COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>Department of Computer Engineering and Informatics</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>CEID NE4160</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>5th, 7th, 9th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Modern 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, Tutorials</td>
<td>3 (L), 2 (T)</td>
</tr>
</tbody>
</table>

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

TOTAL 5

COURSE TYPE
Skills Development

PREREQUISITE COURSES:
Mathematics I & II (NY101 & NY102), Physics (NY 105)

LANGUAGE OF INSTRUCTION and EXAMINATIONS:
Greek (the course may be offered in English for Erasmus students).

IS THE COURSE OFFERED TO ERASMUS STUDENTS?
Yes

COURSE WEBSITE (URL)
https://eclass.upatras.gr/courses/CEID1152/

(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

Upon conclusion of the course the students ought to be able:

In general
To have established an adequate theoretical background needed in quantum computing.

In particular
- To know the basic principles of Quantum Mechanics and the mathematics formalism needed in obtaining the general consequences of the theory.
- To know how to find the energy levels and the corresponding eigenfunctions for typical one-dimensional potentials for Schrödinger equation.
- To know the basics for Maxwell-Boltzmann and Bose-Einstein statistics.
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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

Adapting to new situations.
Production of free, creative and inductive.

(3) SYLLABUS

- Bohr’s theory.
- de Broglie waves, and the wave-particle duality of matter and light.
- Schrödinger’s equation, wave functions, wave packets, probability amplitudes, stationary states, the Heisenberg uncertainty principle, and zero-point energies.
- Statistical Physics, Maxwell-Boltzmann and Bose-Einstein distributions.
**DELIVERY**

Face-to-face, Distance learning, etc.

**USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**

Use of ICT in teaching, laboratory education, communication with students

The course makes use of the facilities offered by the e-Class environment. Course notes and transparencies are placed online, as well as other additional material.

**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>3*13=39</td>
</tr>
<tr>
<td>Tutorials (exercise sessions)</td>
<td>2*13=26</td>
</tr>
<tr>
<td>Solving exercises</td>
<td>4*13=52</td>
</tr>
<tr>
<td>Non-guided study</td>
<td>2*13=26</td>
</tr>
<tr>
<td>Final Exam</td>
<td>3</td>
</tr>
</tbody>
</table>

Course total 146

**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.

The language of evaluation is Greek (English in the case of attendance by foreign students).

**Method of evaluation:**

1. Final written examination including theory and exercises-problems (50% of final grade).
2. In class presentation or written project (50% of final grade).

**Grading scale 0-10.**

Passing grade greater than or equal to 5.

**ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

*(in Greek)*

1. Σ. Τραχανάς, Στοιχειώδης Κβαντική Φυσική, Διαδικτυακό βιβλίο, Πανεπιστημιακές Εκδόσεις Κρήτης.
2. R. Serway, C. Moses, C. Moyer, Σύγχρονη Φυσική (μετάφραση) Πανεπιστημιακές Εκδόσεις Κρήτης, 2009.
3. Μ. Βελγάκης, Σύγχρονη Φυσική, Εκδόσεις Πανεπιστημίου Πατρών, 2014.

*(in English)*

Related academic journals: