MODULE OUTLINE

1. GENERAL INFORMATION

SCHOOL	SCHOOL OF SCIENCE AND TECHNOLOGY			
PROGRAM COURSE	Master's in Teaching Natural Science MSc			
LEVEL OF STUDY	POSTGRADUATE			
MODULE CODE	KFE51	**YEAR OF STUDY**	1st/2nd	
MODULE TITLE	**Motion, Constitution and Fundamental Interactions of Matter**			
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*			**HOURS**	**CREDIS**
Weekly teaching hours 18-19* 30 weeks			560	20 ECTS
COURSE TYPE Compulsory, Optional, Optional mandatory	Compulsory			
PREREQUISITE MODULES:	None.			
LANGUAGE OF INSTRUCTION AND EXAMS	Greek			
THE MODULE IS OFFERED TO ERASMUS STUDENTS	No			
MODULE WEBSITE (URL)	https://www.eap.gr/en/postgraduate-specialization-of-teachers-of-natural-sciences/topics/#k51 Each module has its own space in the Learning Management System of EAP (http://study.eap.gr), with controlled access (use of code) for students and teaching staff.			

2. LEARNING OUTCOMES

Learning Outcomes
• *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:*
By the end of this course, students will be able to, Describe the laws of motion and the conservation laws of Newtonian Mechanics, the Lorentz transformations of special relativity, the harmonic oscillator in the presence of friction and driving forces, the Fermat principle and the applications of geometrical optics, the laws of Statistical Mechanics and Thermodynamics, the physics of waves and the propagation of electromagnetic waves, the interference and diffraction phenomena, the laws of electrostatics and magnetostatics, the radiation

from an accelerated charge and the basic principles of quantum mechanics.
Apply the laws of classical mechanics and evaluate the planetary motion, solve the equations of motion using numerical methods, explain the relativistic phenomena of radiation, the Doppler effect and the aberration of light, calculate the dipole radiation pattern and the refractive index of low density and dense materials, examine the absorption and the scattering of light, demonstrate the operation of thermal machines, the black body radiation and the transmission of acoustic waves. Explain the electric field effects in the atmosphere, the operating principle of electron microscopes and electric motors, the plasma oscillations, the Bohm-Aharonov effect, the bremsstrahlung and the synchrotron radiation.
Examine complicated phenomena using the basic laws of physics, compare modern physics with classical physics analogues, the Fermat's principle with the principle of least action and quantum electrodynamics, and demonstrate the limits of the classical approach to microcosm as well as the use of the thought experiments in physics.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.) …….

Working in an interdisciplinary environment
Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Individual/Independent work
Critical thinking
Development of free, creative and inductive thinking
Introduction of innovative research

3. MODULE CONTENT

The objective of the module it to educate students in the Theory of Classical and Modern Physics

The key subjects of the module are:

A. Modern Perceptions of Classical Physics: Review of Classical Physics through the lens of the Modern perception of Nature (Laws of Conservation, Symmetries, Statistical

Descriptions of Nature, Electromagnetism, Fields, Waves and Light, Relativity)

B. Quantum Description of the Cosmos: Review of Basic Quantum Physics, Applications of Quantum Physics, Applications of Quantum Physics to Solids, Atoms, and Nuclei.

C. Elementary Particles and Cosmology

4. TEACHING METHODS--ASSESSMENT

<table>
<tr><td>MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td><td>Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, Communication with students</td><td>We use :
Remote meetings tools (cisco webex),
Presentation software (e.g. power point),
Web Browsers
e-reader for digital books
In addition, students use word processing software in all written assignments as well as spreadsheets to create graphs and develop simulations..</td></tr>
<tr><td>MODULE DESIGN
Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc

The study hours for each learning activity as well as the hours of selfdirected study are given following the principles of the ECTS.</td><td>
<table>
<tr><th>Activity</th><th>Annual Workload</th></tr>
<tr><td>6 OSS (* 4 hours)</td><td>24</td></tr>
<tr><td>Preparation of Assignments (3 assignments * 20 hours)</td><td>60</td></tr>
<tr><td>Completion of Activities (3*20 hours)</td><td>60</td></tr>
<tr><td>Examination</td><td>3</td></tr>
<tr><td>Individual study</td><td>413</td></tr>
<tr><td>Total module workload (hours)</td><td>560</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</td><td>Elaboration of written assignments and activities during the academic year, the average of the grades of which participates in the formation of the final grade</td></tr>
</table>

Detailed description of the evaluation procedures. *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students*	of module by 30%, if there is a passable in the final or repetitive examinations. In the final written exams the grade of the written assignments participates in the formation of the final grade of module by 70%. All the criteria are posted, both in each written assignment (in the LMS http://study.eap.gr), as well as in the general regulation of HOU at: https://www.eap.gr/wp-content/uploads/2022/03/kanonismos-spoudwn-isxys-apo-to-didaktiko-etos-2022-2023.pdf

(6) SUGGESTED BIBLIOGRAPHY

- *Suggested bibliography:*

Feynman Lectures I, II, III
available at the link: https:www.feynmanlectures.caltech.edu
Giancoli, Douglas C., Physics: Principles with Applications
University Physics with Modern Physics, Hugh D.Young Roger A. Freedman
Physics for Scientists and Engineers, Raymond A. Serway, John W. Jewett
Fundamental of Physics, David Halliday - Robert Resnick - Jearl Walker
Theoretical mechanics, Spiegel, Murray R.
Optics, Hecht Eugene
The Physics of Vibrations and Waves, Pain J. H.
Vibrations and Waves, A.P. French
Introduction to Electrodynamics, David J. Griffiths
Special Relativity, A.P. French
Introduction to Quantum Physics, A.P. French, Edwin F. Taylor
An Introduction to Nuclear Physics, W. N. Cottingham, D. A. Greenwood
Introduction to Elementary Particles, David J. Griffiths
An Introduction to Modern Cosmology, Andrew Liddle

-Related scientific Journals:

Physics Education, IOP
European Journal of Physics, IOP
Physics, MDPI
American Journal of Physics, AAPT
The Physics Teacher, AAPT
8) ACM SIGOPS Operating Systems Review