Assembly techniques
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Cursus
Science et génie des matériaux

Sem. Type
MA2, MA4 Opt.

Language
English

Credits
2

Session
Summer

Semester
Spring

Exam
During the semester

Workload
60h

Weeks
14

Hours
2 weekly

Lecture

Number of positions
2 weekly

Summary
Introduction to the assembly of materials by homogeneous or heterogeneous joints (welding, bonding, mechanical assembly). Mechanical and environmental resistance of joints.

Content

Metallic assemblies
• Assembly systems
• Brazing and welding
• Welding techniques
• Surface and interfacial phenomena

Polymer assemblies
• Theoretical aspects of adhesion
• Principal classes of adhesives and their applications
• Properties of polymeric joints
• Polymer interdiffusion in plastic welding
• Mechanical methods of plastic joining

Ceramic assemblies
• Techniques for ceramic/metal/glass joints
• Physical and chemical basis for determining the properties of heterogeneous joints
• Typical applications

Keywords
Welding, brazing, adhesives, mechanical joining, polymers, ceramics, metals

Learning Prerequisites

Recommended courses
Polymères, structures, propriétés, MSE-230, MX, Plummer
Materials mechanics, MSE-205, MX, Bourban
Deformation of materials, MSE-310, MX, Logé
Surfaces and interfaces, MSE-304, MX, Ceriotti
Important concepts to start the course
Basic physics and chemistry, simple mechanics

Learning Outcomes
By the end of the course, the student must be able to:
• Describe the basic principles of the different joining methods
• Recognize specific characteristics of joints in the different classes of materials (metals, ceramics and plastics)
• Explain the advantages and disadvantages of different joining techniques
• Perform simple structural analysis of mechanical joints
• Discriminate between different classes of adhesives and their applications
• Choose the best joining method for a given application
• Choose the best joining method for different materials
• Analyze the failure of a joint

Transversal skills
• Collect data.
• Make an oral presentation.
• Access and evaluate appropriate sources of information.

Teaching methods
Ex cathedra, seminars, workshop demonstration, exercises

Expected student activities
Attendance at lectures and workshop demonstration, participation in exercises

Assessment methods
Intermediate tests on metals and ceramics and polymers + presentation of a case study. The final mark is the average of the average mark for the tests and the mark for the case study (which hence counts for 50% of the overall mark)

Supervision
Office hours  Yes

Resources
Websites
• http://my.epfl.ch

Prerequisite for
Master thesis