Study Programme : PhD in Ecology

Degree level: PhD

Course Title: Quantitative Ecology

Nastavnik: Dr Snežana Radulović, associate professor

Status: Elective Course

Number of ECTS: 15

Prerequisites: Statistic and softwares in Ecology, IT tools and data bases in Ecology

Course Objective:

The aim of this course is to provide the skills required for statistical analysis of multivariate data in ecology. The four major goals of multivariate analysis and their associated techniques will be considered: (1) data type and standardization; (2) clusification and cluster analyses; (3) ordination and related methods; and (4) computer approaches to multivariate statistical analyses. The course is strongly focused on project-based learning, group work, discussions and analysis of problem sets.

Course Outcome:

Students should gain broad understanding of the various multivariate techniques with respect to the types of research and data sets appropriate for each technique in ecology.

Course Content:

Multivariate statistical techniques and their applications are presented strictly from an ecologica perspective. Specifically, this course focuses on the following:

Data type and standardization. Resemblance measures for binary, quantitative and mixed data. Non-hierarchical clustering: K-means clustering, Fuzzy clustering, OrdClAn-N clustering. Hierarchical clustering: Unweighted Pair Group Method with Arithmetic Mean (UPGMA clustering), weighted pair group method with averaging (WPGMA clustering), Optimal clustering, OrdClAn-H clustering. Indicator species analysis (TWINSPAN method). Ordination and related methods: Correspodence analysis (CA), Detrended Corrispodence analysis (DCA), Canonical Corrispodence analysis (CCA), Detrended Canonical Corrispodence analysis (DCCA), Principal Component analysis (PCA), Non-metric multidimensional scaling (NMDS). Ecological indicators, application and calibration. Data analysis and interpretation; work in software packages for multivariate analysis in Ecology and tools for data storage: CANOCO, Flora, SYN-TAX, Turboveg, and JUICE.

Reading List:

1. Podani, J. 2001. SYN-TAX 2000, Computer Programs for Data Analysis in Ecology and Systematics. User's Manual. Scientia Publishing. P. O. Budapest, Hungary. ISBN 963-8326-23-9
2. Podani, J. 1994. Multivariate Data Analysis in Ecology and Systematics, A methodological guide to the SYN-TAX 5.0 package. Ecological Computations Series (ECS): Vol. 6 SPB. Academic Publishing Bv. ISBN 90-5103-094-0
3. Leps, J., Smilauer, P. 2003. Multivariate Analysis of Ecological Data using CANOCO. Cambridge University Press. ISBN-10 0-521-89108-6
4. Hill, MO. 1979. TWINSPAN - a FORTRAN Program for Arranging Multivariate Data in an Ordered Two-Way Table by Classification of the Individuals and Attributes. Cornell University, Ithaca, NY.
5. Oksanen, J., Minchin, PR. 1997. Instability of ordination results under changes in input data order: explanations and remedies. Journal of Vegetation Science 8: 447–454.

Total hours:				
Lectures: 2	Practicals: 2	Other:	Student research work: 5	

Methods of instruction: Independent work on solving multilevel tasks.

Assessment (maximum number of points 100)

Requirements	**Points**	**Final exam**	**Points**
Active participation in lectures	0	Written exam	80
Active participation in practicals	0	Oral exam	0
Test(s) or	0		
Report	20		