200005 - GAE - Affine and Euclidean Geometry

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 7.5  Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: MIGUEL ANGEL BARJA YAÑEZ
Others: Segon quadriimestre:
        MIGUEL ANGEL BARJA YAÑEZ - M-A, M-B
        JESUS FERNANDEZ SANCHEZ - M-A
        MARINA GARROTE LOPEZ - M-A, M-B
        LÁZARO ALBERTO LARRAURI BORROTO - M-A, M-B
        ANA RIO DOVAL - M-B

Degree competences to which the subject contributes

Specific:
1. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in 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.

General:
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.
200005 - GAE - Affine and Euclidean Geometry

**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:</th>
<th>45h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
<td>30h</td>
<td></td>
<td>16.00%</td>
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<tr>
<td>Guided activities:</td>
<td>7h 30m</td>
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<td>4.00%</td>
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<tr>
<td>Self study:</td>
<td>105h</td>
<td></td>
<td>56.00%</td>
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# 200005 - GAE - Affine and Euclidean Geometry

<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time: 25h</th>
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<tbody>
<tr>
<td><strong>1. AFFINE SPACE</strong></td>
<td>Theory classes: 9h&lt;br&gt;Practical classes: 6h&lt;br&gt;Self study: 10h</td>
</tr>
</tbody>
</table>

**Description:**<br>Affine space, linear varieties, relative positions. Cartesian and baricentric coordinate systems. Simple ratio. Theorems of Thales, Ceva, Menelao and Desargues.

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<tr>
<th>Content</th>
<th>Learning time: 29h 20m</th>
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</thead>
<tbody>
<tr>
<td><strong>2. AFFINE MAPS</strong></td>
<td>Theory classes: 9h&lt;br&gt;Practical classes: 7h&lt;br&gt;Self study: 13h 20m</td>
</tr>
</tbody>
</table>

**Description:**<br>Affine maps. Basic properties. The central theorem of affine geometry. Invariant varieties. Families of affine maps: translations, dilatations, projections and symmetries. Classification of affine maps in dimensions 1 and 2.

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<th>Content</th>
<th>Learning time: 22h 50m</th>
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<tbody>
<tr>
<td><strong>3. EUCLIDEAN GEOMETRY</strong></td>
<td>Theory classes: 6h&lt;br&gt;Practical classes: 3h 30m&lt;br&gt;Self study: 13h 20m</td>
</tr>
</tbody>
</table>

**Description:**<br>Euclidean space, metrics. Distances, area, angles and volumes. Orthogonality and orthogonal projection. Oriented angles. Cross product. Some classic theorems of plane geometry.

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<th>Content</th>
<th>Learning time: 16h</th>
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<tr>
<td><strong>4. MOVMENTS</strong></td>
<td>Theory classes: 10h&lt;br&gt;Practical classes: 5h&lt;br&gt;Self study: 1h</td>
</tr>
</tbody>
</table>

**Description:**<br>Isometries and movements. Study and classification of movements in dimension 1, 2 and 3.
A continuous assessment (CA) is proposed based on solving exercises and the active participation in problem resolution classes. There will be a Midterm exam (ME).

The final exam (FE) will consist of one part containing problems and a final theoretical part.

The final mark (FM) will result from: \( FM = \max \{0.1 \text{ CA} + 0.2 \text{ ME} + 0.7 \text{ FE}; 0.2 \text{ MEP} + 0.8 \text{ FE}; \text{ FE} \} \)

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

### Bibliography

**Basic:**


Berger, M. Geometry (vol.1; vol.2) [on line]. Berlin: Springer Verlag, 1987 Available on: <http://www.springerlink.com/content/978-3-540-11658-5/ (v. 1)  http://www.springerlink.com/content/978-3-540-17015-0/ (v. 2)>. ISBN 3540116583.


**Complementary:**


**Others resources:**

### 5. CONICS AND QUADRICS

Learning time: 27h 20m

<table>
<thead>
<tr>
<th>Theory classes: 8h</th>
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<tr>
<td>Practical classes: 6h</td>
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<tr>
<td>Self study : 13h 20m</td>
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**Description:**

Adapted coordinate systems. Relevant points and lines. Affine and metric classifications. Detailed study of non-degenerated conics and quadrics. Polarity. Study of affine and metric properties.