1. Basic description

Name of the course: Biostatistics and Data Analysis
Module: Mathematics and Statistics

Academic year: 2018-2019
Year: 2018
Term: Second
Degree / Course: First
Code: 51205
Number of credits: 4
Total number of hours committed: 200
Teaching language: English
Lecturer: Hafid Laayouni, Antonio Monleon.
Timetable: See official calendar

2. Presentation of the course

Biostatistics and Data Analysis provides an introduction to selected important topics in biostatistical concepts and reasoning. This course represents an introduction to the field and provides a survey of data and data types. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and statistical hypothesis testing; issues of power and sample size in study designs. The course will familiarize the students with the use of the R statistical package and give them the skills needed for effective data management, data manipulation, and data analysis at a basic level.
3. Competences to be worked in the course

I. General competences

- CB2. That the students know how to apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through devising and defending arguments and solving problems within their field of study.

- CB4. That the students can convey information, ideas, problems and solutions to both specialist and non-specialist audiences.

- CB5. That the students have developed those skills needed to undertake further studies with a high degree of autonomy.

- CG1. That the students will acquire an intra- and interdisciplinary training in both computational and scientific subjects with a solid basic training in biology.

II. Specific competences

CE2. To manage and exploit all kinds of biological and biomedical information to transform it into knowledge.

CE9. To apply statistical and computational methods to solve problems in the fields of molecular biology, genomics and medical research and population genetics.

Learning outcomes

RA2.1. Visualize, manipulate and extract biological data.

RA5.2. Apply mathematical and statistical treatment to large amounts of biological data.

RA8.2. Quote valid sources of scientific information to support the state of the arts of a bioinformatic problem.

RA9.1. Identify and use appropriate statistical methods to each type of data.

4. Contents

Hypothesis testing and student t test. (3h)
Relationships in categorical data, contingency tables. The chi-square goodness-of-fit test. (1h)
Analysis of variance. One-way ANOVA, multiple comparison procedures (4h)
Two-way ANOVA. (2h)
Correlation and regression. Descriptive and inferential aspects of correlation and simple linear regression. (3h)
Multiple regression analysis and Partial Correlation (2h)
Analysis of Covariance (2h)
Effect Size and a summary of inference methods. (2h)
Nonparametric Statistics (1h)
5. Assessment

The competencies of this subject will be evaluated by continuous assessment, including written, practical examinations and individual work.

Theory

Evaluation by several partial tests and a final exam. The partial tests weigh 40% - 60% and the final exam weighs 40% - 60%. The remake exam is aimed at students who have not passed the final. Student must score 4 or more in the final exam to calculate the final grade based on partial and final exams.

Hands On: the evaluation of this section is carried out by a practical test at the computer lab in one to two hour session. In this exam session, the student must use the appropriate statistical program, enter the data of a study, propose an analysis of it and answer specific questions. The weight of this test is about 10% to 30% of the final grade of the course.

The average grade for the course is calculated by weighting coefficients for each section (theory and practices).

It is necessary to obtain a final grade equal to or greater than 5 to pass the subject.

Students who repeat the course must carry out all assessment activities including delivery of problems and evaluation of the practical test.

Copy in any exam or plagiarism in the essay implies failing the course.

Remake exam will take place according to the schedule fixed by the Degree Coordination. Failure to attend this exam implies student will keep his initial score.

All assessment and exercises to deliver are individual work, that is, you must do it on your own. Disciplinary action will be taken against students who breach guidelines (eg colluding with other students or copying other students work).

<table>
<thead>
<tr>
<th>Assessment elements</th>
<th>Time period</th>
<th>Type of assessment</th>
<th>Assessment agent</th>
<th>Type of activity</th>
<th>Grouping</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery of practical works</td>
<td>After each practical session</td>
<td>x</td>
<td>x</td>
<td>Lecturer</td>
<td>Self-assess</td>
<td>Co-assess</td>
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<tr>
<td>Practical exam</td>
<td>By the end of practical sessions</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Pursuit and synthesis</td>
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<td>Partial exams</td>
<td>Exam schedule</td>
<td>x</td>
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<td>Final exam</td>
<td>Exam schedule</td>
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6. Bibliography and teaching resources

- Basic bibliography
  

- Supplementary bibliography
  

- Teaching resources
  
  - http://onlinestatbook.com/
  - http://www.biostathandbook.com/

7. Methodology

It is strongly recommended that students follow the work plan outlaid in section 8 of this document. Work is divided into 3 types of activities: those developed in class (plenary, seminar and practical sessions), directed work (assignments) and autonomous work.

Class sessions (40 hours)

a) Plenary lessons: sessions where the teacher introduces and explains the course contents defined in the previous section. These sessions include definitions, introduction to the most relevant methodologies and examples of each model.

b) Seminar sessions: In the seminar sessions will take place control tests on the exercise lists. Correction of lists of exercises. Discussion of results and explanation. It is extremely important that student do the exercises before correction. Delivery of exercises (when asked for) is mandatory and will score 0 if exercises are not delivered on time without a justified cause.

c) Practical sessions

Hands on session will take place in parallel with theory and seminar sessions. Goal is to acquire skills using appropriate software and to get familiar with the practice of statistical analysis. R software will be used in this part.
La còpia i/o plagi total o parcial als treballs i/o exàmens comportarà suspendre l'assignatura amb una qualificació de zero sense dret a recuperació, sense perjudici de l'aplicació de les altres sancions previstes al Reglament de Règim disciplinari dels estudiants de la Universitat Pompeu Fabra en funció de la gravetat de la infracció.

La copia y/o plagio total o parcial en los Trabajos y/o exámenes comportará suspender la asignatura con una calificación de cero sin derecho a recuperación, sin perjuicio de la aplicación de las otras sanciones previstas en el Reglamento de Régimen disciplinario de los estudiantes de la Universitat Pompeu Fabra en función de la gravedad de la infracción.

Total or partial copy and/or plagiarism will imply a failure in the subject with a final grade of zero points and no access to the make-up exam. According to the academic regulations specified in the Disciplinary rules for students of Universitat Pompeu Fabra, other additional sanctions may apply depending on the seriousness of the offence.