

Module Outline: INTRODUCTION TO NATURAL SCIENCES (FYE14)

1. GENERAL

SCHOOL	SCIENCE AND TECHNOLOGY		
PROGRAMME	STUDIES IN NATURAL SCIENCES		
LEVEL OF STUDIES	Level 6 of the Hellenic and European Qualifications Framework		
MODULE CODE	FYE14	YEAR	1 st
MODULE TITLE	Introduction to Natural Sciences		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>		HOURS	CREDITS
Weekly workload: 17-18 hours x 32 weeks		560	20 ECTS
MODULE TYPE <i>Compulsory/Elective/ Mandatory Optional</i>	Scientific Area (SA), Compulsory		
MODULE DESCRIPTION <i>general background, special background, specialised, general knowledge, skills development</i>	General background		
PREREQUISITE MODULES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	GREEK		
IS THE MODULE OFFERED TO ERASMUS STUDENTS	No		
MODULE WEBSITE (URL)	The Module has its own space in the digital learning environment of HOU (https://study.eap.gr/login/index.php) with controlled access (using a code) for students and Teaching Staff.		

2. LEARNING OUTCOMES

Learning outcomes

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

LEARNING OUTCOMES

Knowledge:

Upon successful completion of the Module, students are expected to:

- Describe using the kinematical equations the motion of a body in 1,2 and 3 dimensions, the Newton's laws and the laws for rotation, as well as the conservation laws of momentum, angular momentum and mechanical energy. To explain the pseudo forces in non-inertial frames of reference, and to perceive the concept of conservative forces and potential energy. To examine the motion in the gravitational field, the static equilibrium of a body, the two-body collision, the kinematics of variable-mass systems, the precession and the general motion of a rigid body. To solve complex problems using the free body diagram, to analyze the body's motion in independent coordinates, to combine the Newton laws to describe the general motion of a rigid body.
- Describe the simple harmonic motion, the general solution and the physical meaning of the parameters and constants of this solution, the functional form of the position, velocity and acceleration as well as the

kinetic and potential energy of a simple harmonic oscillator system. To examine the harmonic motion of the simple, physical and torsional pendulum as well as of the double pendulum, to describe the oscillation motion with dumping and the forced oscillations with dumping.

- Describe the quantities of pressure and density of a fluid, the variation of pressure in a static fluid, the Pascal's and Archimedes' principles, the effects of surface tension of a fluid, to apply the continuity equation and the Bernoulli equation.

- Determine the electric potential and the electric field from a static charge distribution, to formulate the Gauss's law, the Ohm's law, the Kirchhoff rules, the Ampere's law, the Biot-Savart law, the Faraday law and the Lenz rule. To explain the motion of charges in electric and magnetic fields and the sources of the magnetic field. To solve circuit problems with resistors and capacitors, to explain the functionality of: the capacitor, the solenoid, the transformer and the electric generator, and to describe the main devices that are used in electrical measurements. To infer the completeness of Maxwell's equations for electromagnetism problems solving.

Skills:

Upon successful completion of the Module, students are expected to:

- solve complex problems by employing diagrams of free body, resolving the motion of a point or body to three axes, to combine the laws and principles for the description of the complex motion of a solid body.
- solve problems of electromagnetism, be able to analyze and describe the function of electrical circuits.

Competences:

Upon successful completion of the Module, students are expected to:

- to be able to use the knowledge they have acquired as a necessary foundation for understanding and interpreting phenomena associated with fundamental properties and processes that occur in most natural phenomena. Understanding the concepts of mechanics and electromagnetism as the basis for a smooth educational transition from the concepts and laws of the macroscopic world to the fundamental principles and physical laws that govern the microscopic world and, consequently, to the atomistic description of phenomena.
- to be supported, through the knowledge they have acquired, in the professional approach to their work or profession and to possess skills that are typically demonstrated through the development and support of arguments and the solving of problems within the context of the natural sciences. Having also the ability to gather and interpret relevant data (generally within the field of natural sciences) in order to form judgments that include reflection on related scientific issues. Furthermore, they will be able to communicate information, ideas, problems, and solutions to both specialized and non-specialized audiences and, finally, they will have developed the learning skills necessary to pursue further studies with a significant degree of autonomy.

