MATERIALS ENGINEERING AND NANOTECHNOLOGY (LM56)

(Lecce - Università degli Studi)

Teaching METALLIC MATERIALS: PROPERTIES AND APPLICATIONS

GenCod A006457

Owner professor PAOLA LEO

Reference professors for teaching PAOLA LEO, GILDA RENNA

Teaching in italian METALLIC MATERIALS: PROPERTIES AND

Teaching METALLIC MATERIALS: PROPERTIES AND APPLICATIONS

SSD code ING-IND/21

Reference course MATERIALS ENGINEERING AND

Course type Laurea Magistrale

Credits 6.0

Teaching hours Front activity hours: 54.0

For enrolled in 2021/2022

Taught in 2022/2023

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	The course clarifies the microstructure, properties and engineering applications of metallic alloys in the most significant fields (for example aerospace, automotive, civil, structural, biomedical).
REQUIREMENTS	Metallurgy basics
COURSE AIMS	After the course the students: 1) will know the various types of major engineering alloys in term of microstructure, properties and applications 2) will be able to make decision for material selections for engineering design 3) will know the strengthening method, heat treatments and surface hardening/ modifications to apply with regard the required service properties
TEACHING METHODOLOGY	Lectures, laboratory practice, individual project
ASSESSMENT TYPE	The exam consists of two parts: 1. first written part: the student is asked to illustrate theoretical topics 2. second part: the student is asked to discuss the laboratory topics and individual project with the lecturer.

FULL SYLLABUS

Lectures:

1) Metallic alloys application in aerospace, automotive, civil, structural and biomedical fields. 3h
2) Aluminum Alloys: designation, compositions, typical applications, mechanical properties, strengthening methods, corrosion resistance. 5h
2_a Case studies analysis to familiarize with the different Al alloys.
3) Magnesium Alloys: designation, compositions, typical applications, mechanical properties, strengthening methods, corrosion resistance. 4h
3_a Case studies analysis to familiarize with the different Mg alloys.
4) Titanium alloys: designation, compositions, typical applications, mechanical properties, strengthening methods, corrosion resistance. 5h
4_a Case studies analysis to familiarize with the different Ti alloys.
5) Nichel alloys and superalloys: designation, compositions, typical applications, mechanical properties, strengthening methods, corrosion resistance. 4h
5_a Case studies analysis to familiarize with the different Ni alloys.
6) Plain Carbon Steel: designation, non-heat treatable low carbon sheet steel, microalloyed steels, dual phase steels. Properties and Applications 4h
6_a Case studies analysis to familiarize with the different Plain carbon Steel .
7) Alloy Steels: classification, alloying element in Steel, Hardenability. Chemical compositions Properties and applications 5h
7_a Case studies analysis to familiarize with the different alloy steel
8) Stainless Steel: Chemical composition properties and applications 5h
7_a Case studies analysis to familiarize with the different stainless Steel
9) Hardening Method and surface modification 3h
10) Shape memory and superplastic alloys. Applications 3h

Laboratory:

Analysis of microstructural features and properties of the alloys.
Students will be asked to apply the laboratory practice for solving specific questions related to the above topics.

Project:

In depth study of a component for aerospace/automotive/civil/structural/biomedical fields by using scientific literature.

REFERENCE TEXT BOOKS

[1] W.F.Smith, *Structure and Properties of Engineering Alloys*,McGraw-Hill
[2] M.Tisza, *Physical Metallurgy for Engineers,* ASM,
[3] I.J.Polmear, *Light Alloys,* BH
[4] G. Lutjering, J. C. Williams,*'Titanium', Springer* 2nd edition, New York