Course guide
200161 - MD - Discrete Mathematics

Unit in charge: School of Mathematics and Statistics
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR’S DEGREE IN MATHEMATICS (Syllabus 2009). (Compulsory subject).

Academic year: 2023  ECTS Credits: 7.5  Languages: Catalan

LECTURER

Coordinating lecturer: JUAN JOSÉ RUE PERNA

Others:
Segon quadrimestre:
GUILLEM PERARNAU LLOBET - M-A, M-B
JUAN JOSÉ RUE PERNA - M-A, M-B
LLUIS VENA CROS - M-A, M-B

PRIOR SKILLS

The student must have acquired the contents of the first term degree in mathematics.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE-2. Solve problems in Mathematics, through basic calculation skills, taking into account tools availability and the constraints of time and resources.
2. CE-3. Have the knowledge of specific programming languages and software.
3. CE-4. Have the ability to use computational tools as an aid to mathematical processes.

Generical:
4. CB-1. Demonstrate knowledge and understanding in Mathematics that is founded upon and extends that typically associated with Bachelor’s level, and that provides a basis for originality in developing and applying ideas, often within a research context.
5. CB-2. Know how to apply their mathematical knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader or multidisciplinary contexts related to Mathematics.
6. CB-3. Have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements.
7. CG-1. Show knowledge and proficiency in the use of mathematical language.
8. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
9. CG-3. Have the ability to define new mathematical objects in terms of others already know and ability to use these objects in different contexts.
10. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
12. CG-6 Detect deficiencies in their own knowledge and pass them through critical reflection and choice of the best action to extend this knowledge.

Transversal:
11. SELF-DIRECTED LEARNING. Detecting gaps in one’s knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one’s knowledge.

TEACHING METHODOLOGY

(Section not available)
LEARNING OBJECTIVES OF THE SUBJECT

(Section not available)

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>7,5</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>105,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>16.00</td>
</tr>
</tbody>
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Total learning time: 187.5 h

CONTENTS

1. Combinatorics enumerativa

Description:
1.1 Enumerative Combinatorics

1.2 Recursions and Generating Functions
Solving recursions by induction and expansion. Sequences, formal power series and generating functions. Linear recurrence relations. Partitions and generating functions. Catalan numbers and bijections.

Full-or-part-time: 72h
Theory classes: 15h
Practical classes: 11h
Self study: 46h

2. Discrete Probability

Description:

Full-or-part-time: 25h
Theory classes: 6h
Practical classes: 4h
Self study: 15h
3. Graph Theory

**Description:**

3.1 Graphs

3.2 Trees

3.3 Eulerian and Hamiltonian Graphs

3.4 Matchings, Colorings and Planarity
Matchings. Matchings in bipartite graphs. Graph coloring. Chromatic number.

**Full-or-part-time:** 64h
Theory classes: 16h
Practical classes: 10h
Self study: 38h

**GRADING SYSTEM**

Problem assignment/activities (PR, 10%), exam midterm (EP, 30%) and final exam (EF, 60%). The grade of the final exam will be considered if it is larger than the average of the course (see the following formula). The maximum of all possibilities will be considered:

\[ \text{MAX (EF, 0.7*EF+0.3*EP, 0.9*EF+0.1*PR, 0.6*EF+0.3*EP+0.1*PR)} \]

Additionally, there will be an extraordinary exam during july for students who fail the course. In this case the continuous evaluation will be not considered.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**
- Mitzenmacher, M.; Upfal, E. Probability and computing: randomized algorithms and probabilistic analysis. Cambridge: Cambridge...