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.

Prerequisits:

Matura-level knowledge of mathematics is recommended.

Vsebina:

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

Content (Syllabus outline):

1. Analytical geometry of the three-dimensional, Euclidean space.
2. Vectors, the dot and cross products, the norm.
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. M. R. Spiegel: Schaum's Outline of Theory and Problems of Vector Analysis and an Introduction to Tensor Analysis, New York, McGraw-Hill, 1959
4. S. Lipschutz: 3000 Solved Problems in Linear Algebra. New York: McGraw-Hill,1988

Cilji in kompetence:

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.

Objectives and competences:

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:

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,
- 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.

Intended learning outcomes:

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,
- 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.

• Uporaba informacijske tehnologije: uporaba računala ali računalniških aplikacij pri reševanju problemov. • Reševanje problemov: reševanje problemov s pomočjo metod iz linearne algebre in vektorske analize.	• 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:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
<u>Izpit:</u> Pisni izpit – problemi Ustni izpit – teorija Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija. Pisni izpit – problemi se lahko nadomesti z dvema delnima testoma (sprotne obveznosti).	50% 50%	<u>Exam:</u> Written exam – problems Oral exam – theory Each of the mentioned assessments must be assessed with a passing grade. Passing grade of written exam – problems is required to take the oral exam – theory. Written exam – problems can be replaced with two mid-term tests.

Reference nosilca / Lecturer's references:

1. BANIČ, Iztok, TARANENKO, Andrej. Span of a graph : keeping the safety distance. *Discrete mathematics & theoretical computer science*. 2023, vol. 25, no. 1, 19 str. ISSN 1365-8050. DOI: 10.46298/dmtcs.9859. [COBISS.SI-ID 148408835]
2. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A. The Lelek fan as the inverse limit of intervals with a single set-valued bonding function whose graph is an arc. *Mediterranean journal of mathematics*. Jun. 2023, vol. 20, iss. 3, article no. 159, 24 str. ISSN 1660-5446. DOI: 10.1007/s00009-023-02323-3. [COBISS.SI-ID 148424195]
3. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A. Mapping theorems for inverse limits with set-valued bonding functions. *Bulletin of the Malaysian Mathematical Sciences Society*. Nov. 2022, vol. 45, iss. 6, str. 2905-2940. ISSN 0126-6705. DOI: 10.1007/s40840-022-01307-y. [COBISS.SI-ID 111923203]
4. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A. Closed relations with non-zero entropy that generate no periodic points. *Discrete and continuous dynamical systems*. 2022, vol. 42, no. 10, str. 5137-5166. ISSN 1078-0947. DOI: 10.3934/dcds.2022089. [COBISS.SI-ID 117884675]

5. BANIČ, Iztok, KAC, Teja. Mapping theorems for rigid continua and their inverse limits. *Qualitative theory of dynamical systems*. 2022, vol. 21, iss. 4, str. 1-29. ISSN 1575-5460. DOI: 10.1007/s12346-022-00647-1. [COBISS.SI-ID 120844547]