

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	MATEMATIKA II
Course Title:	MATHEMATICS II

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Kemijsko inženirstvo, 1. stopnja	/	2.	3.
USP Chemical Engineering, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type:

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

IN112

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer:

izr. prof. dr. Pavle Saksida /
dr. Pavle Saksida, Associate professor

Jeziki / Languages:

Predavanja / Lectures: slovenski / Slovenian

Vaje / Tutorial: slovenski / Slovenian

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Funkcije več spremenljivk. Definicija funkcije dveh spremenljivk in njen graf. Limita in zveznost. Funkcija treh in več spremenljivk. Parcialni odvodi. Parcialni odvodi posrednih funkcij. Implicitne funkcije. Totalni diferencial in uporaba. Taylorjeva formula za funkcije dveh spremenljivk.

Ekstremi funkcij dveh spremenljivk. Definicija in pogoji za ekstrem. Uporaba ekstremov.

Dvojni in trojni integral. Definicija in lastnosti. Prevedba na večkratni integral. Uvedba novih spremenljivk. Primeri uporabe.

Osnovni pojmi diferencialne geometrije.

Skalarna in vektorska polja. Odvod skalarnega polja v dani smeri, gradient skalarnega polja,

Content (Syllabus outline):

Functions of several variables. The definition of a function of two variables and its graph; The limit and continuity; Functions of three and more variables; Partial derivatives; The chain rule; Implicit functions; Total differential and applications; Taylor's formula for the function of two variables.

Extrema of functions of two variables. The definition and conditions for the extremum and applications.

Double and triple integrals. The definition, the properties; Evaluation with iterated integrals; Change of variables in a multiple integral; Examples of applications.

Concepts of differential geometry. Scalar and

divergenca in rotor vektorskega polja.

Krivulje in ploskve v prostoru. Vektor tangente na krivuljo in vektor normale na ploskev.

Krivuljni in ploskovni integrali. Definicije in računanje. Greenova formula, Gaussov in Stokesov izrek. Primeri in uporabe.

Fourierove vrste. Osnovni pojmi in primeri.

Parcialne diferencialne enačbe. Osnovni pojmi. Enačba za prevajanje toplote, Laplaceova enačba. Reševanje s Fourierovo vrsto.

Osnovni pojmi verjetnostnega računa.

Definicija verjetnosti. Verjetnost vsote in produkta dogodkov. Slučajne spremenljivke, porazdelitvena funkcija. Matematično upanje in disperzija. Normalna porazdelitev.

vector fields; Directional derivative, gradient of a scalar field, the divergence and the curl of a vector field.

Curves and surfaces in the space. Tangent vector to a curve, normal vector to a surface.

Line and surface integrals. Definitions and evaluation; Theorems of Gauss, Stokes and Green; Examples and applications.

Fourier series. Basic concepts and examples.

Partial differential equations. Basic concepts; Heat equation; Laplace equation; Solving with the Fourier series.

Foundation of probability theory. The definition of the probability. Probability of the sum and of the product of events; Random variables; Probability distributions; Mean and variance; Normal distribution.

Temeljna literatura in viri / Readings:

- I. Vidav, Matematika II, DZS, Ljubljana, 1975, 576 str. (20%)
- M. H. Protter, C. B. Morrey, Intermediate calculus, New York, Springer, 1995, 555 str. (30%)

Dopolnilna literatura:

- I. Vidav, Matematika I, DZS, Ljubljana, 1973, 479 str.
- R. Jamnik, Matematika, DMFA Slovenije, Ljubljana, 1994, 568 str.
- P. Mizori-Oblak, Matematika za študente tehnike in naravoslovja II, FS, Ljubljana, 2003, 398 str.
- E. Kreyszig, Advanced engineering mathematics, New York-London-Sydney, J. Wiley, 1993, 898 str.

Opomba: v poštev pridejo le posamezni deli dopolnilnih učbenikov.

Cilji in kompetence:

Cilj predmeta: Študent naj bi v okviru tega predmeta spoznal nekaj novih pojmov in tehnik matematične analize, kot so funkcije več spremenljivk, dvojni, trojni, krivuljni in ploskovni integrali, osnove diferencialne geometrije, parcialnih diferencialnih enačb in verjetnosti. Ta znanja se uporabljajo pri mnogih področjih visokošolskega izobraževanja v naravoslovju, tehniki in nekaterih drugih strokah. Na predavanjih in vajah se študent uči matematičnega razmišljanja in strogosti, ter pridobiva praktično, delovno znanje obravnavanega področja.

Objectives and Competences:

Objectives of the course: The student should in the context of this course meet a few new concepts and techniques of mathematical analysis such as functions of several variables, double and triple integrals, line and surface integrals, the foundation of differential geometry, basic concepts of the partial differential equations and of the probability theory. This knowledge is used in many areas of higher education in science, technology and in some other disciplines. At the lectures and exercises students learn the mathematical thinking and accuracy and acquire working knowledge of the subject under consideration.

Predvideni študijski rezultati:

Intended Learning Outcomes:

<p><u>Znanje in razumevanje</u> Poznavanje in razumevanje nadaljnjih pojmov diferencialnega, integralnega računa, funkcij več spremenljivk, diferencialne geometrije in osnov verjetnostnega računa.</p>	<p><u>Knowledge and Comprehension</u> Knowledge and understanding of further concepts of differential and integral calculus, concepts of functions of several variables, concepts of differential geometry and foundation of the probability theory.</p>
<p><u>Uporaba</u> Predmet Matematika III je nadaljevanje predmeta Matematika II. Namen teh osnovnih matematičnih predmetov je seznaniti študente z osnovnimi matematičnimi pojmi, ki se kasneje uporabljajo pri drugih inženirskih predmetih.</p>	<p><u>Application</u> The course Mathematics III is a continuation of the course Mathematics II. The goal of these basic mathematical courses is to provide students with the fundamental mathematical notions needed later in other engineering courses.</p>
<p><u>Refleksija</u> Povezovanje osvojenega znanja v okviru predmeta in njihova uporaba na drugih področjih.</p>	<p><u>Analysis</u> Integration of acquired knowledge within the course and its application in many other areas.</p>
<p><u>Prenosljive spretnosti</u> Sposobnost jasne formulacije določene vrste problemov v matematičnem jeziku in izbira primernih matematičnih metod. Zmožnost natančnega in samostojnega reševanja problemov ter spremljanje literature.</p>	<p><u>Skill-transference Ability</u> The ability to clearly formulate certain types of problems into mathematical language and to choose the appropriate mathematical methods. The ability to accurately and independently solve problems and to follow the scientific literature.</p>

Metode poučevanja in učenja:

Predavanja, vaje, domače naloge, konzultacije.

Learning and Teaching Methods:

Lectures, exercises, home works and the consultations.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Kolokviji, pisni izpiti, ustni izpiti.
Ocene : 1-5 (negativno), 6-10
(pozitivno) (po statutu UL)

Reference nosilca / Lecturer's references:

- Pavle Saksida: *On zero-curvature condition and Fourier analysis*. Phys. A: Math. Gen. **44** (2011), pp. 85203-85222
- Pavle Saksida: *Integrable anharmonic oscillators on spheres and hyperbolic spaces*, Nonlinearity **14** (2001), pp. 977-994
- Pavle Saksida: *Nahm's equations and generalizations of the Neumann system*, Proc. London Math. Soc. **78** (1999), pp. 701-720