Založba FRI, Ljubljana. Dostopno na <http://eprints.fri.uni-lj.si/3857/1/orel2.pdf> in <http://lmmri.fri.uni-lj.si/la/la1.pdf>
- Povh, J, in drugi (2010). *Matematične metode v uporabi*, Društvo matematikov, fizikov in astronomov Slovenije, Ljubljana.
- Pustavrh, S., Povh, J. in Gorše Pihler, M. (2010). *Zbirka rešenih nalog iz matematike 1*, Založba Vega, Ljubljana.
- Pustavrh, S., Povh, J. in Medic, V. (2010) *Zbirka rešenih nalog iz Matematike 2*, Založba Vega, Ljubljana.
- Stewart, J. (2016). *Calculus: early transcendentals* (8th edition), Cengage Learning.

Cilji in kompetence:

Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:

- razvoj veščin kritičnega, analitičnega in sintetičnega razmišljanja,
- razumevanje in uporaba matematičnih pojmov in matematičnega načina razmišljanja,
- razumevanje pojma abstrakcije,
- razumevanje matematičnih pojmov množica, kompleksna števila, kompleksna ravnina, vektor, matrika, konvergence, zveznosti, odvod, lokalni ekstrem, konveksnost, konkavnost, integral, dolžina, ploščina, volumen, nivojnice, gradient,
- sposobnost za reševanje teoretičnih okoljskih problemov z uporabo matematičnih metod in postopkov.

Objectives and competences:

The learning unit mainly contributes to the development of the following general and specific competences:

- developing skills in critical, analytical and synthetic thinking,
- understanding and using mathematical concepts and mathematical thinking,
- understanding the concept of abstraction,
- understanding the concepts of sets, complex numbers, complex plane, vector, matrix, convergence, continuity, derivative, local extrema, convexity, concavity, integral, length, area, volume, level curves, gradient,
- ability to solve theoretical environmental problems with the use of mathematical methods and procedures.

Predvideni študijski rezultati:

Študent/študentka:

- opiše osnovne pojme in principe matematične analize in linearne algebre,
- pojasni zvezo med simboličnim, grafičnim in numeričnim opisom,
- uporabi metode matematične analize ter abstrakcije linearne algebre in linearnih sistemov za modeliranje in

Intended learning outcomes:

Students:

- describe the basic concepts and principles of calculus and linear algebra,
- explain the connection between the symbolic, graphic and numeric representations,
- use methods of mathematical analysis and abstraction of linear algebra and

reševanje konkretnih okoljskih problemov, • rešuje probleme z vektorji, premicami in ravninami v prostoru, • identificira parcialne odvode in lokalne ekstreme funkcije več spremenljivk, • uporablja matematični jezik za natančno opisovanje teoretičnih problemov iz okolja.	linear systems to model and solve specific environmental problems, • solve problems with vectors, lines and planes in space, • identify partial derivatives and local extrema of a function of more than one variable, • use mathematical language to accurately describe theoretical problems from the environment.
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Metode poučevanja in učenja:
Learning and teaching methods:

• <i>predavanja</i> z aktivno udeležbo študentov – razlaga, diskusija, vprašanja, primeri, reševanje problemov, • <i>seminarske vaje</i> z aktivno udeležbo študentov – študentje bodo na konkretnih problemih ponovili in utrdili pojme in metode, spoznane na predavanjih, • <i>kolokviji</i> – z njimi bodo študentje stimulirani, da sproti študirajo obravnavano snov.	• <i>lectures</i> with active student participation – explanation, discussion, questions, examples, problem solving, • <i>tutorials</i> with active student participation – students will rehearse and revise concepts and methods encountered at lectures, • <i>mid-term examinations</i> – will stimulate students to study the matter dealt with at lectures.
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Načini ocenjevanja:

Delež (v %)

Weight (in %)

Assessment:

Načini: • izpit • sprotno delo kvizi, domače naloge ali seminarska naloga Ocenjevalna lestvica: ECTS.	80 % 20 %	Types: • exam • intermediate work quizzes, homeworks or seminar paper Grading scheme: ECTS.
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