Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Osnove linearne algebre in vektorske analize**
Course title:	Basic Linear Algebra and Vector Analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika, 1. stopnja		**1.**	**2.**
Physics, 1st level		**1.**	**2.**

Vrsta predmeta / Course type **obvezni/compulsory**

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60		**45**			**105**	**7**

Nosilec predmeta / Lecturer: Iztok BANIČ

Jeziki / Languages:		
	Predavanja / Lectures:	SLOVENSKO/SLOVENIAN
	Vaje / Tutorial:	SLOVENSKO/SLOVENIAN

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

Priporočeno je predznanje maturitetnega kurza matematike.

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.

Pozitivni oceni pri ustni predstavitvi in pisnem izpitu sta pogoj za pristop k ustnemu izpitu.

Prerequisites:

Matura-level knowledge of mathematics is recommended.

Each of the mentioned commitments must be assessed with a passing grade.

Passing grades of the oral presentation and the written exam are required for taking the oral exam.

Vsebina:

1. Analitična geometrija trirazsežnega evklidskega prostora.
2. Vektorji, skalarni in vektorski produkt, norma.

Content (Syllabus outline):

1. Analytical geometry of the three-dimensional, Euclidean space.
2. Vectors, the dot and cross products, the norm.

3. Matrike, determinante, rang in lastne vrednosti matrik. 4. Linearni operatorji in povezava operatorjev z matrikami. 5. Funkcije več spremenljivk, parcialni odvodi, ekstremi. 6. Gradient, divergenca, rotor. 7. Pojem diferencialne enačbe.	3. Matrices, determinants, rank and eigenvalues of matrices. 4. Linear operators and relations between operators and matrices. 5. Functions of several variables, partial derivatives, maxima and minima. 6. Gradient, divergence and curl. 7. The concept of a differential equation.

Temeljni literatura in viri / Readings:

1. Vidav: Višja matematika I, II, III. Ljubljana, DZS, 1974
2. J. Grasselli: Linearna algebra. Linearno programiranje. Ljubljana, DMFA Slovenije,1994
3. S. Lipschutz: 3000 Solved Problems in Linear Algebra. New York: McGraw-Hill,1988

Dodatna literatura/Additional Readings:

4. M. R. Spiegel: Schaum's Outline of Theory and Problems of Vector Analysis and an Introduction to Tensor Analysis, New York, McGraw-Hill, 1959

Cilji in kompetence:	**Objectives and competences:**
Cilj in kompetence tega predmeta so, da študentje usvojijo osnovne pojme in metode linearne algebre in vektorske analize, in jih uporabljajo pri nadaljnjem študiju fizike.	The objectives and competences of this course are for students to acquire basic knowledge of linear algebra and vector analysis, and to apply it in the study of physics.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključku tega predmeta bo študent sposoben • razložiti in uporabljati osnovne izreke linearne algebre in vektorske analize. • za reševanje problemov uporabiti linearno algebro in vektorsko analizo. Natančneje, po zaključku tega predmeta bo študent med drugim zmožen: - ločiti med skalarji, vektorji in linearnimi preslikavami,	Knowledge and understanding: On completion of this course the student will be able to • explain and use basic theorems from linear algebra and vector analysis, • apply linear algebra and vector analysis for problem solving. More precisely, on completion of this course, among other things, the student will be able to: - tell the difference between scalars, vectors and linear transformations, - calculate scalar, vector and mixed products of given vectors and apply the knowledge in physics,

- izračunati skalarni, vektorski in mešani produkt vektorjev in uporabiti znanje pri fiziki, - predstaviti linearni operator z matriko in si z njo pomagati pri preučevanju njegovih lastnosti, - parcialno odvajati funkcije več spremenljivk in izračunati ekstremne vrednosti takih funkcij, - reševati diferencialne enačbe. Prenosljive/ključne spretnosti in drugi atributi: • Spretnosti komuniciranja: ustni zagovor izpita, pisno izražanje pri pisnem izpitu. • Uporaba informacijske tehnologije: uporaba računala ali računalniških aplikacij pri reševanju problemov. • Reševanje problemov: reševanje problemov s pomočjo metod iz linearne algebre in vektorske analize.	- present a linear operator with a matrix and to use it to explore its properties, - calculate partial derivatives of functions of several variables and to calculate extreme values of such functions - solve differential equations. Transferable/Key skills and other attributes: • Communication skills: oral exam, manner of expression at written examination. • Use of information technology: use of a calculator or computer applications for problem solving. • Problem solving: problem solving using methods from linear algebra and vector analysis.
Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Teoretične vaje	• Lectures • Theoretical exercises

Načini ocenjevanja: / **Assessment:**

	Delež (v %) / Weight (in %)	
Ustni izpit	50%	Oral exam
Pisni izpit	50%	Written exam

Opombe:
Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50%.

Comments:
Written exam can be replaced by written midterm examination in the weight of 50%.

Reference nosilca / Lecturer's references:

1. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A., MOURON, Christopher, NALL, Van. Transitive mappings on the Cantor fan. Ergodic theory & dynamical systems. 2025, 35 str. ISSN 0143-3857. https://doi.org/10.1017/etds.2025.6, DOI: 10.1017/etds.2025.6.

2. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A., MOURON, Christopher, NALL, Van. Chaos and mixing homeomorphisms on fans. Journal of difference equations and applications. 2025, vol. 31, no. 1, 31 str. ISSN 1023-6198. Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.1080/10236198.2024.2384947, DOI: 20.500.12556/DKUM-90072.

3. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A. An embedding of the Cantor fan into the Lelek fan. Rad Hrvatske akademije znanosti i umjetnosti. Razred za matematičke, fizičke i kemijske znanosti. Matematičke znanosti. 2025, vol. 29 = 564, str. 221-229. ISSN 1845-4100. https://doi.org/10.21857/m8vqrt3lk9, Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.21857/m8vqrt3lk9, DOI: 20.500.12556/DKUM-91938.

4. BANIČ, Iztok, GRIL ROGINA, Rene, KENNEDY, Judy A., NALL, Van. Sufficient conditions for non-zero entropy of closed relations. Ergodic theory & dynamical systems. Nov. 2024, vol. 44, iss. 11, str. 3091-3119. ISSN 0143-3857. DOI: 10.1017/etds.2024.11.

5. BANIČ, Iztok, ČREPNJAK, Matevž, KAC, Teja. Markov set-valued functions on compact metric spaces. Glasnik matematički. Serija 3. 2024, vol. 59, no. 1, str. 193-212. ISSN 0017-095X. https://web.math.pmf.unizg.hr/glasnik/59.1/59(1)-09.pdf, DOI: 10.3336/gm.59.1.09.