# 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>2703004</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>3rd</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Thermodynamics</td>
</tr>
</tbody>
</table>

### INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Exercises</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

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.

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

### COURSE TYPE

Special Background Course

### PREREQUISITE COURSES:

- general background,
- special background, specialised general knowledge, skills development

### LANGUAGE OF INSTRUCTION and EXAMINATIONS:

- Greek (official)- English (optional)

### IS THE COURSE OFFERED TO ERASMUS STUDENTS?

YES

### COURSE WEBSITE (URL)

http://ikaros.teipir.gr/hcplab/
### 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

This course is the basic special lesson on the concepts of thermodynamics.

This course aims to introduce students to the basic concepts of thermodynamics associated with the behavior of both the ideal gas and the pure substances. With the consolidation of these concepts and the selection of appropriate equations by the students solved problems of the specialty of mechanical engineer. In this sense the course is the basis on which developed specific methodologies to individual special courses for the next semesters.

Finally, the aim of the course is to understand the students the importance of thermodynamics in both study and resolve other energy problems.

Upon successful completion of this course the student will be able to:
- Know the fundamental laws of thermodynamics
- Understand the thermodynamic properties governing energy systems
- Apply the thermodynamic laws to solving energy problems
- Evaluates the performance thermal engines, refrigeration equipment and heat pumps
- Analyze and calculate various thermodynamic sizes in energy systems

### 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
- Decision-making
- Adapting to new situations
- Working independently
- Team work
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas
- Project planning and management
- Respect for difference and multiculturalism
- 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
- Others...

Search for, analysis and synthesis of data and information, with the use of the necessary technology
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- Criticism and self-criticism
- Production of free, creative and inductive thinking
1. Thermodynamic systems, Thermodynamic properties, Thermodynamic equilibrium, Thermodynamic processes, Thermodynamic cycle
2. Energy, Work, Heat, Laws of ideal gas equation of state of ideal gas equation van der Waals, Project Ideal Gas
3. Properties of pure substance, Tables of thermodynamic properties
4. First law of thermodynamics, equation of continuity, specific heat capacities, Joule-Thomson coefficient
6. Entropy pure substance, Chart Mollier, Equations Tds, entropy of ideal gas equation Clausius-Clapeyron relation Helmholtz function Gibbs Maxwell equations
7. cycle heat engine (Otto, Diesel, Brayton, Rankine)
8. Nozzles

Class work

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<thead>
<tr>
<th>DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td>
<td>Face-to-face</td>
</tr>
<tr>
<td>TEACHING METHODS</td>
<td>Activity</td>
</tr>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Class work</td>
<td>26</td>
</tr>
<tr>
<td>Study</td>
<td>52</td>
</tr>
<tr>
<td>Solving exercises</td>
<td>21</td>
</tr>
<tr>
<td>Course total</td>
<td>125</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.

Final examination: 80%
Intermediate written examination: 20%

(5) ATTACHED BIBLIOGRAPHY

- Suggested literature:
P. Nikas, 2011, Applied Thermodynamics for Engineers, Leader Enterprises Ltd, (in Greek)
Related Scientific journals:
Renewable Energy
Applied Energy
Energy
Energy Conversion and Management
Applied Thermal Engineering
International Journal of Exergy