COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	PRODUCT AND SYSTEMS DESIGN ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**2002**	**SEMESTER**	**4^{O}**
COURSE TITLE	MATERIALS TECHNOLOGY (MT)		

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	3	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, specialised general knowledge, skills development*	GENERAL BACKGROUND
PREREQUISITE COURSES:	NONE
LANGUAGE OF TEACHING AND EXAMINATIONS:	GREEK
COURSE DELIVERED TO ERASMUS STUDENTS	YES
MODULE WEB PAGE(URL)	https://eclass.uowm.gr/

2. LEARNING OUTCOMES

Learning Outcomes

The course *«Materials Technology»* is a basic course in materials engineering. It seeks students to understand basic concepts of the mechanical properties of materials and aims to provide the student with the necessary knowledge of material processing. The student is called to understand the basic principles and the framework of processing for the formation of the structure, the properties of the final product and the performance of the materials, the way of structuring the solids and the relationship between structure and morphology and behavior of properties of the selected product.

On successful completion of this module the learner will be able to:

1. Understand basic principles of materials technology.
2. Acquire the fundamental experimental skills as an engineer in the field of Materials.
3. Understand the relationship between properties, structure, and processes.
4. Apply engineering knowledge to solve problems for the processing and application of materials.
5. Select the most suitable materials for specific applications.
6. Analyze the data and suggest how can change the structure and the properties of the material.
7. Acquire the necessary skills and techniques for the development and use new and advanced materials.

General Skills

Upon successful completion of the program students will:

- Theoretical and practical background on the field of materials technology for the design of desired products with the necessary materials.
- Apply a wide range of scientific and technical knowledge concerning the processing of materials during their design and applications.

3. COURSE CONTENTS

The course is the training of students in the field of Materials Technology. It seeks to understand them in basic concepts of the mechanical properties of materials and aims to acquire the necessary knowledge to processing of materials. The aim of the courses is to understand the principles and context of the processing: structure - properties - performance of materials, the structure of the solids and the relationship between structure - morphology and behavior of their properties.
The content of the course is as follows:

- Introduction to Materials Science and Technology
- Mechanical Properties: Part One
    - Terminology of Mechanical Properties.
    - Tensile test
    - Bending test
    - Actual Voltage and Actual Distortion
    - Bending Test
    - The Hardness of materials
    - Nano-engraving
    - Deformation rate effect & Dynamic Behavior
    - Impact Test
    - Monolithic Metal Glasses & The Mechanical Behavior
    - Rheology of liquids
- Mechanical Properties: Part Two
    - Fracture mechanics
    - Characteristics of Microstructure of Fracture to Metal Materials
    - Microstructure characteristics of the Fracture of Ceramics, Glasses and Composites
    - Weibull Statistics on Strength Analysis
    - Fatigue – Results of Fatigue Test
    - Creep, stress rupture and Corrosion under tension
    - Evaluation of Behavior in Creep
    - Strain hardening and Annealing
- Strain hardening and Annealing
    - Cold working relationship with the Stress-Strain Curve
    - Strain hardening mechanisms
    - Properties as a function of cold working
    - Microstructure, Textured Strengthening and Remaining Trends
    - Coldness features
    - The Three Stages of Annealing
    - Annealing Control
    - Annealing and Materials processing

- Hot working
- Basic Principles of Solidification
  - Technological Significance
  - Nucleation
  - Controlled nucleation applications
  - Magnification mechanisms
  - Solidification duration and dendrites size
  - Cooling curves
  - Cast structure
  - Structural defects due to solidification
  - Casting techniques for the components production
  - Continuous casting and casting of ingots
  - Directed solidification, Development of monocrystals and Epitaxy
  - Solidification of Polymers and Inorganic Glasses
  - Connection of Metal Materials
- Solid Solutions and Phase Equilibria
  - Phases and the Phase Equilibria Chart
  - Solubility and Solid Solutions
  - Conditions for complete Solubility in the Solid Phase
  - Strengthening due to Solid Solution Formation
  - Isomorphic Phase Equilibria Diagrams
  - Relationships between Properties and the Phase Balance Diagram
  - Solidification of Solid Solution Alloy
  - Solidification under Conditions beyond Equilibrium and Difference
- Strengthening with Dispersion and Diagrams
  - Equilibria of Phases with Eutictic
- Dispersion through Transformation
  - Phases and Thermal Processes
- Categories of materials and processes
  - Hot workings of steels and cast irons
  - Non-Ferrous Alloys
  - Ceramics, Polymers, Composites, Structural, Electronics, Magnetic, Photonic Materials
  - Hot Properties of Materials
  - Corrosion and Wear

4. TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY
Face to face, Distance learning, etc.</td><td>THEORY.
In class, face to face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>• Use of appropriate software
• Use of projection system
• Support of teaching process via the electronic platform e-class.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (teaching hours)</td><td>45</td></tr>
<tr><td>Independent student's own-time course, preparation of the final exam</td><td>55</td></tr>
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	Total Course	**100**
ASSESSMENT METHODS	Written exam at the end of the semester based on theory and exercises developed during the courses. The final written exam include: i. Short-answer questions ii. Problem solving and iii. Multiple choice questions	

5. ATTACHED

-Suggested Bibliography:

- Materials - Structure, Properties and Technological Applications, Askeland Donald, Wendelin Wright, A. TZIOLAS & SONS S.A. PUBLICATIONS, 7th Edition, 2018.
- Materials Science and Technology, V. Zaspalis, 2020, A. TZIOLAS PUBLICATIONS & SONS S.A., 2nd Edition/2020.
- Materials Science and Technology, Vatalis Argyris, ZITI PUBLICATIONS, 2nd Edition, 2009.
- Solid StatePhysics, E.N. Economou, UNIVERSITY PUBLICATIONS OF CRETE, 1st Edition, 2016.

- Related academic journals.