Study Programme : PhD in Biology / Ecology	
Degree level: Doctoral degree	
Course Title: Mathematical and Statistical Methods in Biological Research	
Professor: Dr Andreja Tepavčević	
Elective Course	
Number of ECTS: 15	
Prerequisites: None	

Course Objective: The course aims to enable students to use correctly mathematical and statistical methods in biological research.

Course Outcome: As a result of successful completion of this course, students will be able to select and use an appropriate available mathematical or statistical method in order to solve typical problems. Students will be able to use statistical software.

Course Content:
Basics of theory of sets, correspondences, relations and functions. Matrix algebra. Basic probability. Basics statistical methods and models with application in biological research and in real problems. Distributions. Statistical estimations. Testing hypothesis. Regression and analysis of variance and covariance. Factorial experiments. Nonparametric statistics. Introduction to mathematical taxonomy. The measurement of similarity and distance. Principal component analysis. Factor analysis. Multidimensional scaling. Cluster analysis. Discriminant analysis. Identification and assignment techniques. The construction of evolutionary trees.
Depending on specialization, students can choose one of the topics:
1. Basics of fuzzy sets and relations and applications in taxonomy.
2. Random processes, Markov chains and time series analysis
3. Bioinformatics: Analysis of protein and DNA sequences. Construction of phylogenetics trees. Software packages for sequence similarity analysis and phylogenetics analysis.

Reading List:
1. A. Tepavčević, Z. Lužanin: Mathematical methods in taxonomy, Department of Mathematics and Informatics, Faculty of Science, University of Novi Sad, 2006 (in Serbian).
2. J. Rosenblatt, Basic Statistical Methods and Models for the Sciences, Chapman & Hall, CRC, 2002.
3. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press, 2002.

Total hours:				
Lectures: 5 per week	Practicals:	Other:	Student research work: 5 per week	

Methods of instruction:
The theoretical part of the course will be presented through the use of lecture, power point presentation and interaction with students through group discussion. Practical part will be presented through computer asisted instruction. Typical problems will be presented and solutions will be demonstrated.

Assessment during teaching period will be done through six obligatory tasks and two tests.

Assessment (maximum number of points 100)
Requirements Obligatory tasks (6) : 36 points Tests (2): 24 points Final examination: 40 points
Remark: