

Materials science

Engineering materials

IDENTIFICATION

CODE : GMCIP-3-S1-EC-SIMS
ECTS : 4.0

HOURS

Lectures : 17.0 h
Seminars : 19.0 h
Laboratory : 24.0 h
Project : 0.0 h
Teacher-student
contact : 60.0 h
Personal work : 60.0 h
Total : 120.0 h

ASSESSMENT METHOD

1 Written Exam + 1 control

TEACHING AIDS

Copy of the slides

TEACHING LANGUAGE

French

CONTACT

M. BUFFIERE Jean-Yves
jean-yves.buffiere@insa-lyon.fr
MME SANDIER Celine
celine.sandier@insa-lyon.fr

AIMS

- * Part A: overview of engineering materials. Global picture of materials classes, their properties and a few related processes. Structure-properties relationship. Introduction to material selection.
- * Part B: metals and ceramics Microstructure-properties relationship in metals and ceramics. Influence of process on microstructure and properties. Theory and practice of thermal treatments in metallic alloys.
- * Part C: polymers and composites Synthesis of different classes. Morphology and structure. Process-materials-structure relationship.

CONTENT

Introduction to the world of materials. Origins of elasticity: elements, inter-atomic bonds and atomic packing. Origins of plasticity: defects and microstructure rearrangement. Failure and fatigue behaviour. Durability and aging. introduction to materials selection.

* Part B:

Diffusion and phase diagrams. Phase transformations. Metallurgy of steels and light alloys. Ceramics and glasses.

* Part C:

Introduction to polymer material science. Micro- and macroscopic properties of polymers. Composite materials. Degradation, durability and aging. Lab work: Optimization of the properties of metallic alloys by thermal treatment.

BIBLIOGRAPHY

Engineering Materials I - An Introduction to Properties, Applications and Design, M.F. Ashby and D.R.H. Jones,
Elsevier Butterworth-Heinemann
Engineering Materials 2 - An Introduction to Microstructures, Processing and Design, M.F. Ashby and D.R.H.
Jones, Elsevier Butterworth-Heinemann
Materials - Engineering, Science, Processing and Design, M. Ashby, H. Shercliff and D. Cebon, Elsevier Ltd
Polymeric materials - Structure - Properties - Applications, G.W. Ehrenstein, Ed. Hanser.

PRE-REQUISITE

None