COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**ECE_K130**	**SEMESTER**	**1**
COURSE TITLE	PHYSICS		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		3	5
Seminars / Practice exercises		2	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).			
COURSE TYPE *general background, special background, specialised, general knowledge, skills development*	GENERAL BACKGROUND		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://www.ece.uop.gr/		

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning*

and Appendix B

- *Guidelines for writing Learning Outcomes*

The course is a basic introductory course in the concepts of Physics and especially in the Mechanics. The course seeks to cover basic concepts and principles of physics by combining examples from real life and the physical world. Basic principles are analysed in the field of mechanical Physics, which are useful for the student in explaining and assimilating other concepts that he/she will encounter during his/her studies. The coexistence of the above knowledge together with a number of examples and exercises aims to give to the interested party a quick acquaintance with the basic principles of mechanics and waves.

Upon completion of the course, students will have:

1. Knowledge and critical understanding of the theory and principles of mechanics and waves.
2. Knowledge and understanding of the units of measurement that accompany each physical quantity of mechanics and waves.
3. Knowledge of methodology and problem solving skills.
4. Ability to apply mathematical concepts taught in parallel to engineering problems.

In particular, students will be able to:

1. Describe and analyse problems related to the kinematics and dynamics.

2. Analyse the physical quantities associated with specific problems.

3. Apply basic principles such as energy conservation and other principles of Physics to any problem.

4. Solve problems with different equivalent methods.

5. To design experimental procedures for determining physical quantities.

6. Combine results from theoretical analysis.

7. To apply the knowledge in specialty courses related to electromechanical applications.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search, analyze and synthesize data and information, using the necessary technologies and especially: study and analysis of engineering problems. Autonomous work: solving intermediate exercises at the end of each section.

- Working independently
- Team work
- Working in an interdisciplinary environment

(3) SYLLABUS

- ✓ Physics and Measurement, Standards of Length, Mass, and Time, Dimensional Analysis, Conversion of Units.
- ✓ Motion in One Dimension, Position, Velocity, and Speed, Instantaneous Velocity and Speed, Analysis Model: Particle under Constant Velocity, Acceleration, Motion Diagrams. Analysis Model: Particle under Constant Acceleration, Freely Falling Objects. Kinematic Equations Derived from Calculus, Vectors, Coordinate Systems, Vector and Scalar Quantities, Some Properties of Vectors, Components of a Vector and Unit Vectors.
- ✓ Motion in Two Dimensions. The Position, Velocity, and Acceleration Vectors. Two-Dimensional Motion with Constant Acceleration. Projectile Motion. Analysis Model: Particle in Uniform Circular Motion. Tangential and Radial Acceleration. Relative Velocity and Relative Acceleration. The Laws of Motion.
- ✓ The Concept of Force. Newton's First Law and Inertial Frames. Mass. Newton's Second Law. The Gravitational Force and Weight. Newton's Third Law. Analysis Models Using Newton's Second Law. Forces of Friction. Circular Motion and Other Applications of Newton's Laws. Extending the Particle in Uniform Circular Motion Model. No uniform Circular Motion. Motion in Accelerated Frames. Motion in the Presence of Resistive Forces.
- ✓ Energy of a System. Systems and Environments. Work Done by a Constant Force. The Scalar Product of Two Vectors. Work Done by a Varying Force. Kinetic Energy and the Work–Kinetic Energy Theorem. Potential Energy of a System. Conservative and no conservative Forces. Relationship between Conservative Forces and Potential Energy.
- ✓ Energy Diagrams and Equilibrium of a System. Conservation of Energy. Analysis Model: No isolated System (Energy). Analysis Model: Isolated System (Energy). Situations Involving Kinetic Friction. Changes in Mechanical Energy for No conservative Forces. Power.
- ✓ Linear Momentum and Collisions. Linear Momentum. Analysis Model: Isolated System (Momentum). Analysis Model: Non-isolated System (Momentum). Collisions in One Dimension. Collisions in Two Dimensions. The Center of Mass. Systems of Many Particles.
- ✓ Rotation of a Rigid Object about a Fixed Axis. Angular Position, Velocity, and Acceleration. Analysis Model: Rigid Object under Constant Angular Acceleration. Angular and Translational Quantities. Torque. Analysis Model: Rigid Object under a Net Torque. Calculation of Moments of Inertia. Rotational Kinetic Energy.
- ✓ Energy Considerations in Rotational Motion. Rolling Motion of a Rigid Object. Angular Momentum. The Vector Product and Torque. Analysis Model: Non-isolated System (Angular Momentum).
- ✓ Angular Momentum of a Rotating Rigid Object. Analysis Model: Isolated System (Angular Momentum). The Motion of Gyroscopes and Tops.
- ✓ Static Equilibrium and Elasticity. Analysis Model: Rigid Object in Equilibrium. More on the Center of Gravity. Examples of Rigid Objects in Static Equation.
- ✓ Oscillatory Motion. Motion of an Object Attached to a spring. Analysis Model: Particle in Simple Harmonic Motion. Energy of the Simple Harmonic Oscillator. Comparing Simple Harmonic Motion with Uniform Circular Motion. The Pendulum. Damped Oscillations. Forced Oscillations.
- ✓ Wave Motion. Propagation of a Disturbance. Analysis Model: Traveling Wave. The Speed of Waves on Strings. Reflection and Transmission. Rate of Energy Transfer by Sinusoidal Waves on Strings. The Linear Wave Equation. Sound Waves. Pressure Variations in Sound Waves. Speed of Sound Waves.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face in class</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>View slides. View computer animations to describe the time evolution of physics phenomena. Demonstration of laboratory experiments at the time of teaching. Informational material to the eclass.</td></tr>
<tr><td>TEACHING METHODS

The manner and methods of teaching are described in detail.

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures.</td><td>39</td></tr>
<tr><td>Problem solving.</td><td>26</td></tr>
<tr><td>Project</td><td>13</td></tr>
<tr><td>Study of literature and material exist to the eclass</td><td>47</td></tr>
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<tr><td>Course Total</td><td>125 hours (5 ECTS)</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>I. Written final examination (100%)

II. Optional written assignments (10%)

III. Optional problem solving (10%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

1. Physics for Scientists and Engineers with Modern physics Raymond A. Serway and John W. Jewett Jr. Brooks/Cole

2. Essential University Physics, Richard Wolfson, Pearson Education Inc. 2016.

3. University Physics with modern Physics. Hugh D. Young, Roger A. Freedman. Pearson Education Inc. 2016.

4. Fundamentals of Physics, extended version Halliday D., Resnick R., Walker J. John Wiley and sons Inc. 2008.

5. An Introduction to Mechanics 2nd Edition D. Kleppner, R. Kolenkow. Cambridge University press 2014.

6. Physics: Principles with Applications 7th Edition Douglas C. Giancoli Pearson Education Inc. 2018.