



Aalto University
School of Engineering

MEC-E1003

Machine Design Project

Sept. 02, 2020

Learning goals for the course

Students...

1. Can relate theory and exercises to practice
2. Can iterate a design from the initial concept to a working prototype
3. Can document their contribution within a team-based effort
4. Are familiar with typical issues in project management and teamwork, and ways to address those issues

Credits: 5 ECTS

Grading: 1 - 5

Duration: 02.09.20 - 11.12.20

Teachers in charge: Sven Bossuyt and Kevin Otto

*Access to prototyping facilities is restricted this year, due to the corona virus pandemic, so expectations and assessment criteria for the prototype will be scaled back accordingly.
However, you must still validate your concept and iterate the design, and produce design documentation for prototyping and testing*

Schedule: Overview and milestones

Week	Deadline	Description
Week 36-38	18/09	Group selection and pre-questionnaire
Week 37-39	02/10	Stirling engine starter project (individual work)
Week 40	02/10	Design brief for group project
Week 43	23/10	Concept pitch + peer review & 1 st evaluation questionnaire
Week 46	13/11	Status report + peer review & 2 nd evaluation questionnaire
Week 49	04/12	Information poster
Week 50	11/12	Gala: Prototype demonstration
Week 51	18/12	Final report & final evaluation questionnaire

Student groups will carry-out an initial ideation for the group project during the month of September!

Stirling engine starter project

11.09.20 - 25.09.20, Friday 12.15 - 16.00

Assemble the Stirling engine kit and Test Performance (individual work)

- Students will be provided with disassembled stirling engine kits, a toolbox with the parts in it, and with a set of hand tools and measurement tools.
- Each student, working alone, will check out a kit for 2 days.
- In those 2 days, they follow provided design documentation to check each part against part drawings, to follow assembly instructions to assemble the engine, and to check the assembly against assembly drawings.
- They operate the engine and confirm performance

Group project

Students, working in teams, will complete a specific mechanical design task, representative of mechanisms used in machines. They will develop an initial concept, build a prototype to demonstrate its working, and carry out more detailed designs of critical components.

For the concept, as a team, reflect on everyday- or industry-related activities and solutions you would like to improve, or to simply try and replicate. In other words, start with an existing object, and design it to be in some way better (perhaps better by some metric that was not important for the original design, sustainability for example).

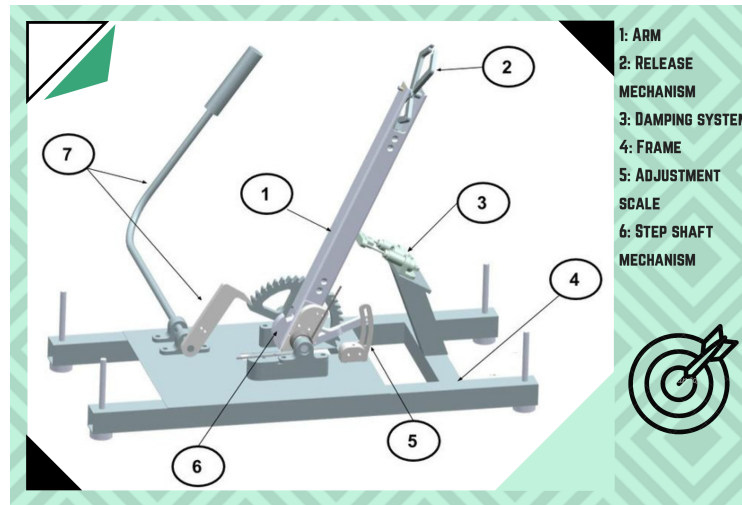
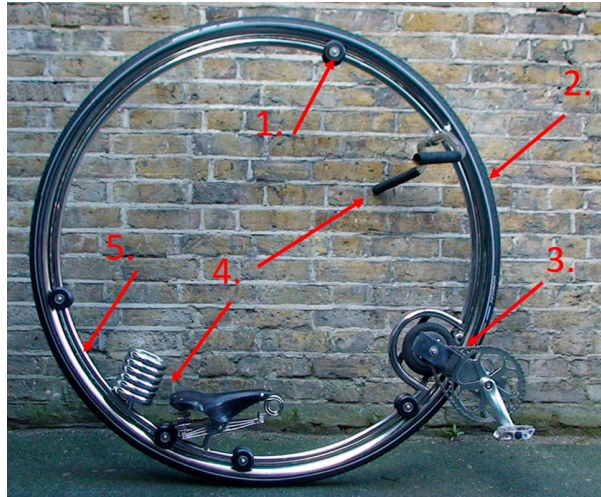
Project-based learning in this course will be supported by the theory and exercises taught in the courses from the common studies, taught concurrently.

