



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria
<b>ACADEMIC YEAR</b>	2019/2020
<b>MASTER'S DEGREE (MSC)</b>	MECHANICAL ENGINEERING
<b>SUBJECT</b>	COMPOSITE MATERIALS - WORKSHOP
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	F
<b>AMBIT</b>	21265-Tirocini formativi e di orientamento
<b>CODE</b>	15199
<b>SCIENTIFIC SECTOR(S)</b>	
<b>HEAD PROFESSOR(S)</b>	ZUCCARELLO                      Professore Ordinario                      Univ. di PALERMO BERNARDO
<b>OTHER PROFESSOR(S)</b>	
<b>CREDITS</b>	3
<b>INDIVIDUAL STUDY (Hrs)</b>	0
<b>COURSE ACTIVITY (Hrs)</b>	0
<b>PROPAEDEUTICAL SUBJECTS</b>	
<b>MUTUALIZATION</b>	
<b>YEAR</b>	2
<b>TERM (SEMESTER)</b>	1° semester
<b>ATTENDANCE</b>	Not mandatory
<b>EVALUATION</b>	Pass/Fail
<b>TEACHER OFFICE HOURS</b>	ZUCCARELLO BERNARDO Monday    10:00    12:00    UFFICIO EDIFICIO 8

**DOCENTE:** Prof. BERNARDO ZUCCARELLO

<b>PREREQUISITES</b>	Knowledge of Statics and Mechanics of Solids.
<b>LEARNING OUTCOMES</b>	<p>Knowledge and ability to understand:                      At the end of the course the student will have acquired knowledge and methods to address and solve the problems related to the manufacturing of composites and their mechanical characterization.</p> <p>Capacity to apply knowledge and understanding:                      The student will have acquired knowledge and methodologies to the systematic realization of structural components in the fields of the industrial manufacturing.</p> <p>Making judgments:                      the student will have acquired the methods for the manufacturing and the mechanical characterization of components and structures made entirely or partially by composites.</p> <p>Communication skills:                      the student will be able to communicate competently about complex issues related to the manufacturing and the characterization of composites.</p> <p>Learning capacity: the student will be able to solve issues related to the correct choice of the methods for composite manufacturing in any field of the mechanical design.</p>
<b>ASSESSMENT METHODS</b>	Oral examination with discussion of the exercitations carried out in laboratory.
<b>EDUCATIONAL OBJECTIVES</b>	The course intends to train the student so that he is able to solve the problems related to the manufacturing and successive characterization of composites, by applying the methods currently available to these aims.
<b>TEACHING METHODS</b>	Lectures and laboratory exercitations.
<b>SUGGESTED BIBLIOGRAPHY</b>	Zuccarello, B., Dispense di PROGETTAZIONE MECCANICA CON MATERIALI NON CONVENZIONALI, Palermo, 2002. Agarwal, B.D., Broutman, L.J., ANALYSIS AND PERFORMANCE OF FIBER COMPOSITES, John Wiley & Sons, New York, 1980. Barbero, E.J., INTRODUCTION TO COMPOSITE MATERIAL DESIGN, Taylor and Francis, New, York, 1999. Wachtman, J.B., STRUCTURAL CERAMICS, Academic Press inc., Londra, 1989. Reddy, J.N., MECHANICS OF LAMINATED COMPOSITE PLATES, CRC Press, 1997. Kaw, A. K., Mechanics of Composite Materials, CRC Press, 1997. Musikant, S., CERAMICS, Marcel Dekker, New York 1991.

### SYLLABUS

Hrs	Frontal teaching
2	MANUFACTURING PROCESSES OF COMPOSITE MATERIALS: Hand ly-up, Pultrusion, Bag Molding, Autoclave Processing, Prepreg- lay-up, Compression-Molding, Resin Transfer Molding.
3	EXPERIMENTAL CHARACTERIZATION OF COMPOSITE MATERIALS: Tensile test, Compression test, Shear tests, Bending tests, Fatigue tests, Fracture test.

  

Hrs	Workshops
10	MANUFACTURING PROCESSES OF COMPOSITE MATERIALS: Hand ly-up, Bag Molding, Prepreg- lay-up, Compression-Molding.
12	EXPERIMENTAL CHARACTERIZATION OF COMPOSITE MATERIALS: Tensile test, Compression test, Shear tests, Bending tests.