Course guides
200650 - EPIGEN - Genetic Epidemiology

Unit in charge: School of Mathematics and Statistics
Teaching unit: 1004 - UB - (ENG)Universitat de Barcelona.
Degree: MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Optional subject).
Academic year: 2021 ECTS Credits: 5.0 Languages: English

LECTURER

Coordinating lecturer: JOSEP LLUÍS CARRASCO JORDAN
Others:
Segon quadrimestre: JOSEP LLUÍS CARRASCO JORDAN - A
GUÍLLEM CLOT RAZQUIN - A
CRISTINA LÓPEZ GONZÁLEZ - A

PRIOR SKILLS

Knowledge of basic statistical inference and generalized linear regression models.
Basic knowledge of the use of the R analysis program.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
MESIO-CE1. CE-1. Ability to design and manage the collection of information and coding, handling, storing and processing it.
MESIO-CE2. CE-2. Ability to master the proper terminology in a field that is necessary to apply statistical or operations research models and methods to solve real problems.
MESIO-CE3. CE-3. Ability to formulate, analyze and validate models applicable to practical problems. Ability to select the method and / or statistical or operations research technique more appropriate to apply this model to the situation or problem.
MESIO-CE4. CE-4. Ability to use different inference procedures to answer questions, identifying the properties of different estimation methods and their advantages and disadvantages, tailored to a specific situation and a specific context.
MESIO-CE5. CE-5. Ability to formulate and solve real problems of decision-making in different application areas being able to choose the statistical method and the optimization algorithm more suitable in every occasion.
Translate to english
MESIO-CE6. CE-6. Ability to use appropriate software to perform the necessary calculations in solving a problem.

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
TEACHING METHODOLOGY

There will be sessions where the main concepts of each topic will be explained, which will be illustrated with examples of real data. Additionally, the student will have material with which he will be able to complement the concepts treated in the theoretical classes.

LEARNING OBJECTIVES OF THE SUBJECT

- Knowledge of the type of inheritance, susceptibility and linkage disequilibrium to be able to choose the most appropriate analyzes to develop epidemiological studies.
- Knowledge of statistical analysis techniques to investigate the relationships between genes and diseases.
- Knowledge of statistical analysis techniques to calculate the influence of the environment and the gene-gene association.
- Treatment of data with appropriate structure to be used depending on the type of study. Elaboration of genealogical trees.
- Knowledge of statistical methods of analysis of genetic data.
- Use of the necessary software to carry out the appropriate statistical analyzes

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

1. Introduction to genetic epidemiology
   Description: Basic nomenclature. Types of study design. Inheritance models. Hardy-Weinberg equilibrium. Linkage disequilibrium
   Full-or-part-time: 30h
   Theory classes: 30h

2. Familial aggregation studies
   Description: Case-control studies. Twin studies. Family designs. Variance components.
   Full-or-part-time: 20h
   Theory classes: 20h

3. Segregation studies
   Description: Inheritance patterns. Maximum likelihood approach. Inheritance models.
   Full-or-part-time: 20h
   Theory classes: 20h
4. Linkage studies

**Description:**
Model based linkage analysis. Non parametric and model free linkage analysis

**Full-or-part-time:** 20h  
Theory classes: 20h

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5. Association studies

**Description:**

**Full-or-part-time:** 35h  
Theory classes: 35h

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**GRADING SYSTEM**

At the end of each subject’s block the students will have to solve some exercises, which will have to be delivered in a determinate term that will be announced during the course.

The exercises will be scored between 0 and 10, and the average of these grades (NE) will be the grade of the subject. Additionally, an optional test will be scheduled for those students who wish to modify the grade NE. The grade for this test (NP) will be between 0 and 10.

The final grade of the course will be calculated as the maximum of NE and NP. The subject is considered passed if the final grade is higher than 5.

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**BIBLIOGRAPHY**

**Basic:**