# ETY305 - Introduction to Materials Science

## COURSE OUTLINE

## (1) GENERAL

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|---|---|---|---|
| **SCHOOL** | SCHOOL OF ENGINEERING | | |
| **ACADEMIC UNIT** | DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING | | |
| **LEVEL OF STUDIES** | UNDERGRADUATE | | |
| **COURSE CODE** | ETY305 | **SEMESTER** | 1 |
| **COURSE TITLE** | Introduction to Materials Science | | |

| **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* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures | 4 | 4 |
| *Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).* | | |

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|---|---|
| **COURSE TYPE** *general background, special background, specialized general knowledge, skills development* | General background |
| **PREREQUISITE COURSES:** | NO |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | LECTURES IN GREEK, PRESENTATION IN ENGLISH/GREEK |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | NO |
| **COURSE WEBSITE (URL)** | http://users.uoi.gr/nbarkoul/, http://ecourse.uoi.gr/enrol/index.php?id=2036 |

## (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*

One of the main objectives of the course is to familiarize the students with the fundamental concepts of Materials Science and Engineering which will be used as background knowledge for the understanding of specialized courses in the field of Materials Science and Engineering that follow. Thus, this course introduces the type of materials, structure, properties, characteristics, and applications, with special emphasis on the interrelationships among structure, properties & processing.

- **Learning outcomes:** Upon successful completion of the course, the student will be able to know and describe the structure of the different categories of materials, know the properties that characterize the behavior of materials, understand the type of loadings/environment that materials should withstand, determine the phases that are present, etc .
- **Skills**: Upon successful completion of the course, the student will be able to cite the four

components that are involved in the design, production, and utilization of materials, to develop classification diagrams of the materials, to develop stress-strain diagrams, phase diagrams etc.

- **Competences**: Combining the knowledge acquired during this course the student will be able to properly classify the materials, choose the most suitable material for a specific application, propose ways to change the structure / microstructure and the properties for a specific application, suggest testing methodologies for the characterization of different categories of materials, suggest modifications in the composition or processing temperature / heat treatment of an alloy to control the microstructure, suggest alterations in the geometry of a component so as to increase its service life. Overall, the students will be able to cope in an interdisciplinary environment where materials science and engineering is one of the key components in the synthesis, manufacturing, characterization, and design of materials.

**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?*

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|---|---|
| *Search for, analysis and synthesis of data and information, with the use of the necessary technology* | *Project planning and management* |
| *Adapting to new situations* | *Respect for difference and multiculturalism* |
| *Decision-making* | *Respect for the natural environment* |
| *Working independently* | *Showing social, professional and ethical responsibility and sensitivity to gender issues* |
| *Team work* | *Criticism and self-criticism* |
| *Working in an international environment* | *Production of free, creative and inductive thinking* |
| *Working in an interdisciplinary environment* | *……* |
| *Production of new research ideas* | *Others…* |
| | *…….* |

- Production of free, creative, and inductive thinking
- Search for, analysis and synthesis of data and information

## (3) SYLLABUS

This course provides an introduction in the field of materials science and engineering and the essential background required to follow the specialized topics that follow. The content of the course is as follows:

- Historical Perspective
- Classification of Materials
- Understanding the relationships:
  - Processing / Structure / Properties / Performance
- Atomic Structure and Interatomic Bonding
- The Structure of Crystalline Solids
- Imperfections in Solids
- Mechanical Properties of Metals
- Failure
- Phase Diagrams
- Polymer Structures and mechanical behaviour
- Thermal Properties

## (4) TEACHING and LEARNING METHODS - EVALUATION

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|---|---|
| **DELIVERY** *Face-to-face, Distance learning, etc.* | In class, face-to face lectures |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* | Electronic presentations, use of ecourse platform |

| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail.*<br>*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.*<br>*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* | ***Activity*** | ***Semester workload*** |
|---|---|---|
| | Lectures | 39 |
| | Tutorials/ essay writing | 13 |
| | Self-study | 48 |
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| | Course total | 100 |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br>*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*<br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | LANGUAGE OF EVALUATION: Greek<br>METHOD OF EVALUATION: Written exam at the end of the semester which is based on theory and exercises developed during the course | |

## (5) ATTACHED BIBLIOGRAPHY

*-Suggested bibliography:*


- Materials Science and Engineering, 9th Edition SI Version, William D. Callister, Jr., David G. Rethwisch, ISBN: 978-1-118-31922-2, 936 pages July 2014, ©2013
- Materials: Engineering, Science, Processing and Design, Michael F. Ashby, Hugh Shercliff, David Cebon, Butterworth-Heinemann, Feb 13, 2007 - Technology & Engineering - 528 page