



## Module syllabus: *Statistical methods in natural sciences*

### 1. Overall information

Module coordinator	Prof. Piotr Skubała Ph.D. (Department of Ecology)
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ECTS	
Method for the verification of learning outcomes	<p>The final grade for the module is weighted on the average of the following student activities:</p> <ul style="list-style-type: none"><li>- Active participation in seminars (0.2)</li><li>- Reports from the realised laboratory tasks (0.8)</li></ul> <p>To be awarded a final grade, the student must have passed each activity of the module.</p> <p>Grades: below 51% – fail (F); 52-60% – with minimum academic criteria (E); 61-65% – satisfactory (D); 66-75% – good (C); 76-85% – very good (B), ≥ 85% – excellent (A)</p>

### 2. Description of student activity and work

Laboratory	
Responsible instructors	Prof. Piotr Skubała Ph.D.; dr. Anna Orczewska PhD; dr. Izabella Franiel PhD (Department of Ecology)
Content	<p>The aim of the module is to broaden the students' knowledge of some basic and advanced methods in the statistics that are applied in natural sciences.</p> <p>Students will be prepared to analyse data in three major steps:</p> <ul style="list-style-type: none"><li>• Cleaning and organising the data for analysis (Data Preparation)</li><li>• Describing the data (Descriptive Statistics)</li><li>• Testing Hypotheses and Models (Inferential Statistics)</li></ul> <p>Students will learn the two methods used to test data – parametric and non-parametric tests. Furthermore, participants will be familiarised with diversity indices and different methods of multivariate analysis; ordination and classification (cluster analysis) will also be analysed. Test and gradient analyses will be discussed and practiced on numerous examples. Practicals will be taught using the following statistical programs: Statistica, Multivariate Variate Statistical Package (MVSP), CANOCO and PAST (PAleontological STatistics).</p>
Methodology of laboratory classes	Short computer presentations of a selected theoretical problem, exercises using various computer programs.
Number of didactic hours (contact hours)	30
Literature	<p><u>Lepš J., Šmilauer P.</u> 2003. <i>Multivariate Analysis of Ecological Data Using CANOCO</i>. Cambridge University Press.</p> <p>Multi-Variate Statistical Package. 2007. Version 3.1. Users' Manual. Kovach</p>





	Computing Services. PAST. PAleontological Statistics. Version 3.0. Reference manual. Øyvind Hammer, Natural History Museum, University of Oslo, 1999-2013.
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### 3. Forms of verification

Continuous evaluation of knowledge and activity	
Grades	<p>Grades are awarded on a scale of A-F, where A is the best and F is a fail.</p> <p><u>An excellent performance (A)</u> – the student actively participates in the laboratories, demonstrates an excellent understanding of the discussed problems, is engaged and creative in solving the analysed problems.</p> <p><u>A good performance (C)</u> – the student actively participates in the laboratories, demonstrates a good understanding of the discussed problems, is engaged and creative in solving the analysed problems.</p> <p><u>A satisfactory performance (E)</u> – the student participates in the laboratories with some engagement, demonstrates a proper understanding of the discussed problems, is satisfactorily engaged and sufficiently creative in solving the analysed problems.</p> <p><u>A performance that does not meet the minimum academic criteria (F)</u> – the student does not participate in some laboratories, does not demonstrate a proper understanding of the discussed problems, is not engaged and creative in solving the analysed problems.</p>

Reports from realised laboratory tasks	
Evaluation	<p>Evaluation comprises judgment and knowledge related to the solved tasks, engagement in realisation, quality of presentation of the final results, use of reference materials.</p> <p>Grades for reports are awarded on a scale of A-F, where A is the best and F is a fail.</p> <p>An excellent report (A) – without any essential errors</p> <p>Fail (F) – no report</p> <p>Excellent (A) – the student presents fluent knowledge of the basic and advanced methods of the statistics applied in the natural sciences, makes minimal errors that do not affect the quality of the presentation.</p> <p>Good (C) – the student presents good knowledge of the basic and advanced methods of the statistics applied in the natural sciences, makes rare but subtle errors.</p> <p>Satisfactory (E) – the student exhibits satisfactory knowledge of the basic and advanced methods of the statistics applied in the natural sciences, but with a poor understanding of some the discussed problems and makes subtle errors.</p> <p>Fail (F) – the student does not present satisfactory knowledge of the basic and advanced methods of the statistics applied in the natural sciences and makes many substantial errors, which disqualify their presentation.</p>

