Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Izbor iz matematike za ekologe
Course title:	Selection in Mathematics for Ecologists

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Doktorski študij Ekološke znanosti, 3. stopnja		**1. ali 2.; 1st or 2nd**	**1. 2. ali 3. ; 1st, 2nd or 3rd**
Doctoral Study Ecological Sciences, 3rd degree			

Vrsta predmeta / Course type Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
5		5			140	5

Nosilec predmeta / Lecturer: Daniel Eremita

Jeziki / Languages:		
	Predavanja / Lectures:	slovenski / slovene
	Vaje / Tutorial:	slovenski / slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje matematike na ravni dodiplomskega programa	Knowledge of mathematics at undergraduate level

Vsebina:	**Content (Syllabus outline):**
Obravnavana so izbrana poglavja iz naslednjih sklopov. • Funkcije več realnih spremenljivk. Definicija in zveznost, parcialni odvod in totalni diferencial, višji parcialni odvodi, ekstremi, Taylorjeva vrsta. • Diferencialne enačbe. Osnovni pojmi, preproste diferencialne enačbe prvega reda, linearne diferencialne enačbe prvega reda,	Selected topics in the following chapters are discussed. • Functions of several variables. Definition and continuity, partial derivative, total differential, higher order partial derivatives, extrema, Taylor series. • Differential equations. Basic notions, simple first order differential equations, first order linear differential equations, second order

linearne diferencialne enačbe drugega reda s konstantnimi koeficienti, sistemi linearnih diferencialnih enačb, uporaba diferencialnih enačb v biologiji in ekologiji. • Osnovni pojmi teorije verjetnosti. Definicija verjetnosti in njene lastnosti. Pogojna verjetnost. Zaporedja neodvisnih poskusov. Naključne spremenljivke. Pomembne diskretne in zvezne porazdelitve. • Analiza diskretnih in zveznih stohastičnih modelov. Zaporedje odvisnih poskusov: markovske verige. Klasifikacija stanj. Stacionarna porazdelitev. Primeri uporabe stohastičnih modelov v biologiji in ekologiji.	linear differential equations with constant coefficients, systems of linear differential equations, applying differential equations to problems in biology and ecology. • Basic concepts of probability theory. The definition of probability and its properties. Conditional probability. Sequences of independent trials: Bernoulli trials. Random variables. Examples of the most important discrete and continuous distributions. • Analyzing discrete and continuous stochastic models. Sequences of dependent trials: Homogeneous Markov chains. Classification of states. Stationary distribution. Examples of stochastic models in biology and ecology.

Temeljni literatura in viri / Readings:

• Jamnik, R.,, 1987: Verjetnostni račun, DMFA, Ljubljana.
• Kot, M., 2001: Elements of Mathematical Ecology. Cambridge.
• Mizori-Oblak, P., 1986: Matematika za študente tehnike in naravoslovja, I-III, FS, Ljubljana.
• Otto, S., T. Day, 2006: A Biologist's Guide to Mathematical Modeling, Princeton University Press.
• Vidav, I, 1976: Višja matematika III, DZS, Ljubljana.

Cilji in kompetence:	**Objectives and competences:**
Predstaviti: • Koncepti obravnave izbranih funkcij več realnih spremenljivk • Teorijo diferencialnih enačb in njihovo uporabo v biologiji in ekologiji • Izbrane koncepte verjetnostnega računa • Teorijo stohastičnih procesov in njihovo uporabo v biologiji in ekologiji	To present: • Concepts of the study of selected functions of several variables • Theory of differential equations and to illustrate several applications of differential equations to problems in biology and ecology • Selected concepts of the study of probability • Theory of stochastic process and its application in biology and ecology

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Znanje in razumevanje: • Poznavanje konceptov obravnave izbranih funkcij več realnih spremenljivk • Prepoznavanje izbranih tipov diferencialnih	**Knowledge and understanding:** Knowledge and Understanding: • Understanding concepts of the study of selected functions of several variables • Identifying selected types of differential

enačb • Poznavanje izbranih metod reševanja diferencialnih enačb • Poznavanje izbranih primerov uporabe diferencialnih enačb v biologiji in ekologiji • Razumevanje izbranih konceptov verjetnosti, ki so povezani s naqključnimi procesi • Poznavanje izbranih primerov uporabe stohastičnih modelov v biologiji in ekologiji **Prenesljive/ključne spretnosti in drugi atributi:** • Pridobljeno znanje je prenesljivo na druga področja (biologija, ekologija, fizika, kemija, ekonomija,...)	equations, • Knowledge of selected methods for solving differential equations • Knowledge of applications of selected differential equations to problems in biology and ecology. • Understanding selected concepts of the probability theory which are related to stochastic process. • Knowledge of selected applications of stochastic models to problems in biology and ecology. **Transferable/Key Skills and other attributes:** • The obtained knowledge is transferable to other fields (biology, ecology, physics, chemistry, economics, …).

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Teoretične vaje • Konzultacije	• Lectures • Theoretical excersises • Consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): Pisni test – praktični del Izpit (ustni) – teoretični del Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.	50% / 50%	Type (examination, oral, coursework, project): Written test – practical part Exam (oral) – theoretical part Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written test is required for taking the exam.

Reference nosilca / Lecturer's references:

1. EREMITA, Daniel, GOGIĆ, Ilja, ILIŠEVIĆ, Dijana. Generalized skew derivations implemented by elementary operators. Algebras and representation theory, ISSN 1386-923X, 2014, vol. 17, iss. 3, str. 983-996. http://dx.doi.org/10.1007/s10468-013-9429-8. [COBISS.SI-ID 17043545]

2. EREMITA, Daniel. Functional identities of degree 2 in triangular rings revisited. Linear and Multilinear Algebra, ISSN 0308-1087, 2014, 20 str. http://dx.doi.org/10.1080/03081087.2013.877012, doi: 10.1080/03081087.2013.877012. [COBISS.SI-ID 17044057]

3. EREMITA, Daniel. Functional identities of degree 2 in triangular rings. Linear Algebra and its Applications, ISSN 0024-3795. [Print ed.], 2013, vol. 438, iss 1, str. 584-597. http://dx.doi.org/10.1016/j.laa.2012.07.028. [COBISS.SI-ID 16528217]

4. EREMITA, Daniel, ILIŠEVIĆ, Dijana. On (anti-)multiplicative generalized derivations. Glasnik matematički. Serija 3, ISSN 0017-095X, 2012, vol. 47, no. 1, str. 105-118. http://dx.doi.org/10.3336/gm.47.1.08. [COBISS.SI-ID 16341849]

5. BENKOVIČ, Dominik, EREMITA, Daniel. Multiplicative Lie n-derivations of triangular rings. Linear Algebra and its Applications, ISSN 0024-3795. [Print ed.], 2012, vol. 436, iss 11, str. 4223-4240. http://dx.doi.org/10.1016/j.laa.2012.01.022. [COBISS.SI-ID 16278361]