Course guide
804022 - FIS-M - Physics

Last modified: 18/03/2025

Unit in charge: Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre.

Degree: BACHELOR'S DEGREE IN MULTIMEDIA STUDIES (Syllabus 2009). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 9.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Sureda Anfres, Miquel

Others: Del Campo Sud, David

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. Be able to solve problems using various systems: analytical, numerical, computer simulation.
5. Learn to search for and verify information.
6. Understand the basic physical phenomena of multimedia and photographic technologies.
7. Understand and apply knowledge related to: the formation of images in capture instruments; lighting in real and virtual environments; the mechanisms that govern lighting and natural colours and the parameters that define it; architectural acoustics, ultrasound and underwater acoustics; the workings of screens and monitors.
8. Understand the basic operation of electrical and electronic circuits that make up audiovisual systems.

TEACHING METHODOLOGY

The two-hour sessions are generally divided into three different parts:
1. Resolution of doubts about the exercises proposed in previous sessions.
2. Explanatory session to acquire new knowledge.
3. Problem-solving practical session.
These ranges of activity are modulated according to the complexity of the exercises and the corresponding content.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student must be able to:
Understand the operation of basic technologies in Multimedia, Photography and Digital Creation, as well as the specific techniques of Mathematics and Programming that are needed to understand the concepts of physics.

STUDY LOAD

Type	Hours	Percentage
Self study	135,0	60.00
Hours medium group	90,0	40.00

Total learning time: 225 h

CONTENTS

INTRODUCTION TO PHYSICS

Description:
- Introduction and revision of fundamental concepts of physics and mathematics:
- Magnitude, units and dimensions, significant figures, scientific notation and orders of magnitude.
- Coordinate systems and relative position.
- Basic concepts in vector and differential calculus.

Related activities:
Theoretical introduction sessions, with practical exercises in the classroom.

Full-or-part-time: 27h 52m
Practical classes: 9h
Laboratory classes: 2h
Self study : 16h 52m

KINEMATICS AND MECHANICS

Description:
- Description of the movement in 2D:
- Description of the linear and circular movement under the action of forces:
- Description of work, energy and physical concepts derived.
- Description of the kinematics in shock conditions in 1D and 2D

Related activities:
Theoretical class with problems and computer-practice.

Full-or-part-time: 31h 52m
Practical classes: 9h
Laboratory classes: 6h
Self study : 16h 52m

OSCILLATIONS AND WAVES

Description:
- Basic concepts of oscillatory movement.
- Oscillatory movement: Waves.
- Simple Harmonic.

Related activities:
Theoretical class with problems and computer-practice.

Full-or-part-time: 31h 52m
Practical classes: 9h
Laboratory classes: 6h
Self study : 16h 52m

ACOUSTICS

Description:
- Sound, basic properties.
- Origin of sound
- Nature of sound in the air
- Media that transmit sound
- Resonance, Interference
- Fourier analysis.

Related activities:
Theoretical class with problems.

Full-or-part-time: 25h 52m
Practical classes: 9h
Self study : 16h 52m

ELECTROMAGNETISM

Description:
- Electrostatics. Electric charge Coulomb law.
- Field and electric potential.
- Magnetism: field and magnetic force.
- Electromagnetic induction

Full-or-part-time: 31h 52m
Practical classes: 9h
Laboratory classes: 6h
Self study : 16h 52m

CIRCUIT THEORY

Description:
- Electric current, electrical resistance.
- Continuous current.
- Ohm's law.
- Electrical circuits, serial and parallel.
- Multiple mesh circuits. Kirchhoff's laws.

Related activities:
Theoretical introduction classes, with practical exercises in the classroom both on paper and computer-assisted.

Full-or-part-time: 31h 52m
Practical classes: 9h
Laboratory classes: 6h
Self study : 16h 52m

OPTICS

Description:
- Properties of light
- Reflection and refraction
- Glasses
- Image formation by a lens
- Defects of lenses

Related activities:
Theoretical class with problems.

Full-or-part-time: 21h 52m
Practical classes: 5h
Self study : 16h 52m

COLOR THEORY

Description:
- Vision of light: the eye
- Mix of colored lights
- Mix of colored pigments
- Chromaticity diagrams.

Related activities:
Theoretical class with problems.

Full-or-part-time: 21h 56m
Practical classes: 5h
Self study : 16h 56m

ACTIVITIES

THEORY CLASSES AND PROBLEMS

Description:
Theoretical classes in which new concepts, their application and exercises are combined.

Full-or-part-time: 68h 20m
Self study: 13h 20m
Theory classes: 55h

PRACTICAL EXERCISES

Description:
Compendium of exercises related to each of the blocks of the subject.

Full-or-part-time: 30h
Self study: 30h

COMPUTER PRACTICE

Description:
Computer practice related to each the different theoretical blocks of the subject.

Full-or-part-time: 30h
Self study: 30h

INDIVIDUAL EVALUATION TESTS

Description:
Partial and finals exams

Full-or-part-time: 20h 40m
Self study: 16h 40m
Theory classes: 4h

GRADING SYSTEM

The qualification of the subject will be obtained following a system of continuous evaluation. There will be three (3) written tests during the course (partial exams), one (1) group project and one (1) final exam.
The weight of each part is as follows:

Partial Exam 1: 15%
Partial Exam 2: 15%
Partial Exam 3: 15%
Project: 20%
Final Exam - 25%
Participation and attitude of learning: 10%

The pass mark is obtained by achieving a grade of 5 in the final weighted average according to the previous criterion. If an exam or project is not presented, it will be marked zero (0).

If the subject is not passed, there is the possibility of taking a re-evaluation exam. It's mark will substitute the one of the exams and the project. The maximum mark of the subject, if it is passed through re-evaluation, is 5.

EXAMINATION RULES.

Exercises in class:
During the theoretical classes, students will work with problems that will be discussed and solved in the same class. These exercises will serve as a training for the partial and final exams (individual).

BIBLIOGRAPHY

Basic:
- Tipler, P.A.; Mosca, G. Física para la ciencia y la tecnología [on line]. 6ª ed. Barcelona: Reverté, 2010 [Consultation: 17/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=10372. ISBN 9788429144284.
- Giró i Roca, A. (coord.). Física per a estudiants d'informàtica [on line]. Barcelona: UOC, 2009 [Consultation: 17/06/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3206945. ISBN 9788490293089.
- Bourg, David M. Physics for game developers. 2nd ed. Beijing: O'Reilly, 2013. ISBN 9781449392512.

Complementary:
- Shiffman, Daniel. The nature of code: simulating natural systems with processing. Magic Book Project, 2012. ISBN 9780985930806.
- Reas, Casey; Fry, Ben. Processing: a programming handbook for visual designers and artists. 2nd ed. Cambridge, MA: MIT Press, 2014. ISBN 9780262028288.
- Rossing, T.D.; Moore, F.R.; Wheeler, P.A. The science of sound. 3rd ed. San Francisco, CA: Addison Wesley, 2002. ISBN 0805385657.

RESOURCES

Hyperlink:
- Web de Processing. http://www.processing.org

Other resources:
Website: Física con ordenador. Author: Ángel Franco
http://www.sc.ehu.es/sbweb/fisica/default.htm