COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	MY0600	**SEMESTER**	3rd
COURSE TITLE	Materials Science and Engineering		

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**
	5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (tutoring)
COURSE WEBSITE (URL)	https://www.mie.uth.gr/?page_id=17771

(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*

Materials Technology is an introductory course to the basic principles of Materials Science, aiming at providing the students with fundamental knowledge on the interrelation between structure, processing and properties of technological materials. In the course basic concepts such as crystal and amorphous structure, crystal defects, mechanical properties and their dependence on basic microstructural characteristics are discussed. The materials are categorized based on their structure in metals, ceramics, polymers and composite materials. Emphasis is given on the concept of material performance and how this is related to its structure, properties and processing in order to select a material for a specific application. The importance of material selection in the design of mechanical engineering systems is analyzed so the students become capable of applying their knowledge on using appropriate criteria for the selection of materials regarding a specific application in mechanical design.

With successful participation in the course of Materials Technology the student will be able to:

- Recognize the basic characteristics related to the structure of technological materials
- Categorize the technological materials based on their characteristics regarding their structure and associated properties in metals, ceramics or polymers.

- Select a material type for a certain application based on required design criteria
- Recognize appropriate experimental techniques for the determination of basic material mechanical properties
- Recognize the basic strengthening processes of materials
- Determine the tensile properties of a material using the engineering stress strain diagram
- Implement the rule of mixture to determine the modulus of Elasticity in fiber reinforced composite materials
- Use the mechanical properties as criteria for material selection in mechanical design

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
thinking 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
……
Others…
…….

The aim of the course is to develop student competences in:

- Understanding the basic principles of the interrelation between material structure, properties and processing
- Developing decision making abilities in material selection based on material performance with regard to specific applications

(3) SYLLABUS

The material structure (chemical bond, crystal structure, crystal defects etc.) is analyzed and the influence of its main features on the properties of materials is described. The basic material types that are considered in the frame of the course are metals, polymers, ceramics and composite materials.

Course syllabus:

Technological materials and their properties – Life cycle of materials – Price and availability – Sructure of materials , chemical bonds – Primary and secondary chemical bonds, interatomic forces – Atomic arrangements in solids-Atomic model of hard spheres-Crystallography- Structure of polymers and inorganic glasses – Density of solids – Modulus of Elasticity, Hooke's law – Theoretical basis of Modulus of Elasticity – Composite materials – Linear and nonlinear elasticity – Inelastic behavior and plastic deformation – Theoretical strength of crystals – Dislocations – Strengthening mechanisms, strain hardening – Fracture and fracture toughness – Fatigue : Low and high cycle fatigue – Creep – Oxidation and corrosion.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of personal computer and projection media for teaching assistance
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*	

Activity	*Semester workload*
Lectures	52
Assignments	20
Laboratory assignments	12
Literature Study	42
Interactive teaching	10
Tutoring	*14*
Course total	*150*

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 language. The method of evaluation is summative using short answer questions and examining the problem solving capabilities. The final evaluation is based on the following: I. Final written exam (60%): II. Intermediate exam (20%) III. Laboratory assignments (10%) III. Assignments (10%) The evaluation criteria are described in the course website.

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

1. G.N. Haidemenopoulos and A.I. Katsamas, ‘‘Introduction to Materials Technology’’, Course Lectures, Thessaly University Press (2003), Volos, Greece.
2. W.D. Callister Jr., ‘‘Science and Materials Technology’’, 9th edition, (Greek Translation K Galliotis) Tziolas Publisher (2004), Thessaloniki, Greece.
3. G.N. Haidemenopoulos, ‘‘Physical Metallurgy’’, Tziolas Publications (2007)
4. D.R. Askeland, ‘‘The Science and Engineering of Materials’’, 3rd edition, Chapman & Hall (1996), London, U.K.
5. W. Bolton, ‘‘Engineering Materials Technology’’, 3rd edition, Butterworth-Heinemann (1998), Oxford, U.K.

6. M.F. Ashby and D.R.H. Jones, ‘‘Engineering Materials: An Introduction to their Properties and Applications’’, Pergamon Press (1980), Oxford, U.K.

- Related academic journals:

1. -Materials Science and Engineering A
2. -Journal of Materials Engineering Performance
3. Materials Characterization