In the end of the course, there will be a final gala where you will be required to demonstrate the prototype of your solution.

Previous years

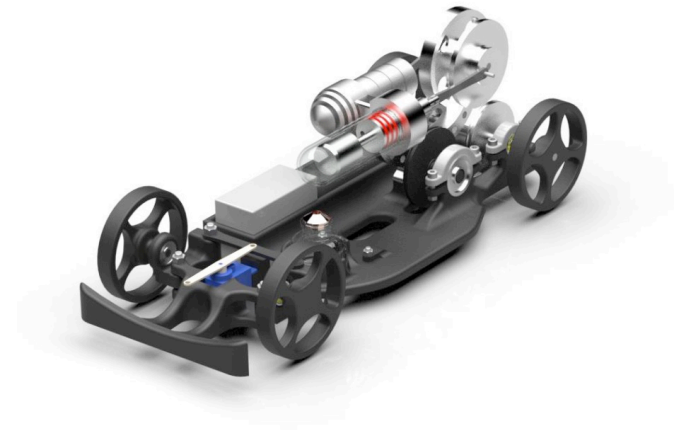
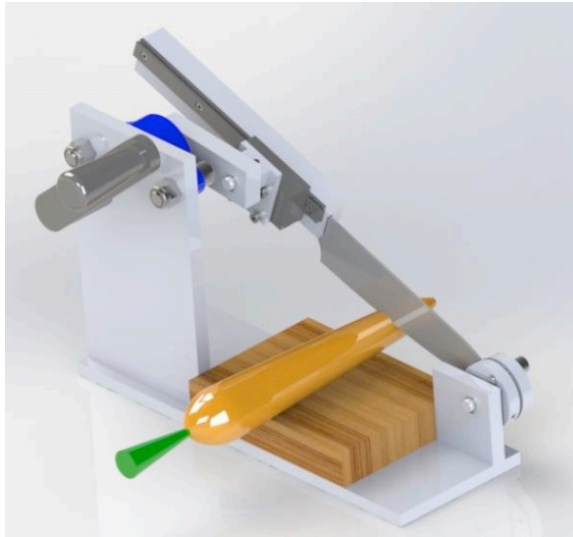


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Group project: Changes this year!

- Most of the teamwork will happen online
- Iterating from initial concept to working prototype will be limited, if students cannot access the production facilities for prototyping. Multi-body dynamics or finite element modelling can be used to iterate the design
- Some preliminary prototype with cardboard cutouts or a wireframe model is still possible
- Whether students get to a working prototype will not be a part of the evaluation criteria
- Teams still need to prepare and document a plan for manufacturing and testing a working prototype

Assessment

Final outcomes and grading

30% Stirling engine starter project

As determined by Prof. Kevin Otto

70% Final design project

Prototype demonstration & reporting

Report should include

- Final design documentation,
- Manufacturing and testing reports,
- Conclusions about course and demo, constructive self-evaluation by including scope for improvement

One grade for the whole report and gala presentation

- Individual grades modified according to contribution to team effort

Contribution to team effort

Mutual assessment within each team

- With the help of three evaluation questionnaires
- Includes self-assessment
- May be overruled in teams where it doesn't work well

Multiplicative combination of four factors

- Timeliness
- Participation/effort
- Quality
- Communication

Criteria for assessment of the contribution to the team effort

Criterion	Characteristics lowering the grade	Grade 3 (good)	Characteristics improving the grade
Timeliness	Work is often not ready on time	Work is usually completed on time, according to the common plan agreed	Work is always completed before the agreed deadline
Participation	Avoiding duties	Participation in the group work, attending meetings, contributing to discussions, taking their part of duties	Taking responsibility for their own duties and readily available to help others
Quality	Deliverables and tasks are incomplete, not working, or poorly documented	Deliverables and tasks are completed in a way that meets expectation	Deliverables are working reliably and are well documented
Communication	Not communicating as planned, difficulty in reaching-out via selected channels	Active communication whenever necessary via planned channels	Proactive, taking initiative in team communication

Questions?