### 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.
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.

#### Transversal:

- **PREVIOUS KNOWLEDGE:** Elementary Calculus and Linear Algebra; basic notions and abilities in combinatorics and probability.
- **PREVIOUS SKILLS:**
  - Elementary Calculus and Linear Algebra; basic notions and abilities in combinatorics and probability.

### Learning objectives of the subject

Application of spectral techniques to the study of graphs.
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></th>
<th>Hours large group:</th>
<th>Self study:</th>
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</thead>
<tbody>
<tr>
<td>Total learning time:</td>
<td>187h 30m</td>
<td>60h</td>
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<td></td>
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<td>127h 30m</td>
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<td>68.00%</td>
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</tbody>
</table>
### Spectral techniques in Graph Theory

**Description:**

**Specific objectives:**

**Learning time:** 1h
**Theory classes:** 1h

### Symmetries in graphs

**Learning time:** 1h
**Theory classes:** 1h

### 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:**