34957 - GT - Graph Theory

**Degree competences to which the subject contributes**

**Specific:**
1. **RESEARCH.** Read and understand advanced mathematical papers. Use mathematical research techniques to produce and transmit new results.
2. **CALCULUS.** Obtain (exact or approximate) solutions for these models with the available resources, including computational means.
3. **CRITICAL ASSESSMENT.** Discuss the validity, scope and relevance of these solutions; present results and defend conclusions.

**Transversal:**
4. **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.
5. **EFFICIENT ORAL AND WRITTEN COMMUNICATION.** Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
6. **THIRD LANGUAGE.** Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
7. **TEAMWORK.** Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
8. **EFFECTIVE USE OF INFORMATION RESOURCES.** Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

**Teaching methodology**

Sessions of presentation of material alternate with sessions with student presentations of problems and specific topics. The active participation of students is a requirement for the evaluation of the course.

**Learning objectives of the subject**

Application of spectral techniques to the study of graphs.

**Prior skills**

Elementary Calculus and Linear Algebra; basic notions and abilities in combinatorics and probability.

**Teaching staff**

**Coordinator:** ORIOL SERRA ALBO

**Others:** Primer quadrimestre:
  - ANNA LLADO SANCHEZ - A
  - ORIOL SERRA ALBO - A
34957 - GT - Graph Theory

Application of the probabilistic method.
Properties of almost all graphs.
Properties of Cayley and vertex symmetric graphs.
Graphs on surfaces.
Minors.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 187h 30m</th>
<th>Hours large group:</th>
<th>60h</th>
<th>32.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study:</td>
<td>127h 30m</td>
<td></td>
<td>68.00%</td>
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### Content

| **Spectral techniques in Graph Theory** | **Learning time:** 1h  
  **Theory classes:** 1h |
<table>
<thead>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
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</tbody>
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| **Symmetries in graphs**               | **Learning time:** 1h  
  **Theory classes:** 1h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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| **Minors and treewidth**               |                      |
| **Degree competences to which the content contributes:** | |

| **Graphs on surfaces**                 |                      |
| **Degree competences to which the content contributes:** | |

| **Graph homomorphisms**                |                      |
| **Degree competences to which the content contributes:** | |

| **Random graphs**                      |                      |
| **Degree competences to which the content contributes:** | |
The evaluation of the course is based on the weekly work on problems proposed in the presentation sessions. There will be a final comprehensive exam based on the problem sessions during the course.

**Qualification system**

The active participation in the course is a requirement for the evaluation of the final exam.

**Bibliography**

**Basic:**


