

MSE-474

Materials selection

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Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Opt.
Mechanical engineering	MA2, MA4	Opt.
Space technologies minor	E	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Written
Workload	60h
Weeks	14
Hours	2 weekly
Lecture	2 weekly
Number of positions	

Remark

4h lecture every two weeks, from the first week.

Summary

Propose suitable materials, design, and production routes depending on different performance criteria using a computer based software approach. The course is based on Prof. Mike Ashby's well known "Ashby plots" comparing different material properties (mechanical, thermal, chemical, etc.).

Content

- General introduction and presentation of the methodology
- Design and manufacturing of "new" materials and material combinations with desired attributes
- Illustration of the approach based on practical case studies; the examples range from structural & functional bulk materials, thin & thick film coatings, and composites down to complex systems like music instruments
- Exercises

Keywords

Materials evaluation,
production processes evaluation,
economical and ecological considerations
case studies

Learning Prerequisites**Required courses**

Basics in materials &
mechanical engineering

Recommended courses

Engineering Design

Learning Outcomes

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

- Propose the best material for a specific application..
- Work out / Determine materials constraints and free variables.

- Derive indices of goodness (mechanical, thermal, ecological...).
- Create and defend a selection strategy respecting multiple objectives.
- Assess / Evaluate production methods with respect to economical and ecological aspects.

Transversal skills

- Use a work methodology appropriate to the task.
- Use both general and domain specific IT resources and tools
- Continue to work through difficulties or initial failure to find optimal solutions.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Set objectives and design an action plan to reach those objectives.
- Access and evaluate appropriate sources of information.

Teaching methods

50% ex-cathedra, 50% cases studies, team work, exercises and discussion

Expected student activities

Attendance at lectures and solving of case studies

Assessment methods

Written exam

Resources

Virtual desktop infrastructure (VDI)

Yes

Bibliography

e.g. "Materials Selection in Mechanical Design" by Michael F. Ashby, Elsevier Butterworth-Heinemann, Oxford, ISBN : 1-282-87870-0; ISBN : 9786612878701

Ressources en bibliothèque

- [Materials Selection in Mechanical Design](#) by Michael F. Ashby

Notes/Handbook

PDFs of the manuscript/slides will be distributed.

Moodle Link

- <https://go.epfl.ch/MSE-474>