



Aalto University
School of Engineering

MEC-E1070

Selection of Engineering Materials

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Course grade

35 points: participation

12 flipped classrooms

18 seminar questionnaires

2 pre-assignment (Task 0)

3 course feedback

40 points: quality of tasks

6 selection basics & 2 peer assessment

6 multiple constraints & 2 peer assessment

6 effect of shape & 2 peer assessment

6 hybrid materials & 2 peer assessment

6 materials, environment and processes & 2 peer assessment

(≤20 from review task, for tasks you missed)

40 points: case study

Total: 115 points

Total	Grade
≥95	5
≥85	4
≥75	3
≥65	2
≥50	1
<50	0

Case Study (instead of exam)

Choose your application

- Each student must carry out the material selection for one or more parts of a product for which the material selection is sufficiently interesting to be able to address the different elements of the report.

Minimum requirements

- The report must have an introduction explaining as much about the product and its parts as is necessary to justify the choices made. For each case, the report must at least address the derivation of the performance indicators and the combination of multiple constraints or objectives, to arrive at a specific choice for a material for that part.

Length

- All derivations and discussions must be detailed enough to be clear and demonstrate understanding, but should otherwise be as short as possible.

Case Study (instead of exam)

Work out a materials selection problem in detail

3 options

- Part of a project or other course
- Individually, compare different materials for a case study you choose
- Groups of at least 3 students, compare your materials with each other

3 levels

- Basic case study (≤ 20 points)
- Detailed case study (≤ 30 points)
- Comparison (+ ≤ 10 points)

To be reported in writing, instead of an exam

simple case study (20 points)

Setting (5 points)

- Describe the product and the part you are selecting the material for.

Material performance index (5 points)

- Derive (do not simply look up or posit) the performance indicators used.

Multiple objectives (5 points)

- Address the combination of multiple constraints or objectives.

Selection (5 points)

- Explain which class or classes of materials contain the best choices for this part and why those materials are good, as well as how the performance indicators are used to select a specific material from them.

detailed case study (30 points)

= **simple case study** (20 points) + ...

additionally expand at least one version of one part with:

Shape (3 points)

- discuss the effect of shape on the material performance in this case

Hybrid materials (3 points)

- explain whether a hybrid solution might be recommended

Environmental impact (2 points)

- estimate at least one aspect of environmental impact

Production methods (2 points)

- discuss at least one suitable production method

Please keep this brief!

We just want to see that you understand the

comparative case study (+10 points)

Combine three or more closely related simple case studies

- The cases should be related such that different choices can be compared that are appropriate for different parts or versions of the product.

For example, you might have one choose the material for a prototype, another choose the material for a mass-produced version of the product, while a third chooses the material for a luxury or high-performance version of the product.

Introduction (5 points)

- The introduction needs to explain what the different parts and versions have in common, as well as who does what part of which version.

Discussion (5 points)

- Discuss how the cases differ from each other and how that is reflected in the materials selected. This should be a common discussion for all the different parts and versions. (5 points)

group work

Comparative case studies can be carried out as a group

- Each student in the group is responsible for one or more versions of one or more of the parts to be compared, and the introduction and discussion are written together.
- Each student should contribute all the elements of a simple case study or of a detailed case study for at least one version of one component, submitted separately as an individual case study.

Submission on MyCourses

Everyone submits their individual case study, individually

- Each student still makes an individual case study submission with their own report of a basic case study or detailed case study to be compared with the other cases.
- For a comparative case study carried out individually, the common introduction and discussion may simply be included in the individual case study report, but it should be clearly indicated in the report that this is a comparative case study carried out individually.

Group submissions

- The group submission should include (for example as appendices) the individual case study reports and refer to them as needed, so that the common part can be clear and concise.
- A single version of the group report is uploaded to MyCourses, and each student in the group separately must submit that version of the report, before the system registers the report as submitted.

Examples

Bicycle

- frame, fork, tires, spokes, pedal crank, ...
- racing bike, mountain bike, eco-friendly bike, ...

Brake pads

- car, bicycle (calliper brake), bicycle (disk brake), elevator, ...

Wind turbine

- arctic, offshore, low-tech, ...
- tower, blade, foundation, ...

Building materials

- load-bearing wall, floor, roof, sound-isolating internal wall, ...

Review task



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Assessment of tasks

The task is a tool for guidance and self-assessment of independent study with the textbook; each task contains at least two subtasks, and your report of the task is used to discuss and compare in class how each of you did it

- 1 point: you make clear that you read the textbook and tried the subtask
- 2 points: you completed the task in a way that makes clear that you understood the textbook, or asked a good question about where you got stuck
- 3 points: a model answer, with clear & concise explanations, and exemplary language and presentation

At the end of the course, a review task gives you a second chance for the topics covered in weekly tasks

- 1 point: you completed the task in a way that makes clear that you understood the textbook
- 2 points: a model answer, with clear concise explanations, and exemplary language and presentation

Review task

Select the material for one of the following load-bearing components:

- hoist cables for an elevator, which need to withstand tension and to bend over the hoist pulley
- the tower of a wind turbine
- a ladder
- a playground seesaw

Subtasks correspond exactly to assessment criteria of the weekly tasks

1 point: you completed the task in a way that makes clear that you understood the textbook

2 points: a model answer, with clear concise explanations, and exemplary language and presentation

(if the score for your weekly task is higher than 3.00/6.00, no bonus points can be granted from the corresponding review tasks)