# COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>ENGINEERING SCHOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>MECHANICAL ENGINEERING DEPARTMENT</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>UNDER GRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>2702004</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>2</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Special topics on Physics</td>
</tr>
</tbody>
</table>

**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.*

<table>
<thead>
<tr>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>2</td>
</tr>
<tr>
<td>Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).

**COURSE TYPE**

Specialized General Knowledge,

**PREREQUISITE COURSES:**

**LANGUAGE OF INSTRUCTION and EXAMINATIONS:**

Greek

**IS THE COURSE OFFERED TO ERASMUS STUDENTS:**

YES (in English for ERASMUS students)

**COURSE WEBSITE (URL):**

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 an introductory course of physics applications in modern fields of engineering. This course aims to deepen students' knowledge in the basic physics behind the modern applications, but also to give them the basis they need to monitor the course of subsequent semesters.
A large part of the course material focuses on the theory underlying the interaction of radiation with matter and analyzes the working principle of methods used for the study of modern materials, which will be in the future part of the job of a graduate. The student at the end of this course knows in depth the physics behind the newer applications, both in the energy sector and construction. He will have an overall understanding of materials characterization techniques and will be able to select and combine the proper techniques to take decisions relevant to the selection of appropriate materials.
Upon successful completion of this course the student will be able to:
• Generally recognize the contribution and application of Modern Physics in mechanical engineering
• Be aware of special techniques and methods of materials characterization.
• Evaluate the results of research and propose solutions

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, using the necessary technologies.
Autonomous work
Teamwork
Production of free, creative and inductive thinking

(3) SYLLABUS

• LASER: basic principles and applications in mechanical engineering.
• Semiconductors and semiconductor devices.
- Photovoltaic Elements: The technological evolution from first to fourth generation of solar cell photovoltaics.
- Nanotechnology-Nanomechanics.
- Interaction of electromagnetic radiation and matter (X-Rays, gamma radiation etc)
- Crystallography- Diffraction
- Geometrical optics
- Materials characterization techniques (Basic aspects of XRD, XRF, SEM, TEM, AFM etc)

Laboratory training of students carrying 13 laboratory exercises focused on key items of theoretical courses.

### (4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<thead>
<tr>
<th>DELIVERY</th>
<th>Lectures, laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td>
<td>Use of moodle platform</td>
</tr>
</tbody>
</table>

#### 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.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Laboratories</td>
<td>26</td>
</tr>
<tr>
<td>Preparation for Writing laboratory reports-homework</td>
<td>25</td>
</tr>
<tr>
<td>Personal study</td>
<td>35,5</td>
</tr>
<tr>
<td>Course total</td>
<td>112,5</td>
</tr>
</tbody>
</table>

#### 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.

Written examination: 60%
Laboratory exercise: 40%

### (5) ATTACHED BIBLIOGRAPHY
• Modern Physics, SERWAY R., MOSES C., MOYER C. Publisher: Crete University Press (in greek)
• Science and Technology of Metallic Materials, Chrysoulakis John, Pantelis D Publisher: Papasotiriou (in greek)
• Simserides 2016, Quantum Optics and Laser. [e-book.] (in greek) Available at: http://hdl.handle.net/11419/2108
• Giannopapas B, 2016. Condenced matter physics problems [e-book.] (in greek) Available at: http://hdl.handle.net/11419/1314
• Course notes