1 Name, Scope and Level of the Course
The course is provided by the University of Skövde and is named Bioinformatics Analysis with R A1N. It comprises 7.5 credits and is on advanced level. The level of progression of the course is A1N.

2 Objectives
After completed course the student should be able to:
- in an advanced way use R to read, organize and visualize data,
- use different data types and structures in R,
- in an advanced way describe different types of expression data,
- in depth explain and perform appropriate quality controls of global gene expression data,
- in depth describe the concept of normalization and practically perform normalization of global gene expression,
- independently perform advanced statistics and bioinformatics analyses of global gene expression data such as classification and clustering,
- critically explain and practically use public databases for downloading global gene expression datasets,
- practically use packages from Bioconductor.

3 Course Content
The course introduces R as a tool for bioinformatics analysis of different types of omics data. The basics of the programming language R is covered with an aim to be able to solve specific questions, by reading and analyzing data, as well as visualize the results. Basic data types, functions and structure in R are covered. An incremental way of working with data is emphasized, i.e. data from one type of analysis is used as input for the next step. Sources of error from different experiments and their effect on the data analysis are discussed. The course contains computer labs with exercises in R.

4 Forms of Teaching
The teaching comprises lectures, laboratory sessions and exercises.

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).

The final grade will be issued only when all examinations are approved.

The final grade of the course is determined by the average from the grades for all written assignments; A=5, B=4, C=3, D=2 and E=1. The average value is rounded to the nearest integer (half rounded up) and translated into a final grade according to 5=A, 4=B, 3=C, 2=D and 1=E.
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 1</td>
<td>4 credits</td>
<td>A/B/C/D/E/F</td>
</tr>
<tr>
<td>Written assignment 2</td>
<td>2 credits</td>
<td>A/B/C/D/E/F</td>
</tr>
<tr>
<td>Written assignment 3</td>
<td>1.5 credits</td>
<td>A/B/C/D/E/F</td>
</tr>
</tbody>
</table>

Students with a permanent disability who have been approved for special educational support may be offered adapted or alternative examinations.

6 Admission Requirements
The prerequisites for this course are 90 Higher education credits which must be courses within natural science, medicine or computer science. Among these higher education credits, at least 15 must be advanced level (G2 level).

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 or TOEFL or the equivalent.

7 Subject, Main Field of Study and Disciplinary Domain
The course forms a part of the academic subject area of Bioinformatics. The course is a part of the main field of study in Bioinformatics at the University of Skövde. The course can also be a part of the main field of study in Systems Biology. 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 22 February 2018. 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, e.g. Gene Expression Analysis Using R A1F 7.5 credits
Gene Expression Analysis and Networks Inference using R A1F 7.5 credits

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 and webb based materials. They are reported on a separat list provided by the course coordinator.