UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Course guide
330052 - F1 - Physics I

Last modified: 04/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
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 MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: LAURA CONANGLA TRIVIÑO

Others: Ciriano Nogales, Yolanda
Lladó Valero, Jordi
Miquel Grau, Ramon
Rota Font, Francesc
Temes Mendoza, David
Vallbe Mumbru, Marc
Vilanova Arnau, David

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

Type	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: http://www.epsem.upc.edu/~practiquesfisica
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: http://www.epsem.upc.edu/~practiquesfisica
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: http://www.epsem.upc.edu/~practiquesfisica
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: http://www.epsem.upc.edu/~practiquesfisica
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:

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- Bauer, W; Westfall, Gary D; Bauer, W; Bauer, W. Física para ingeniería y ciencias, Vol. 2 [on line]. Segunda edición. México, D. F: McGraw-Hill Education, 2014 [Consultation: 03/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5627. ISBN 9786071511928, VOL. 2.
- 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).
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- Walker, James S. Physics. 5th ed. Upper Saddle River: Pearson Prentice, 2017. ISBN 9780321976444.
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- Serway, R. A.; Jewett, J. W. Física: para ciencias e ingeniería. 7ª ed. Madrid: Cengage Learning, 2008. ISBN 9789706868220 (V. 1), 9789706868374 (V. 2).
- 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.
- Young, Hugh D.; Freedman, Roger A. Física universitaria con física moderna, Vol. 2 [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=8237. ISBN 9786073244404.

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]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1249. ISBN 8420544477.
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RESOURCES

Other resources:

Web page http://epsem.upc.edu/~practiquesfisica/