1 Name, Scope and Level of the Course
The course is provided by the University of Skövde and is named Multivariate Biological Analysis with R A1F. It comprises 7.5 credits and is on advanced level. The level of progression of the course is A1F.

2 Objectives
After completed course the student should be able to:

- analyze and interpret multivariate biological data using graphical visualization in R,
- analyze large scale genomic and proteomic data with different multivariate techniques in R,
- validate results from multivariate analyses,
- evaluate different multivariate methods appropriate for different types of data sets,
- report and discuss results from multivariate statistical analyses,
- develop and present a methodology for analyzing large scale data,
- critical review and present a scientific report in life sciences that include some of the multivariate methods that are included in the course,
- describe the underlying theoretical basis for multivariate analysis.

3 Course Content
Multivariate analysis includes different types of methods for analyzing several variables simultaneously. The course includes different types of analysis methods that will be applied on medical and biological multivariate data. The software R will be used throughout the course for all analyses. The multivariate techniques that are included in the course include, for example, principal component analysis, partial least squares, clustering analysis, classification methods and different types of validation techniques. The course also includes large scale analysis of genomic and proteomic data to identify potential biomarkers.

4 Forms of Teaching
The teaching comprises lectures, supervision, project work and presentations.

The teaching is conducted in English.

5 Examination
The course is graded A (Excellent), B (Very good), C (Good), D (Satisfactory), E (Sufficient) or F (Fail).

Registration of examination results:

<table>
<thead>
<tr>
<th>Name of examination</th>
<th>Credits</th>
<th>Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written assignment</td>
<td>1.5</td>
<td>G/U</td>
</tr>
<tr>
<td>Presentation</td>
<td>1</td>
<td>G/U</td>
</tr>
<tr>
<td>Written examination in computer lab</td>
<td>5</td>
<td>A/B/C/D/E/F</td>
</tr>
</tbody>
</table>

3 Determines the final grade of the course.

Students with a permanent disability who have been approved for special educational support may be offered adapted or alternative examinations.
6 Admission Requirements
Prerequisite courses for this course are: Passed SY763A-Experimental Design and Data Analysis for Life Science A1N (or the equivalent).

A further requirement is proof of skills in English equivalent of studies at upper secondary level in Sweden, known as English course 6 / English course B. This is normally demonstrated by means of an internationally recognized test, e.g. IELTS, TOEFL or the equivalent.

7 Subject, Main Field of Study and Disciplinary Domain
The course forms a part of the academic subject area of Systems Biology. The course is a part of the main field of study in Systems Biology at the University of Skövde. The course can also be a part of the main field of study in Bioscience. The disciplinary domain of the course is Natural Sciences.

Every course at the University of Skövde belongs to a subject. The division of subjects is used for follow-up and quality assurance. A main field of study is an area in which a degree can be awarded. Disciplinary domain is a division which is used by the government for the allocation of resources for studies at basic level and advanced level.

8 Approval of Course and Course Syllabus
The course was approved by the Curriculum Committee for Bioscience on 28 September 2017. This course syllabus was approved by the Curriculum Committee for Bioscience on 27 August 2020. It is valid from 1 January 2021 and replaces the course syllabus approved 26 March 2020.

9 Overlapping with Another Course
This course cannot constitute a part of a degree also containing a course the content of which is totally or partly equivalent to the content of this course.

10 Additional Information
Further information will be available on the university’s website before a course is given.

National and local regulations for higher education are available on the university’s website.

Upon completion of the course there will be a follow-up. The main purpose of this follow-up is to contribute to improvements of the course. The students' experiences and views constitute one of the criteria for the follow-up and are gathered by means of course evaluations. The students will be informed of the results of the follow-up and any decisions regarding actions that are to be taken.

11 Course Literature and Other Educational Materials


Scientific articles.