

## SUBJECT TEACHING GUIDE

G416 - Physics I

Degree in Industrial Technologies Engineering

Academic year 2016-2017

1. IDENTIFYING DATA					
Degree	Degree in Industrial Technologies Engineering			Type and Year	Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	First Year Subjects Subject Area: Physics Basic Training Module				
Course unit title and code	G416 - Physics I				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS DE LA TIERRA Y FISICA DE LA MATERIA CONDENSADA				
Name of lecturer	JESUS MARIA RODRIGUEZ FERNANDEZ				
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Office	Facultad de Ciencias. Planta: + 2. DESPACHO PROFESORES (2017)				
Other lecturers	JOSE JAVIER SANDONIS RUIZ				

3.1 LEARNING OUTCOMES
- To know precisely fundamental concepts and models associated to the different parts of the subject.
- To write properly the concepts and to know how to establish comparisons about of the relative importance and the role of the models in addressing a physical problem. To write correctly a judgment on the obtained results.
- To write properly the concepts and to know how to establish comparisons about of the relative importance and the role of the models in addressing a physical problem. To write correctly a judgment on the obtained results.
- To solve numerical problems associated to the contents of subject using different units and basic mathematical tools.
- To be able to verbally make judgments about practical situations related to the contents of the subject.

#### 4. OBJECTIVES

To know the basic concepts and variables associated with mechanics. To be able to solve analytically and / or numerically practical cases associated with these concepts.

To appreciate the physics as a way to understand the Nature. To be able to verbally make judgments about practical situations related to the contents of the subject.

To identify the key points of a physical phenomenon. To know how to analyse the physical phenomenon experimentally considering the proposed model and the mathematical methods needed and provide a quantitative result testable with experience.

Analyse and present the results taking into account the accuracy of the instruments used.

## 6. COURSE ORGANIZATION

### CONTENTS

1	<p>1.-VECTORS: Vectors and scalars. Laws of vectors algebra. Coordinate systems and components of vectors. Scalar and vector products. Derivatives and integrals of a vector. Nabla operator, gradient, divergence and rotational. Systems with many vectors.</p> <p>2. PARTICLE KINEMATIC. Motion in one dimension: speed and acceleration. Movement in two and three dimensions: speed and acceleration, motion with constant acceleration, intrinsic components of acceleration, projectile motion, motion in a circle.</p> <p>3. RELATIVE MOVEMENT: Speed and acceleration relative. Relative motion of uniform translation, Galileo transformations. Relative motion of uniform rotation. Relative motion in the Earth. Basic concepts of the relativity theory: Lorentz transformations.</p>
2	<p>4. PARTICLE DYNAMICS: Newton's laws, force concept and linear momentum conservation principle. Fundamental forces. Types of forces: restraining forces, elastic and frictional. Dependent speed friction forces. Fictitious forces. Angular momentum. Central forces and Kepler's laws.</p> <p>5. WORK AND ENERGY: Work made by a force. Power. Kinetic energy. Conservative forces and potential energy. Strength and potential gradient. Conservation of mechanical energy and non-conservative forces. Potential energy curves. Time dependent forces and impulse. Collisions</p> <p>6. Simple Harmonic Motion: kinetic and potential energies. Examples: simple pendulum and vertical spring. Damped and forced oscillations, resonance.</p>
3	<p>7. DYNAMICS OF PARTICLE SYSTEMS: Properties of internal forces. Application of Newton's laws to a particle system, linear and angular momentum. Center of mass of a particle system: definition and movement. Kinetic energy of a particle system. Energy conservation. Variable mass systems. Centers of gravity: definition and determination. Theorems of Pappus Guldin.</p> <p>8. DYNAMICS OF RIGID SOLID: translational and rotational movement. Angular momentum and moment of inertia. Calculating moments of inertia. Steiner theorem. Equation of motion for rotation of a solid. Rotational kinetic energy. Physical pendulum. Gyroscopes and precession.</p> <p>9. EQUILIBRIUM: Equilibrium of a particle and of a rigid solid. Equilibrium of a rigid body submitted to two or three forces. Conditions for equilibrium. Solving rigid-body equilibrium problems.</p>
4	<p>10. STATIC OF FLUIDS: Fluid Definition. Concept of pressure. Fundamental equation of hydrostatic. Pascal principle, applications. Pressure gauges and barometers. Archimedes' principle. Forces on a dam.</p>
5	<p>11 EXPERIMENTATION IN PHYSICS</p> <ol style="list-style-type: none"> <li>1) Introduction to the theory of errors. Calculating the density of a solid (using rule, calibre and scale).</li> <li>2) Kinematics of uniformly accelerated motion by using inclined planes.</li> <li>3) Collisions and coefficient of restitution.</li> <li>4) Concept of angular momentum and inertia moment measurements of a human body.</li> <li>5) Measurements of specific heat. Use of a calorimeter.</li> </ol>

### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Laboratory work 15%	Laboratory evaluation	No	No	15,00
Partial written exams (theory and problems) 25%	Written exam	No	Yes	25,00
Final written exam (theory and problems) 60%	Written exam	No	Yes	60,00
TOTAL				100,00
Observations				
Observations for part-time students				

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

- M. Alonso, E.J. Finn. "Física" Addison-Wesley Iberoamericana, 1995
- F.W. Sears, M.W. Zemansky, H.D. Young. R.A. Freedman "Física". Ed. Addison Wesley Longman, 1998
- R.A. Serway, J.W. Jewett. "Física", Thomson, 2005
- P.A. Tipler. "Física". Ed. Reverte, 1999
- José María de Juana. "Física General" Vol 1. Prentice Hall, 2003