| a) General | | | |
|---|---|---|---|
| *School* | ENGINEERING | | |
| *Academic unit* | MECHANICAL ENGINEERING | | |
| *Level of studies* | Undergraduate | | |
| *Course code* | MM006Y04 | *Semester* | 6 |
| *Course title* | **Advanced materials technology** | | |

| *Independent teaching activities* | *Weekly teaching hours* | *ECTS* |
|---|---|---|
| Lectures | 3 | 6.5 |
| Laboratory exercises | 2 | |

| | |
|---|---|
| *Course type* | Special background |
| *Course category* | Compulsory |
| *Prerequisite courses* | - |
| *Language of instruction and examinations* | Greek |
| *Is the course offered to Erasmus students* | Yes |
| *Course website (url)* | http://triblab.puas.gr |

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the fundamental mechanisms and the scientific principles that govern the microstructure and the resulting properties (physical, chemical and mechanical) of the three non-metallic materials' families, namely polymers, ceramics and composites
- Determine the crucial parameters that define the feasibility of materials synthesis and the fabrication of final products.
- Distinguish the discrete application fields of materials' families and evaluate the materials' advantages and drawbacks for a given application, taking into account their performance level within a given operation environment.
- Classify crucial constraints per application that should be taken into account in evaluating the criteria for proper materials selection.

b2. General competences

Upon completion of the course, the students would develop, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making on the particular item of materials selection.
- Understanding the requirements for generic approaches in a worldwide environment.
- Capability of performing individual- and team-working case studies.
- Ability to approach the trans-scientific and multi-disciplinary character of various engineering applications.

c) Syllabus

The course is focused on the technology of non-metallic engineering materials, with emphasis on microstructure, physical properties and mechanical performance of (a) polymers, (b) ceramics and (c) composites. Special attention is given to the performance of these material families under real operation conditions. The course is completed with the analysis of specific advanced materials (nanostructured, porous and carbon-based materials among others) for environmental, energetical and optical applications.

Within the laboratory part, the materials and shape selection methodologies are analysed for targeted engineering components designed to operate under given mechanical and/or thermal

<table>
<tr><td colspan="3">loading.</td></tr>
<tr><td colspan="3">d) Teaching and learning methods - Evaluation</td></tr>
<tr><td>Delivery</td><td colspan="2">Lectures of theory and laboratory exercises face-to-face, within the classroom.</td></tr>
<tr><td>Use of information and communications technology</td><td colspan="2">Teaching using ICT, Laboratory education using ICT and experimental devices, communication and electronic submission</td></tr>
<tr><td rowspan="7">Teaching methods</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Tutorials</td><td></td></tr>
<tr><td>Laboratory exercises</td><td>13</td></tr>
<tr><td>Computational exercises</td><td></td></tr>
<tr><td>Individual work</td><td>91</td></tr>
<tr><td>Course total</td><td>156</td></tr>
<tr><td>Student performance evaluation</td><td colspan="2">Theory: Intermediate assessment and written final examination.<br>Laboratory: bibliographic case study analysis in teams of at maximum five (5) persons and open-doors presentation.</td></tr>
<tr><td colspan="3">e) Suggested bibliography</td></tr>
<tr><td colspan="3">1. Askeland, D. and Wright, W. (2015). Science and Engineering of Materials, SI Edition. Cengage Learning Editions.<br>2. Ashby, M., Shercliff, H. and Cebon, D. (2007). Materials: Engineering, Science, Processing and Design. Elsevier Ltd.<br>3. Callister, W. D. and Rethwisch, D.G. (2014). Materials Science and Engineering. John Wiley & Sons Inc.</td></tr>
</table>