

804222 - FIS1VJ - Physics I

Coordinating unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Academic year: 2019
Degree: BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: Miquel Sureda
Others: Miquel Sureda

Opening hours

Timetable: To be determined.

Degree competences to which the subject contributes

Specific:

1. (ENG) Analitzar, decidir i aplicar tècniques de programació gràfica, física, intel·ligència artificial, interacció, realitat augmentada i xarxes a un projecte de videojoc.

Generical:

2. (ENG) Interpretar y dominar los conceptos básicos sobre las leyes generales de la mecánica, la termodinámica, los campos y las ondas y el electromagnetismo; y su aplicación para la resolución de problemas propios de la ingeniería.

804222 - FIS1VJ - Physics I

Teaching methodology

Method Presentation / Lecture:

The course consists of 2 hours a week of lecture and 2 hours of laboratory practice.

Class participation is required. The classroom will be an active learning environment where students are encouraged to participate in the lectures and solve problems in class when asked.

Computer lab based activities will be periodically assigned.

Students are expected to show a basic understanding and solving of problems.

Self-learning is imperative as all homework will be completed outside of classtime.

Planning of activities:

1. Presentation of new content and problem solving techniques. Description of study materials (teacher).
2. Active learning platform: Students must participate in class in the form of answering questions or solving problems based on the lesson content.
3. Homework must be completed outside of class. Each student must turn in their own work, but are allowed to work together in groups to solve the assigned problems. There will be zero-tolerance for plagiarism.
4. Students will review the homework with the teacher in class and raise doubts about the material when needed.
5. Working individually or in teams, the students will begin or continue development exercises, computer lab practices or projects with the support of the teacher in the classroom.
6. Preparation and testing of individual progress will be carried out with weekly short quizzes.
7. Students must be able to work independently outside of class time. They must be able to study the content taught by the teacher through their own notes, other materials provided by the instructor, and supplementary electronic resources.

Learning objectives of the subject

- Learn and use the basic laws of mechanics. Calculation of particle trajectories in the classical radial force fields. Moving under the gravitational field.
- Learn the basic principles of electromagnetism. Understanding the effects associated with electric and magnetic fields.
- Use basic knowledge for the study of wave phenomena, and in particular, its effects on the various elements that could be part of a game or animation realistic.
- Know and understand the principles of mechanics typically associated with game development: direct and inverse kinematics; collision detection. Relative motion.
- Understand the basic principles of game engine software and its appropriate use.
- To obtain valid experimental results, analyze them and discuss them properly.
- Being able to assess the efficiency and utility of the methods and tools for modeling and simulation in the usual video game design and programming and realistic animations.
- To critically analyze the results.
- Solving problems related to the basics.
- Planning oral communication, respond appropriately to the questions posed and write texts with basic spelling and grammar.
- Engage in teamwork and positive contributions once the objectives and individual and collective responsibilities and jointly decide the strategy to be followed.
- Identify information needs and use collections, spaces and services available to design and run simple searches appropriate to the topic.
- To carry out the tasks assigned on time, working with information sources, according to the guidelines set by teachers.
- Demonstrate sufficient comprehension in reading documents written in English, related to the subject, such as notes taken in class, scientific articles, popular articles, websites, etc.

804222 - FIS1VJ - Physics I

Study load

Total learning time: 150h	Hours large group:	34h	22.67%
	Hours medium group:	16h	10.67%
	Hours small group:	0h	0.00%
	Guided activities:	10h	6.67%
	Self study:	90h	60.00%

804222 - FIS1VJ - Physics I

Content

<p>Introductory Physics</p>	<p>Learning time: 14h Practical classes: 4h Guided activities: 2h Self study : 8h</p>
<p>Description: Introduction and review of basic physics and mathematical tools:</p> <ul style="list-style-type: none"> - Magnitudes, units and dimensions, significant digits, scientific notation, magnitude order. - Coordinate systems and relative position. - Basics on vector and differential calculus. <p>Related activities: Theoretical lessons, exercises, practices with computer</p> <p>Specific objectives: Learn and review basic physical and mathematical concepts: systems of units, dimensional analysis, vector algebra.</p>	
<p>Kinematics</p>	<p>Learning time: 30h Practical classes: 10h Guided activities: 2h Self study : 18h</p>
<p>Description: Description of the motion in 2D.</p> <ul style="list-style-type: none"> - Basics on kinematics: path, velocity and acceleration. - Movement equations: Uniform and non-uniform - Circular movement <p>Related activities: Theoretical lessons, exercises, practices with computer</p> <p>Specific objectives: Learn how to understand and how to calculate the trajectory that describes a free point particle in two dimensions, in order to apply it in the dynamics of specific objects in simple videogames.</p>	

