

# Course guide 330052 - F1 - Physics I

Last modified: 22/05/2024 Unit in charge: Manresa School of Engineering 750 - EMIT - Department of Mining, Industrial and ICT Engineering. **Teaching unit:** BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject). Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject). BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject). BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject). BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2016). (Compulsory subject). BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2016). (Compulsory subject). BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2016). (Compulsory subject). BACHELOR'S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Compulsory subject). ECTS Credits: 6.0 Academic year: 2024 Languages: Catalan

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LECTURER
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Coordinating lecturer:	LAURA CONANGLA TRIVIÑO
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# DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

#### Specific:

1. Understanding and mastery of the fundamental concepts on the general laws of mechanics, thermodynamics, and their application for solving problems of engineering.

## Transversal:

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

3. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

# **TEACHING METHODOLOGY**

The subject consists of two hours a week of face-to-face lessons in the classroom (large group) and two hours a week in a small group in which applied aspects are worked on. Small-group classes will be held in the physics laboratory or the classroom.



# LEARNING OBJECTIVES OF THE SUBJECT

On completion of the subject, students must be able to:

- Understand and use the basic principles of the mechanics of a particle and a system of particles, and mechanical equilibrium.
- Understand the fundamental principles of thermodynamics and relate them to their practical applications.
- Handle laboratory instruments, collect data correctly, process these data and draw up a report.

# **STUDY LOAD**

Туре	Hours	Percentage
Self study	90,0	60.00
Hours small group	30,0	20.00
Hours large group	30,0	20.00

#### Total learning time: 150 h

## CONTENTS

#### **1. MAGNITUDES AND MEASUREMENTS**

#### **Description:**

Scalar and vectorial magnitudes. Measurements and significant figures. Error and uncertainty. Graphs.

## **Related activities:**

Activity 1, a series of exercises on data processing.

# Full-or-part-time: 17h

Theory classes: 3h Laboratory classes: 4h Self study : 10h

# 2. MECHANICS OF A PARTICLE

## **Description:** Kinematics and dynamics of a particle. Work and energy.

#### **Related activities:**

Activity 2: Laboratory practical Activity 5: Continuous assessment test Activity 8: Deliverables Activity 9: Final exam

# Full-or-part-time: 38h Theory classes: 8h Laboratory classes: 7h Self study : 23h



## **3. MECHANICS OF A SYSTEM OF PARTICLES**

## **Description:**

System of particles and conservation of linear momentum. Rotation of rigid solids. Static equilibrium of rigid bodies. Elastic properties of solids.

## **Related activities:**

Activity 3. Laboratory practical Activity 6: Continuous assessment test Activity 8: Deliverables Activity 9: Final exam

## Full-or-part-time: 40h

Theory classes: 8h Laboratory classes: 8h Self study : 24h

## 4. THERMODYNAMICS

## **Description:**

Temperature. First principle of thermodynamics. Second principle of thermodynamics.

## **Related activities:**

Activity 4: Laboratory practicals Activity 7: Continuous assessment test Activity 8: Deliverables Activity 9: Final exam

**Full-or-part-time:** 55h Theory classes: 11h Laboratory classes: 11h Self study : 33h



# ACTIVITIES

## **1. DATA PROCESSING (TOPIC 1)**

## **Description:**

A series of exercises on data processing

## **Specific objectives:**

On completion of the activity, students must be able to: Write correctly any measurement taken in the laboratory and take into account that errors in the measuring process are inevitable and that they create uncertainty in the result of the measurement. Represent experimental data graphically and describe the relationship between the quantities represented.

## Material:

Practicals book (available on the ATENEA digital campus) Web page: https://fisicalaboratori.epsem.upc.edu/ Exercises

#### **Delivery:**

Exercises must be handed in to the professor. They are corrected and returned. Feedback is given in the next lesson. They make up 20% of the laboratory mark.

## Full-or-part-time: 8h

Laboratory classes: 4h Self study: 4h

# 2. LABORATORY PRACTICAL: MECHANICS OF A PARTICLE (TOPIC 2)

#### **Description:**

Laboratory practical in pairs lasting two hours. Students read the script beforehand and then draw up a sheet in which they record the experimental data.

