Materials selection
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<tr>
<th>Cursus</th>
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<td>Energie et durabilité</td>
<td>MA2, MA4</td>
<td>Opt.</td>
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<td>Mineur STAS Chine</td>
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<td>Science et génie des matériaux</td>
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Language: English
Credits: 2
Session: Summer
Semester: Spring
Exam: Written
Workload: 60h
Weeks: 14
Hours: 2 weekly
Lecture: 2 weekly

Remarque
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**

**Bibliography**

**Ressources en bibliothèque**
• Materials Selection in Mechanical Design / Ashby

**Notes/Handbook**
PDFs of the manuscript/slides will be distributed.