



OPIS PREDMETA / SUBJECT SPECIFICATION

Predmet:	Izbor iz matematike za ekologe
Subject Title:	Selection in Mathematics for Ecologists

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Doktorski študij Ekološke znanosti / Doctoral Study Ecological Sciences		Izbirni 1 ali 2 ali 3	2 ali 3 ali 4 ali 5

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
5		5			140	5

Nosilec predmeta / Lecturer:

Jeziki /	Predavanja / Lecture:	slovenski / Slovenian
Languages:	Vaje / Tutorial:	slovenski / Slovenian

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

Vsebina:	Contents (Syllabus outline):
<p>Obravnavana so izbrana poglavja iz naslednjih sklopov.</p> <ul style="list-style-type: none"> 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, 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. 	<p>Selected topics in the following chapters are discussed.</p> <ul style="list-style-type: none"> 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 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 študijski viri / Textbooks:

- 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:

Predstaviti:

- Koncepti obravnave izbranih funkcij več realnih spremenljivk
- Teorij diferencialnih enačb in njihovo uporabo v biologiji in ekologiji
- Izbrani koncepti verjetnostnega računa
- Teorija stohastičnih procesov in njihovo uporabo v biologiji in ekologiji

Predvideni študijski rezultati:

Znanje in razumevanje:

- Poznavanje konceptov obravnave izbranih funkcij več realnih spremenljivk
- Prepoznavanje izbranih tipov diferencialnih 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,...)

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

Načini ocenjevanja:

- Pisni kolokvij
- Ustni izpit

Delež (v %) /
Weight (in %)

50 %
50 %

Assessment:

- Written partial exam
- Oral exam

Objectives:

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

Intended learning outcomes:

Knowledge and Understanding:

- Understanding concepts of the study of selected functions of several variables
- Identifying selected types of differential 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, ...).

Learning and teaching methods:

- Lectures
- Theoretical excersises

Materialni pogoji za izvedbo predmeta :

- Predavalnica

Material conditions for subject realization

- Lecture hall

Obveznosti študentov:

(pisni, ustni izpit, naloge, projekti)

- Pisni kolkvij
- Ustni izpit

Students' commitments:

(written, oral examination, coursework, projects):

- Written partial exam
- Oral exam