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 Module aim?

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

The general skills that the students will acquire are:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Adapting to new situations.
- Decision-making.
- Working independently.
- Respect for the natural environment.
- Showing social, professional and ethical responsibility and sensitivity to gender issues.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.

3. SYLLABUS

Purpose of Module

The main objective of the course is to upgrade the students' knowledge regarding the Fundamental Principles of Physics and the necessary Mathematical Tools required for the scientific description of physical phenomena. After successfully completing this introductory module, the students will have accumulated the knowledge and skills required for the successful completion of the program in the "Studies in Natural Sciences".

Subjects covered

- Introduction to mathematics
- Introductory physics

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	- Distance teaching and learning with six (6) Group Counseling Meetings (GCMs) of 4-hour duration during the academic semester on weekends. - Additional 10 supportive GCMs of 2-hour duration for answering questions and practice. - Personal communication and feedback (advisory role of Adjunct Faculty).																
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	<u>During GCMs and teaching the following are used:</u> - Remote meetings tools (webex, Teams), - Presentation software (PowerPoint, educational video - animations etc.), - Specialized software/databases for the subjects under study (NCBI PubMed, NCBI Blast, EndNote etc.). In addition, students use office automation tools, web browsers and e-reader for digital books. <u>Communication with the students is supported by:</u> - The digital platform of HOU (https://study.eap.gr/login/index.php) (course information, educational material posts, announcements, messages, examination results, user groups, discussion forums etc.). - e-mail																
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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.</i> <i>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</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Activity</th><th style="text-align: center;">Year Workload</th></tr> </thead> <tbody> <tr> <td>6 GCMs (x 4 hours)</td><td style="text-align: center;">24</td></tr> <tr> <td>10 supportive GCMs (x 2 hours)</td><td style="text-align: center;">20</td></tr> <tr> <td>6 Written Assignments (x 20 hours)</td><td style="text-align: center;">120</td></tr> <tr> <td>Individual Study time (12-13 hours x 32 weeks)</td><td style="text-align: center;">386</td></tr> <tr> <td>Self-evaluation activities</td><td style="text-align: center;">7</td></tr> <tr> <td>Final examination</td><td style="text-align: center;">3</td></tr> <tr> <td style="text-align: center;">Total Workload</td><td style="text-align: center;">560</td></tr> </tbody> </table>	Activity	Year Workload	6 GCMs (x 4 hours)	24	10 supportive GCMs (x 2 hours)	20	6 Written Assignments (x 20 hours)	120	Individual Study time (12-13 hours x 32 weeks)	386	Self-evaluation activities	7	Final examination	3	Total Workload	560
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STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended</i>	<u>Students' evaluation – Grade assessment of a Module:</u> a. Six (6) Assignments (A) which contribute equally to the final grade with a value of 5% each. The scoring of educational activities and assignments is activated only if the student succeeds in an overall score equal to or above the base (≥ 5) in the final or repeat exams. b. Final or repeat exams (E) contributing to the final grade of the module by 70%.																

<i>questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	The Final Grade of the module, within scale 1-10 (10 is the excellent), is calculated as follows: $\text{Final Grade} = (A1 \times 0.05) + (A2 \times 0.05) + (A3 \times 0.05) + (A4 \times 0.05) + (A5 \times 0.05) + (A6 \times 0.05) + (Ex \times 0.7)$ The applied criteria are all uploaded/known for assessments (in study.eap.gr), and in the general regulation at https://www.eap.gr/el/spoudes-sto-eap/ekpaideusi/kanonismoi/kanonismos-spoudwn In the this module a mid-term assessment is also conducted. <u>Language of evaluation:</u> Greek
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5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- 1) University Physics, H. D. Young, R. A. Freedman, Papazisi publishing house, volumes A' and B'.
 - 2) Publications of ΕΑΠ (Hellenic Open University): Introductory Physics: Classical Mechanics, Patras 2003.
 - 3). Publications of ΕΑΠ (Hellenic Open University): Introductory Concepts of Mathematics, Patras 2003.
- In addition, supplementary digital studying material is uploaded to the module's website on the platform study.eap.gr.

- Related academic journals:

- 1) Physics Today.
- 2) European Journal of Physics.