

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.

Contact language	English
Credits	2
Session	Summer
Semester	Spring
Exam	Written
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Lecture	2 weekly
<b>Number of positions</b>	

**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>