



|   |  |   |
|---|--|---|
| <b>Course Code</b><br>MENG-470                  | <b>Course Title</b><br>Composite Materials | <b>ECTS Credits</b><br>6                                |
| <b>Department</b><br>Engineering                | <b>Semester</b><br>Fall, Spring            | <b>Prerequisites</b><br>MENG-270, MENG-272,<br>MENG-452 |
| <b>Type of Course</b><br>Elective               | <b>Field</b><br>Engineering                | <b>Language of Instruction</b><br>English               |
| <b>Level of Course</b><br>1 <sup>st</sup> Cycle | <b>Year of Study</b><br>4 <sup>th</sup>    | <b>Lecturer(s)</b><br>Dr Vasileios Drakonakis           |
| <b>Mode of Delivery</b><br>Face-to-face         | <b>Work Placement</b><br>N/A               | <b>Co-requisites</b><br>None                            |

### **Objectives of the Course:**

The main objectives of the course are to:

- Present a concise introduction to composite materials and mechanics
- Include the most effective methods for analysis and design of composite materials
- Provide detailed information on fiber and matrix and their properties essential for design
- Add new information on the latest technology, including modern fiber properties and new developments in the use of carbon nanotubes as reinforcement, etc.
- Explore applied design and analysis of beams, plates, shells, and external strengthening of reinforced concrete beams, columns, and beam-columns
- Demonstrate the application of presented analysis techniques and design methodology

### **Learning Outcomes:**

After completion of the course students are expected to:

- Understand the nature, physics and engineering of composite materials
- Have a deeper understanding on polymer composite materials
- Comprehend mechanical and physical properties of composite materials
- Be able to do engineering design with composite materials
- Be able to design composite materials
- Comprehend the interphase/interface region between fiber and matrix
- Be able to perform basic fabrication processes of composites

### **Course Contents:**

- Introduction to Composite Materials
- Metal-, Ceramic-, Polymer- Composites
- Nature of polymeric composites,
- polymeric matrices,
- mechanical and ultimate properties of polymers,

- physical properties of polymers,
- fabrication processes of polymeric systems,
- fibers, interfaces and interphases,
- introduction to composites,
- elastic properties of fiber reinforced polymers,
- mechanical properties of composites,
- physical properties of composites,
- fabrication processes of polymer composites.

**Learning Activities and Teaching Methods:**

Lectures, in-class examples and exercises, in-class activities, videos.  
The course format is 3 h lectures and 1 h design lab per week.

**Assessment Methods:**

In-class activities, weekly tests, homework (applied exercises), mid-term exam, final exam.

**Required Textbooks/Reading:**

| Authors         | Title  | Publisher                         | Year | ISBN          |
|-----------------|--|-----------------------------------|------|---------------|
| Ever J. Barbero | Introduction to Composite Materials Design, Second Edition | CRC Press, Taylor & Francis Group | 2010 | 9781420079159 |

**Recommended Textbooks/Reading:**

| Authors               | Title                                  | Publisher                            | Year | ISBN          |
|-----------------------|--|--------------------------------------|------|---------------|
| D. Hull & T. W. Clyne | An Introduction to Composite Materials | Cambridge Solid State Science Series | 1996 | 9780521388559 |