

Study Programme: Bachelor of Science in Biology, Bachelor of Science in Ecology		
Course Unit Title: Geometric morphometrics in biological research		
Course Unit Code: OBE006		
Name of Lecturer(s): Dr Jasmina Ludoški		
Type and Level of Studies: Bachelor Academic Degree		
Course Status (compulsory/elective): Elective		
Semester (winter/summer): Summer		
Language of instruction: English		
Mode of course unit delivery (face-to-face/distance learning): face-to-face		
Number of ECTS Allocated: 5		
Prerequisites: None		
Course Aims: Geometric morphometry presents a modern morphometric method for quantitative analysis that compares and visualizes differences in size and shape of morphological structures. The aim of the course is to enable the student to master the theoretical basis and acquire knowledge and skills for applying the geometric morphometric method in biological research.		
Learning Outcomes: Skills and knowledge for collecting and analyzing morphometric data and their application in biological research.		
Syllabus: <i>Theory</i> Geometric morphometrics- definition, geometric vs. traditional (linear) morphometry, size and shape of morphological structures: Landmarks coordinations and configurations (landmarks and semilandmarks)- definition, selection and data acquisition; Types of morphometric data (landmarks, curves, outlines, surfaces, 2D, 3D objects); Size and shape variable; Mathematical theory of shapes; Comparing shapes and visualisation of shape changes; Analyzing of shape variables: analytic methods for describing diversity and statistical methods for testing hypothesis <i>Practice</i> Softwares for acquisition and preparation of morphometric data (digitizing landmarks, curves, outlines, surfaces), superimposition and size and shape variable extraction, analyzing differences and visualizing of shape changes, statistical analyses: tps (thin-plate-spline) softwares, MorphoJ, PAST... Geometric morphometrics in biological research: examples.		
Required Reading: 1. Zelditch, M. L., Swiderski, D.L., Sheets, D.H. (2012) Geometric Morphometrics for Biologists. Second edition. Elsevier Academic Press, New York. 2. Ivanović, A., Kalezić, M. (2013). Evolucionarna morfologija: teorijske postavke i geometrijska morfometrija. Biološki fakultet, Beograd. 3. scientific papers		
Weekly Contact Hours:	Lectures: 2	Practical work: 2
Teaching Methods: Lectures, practical work of students on computers, independent student work (analysis of a specific problem / topic, short presentation, debate), consultations		
Knowledge Assessment (maximum of 100 points):		

Pre-exam obligations	points	Final exam	points
Active class participation		written exam	
Practical work		oral exam	70
Preliminary exam(s)	20	
Seminar(s)	10		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.