804222 - FIS1VJ - Physics I

<p>Dynamics</p>	<p>Learning time: 30h Practical classes: 10h Guided activities: 2h Self study : 18h</p>
<p>Description: Description of linear and circular movement under force action. - Newton's law and force balance. - Contact forces and friction. - Relative movement: inertial- non inertial frames</p> <p>Related activities: Theoretical lessons, exercises, practices with computer</p> <p>Specific objectives: Studying the motion of bodies in mobile coordinate systems, understand how to change from a fixed coordinate system to the mobile one and vice versa.</p>	
<p>Energy</p>	<p>Learning time: 26h Practical classes: 10h Self study : 16h</p>
<p>Description: Description of energy conservation and derived physics. - Potential, kinetic and elastic energy. - Energy conservation</p> <p>Related activities: Lectures, practical exercises, practices with computer</p>	

804222 - FIS1VJ - Physics I

<p>Collisions.</p>	<p>Learning time: 30h Practical classes: 10h Guided activities: 2h Self study : 18h</p>
<p>Description: Description kinematics under collision conditions in 1D and 2D. - Momentum conservation. - Collisions in 1D and 2D: elastic and fully inelastic, non frontal collisions.</p> <p>Related activities: Theoretical lectures, applications and practices based on computer.</p> <p>Specific objectives: Learn the basics of a collision between particles in two dimensions, the variety of existing collisions and their numerical treatment. Predict the angles, velocities and trajectories out in a collision.</p>	
<p>Harmonics</p>	<p>Learning time: 20h Practical classes: 6h Guided activities: 2h Self study : 12h</p>
<p>Description: Basics on oscillatory movement. - Oscillatory movement: waves. - Simple harmonic motions.</p> <p>Related activities: Lectures, exercises and practical application with computer.</p> <p>Specific objectives: Understanding the basic physical characteristics of the oscillatory motion and wave as the preamble to the study of light.</p>	

804222 - FIS1VJ - Physics I

Planning of activities

ACTIVITY 1: LECTURES AND PRACTICAL EXERCISES	Hours: 60h Self study: 30h Theory classes: 30h
<p>Description: Development of theoretical concepts and supervision of practical exercises.</p> <p>Support materials: Course notes. Collections of problems.</p> <p>Descriptions of the assignments due and their relation to the assessment: Weekly.</p>	
ACTIVITY 2: TUTORIAL EXERCICES (4)	Hours: 12h Theory classes: 12h
<p>Description: Compendium of exercises related to each of the blocks of the subject</p>	
ACTIVITY 3: COMPUTER BASED PRACTICE (1)	Hours: 60h Laboratory classes: 30h Theory classes: 30h
<p>Description: Development of practical activities using computer simulation programs suitable to represent physical systems.</p>	
ACTIVITY 4: INDIVIDUAL EVALUATION TESTS	Hours: 18h Laboratory classes: 8h Self study: 10h
<p>Description: Partial and final exams</p>	

804222 - FIS1VJ - Physics I

Qualification system

The qualification of the subject will be obtained following a system of continuous evaluation. There will be one written tests during the course (Partial I), four (4) practical exercises (PE), one (1) computer practice (T) to be delivered and a final exam.

The weight of each part is as follows:

- Partial Exam I - 30%
- Final Exam - 30%
- Practical exercises (4) - 20%
- Computer practice (1) - 10%
- Participation - 10%

If the pass mark is not obtained, there is the possibility of a reevaluation exam and the obtained qualification will substitute those of the partial exams and the final exam. The maximum mark to be obtained in the reevaluation is 5.

Regulations for carrying out activities

Practical Exercises (PE):

During four of the theory lectures, the student will develop exercises in pairs. Then, these exercises will be discussed and corrected in the same lecture, and a mark will be obtained for each pair.

Computer tutorials (T):

Computer tutorials should be submitted within the indicated deadline, in pdf format. Complementary material (Excel, Matlab, Phytion), if convenient, should be submitted as well.

Bibliography

Basic:

- Tipler, P.A. Física: para la ciencia y la tecnología. 4a ed. Barcelona [etc.]: Reverté, 2000. ISBN 842914384X.
- Gettys, W.E.; Keller, F.J.; Skove, M.J. Física: clásica y moderna. Madrid [etc.]: McGraw-Hill, DL 1991. ISBN 8476156359.
- Giró, A. [et al.]. Física per a estudiants d'informàtica [on line]. Barcelona: UOC, 2005 [Consultation: 21/12/2016]. Available on: <<http://site.ebrary.com/recursos.biblioteca.upc.edu/lib/upcatalunya/detail.action?docID=10646191>>. ISBN 8497881443.
- Eberly, D.H. Game physics [on line]. 2nd ed. Burlington, MA: Morgan Kaufmann/Elsevier, 2010 [Consultation: 21/12/2016]. Available on: <<http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10427976>>. ISBN 9780080964072.
- Erleben, K. [et al.]. Física para videojuegos. [s.l.]: Cengage Learning, 2011. ISBN 9786074815061.
- Tipler, P.A.; Mosca, G. Physics for scientists and engineers. 6th ed. New York: W.H. Freeman and Company, 2008. ISBN 9781429201339.

Others resources: