Course Specifications
Valid as from the academic year 2016-2017

Multivariate Data Analysis (C002776)

Course size (nominal values; actual values may depend on programme)
- Credits 5.0
- Study time 135 h
- Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2019-2020
- A (semester 2) English
- self-reliant study activities 20.0 h
- seminar: practical PC room classes 15.0 h
- lecture 25.0 h

Lecturers in academic year 2019-2020
- Sabbe, Koen WE11 lecturer-in-charge
- De Meyer, Jens WE11 co-lecturer
- De Troch, Marleen WE11 co-lecturer
- Vanaverbeke, Jan WE11 co-lecturer

Offered in the following programmes in 2019-2020
- Master of Science in Teaching in Science and Technology (main subject Biology) 5 A
- Master of Science in Biology 5 A
- Exchange Programme in Biology (master's level) 5 A

Teaching languages
- English

Keywords
- Multivariate data analysis, morphometry, community ecology, ordination

Position of the course
- Students learn how to analyze multivariate morphological or community ecological data using modern statistical software.

Contents
1. General introduction to multivariate data analysis: aim, general concepts - variance, covariance, correlation, basic concepts in matrix calculus, variance-covariance matrices, eigenvalues and eigenvectors, Principal Components Analysis (including partial PCA), Multivariate Analysis of Variance, Randomisation testing in multivariate analysis
2. Multivariate analysis techniques for morphometric data: traditional morphometrics - biometrics, geometric morphometrics, exploring shape variation within and between taxonomic units, testing hypotheses of shape variables between taxonomic units, analysis of evolutionary shape changes. Lectures include practical case studies of data acquisition and statistical analyses using MS Office and freeware statistical packages (TPS-series, PAST, SHAPE).
3. Multivariate techniques in community ecology: indirect and direct ordination techniques: correspondence analysis (CA), canonical correspondence analysis (CCA), redundancy analysis (RDA), multidimensional scaling, PERMANOVA, variance partitioning.
   The theoretical part is supplemented with practical exercises and an assignment.

Initial competences
- The course builds on the basic statistical concepts taught in Statistics I (Biol Ba1), Biostatistics (Biol Ba3) and Advanced biostatistics (Biol Ma1).

Final competences

(Approved)
1. The student knows and understands the most important basic concepts and principles of multivariate data analysis as applied to morphometric and ecological research.
2. The student is able to independently extract the essential information from morphometric and ecological multivariate datasets by selecting and applying the appropriate multivariate techniques.
3. The student is able to formulate the statistical results scientifically and to depict them graphically in an appropriate way.

Conditions for credit contract
Access to this course unit via a credit contract is determined after successful competences assessment.

Conditions for exam contract
This course unit cannot be taken via an exam contract.

Teaching methods
Lecture, self-reliant study activities, seminar: practical PC room classes

Extra information on the teaching methods
(1) seminar practical PC room classes: analysis of biological and simulated datasets using specialised multivariate analysis software
(2) an (individual) assignment in which the student chooses between several ecological or morphometric data sets. This will enable the student to gain more in-depth knowledge of the most relevant statistical methods. For the Oceans & Lakes students, the individual assignment also includes and additional part on Permanova and Multidimensional Scaling.

Learning materials and price
Powerpoint slide notes available for the theoretical background as well as for the use of statistical software.

References

Course content-related study coaching
Opportunity for questioning the lecturers during the orals and seminars, and outside these via email, personal contact and via the electronic teaching environment.

Evaluation methods
end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
Oral examination, assignment

Examination methods in case of periodic evaluation during the second examination period
Oral examination, assignment

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation
not applicable

Extra information on the examination methods
Periodic evaluation: after written preparation, the answers are discussed with the examiner(s). Additional questions may be asked. In addition to the exam, the assignment is also discussed.

Calculation of the examination mark
1st and 2nd examination period: periodic evaluation (100 %). The assignment is discussed during the oral exam and counts for 50% of the final score. To succeed for this course, the students are obliged to follow the seminars and make the assignment.

(Approved)