MSE-485 **Tribology**

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Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Opt.
Mechanical engineering	MA1, MA3	Opt.
Space Technologies minor	H	Opt.

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

Summary

This introductory course in tribology (science of friction, lubrication and wear) has specific goals : to present the basic principles of tribology, to develop the attitude to analyse tribological and to illustrate correlations between materials and tribological properties.

Content

BASIC PRINCIPLES Elastic/plastic contacts, friction, lubrication, deformation and fracture in contacts, wear, third body and tribological flow, experimental techniques.
MATERIALS AND CONTACTS Metals and alloys, ceramics, coatings, polymers and composites.
SURFACE CHEMISTRY AND TRIBOLOGY Reaction layers, tribocorrosion, boundary lubricated wear.
APPLICATIONS EXAMPLES Biomedical implants, micro-technology.

Keywords

Wear, friction, lubrication,

Learning Prerequisites

Recommended courses

Introduction à la science des matériaux

Important concepts to start the course

Basics of mechanics (forces, work, energy), Basics of material science (polymers, ceramics, metals)

Learning Outcomes

By the end of the course, the student must be able to:

- Describe tribological systems.
- Describe basic phenomena related to friction, wear and lubrication.
- Link tribological behaviour to material and system parameters.
- Analyze tribological systems in terms of structure and material properties.
- Assess / Evaluate possible relationships between tribological response and involved mechanisms.
- Critique and assess literature published on the subject.
- Work out / Determine possible ways to improve the tribological perfomance of systems.
- Identify acting main wear mechanisms.

Transversal skills

- Communicate effectively, being understood, including across different languages and cultures.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Negotiate effectively within the group.
- Summarize an article or a technical report.
- Make an oral presentation.
- Access and evaluate appropriate sources of information.

Teaching methods

Ex cathedra with exercises and case studies
2-3 presentations by external speakers (one in French)

Expected student activities

Participation in the course, resolution of excercises, practical case studies.

Assessment methods

Mid term written exam (50%)
Oral presentation to the other students of the critical analysis of an article published in a tribology journal (in groups). Questions by students to the presenting group will be evaluated. (50%). In case of a too large number of registered students, this oral presentation will be replaced by a second written exam (50%).

Supervision

Office hours	No
Assistant.e.s	No
Forum	No
Others	Teacher availble for meetings (by prior arrangement through email).

Resources

Bibliography

Book list indicated below.

Notes/Handbook

Slides copies and general information available on the Moodle site.

Moodle Link

- https://go.epfl.ch/MSE-485

Prerequisite for

Projects in the field of tribology