## Syllabus

### Course description

<table>
<thead>
<tr>
<th>Course title</th>
<th>Statistics</th>
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<tbody>
<tr>
<td>Course code</td>
<td>43078</td>
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<tr>
<td>Scientific sector</td>
<td>SECS-S/02</td>
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<tr>
<td>Degree</td>
<td>Bachelor in Industrial and Mechanical Engineering</td>
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<tr>
<td>Semester</td>
<td>I</td>
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<tr>
<td>Year</td>
<td>(optional)</td>
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<tr>
<td>Academic year</td>
<td>2021/2022</td>
</tr>
<tr>
<td>Credits</td>
<td>3</td>
</tr>
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<td>Modular</td>
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| Total lecturing hours | 18                       |
| Total lab hours       | 12                       |
| Total exercise hours  | 12                       |
| Attendance            | Not required, but strongly suggested |
| Prerequisites         | Basic Math at a Bachelor course level |
| Course page           | See ole.unibz.it         |

### Specific educational objectives

**Applied Statistics:**

The course is designed for acquiring professional skills and knowledge. The students will be able to:

- analyze their own data statistically and to present them graphically
- judge critically scientific results and conclusions
- use specific functions of the statistical software package R
- apply methods of inferential statistics

### Lecturers

Prof. Giovanni Modanese

### Scientific sector of the lecturer

English

### Office hours

See Timetable on unibz web page

### Teaching assistant (if any)

### List of topics covered (Applied Statistics)

1. Introduction to descriptive statistics and probability
2. Random variables discrete and continuous
3. Confidence intervals
4. Hypothesis testing
5. Correlation and linear regression

### Teaching format (Applied Statistics)

Frontal lectures, exercises on the PC with R

### Learning outcomes

**Knowledge and understanding**

Knowledge of the most important statistical tests, understanding their rationale, conditions of usage and
their results.

**Applying knowledge and understanding**
Identification of appropriate statistical method for data analysis; independent application of tests using software package R.

**Making judgements**
Critical reviewing of own scientific work and of original publications; interpretation of statistical analyses in the context of environmental sciences.

**Communication skills**
Ability to present results of statistical analyses correctly and intelligibly at the level of scientific publications.

**Learning skills**
Ability to recognize situations in which statistical analysis is necessary. Ability to judge the appropriateness of statistical methods, even if not explicitly treated in this course.

**Assessment**
Written exam and Project work.
The length of the written exam will be 90 minutes. This will include 8/10 questions (that is exercises and theory questions) which will allow to reach a maximum of 30 points. The student will be allowed to consult only a sheet of formulas and use a calculator to perform simple calculations. The ability to accurately trace the solution will be more important than the final calculation result. The programming language R will not be concretely examined. However, the student may be asked to correctly interpret numerical and graphical outputs generated using R.
The Project work will consist of a small individual applied project with real data to describe and analysis, that should be presented with 4 slides (1. Data and scientific hypothesis to be analyzed; 2. Method used; 3. Results; 4. Conclusions).

**Assessment language**
English

**Evaluation criteria and criteria for awarding marks**
The written exam will be the 80% of the final grade; the Project work will be the 20% of it.
The written exam will be pass if the student reach at least 18 points over 30. In the Project work, the ability to identify a scientific hypothesis and the appropriate statistical method, and the ability to synthesize and present data and results, will be evaluated.

**Required readings**
Teacher's slides in the electronic reserve collection.
Heumann, Christian/ Schomaker, Michael/ Srivastava,
**Supplementary readings**


- James, Witten, Hastie, Tibshirani. *An Introduction to Statistical Learning with Applications in R*, Springer 2013, freely available at [http://www-bcf.usc.edu/~gareth/ISL/index.html](http://www-bcf.usc.edu/~gareth/ISL/index.html)