

## 220009 - Physics II

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|---------------------|---|
| Coordinating unit:  | 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering  |
| Teaching unit:      | 748 - FIS - Department of Physics   |
| Academic year:      | 2019  |
| Degree:             | BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)<br>BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) |
| ECTS credits:       | 6   |
| Teaching languages: | Catalan   |

### Teaching staff

|              |  |
|--------------|--|
| Coordinator: | Carles Serrat Jurado   |
| Others:      | CRINA MARIA COJOCARU - CRISTINA MASOLLER - JAUME CALAF ZAYAS |

### Degree competences to which the subject contributes

#### Specific:

1. Understanding and mastery of basic concepts about the general laws of mechanics, thermodynamics and electromagnetism fields and waves and their application to solving problems in engineering.

### Teaching methodology

The directed learning consists of several processes. At first, it is necessary to consider the theory classes which develop in a big group. The teaching staffs introduce, in a brief way, general objectives of the chapter. Later, it is attempted to involve students with exercises for their active participation. The material of this part is in ATENEA: objectives, concepts, examples, evaluated programmed activities and bibliography. In second place, resolution of exercises, which develop in medium groups, are carried out. People work in reduced groups doing problems and exercises related with the objectives of the subject. This is an opportunity to develop transversal competences of work in team and to introduce, for the first time, concepts of cooperative learning. In last place, laboratory practices allow to develop basic concepts of methodology, objectives, experimental material, results and conclusions. Also it is a way to know the scientific method for the resolution of technological challenges. These practices are made in groups small, teams of two persons. Students have to prepare some part of work out of the laboratory classroom. This work could be individual or in group. Finally, it is necessary to stand out a time dedicated to autonomous learning dedicated to recommended readings and exercises proposed.

### Learning objectives of the subject

If the Physics I course provides an understanding and domain of basic principles of Physics in its Mechanics aspect, the Physics II course will extend this domain to Oscillations, Waves and Thermodynamics.

On overcoming the subject, students will have acquired:

Understanding and mastery of kinematics and dynamics of the oscillations of particles as well as of solids.

Understanding and mastery of wave phenomena.

Understanding and mastery of the concepts of Temperature and Heat, and their applications in Thermodynamics.



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### Study load

|                           |                     |     |        |
|---------------------------|---------------------|-----|--------|
| Total learning time: 150h | Hours large group:  | 32h | 21.33% |
|                           | Hours medium group: | 14h | 9.33%  |
|                           | Hours small group:  | 14h | 9.33%  |
|                           | Self study:         | 90h | 60.00% |

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### Content

|   |   |
|---|---|
| <p>1. Oscillations</p>  | <p>Learning time: 44h<br/>Theory classes: 10h<br/>Practical classes: 4h<br/>Laboratory classes: 4h<br/>Self study : 26h</p> |
| <p>Description:<br/>Simple harmonic motion (SHM). Examples.<br/>Damped oscillations.<br/>Forced oscillations.<br/>Superposition of SHMs.</p> <p>Related activities:<br/>(ENG) 1,2,3,4,6,7,8</p>                           |   |
| <p>2. Waves</p>   | <p>Learning time: 71h<br/>Theory classes: 14h<br/>Practical classes: 7h<br/>Laboratory classes: 6h<br/>Self study : 44h</p> |
| <p>Description:<br/>General introduction to wave motion.<br/>Physical description of some waves.<br/>Wave propagation.<br/>Superposition of waves.<br/>Acústica.</p> <p>Related activities:<br/>(ENG) 1,2,3,4,5,6,7,8</p> |   |
| <p>3. Thermodynamics</p>  | <p>Learning time: 35h<br/>Theory classes: 8h<br/>Practical classes: 3h<br/>Laboratory classes: 4h<br/>Self study : 20h</p>  |
| <p>Description:<br/>Temperature.<br/>Heat and changes of phase (or state).<br/>First law of Thermodynamics.<br/>Second law of Thermodynamics.</p> <p>Related activities:<br/>(ENG) 1,2,3,5,6,7,8</p>                      |   |

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### Planning of activities

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|--|--|
| ACTIVITY 1: THEORY SESSIONS            | Hours: 78h<br>Theory classes: 28h<br>Self study: 50h     |
| ACTIVITY 2: PRACTICAL SESSIONS         | Hours: 37h<br>Self study: 23h<br>Practical classes: 14h  |
| ACTIVITY 3: LABORATORY                 | Hours: 26h<br>Laboratory classes: 12h<br>Self study: 14h |
| ACTIVITY 4: FIRST EVALUATION TEST      | Hours: 2h<br>Theory classes: 2h                          |
| ACTIVITY 5: SECOND EVALUATION TEST     | Hours: 2h<br>Theory classes: 2h                          |
| ACTIVITY 6: LABORATORY EVALUATION TEST | Hours: 2h<br>Laboratory classes: 2h                      |
| ACTIVITY 7: ATENEA EVALUATION TEST     | Hours: 3h<br>Self study: 3h                              |
| ACTIVITY 8: DELIVERING WORKS           | Hours: 8h<br>Self study: 8h                              |

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### Qualification system

The final grade is the weighted sum of the various grades.

- If the final exam has chosen the modality of the Second Partial (explained in Activity 5):

$$\text{Final Grade} = 0.32 * N1A + 0.43 * N2A + 0.15 * NL + 0.10 * NAC$$

- If the final exam has chosen the modality of the Global Exam (explained in Activity 5):

-If the Global Examination grade, NEG, is greater than the grade of the First Partial, N1A:

$$\text{Final Grade} = 0.32 * NEG + 0.43 * NEG + 0.15 * NL + 0.10 * NAC$$

-If the Global Examination grade, NEG, is smaller than the grade of the First Partial, N1A:

$$\text{Final Grade} = 0.32 * N1A + 0.43 * NEG + 0.15 * NL + 0.10 * NAC$$

N1A: First Partial score (activity 4)

N2A: Second Partial score (activity 5);

NEG: Global Exam grade (activity 5);

NL: grade of the laboratory (activity 6);

NAC: continuous evaluation grade (activity 7);

### Regulations for carrying out activities

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### Bibliography

#### Basic:

Calaf, Jaume. Oscil·lacions: teoria i problemes [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 07/07/2017]. Available on: <<http://hdl.handle.net/2099.3/36604>>. ISBN 9788476539101.

Tipler, Paul Allen [et al.]. Física para la ciencia y la tecnología, vol. 1B, Oscilaciones y ondas [on line]. Barcelona: Reverté, 2005 [Consultation: 03/10/2018]. Available on: <[http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6536](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6536)>. ISBN 8429144021.

Tipler, Paul Allen [et al.]. Física para la ciencia y la tecnología, vol. 1C, Termodinámica [on line]. Barcelona: Reverté, 2005 [Consultation: 03/10/2018]. Available on: <[http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6536](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6536)>. ISBN 842914403X.

#### Complementary:

Serway, Raymond A [et al.]. Física. 3a ed. Madrid: International Thomson, 2003. ISBN 8497321685.

#### Others resources:

##### Hyperlink

Apunts de l'assignatura a Atenea  
<http://atenea.upc.edu/moodle>

Controls i notes en Aransa  
<http://aransa.upc.es>

Física con ordenador (Ángel Franco García)  
<http://www.ehu.es>