## Specific objectives:

On completion of the activity, students must be able to: Use the apparatus for the practical effectively. Interpret the physical phenomena involved in the practical.

## Material:

Practicals book (available on the ATENEA digital campus) Web page: https://fisicalaboratori.epsem.upc.edu/ All the materials needed for the practical.

#### **Delivery:**

Students draw up a report in pairs following the instructions given and they hand it in to the professor. The report is corrected and returned. Feedback is given in the next lesson. It makes up 20% of the laboratory mark.

**Full-or-part-time:** 5h Laboratory classes: 2h Self study: 3h



## 3. LABORATORY PRACTICAL: MECHANICS OF A SYSTEM OF PARTICLES (TOPIC 3)

## **Description:**

Laboratory practical in pairs lasting two hours. Students read the script beforehand and then draw up a sheet in which they record the experimental data.

### **Specific objectives:**

On completion of the activity, students must be able to: Use the apparatus for the practical effectively. Interpret the physical phenomena involved in the practical.

#### Material:

Practicals book (available on the ATENEA digital campus) Web page: https://fisicalaboratori.epsem.upc.edu/ All the materials needed for the practical.

#### **Delivery:**

Students draw up a report in pairs following the instructions given and they hand it in to the professor. The report is corrected and returned. Feedback is given in the next lesson. It makes up 20% of the laboratory mark.

## Full-or-part-time: 5h

Laboratory classes: 2h Self study: 3h

## 4. LABORATORY PRACTICAL: THERMODYNAMICS (TOPIC 4)

## **Description:**

Students carry out two practicals in pairs, in two 2-hour sessions.

### **Specific objectives:**

On completion of the activity, students must be able to: Use the apparatus for the practical effectively. Interpret the physical phenomena involved in the practical.

#### Material:

Practicals book (available on the ATENEA digital campus) Web page: https://fisicalaboratori.epsem.upc.edu/ All the materials needed for the practical.

#### **Delivery:**

Students draw up a report in pairs following the instructions given and they hand it in to the professor. The report is corrected and returned. Feedback is given in the next lesson. It makes up 40% of the laboratory mark.

**Full-or-part-time:** 10h Laboratory classes: 4h Self study: 6h



# 5. INDIVIDUAL CONTINUOUS ASSESSMENT TEST: MECHANICS OF A PARTICLE (TOPIC 2)

## **Description:**

Individual test in the classroom covering part of the theory on the mechanics of a particle and exercises and problems related to the learning objectives.

## Specific objectives:

On completion of the activity, students must be able to: Understand and use the basic principles of the mechanics of a particle.

#### Material:

Test paper and calculator

## **Delivery:**

The completed test It represents 22% of the final mark.

## Full-or-part-time: 7h

Theory classes: 2h Self study: 5h

# 6. INDIVIDUAL CONTINUOUS ASSESSMENT TEST: MECHANICS OF A SYSTEM OF PARTICLES (TOPIC 3)

## **Description:**

Individual test in the classroom covering part of the theory on the mechanics of a system of particles and exercises and problems related to the learning objectives.

## Specific objectives:

On completion of the activity, students must be able to: Understand and use the basic principles of the mechanics of a system of particles.

## Material:

Test paper and calculator

#### **Delivery:**

The completed test It represents 22% of the final mark.

#### Full-or-part-time: 7h

Theory classes: 2h Self study: 5h



# 7. INDIVIDUAL CONTINUOUS ASSESSMENT TEST: THERMODYNAMICS (TOPIC 4)

## **Description:**

Individual test in the classroom covering part of the theory on thermodynamics and exercises and problems related to the learning objectives.

## Specific objectives:

On completion of the activity, students must be able to: Understand and use the basic principles of thermodynamics.

#### Material:

Test paper and calculator.

## **Delivery:**

The completed test It represents 22% of the final mark.

### Full-or-part-time: 7h

Theory classes: 2h Self study: 5h

# 8. DELIVERABLES (TOPICS 2, 3 AND 4)

## **Description:**

A set of individual or group deliverables covering part of the theory of the subject and exercises and problems related to the learning objectives.

