

MATERIALS ENGINEERING AND NANOTECHNOLOGY (LM56)

(Lecce - Università degli Studi)

Teaching HEAT AND MASS TRANSFER PHENOMENA IN COMPOSITES AND POLYMERS

GenCod A003120

Owner professor Alfonso MAFFEZZOLI

Teaching in italian HEAT AND MASS TRANSFER PHENOMENA IN

Teaching HEAT AND MASS TRANSFER PHENOMENA IN COMPOSITES AND

SSD code ING-IND/24

Reference course MATERIALS ENGINEERING AND

Course type Laurea Magistrale

Credits 9.0

Teaching hours Front activity hours: 81.0

For enrolled in 2017/2018

Taught in 2018/2019

Course year 2

Language ENGLISH

Curriculum PERCORSO COMUNE

Location Lecce

Semester First Semester

Exam type Oral

Assessment Final grade

Course timetable

<https://easyroom.unisalento.it/Orario>

BRIEF COURSE DESCRIPTION

This course provides a strong interdisciplinary approach to composite materials in view of their application in aeronautic structure. Competences on polymer matrices and reinforcements, mechanics of anisotropic materials, fabrication technologies of thermoplastic and thermosetting matrix composites are provided. Also ceramic matrix materials are presented with special attention to their processing and properties.

REQUIREMENTS

Knowledge of transport phenomena and polymer physics and chemistry.

COURSE AIMS

Knowledge and understanding:

The course provides the basis of knowledge to understand and solve complex new problems in materials processing and in mass and heat diffusion, applying ideas often in a research context

Applying knowledge and understanding

The student will be able to solve heat and mass balances, applied to materials processing, using approximate solution or numerical methods. A multidisciplinary approach is presented accounting for chemical, materials and mechanical engineering aspects.

Making judgements

Dimensionless and approximate methods are presented in order to promote the judgement and evaluation capabilities of the students

Communication

The course promotes the development of the following skills of the student: ability to expose in precise and formal terms an abstract model of concrete problems, identifying the salient characteristics of them and discarding the inessential characteristics; ability to describe and analyze an efficient solution for the problem under consideration.

Learning skills

Autonomous learning is promoted thanks to the use of: different books and slides, numerical methods, homework exercise to be solved in groups of two

ASSESSMENT TYPE Oral after a homework . A homework regarding modeling topics, and an associated finite element solution of the related differential equations, is assigned to students. During the exams the homework is discussed and if the results are satisfactory an oral stage is started with questions regarding the main topics of the course

FULL SYLLABUS Introduction, thermosetting composite matrices (12 hours).
Basic principles of the processing of thermosetting matrix composites: autoclave lamination as case study (20 hours).
Process modeling through numerical solution of differential equations (10 hours).
Modeling approach to filament winding, pultrusion, RTM and other processes (16 hours).
Processing of thermoplastic composites (10 hours).
Visit to industrial plants (8 hours).
Mass transport in polymers: technological and modeling issues (12 hours).
Industrial plant visits are programmed. A full day to the Journée européenne de composites (JEC) in Paris (France), the most relevant world fair on materials and processes for composites, is organized if adequate financial support is provided by University to students.

REFERENCE TEXT BOOKS Slides in *.ppt format available at the intranet of dipartimento di ingegneria dell'innovazione
Crank "Mathematics of diffusion"
D. S. Burnett "Finite Element Analysis: From Concepts to Applications"
P.K. Mallick "Fiber-Reinforced Composites: Materials, Manufacturing, and Design"