SUBJECT TEACHING GUIDE

G46 - Basic Experimental Physics

Degree in Mathematics

Academic year 2026 - 2027

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)	
Knowledge Field	Mathematics and statistics				
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	AMALIA CORRAL RAMOS
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Other lecturers	RAFAEL VALIENTE BARROSO DIEGO PEREZ FRANCES

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. SUBJECT PROGRAM

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 and in the lab. During the course, five compulsory sessions of experiments will be programmed. They will illustrate the contents described in blocks 1-7.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessment	%
Contents of blocks 1-3	Activity evaluation with Virtual Media	No	Yes	10,00
Contents of blocks 4-5	Activity evaluation with Virtual Media	No	Yes	10,00
Final exam: full contents of the subject	Written exam	Yes	Yes	40,00
Deliver written lab reports and questionnaires within the deadline	Others	No	Yes	30,00
Continuous assessment of the participation in class	Others	No	No	10,00
TOTAL				100,00

Observations

Attending the experimental sessions is compulsory. The student may miss at most one of them, but only with a proper justification. Unless justified, delivering laboratory reports is not allowed if the student did not attend the experimental session. Submitting a report past the deadline will be penalized with 2 points per week of delay. This delay, unless justified, can never be longer than two weeks.

If, for justified reasons, continuous assessment of the participation in class is not possible for a student, the final exam will contribute 50% to the final score in the ordinary round.

To pass the subject in the ordinary round the student has to obtain a minimum global mark of 5 in 10.

Students who fail in the ordinary round, may still pass in the extraordinary round in the following way:
- Do a written exam about the full contents of the subject, which will be 60% of the final score
- If the marks of the lab reports and questionnaires in the ordinary round is below 4, students may provide improved lab reports, which will be graded up to 5 in 10. Otherwise, the previous marks are kept. In any case, this part will be 30% of the final score.

To pass the subject in the extraordinary round students 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 laboratory experiments is compulsory.

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. (disponible en línea en la BUC)
Colección de problemas suministrada por el profesor.
Guías de los experimentos de laboratorio y de las experiencias de aula suministradas por el profesor.