#### Specific objectives:

On completion of the activity, students must be able to: Understand and use the basic principles of the mechanics of a particle and a system of particles, and thermodynamics, work independently and in a team and communicate results effectively.

Material:

Instructions.

## **Delivery:**

Solution of the problems. 9% of the final mark.

Full-or-part-time: 13h Laboratory classes: 3h Self study: 10h



# 9. FINAL EXAM (TOPICS 2, 3 AND 4)

## **Description:**

Individual test in the classroom covering part of the theory of the subject and exercises and problems related to the learning objectives.

### **Specific objectives:**

On completion of the activity, students must be able to: Understand and use the basic principles of the mechanics of a particle and a system of particles, and thermodynamics.

Material: Exam paper and calculator.

**Delivery:** The completed exam 66% of the final mark

**Full-or-part-time:** 13h Theory classes: 3h Self study: 10h

# **GRADING SYSTEM**

Laboratory (activities 1, 2, 3 and 4) 25% of the final mark Test on the mechanics of a particle (Activity 5) 22% of the final mark Test on the mechanics of a system of particles (Activity 6) 22% of the final mark Test on thermodynamics (Activity 7) 22% of the final mark Deliverables (Activity 8) 9% of the final mark

Students who have not passed one of the three continuous assessment tests, it is recommended to recover the pending part in the final exam.

Final exam 66% of the final mark

## **EXAMINATION RULES.**

It is an essential condition to pass the course having carried out the laboratory practicals and having submitted the corresponding reports.



# BIBLIOGRAPHY

#### **Basic:**

- Bauer, W.; Westfall, G. D. Física para ingeniería y ciencias, Vol. 1 [on line]. 2ª ed. México: McGraw-Hill/Interamericana, 2014 [Consultation: 30/07/2020]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=5626. ISBN 9786071511911 (V. 1). - Moran, M. J.; Shapiro, H. N. Fundamentos de termodinámica técnica [on line]. 2ª ed. Barcelona: Reverté, 2004 [Consultation: 30/11/2021]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5635437. ISBN 8429143130. - Serway, R. A.; Jewett, J. W. Física: para ciencias e ingeniería. 7ª ed. Madrid: Cengage Learning, 2008. ISBN 9789706868220 (V. 1), 9789706868374 (V. 2). - Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, Vol. 1 [on line]. Barcelona: Reverté, 2010 [Consultation: 30/11/2021]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5758258. ISBN 9788429144321. - Walker, James S. Physics. 5th ed. Upper Saddle River: Pearson Prentice, 2017. ISBN 9780321976444. - Bauer, W; Westfall, Gary D; Bauer, W; Bauer, W. Física para ingeniería y ciencias, Vol. 2 [on line]. Segunda edición. México, D. F: Education, 2014 [Consultation: 03/06/2022]. McGraw-Hill Available on · https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=5627. ISBN 9786071511928, VOL. 2. - Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, Vol. 2 [on line]. Barcelona: Reverté, 2010 [Consultation: 10/06/2022].Available on:

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- Young, Hugh D.; Freedman, Roger A. Física universitaria con física moderna, Vol. 1 [on line]. México: Pearson Educación de México, S. A. de C. V, 2018 [Consultation: 08/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=8236. ISBN 9786073244398.

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#### **Complementary:**

- Abad, L.; Iglesias, L. M. Problemas resueltos de física general. 2ª ed. Madrid: Bellisco, 2006. ISBN 8496486273.

- Alcaraz, O.; López, J.; López, V. Física: problemas y ejercicios resueltos [on line]. Madrid: Pearson Educación, 2006 [Consultation: 02/06/2022]. A vailable on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=1249. ISBN

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- Conangla, L.; Ciriano, Y.; Ferreres, E.; Mercadé, J.. Pràctiques de física: graus EPSEM. Manresa: EPSEM, 2023.

## **RESOURCES**

**Other resources:** 

Web page <a href="https://fisicalaboratori.epsem.upc.edu/">https://fisicalaboratori.epsem.upc.edu/</a>