200021 - FIS - Physics

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
749 - MAT - Department of Mathematics
748 - FIS - Department of Physics

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: NARCISO ROMAN ROY

Others: Segon quadrimestre:
JOSEP ELGUETA MONTO - M-A
NARCISO ROMAN ROY - M-A

Opening hours

Timetable: Will be fixed the day of the first lecture.

Prior skills

Single and multiple variable calculus: derivation and integration. Vector analysis.

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.

General:
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.

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

The teaching activity is divided into three hours of theory (description and development of the topics presented in the syllabus) and two hours devoted to solving exercises as direct applications of the theory. Students will have access to resumés of each topic and a collection of related exercises that will be available in the web.

Learning objectives of the subject

Knowledge of: Newton’s Laws, dynamics of particle systems, kinematic and dynamics of accelerated systems
Understand the concepts of work and energy
Understand the conservation laws.
Basic knowledge on the gravitational field.
Basic knowledge on electric and magnetic fields.

Study load

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

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **1. Dynamics of a particle. Newton Laws. Work and Energy.** | **37h 30m** | - Theory classes: 9h  
- Practical classes: 6h  
- Self study: 22h 30m |
| **2. Changes of reference systems.** | **12h 30m** | - Theory classes: 3h  
- Practical classes: 2h  
- Self study: 7h 30m |
| **Description:** | Galilean relativity. Motion equations in rotation reference systems. The Coriolis theorem. The second Newton's law in non-inertial reference systems. Vertical deviation and Foucault pendulum. |
| **3. Dynamic of a system of particles. Rigid Solid.** | **26h 30m** | - Theory classes: 5h 30m  
- Practical classes: 5h  
- Self study: 16h |
| **Description:** | Motion of the centre of mass. Conservation theorems: Linear momentum, angular momentum and energy. The two body problem. Rigid solid. Tensor of inertia. Dynamical equations. |
| **4. Gravity field** | **30h** | - Theory classes: 8h  
- Practical classes: 4h  
- Self study: 18h |
## 5. Electrostatics.

**Learning time:** 27h 30m  
- Theory classes: 6h  
- Practical classes: 5h  
- Self study: 16h 30m

**Description:**  
Electric charge and structure of matter. Coulomb law and electric field. Continuum charge distribution. Gauss law for the electric field. Electrostatic potential. Field lines and equipotential surfaces. Electrostatic energy and energy density of an electric field. Conductor in electrostatic equilibrium.

## 6. Electrokinetics.

**Learning time:** 17h 30m  
- Theory classes: 3h  
- Practical classes: 4h  
- Self study: 10h 30m

**Description:**  

## 7. Magnetostàtica

**Learning time:** 22h 30m  
- Theory classes: 5h  
- Practical classes: 4h  
- Self study: 13h 30m

**Description:**  
Lorentz force. Motion of charged particles in a magnetic field. Magnetic forces on an electric current. Magnetic field created by an electric current: Biot and Savart law. Field lines and magnetic flux. Gauss law of magnetism. Ampère law.

## 8. Time dependent fields. Maxwell Equations

**Learning time:** 13h 30m  
- Theory classes: 3h 30m  
- Practical classes: 2h  
- Self study: 8h

**Description:**  
Faraday-Lenz law. Motion-Induced electromotive force. Maxwell equations.
Qualification system

The subject is assessed by means of a midterm exam (P) and a final exam. The final exam can either embrace all the content covered throughout the term (F) or only the Electromagnetism (E). The final mark will be obtained as max \(\frac{1}{2}(P+E), F\). An extra exam will take place on July for students that failed during the regular semester.

Bibliography

Basic:


Complementary: