SUBJECT TEACHING GUIDE

G46 - Basic Experimental Physics

Degree in Mathematics

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Degree in Mathematics			Type and Year	Core. Year 1
Faculty	Faculty of Sciences				
Discipline	Basic Related Subject Area: Basic Module				
Course unit title and code	G46 - Basic Experimental Physics				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	https://aulavirtual.unican.es/				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA
Name of lecturer	FRANCISCO JESUS CARRERA TROYANO
E-mail	francisco.carrera@unican.es
Office	IFCA - Edificio Juan Jordá. Planta: + 1. DESPACHO (107)
Other lecturers	RAFAEL VALIENTE BARROSO AMALIA CORRAL RAMOS

3.1 LEARNING OUTCOMES
- To perform mathematical operations like integration, differentiation, derivation...appropriate to the level of the course, that let the student to obtain qualitative solutions in a reasonable timescale.
- To perform experiments in Physics in which the student is able to solve the problems that the experimental set -up may present. To acquire data and to analyse the experimental results to extract the appropriate conclusions .
- To observe in a critical way a variety of physical phenomena and to interpret these using the theoretical concepts of the subject.
- To be able to write a report, which is well structured, shows a synthesis of the developed experimental work, the results in tables and graphics, a proper analysis, and the conclusions reached.
- To get used to do bibliographic consultations and to obtain the information in a reasonable timescale.
- To solve quantitatively problems related to the subject.

4. OBJECTIVES
To realise that the natural language of Physics is Mathematics
To recognise in different physical problems the common characteristics that permit to treat them with similar methods and to solve them.
To be aware of the experimental nature of Physics and the errors inherent to the measurements.
To be familiar with instruments and measurement techniques.
To develop the ability to express ideas in writing. To develop the ability to search for information.

6. COURSE ORGANIZATION	
CONTENTS	
1	Measurement in Physics. Systems of units. Unit conversion. Dimensions of physical magnitudes. Dimensional analysis. Estimations. Orders of magnitude. Significant figures. Records of experimental measurements: tables and graphics. Reports about experimental work.
2	The language of Physics. A space-time model. Reference frame. Kinematics. Vectors. Movements in one dimension. Displacement, velocity and acceleration vectors. Movement with constant acceleration. Kinematic equations. Movement in two and three dimensions. Parabolic movement. Circular movement. Interpretation of graphics with position and velocity versus time. Relative movement. Galileo's principle of relativity: inertial systems. Non-inertial systems.
3	Newton´s laws. Force and mass. Friction. Elastic force and the harmonic oscillator. The pendulum.
4	Work and energy. Work done by a force. Conservative forces. Potential energy. Conservation of mechanical energy.
5	Systems of particles. Center of mass. Linear momentum and its conservation. Collisions. Rotation. Torque. Angular momentum. Moments of inertia. Fundamental equation of rotational dynamics. Conservation of angular momentum.
6	Newton's law of Gravitation. Gravitational field and potential. Astronomy: a historical introduction. Some astronomical measurements. Gravity and its impact on Universe. Solar system: Kepler' laws. Newtonian interpretation. Orbits: energy, angular momentum and eccentricity.
7	Electric and magnetic fields. Electrical charge. Force between charges: Coulomb´s law. Electrostatic field and potential. Gauss' law. Electrical energy: capacitors. Electrical current. Electrical resistance: Ohm´s law. Static magnetic fields. Lorentz's force. Magnetic fields sources. Ampere´s law. Electromotive force and induced currents.
8	Experiments in the classroom. During the course 4 compulsory sessions of experiments in the classroom will be programmed. They will illustrate the contents described in blocks 1-7.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Contents of blocks 1-4	Written exam	No	Yes	10,00
Contents of blocks 5-7	Written exam	No	Yes	10,00
Final exam: full contents of the subject	Written exam	Yes	Yes	40,00
Carrying out lab work and attend to experiments	Laboratory evaluation	No	No	10,00
Deliver written lab reports and questionnaires within the deadline	Others	No	Yes	20,00
Continuous assessment of the participation in class	Others	No	No	10,00
TOTAL				100,00

Observations

Carrying out the experiments in the lab is compulsory, as are experiments in the classroom. The student may miss at most one of the classroom or lab experiments, but only with a proper justification.
To pass the subject in the ordinary round (February) the student has to obtain a minimum global mark of 5 in 10.
The student who fails in the ordinary round, may still pass in the extraordinary round (September) provided that he/she obtains a mark of 5 in 10 in the following way:
- The marks and percentage (10%) of the non-recoverable part are kept
- The student must do a written exam about the full contents of the subject, which will be 70% of the final score
- If the marks of the laboratory part in the ordinary round is below 4, the student may provide improved lab reports of the experiments. Otherwise, the previous marks are kept. In any case, this part will be 20% of the final score
- To pass the subject in the extraordinary round the student must obtain a minimum global mark of 5 in 10

Observations for part-time students

In the case of part-time students, it is not necessary to attend to the classroom experiments. In this case, the student will undergo an exam of the contents of the classroom experiments. Attending the lab experiments is compulsory.

Part-time students should let their status as such be known at the beginning of the semester.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

H. D. Young, R. A. Freedman, "Física Universitaria". Ed. Pearson educación, S.A. México, 2009. Volúmenes 1 y 2.

Colección de problemas suministrada por el profesor.

Guías de los experimentos de laboratorio y de las experiencias de aula suministradas por el profesor.