

# MSE-464 Assembly techniques

Leinenbach Christian, Plummer John Christopher

Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Opt.

Language of English teaching Credits Summer Session Spring Semester Exam During the semester Workload 60h Weeks 14 Hours 2 weekly 2 weekly Courses Number of positions

#### **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

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#### 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 pricinples 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

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