

## COURSE OUTLINE

### 1. GENERAL

|  |  |                              |                |
|--|--|------------------------------|----------------|
| <b>SCHOOL</b>  | ENGINEERING  |                              |                |
| <b>DEPARTMENT</b>  | PRODUCT AND SYSTEMS DESIGN ENGINEERING                               |                              |                |
| <b>LEVEL OF STUDIES</b>  | UNDERGRADUATE  |                              |                |
| <b>COURSE CODE</b>   | <b>4303</b>  | <b>SEMESTER</b>              | 7 <sup>o</sup> |
| <b>COURSE TITLE</b>  | MATERIALS SPECIAL TOPICS (MST)                                       |                              |                |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br><i>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</i> |  | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b> |
| Lectures   |  | 3                            | 6              |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>   |  |                              |                |
| <b>COURSE TYPE</b><br><i>general background, special background, specialised general knowledge, skills development</i>   | SCIENTIFIC AREA<br>Compulsory Specialization "Systems Design" (YEK3) |                              |                |
| <b>PREREQUISITE COURSES:</b>   | MATERIALS SCIENCE AND TECHNOLOGY                                     |                              |                |
| <b>LANGUAGE OF TEACHING AND EXAMINATIONS:</b>  | GREEK  |                              |                |
| <b>COURSE DELIVERED TO ERASMUS STUDENTS</b>  | YES  |                              |                |
| <b>MODULE WEB PAGE(URL)</b>  | <a href="https://eclass.uowm.gr/">https://eclass.uowm.gr/</a>        |                              |                |

### 2. LEARNING OUTCOMES

#### Learning Outcomes

The course "Materials Special Topics" is an entrance of students to the study and application of composite materials. The aim of the course is to get acquainted with these materials and to understand the techniques used for the synthesis of traditional and advanced materials, to study their structure, properties, and application. In the first part of the course, include the acquaintance with composite materials and their classification into categories. Then the student is asked to understand the parameters that affect their own values and structure, but also to study the methods of their preparation and the properties of these materials through their design, applications, and the solution of technical problems.

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

1. Understand meanings and categories of composite materials.
2. Understand the relationship between the properties and the structure of these materials.
3. Be able to develop new useful materials by combining materials, as they are or after modifications.
4. Select materials by their properties.
5. Understand the properties of composite materials according to the properties of the simple materials and the microstructure of the composites.
6. Analyze and combine the properties of materials to study the applications of advanced materials.
7. Acquire the fundamental data processing skills for the selection of Materials.

## General Skills

### Upon successful completion of the program students will:

- have the theoretical background concerning the Selection of Advanced and Composite Materials studying their structure and properties.
- the ability to apply a wide range of scientific and technical knowledge concerning the structure and properties of composite and advanced materials, study their processing for design and development new products.

## 3. COURSE CONTENTS

The course is taught in the Seventh Semester of Studies, as a Compulsory Course of Specialization "Systems Design", for the students of the Department of Product and Systems Design Engineering of the University of Western Macedonia. The subject matter is the study of composite materials. The aim of the course is for the student to understand the basic principles of composite materials, structure and properties of the constituent materials, the way of their combination, their mechanical behavior, the methods of their construction and forming. The student is asked to understand the principles and context of synthesis-processing-structure-properties and the final structure of composite materials.

The content of the course is as follows:

- Nature of composite materials
- Polymeric matrices
  - o Polymerization
  - o Polymer Classification
  - o Polymer Chemistry
  - o Ordinary polymeric, ceramic, carbonated and metal matrices
- Stratified composite materials
- Reinforcing Fibers
- Interfaces of Composite Materials.
- Mechanical properties of Composite Materials
- Formulations and Behavior of Composite Materials
- Introduction to special categories of composites: Foams, Biosynthetically, Porosity and Membranes.

## 4. TEACHING METHODS - ASSESSMENT

|   |   |                          |
|---|---|--------------------------|
| <b>MODE OF DELIVERY</b><br><i>Face to face, Distance learning, etc.</i> | <b>THEORY</b><br>In class, face to face   |                          |
| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>                 | <ul style="list-style-type: none"> <li>• Use of appropriate software</li> <li>• Use of projection system</li> <li>• Support of teaching process via the electronic platform e-class.</li> </ul> |                          |
| <b>TEACHING METHODS</b>   | <i>Activity</i>   | <i>Semester workload</i> |
|   | Lectures (teaching hours)   | 45                       |
|   | Independent student's own-time course, preparation for the final exam   | 55                       |
|   |   |                          |

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|                           | Total Course   | <b>100</b> |
| <b>ASSESSMENT METHODS</b> | <p>Written exam at the end of the semester based on theory and exercises developed during the courses.</p> <p>The final written exam include:</p> <ol style="list-style-type: none"> <li>i. Short-answer questions</li> <li>ii. Problem solving and</li> <li>iii. Multiple choice questions</li> </ol> |            |

## 5. ATTACHED

*- Suggested Bibliography:*

- Composite Materials, Giorgos Papanikolaou, Dionysis Mouzakis, KLEDARETHMOS PUBLICATIONS LTD, 1<sup>st</sup>Edition, 2007.
- Polymer Chemistry, Raul C. Heimenz, Timothy P. Lodge, UNIVERSITY PUBLICATIONS OF CRETE, 1<sup>th</sup>Edition, 2014.
- Science and technology of composite materials, Beltsios K., PUBLICATIONS A. TZIOLA & SONS S.A., 1<sup>th</sup>Edition, 2010.
- Nanotechnology and advanced polymeric materials, Papaspyridis K. Pavlidou S, KALAMARA ELLI Publications, 1<sup>st</sup>Edition, 2012.

*- Relevant scientific journals.*