200121 - TOP - Topology

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2018
Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 7,5
Teaching languages: Catalan

Teaching staff

Coordinator: PEDRO PASCUAL GAINZA

Others: Segon quadrimestre:
JOSE BURILLO PUIG - A, B
ANNA DE MIER VINUÉ - A, B
JOSEP ELGUETA MONTO - CFIS
PEDRO PASCUAL GAINZA - A, B, CFIS

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.
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Teaching methodology

(Section not available)

Learning objectives of the subject

(Section not available)

Study load

<table>
<thead>
<tr>
<th>Total learning time: 187h 30m</th>
<th>Hours large group: 45h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td>Hours small group: 30h</td>
<td>16.00%</td>
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<tr>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td>Self study: 112h 30m</td>
<td>60.00%</td>
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</tbody>
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## Content

<table>
<thead>
<tr>
<th>Metric spaces</th>
<th>Learning time: 10h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
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<tr>
<td></td>
<td>Self study : 5h</td>
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</tbody>
</table>

**Description:**
Open and closed balls. Open sets. Continuous applications. Equivalent distances.

<table>
<thead>
<tr>
<th>Topological spaces</th>
<th>Learning time: 24h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 5h</td>
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<tr>
<td></td>
<td>Self study : 12h</td>
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</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Building topological spaces</th>
<th>Learning time: 24h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Practical classes: 5h</td>
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<tr>
<td></td>
<td>Self study : 12h</td>
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**Description:**

<table>
<thead>
<tr>
<th>Compactness</th>
<th>Learning time: 14h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 7h</td>
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</tbody>
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**Description:**
### Connectedness

**Learning time:** 14h

- Theory classes: 4h
- Practical classes: 3h
- Self study: 7h

**Description:**

### Introduction to homotopy

**Learning time:** 20h

- Theory classes: 6h
- Practical classes: 4h
- Self study: 10h

**Description:**
Introduction to the homotopy of continuous maps. Contractile spaces. Deformation retracts. The set of homotopic classes \([X,Y]\). The abelian group \([S^1,S^1]\): degree of a map.

### Applications to plane topology

**Learning time:** 22h

- Theory classes: 7h
- Practical classes: 4h
- Self study: 11h

**Description:**

### Compact surfaces classification

**Learning time:** 22h

- Theory classes: 7h
- Practical classes: 4h
- Self study: 11h

**Description:**
Homework.

Not eliminatory midterm exam.

Final exam including a theory question and some problems.

The final mark is the result of the maximum between the final exam mark and the midterm exam mark (weighted 25% and homework weighted 10%).

An extra exam will take place on July for students that failed during the regular semester.

**Bibliography**

**Basic:**


**Complementary:**