



Aalto University
School of Electrical
Engineering

Project Work

ELEC- E8004 (10 cr)

Kick-off Lecture

Tomasz Kucner, Lauri Palva & Vesa Vuorinen

10.1.2023

General info

Teachers in charge: Tomasz Kucner, Lauri Palva, Vesa Vuorinen & Rinna Toikka & Co. (Language center, communication competences)

- Please send all course related questions, inquires etc. to:

project-work@aalto.fi

- The individual e-mails are:

Firstname.Surname@aalto.fi

Visiting experts:

- Jochen Kruska, EKE-Electronics, Project management
- Mikko J Salminen, Spinverse, Project consultation
- Tuomo Ritari, Finnish Patent and Registration Office (PRH)

General info

Lectures

- Held in TU1 Saab Auditorium - 1017, Maarintie 8 on Tuesdays @ 12:15-14:00 (default)
- Lecture schedule (in MyCourses)
 - 10.1.2023 12:15-14:00 Kick-off
 - 24.1.2023 12:15-14:00 Project planning lecture
 - 31.1.2023 12:15-14:00 Project management/planning lecture
 - 7.2.2023 12:15-14:00 Project management/planning lecture
 - 28.2.2023 12:15-14:00 Business case exercise kick-off
 - 2.3.2023 12:15-14:00 Product concept lecture (Held in AS1, Maarintie 8)
 - 7.3.2023 12:15-14:00 Intellectual property rights lecture

**NOT YET REGISTERED IN SISU?
DO IT TODAY!**

MSc in Automation and Electrical Engineering

Prof. Mervi Paulasto-Kröckel

Joint Courses:

20 cr

- ELEC-E8001 Embedded Real-time Systems (5 cr)
- ELEC-E8004 Project work (10 cr)
- ELEC-E0110 Academic Skills in Master's Studies (3 cr)
- ELEC-E0210 Master's Thesis Process (2 cr)

20 cr

Electronic and Digital Systems

Prof. Simo Särkkä

Embedded sys and sensing

Integrated smart systems

Electrical Power and Energy Engineering

Prof. Marko Hinkkanen

Electric Powertrains

Energy Storage and Hydrogen

Power and Energy Systems

Renewable Energy

Smart Buildings and Lighting

Control, Robotics and Auto. Systems

Prof. Quan Zhou

Robotics and Auton. Systems

Automation Software Eng.

Factory Automation

Smart Living Environment

Control Engineering

Intelligent Systems

25 cr

Elective studies
25 cr

Master' thesis (30 cr)

(Generic) Learning Objectives/Outcomes

After completing the course, the student:

- knows the benefits of project planning,
- is able to create a project plan,
- has an experience of working in a group,
- understands quality requirements of in-project deliverables,
- is able to communicate within project team and with external stakeholders
- is able to describe typical phases of a project,
- is able to use common project management tools and methods, and
- has an experience of completing a real project.

NB: Every topic has specific “technical” learning objectives

- has acquired a deep new knowledge on the project topic

Terminology

Project topic

- project in which you are working during the course

Project group

- group of students (4 ± 1) in Project topic

Instructor

- teacher/researcher/professor guiding you in your topic

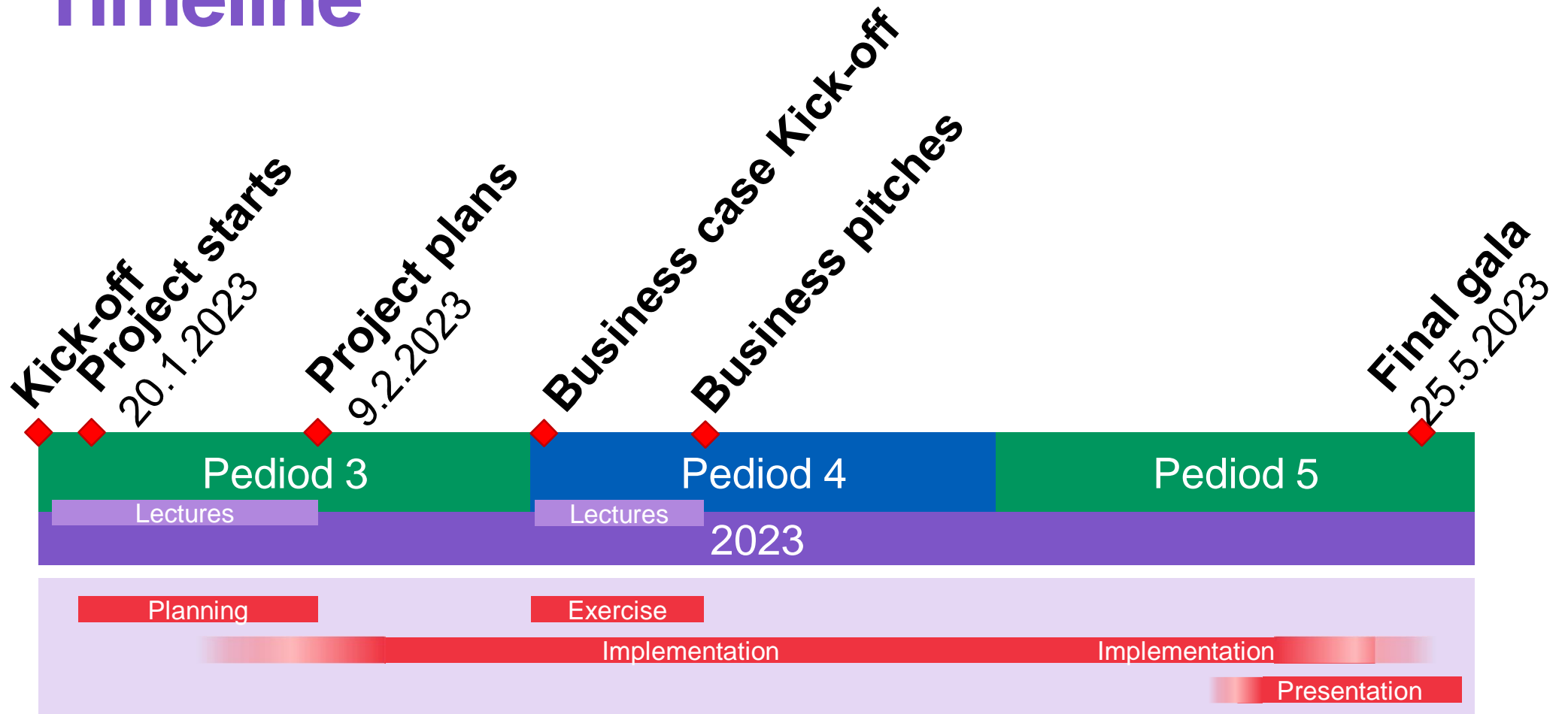
Project plan

- the formal plan of the objectives and execution of the project

Business case document

- "light version" of business plan, includes product concepts

Timeline



First events and milestones

10.1.2023

Kickoff Lecture

Project topics have been revealed

16.1.2023 @12:00

**DL for the selection of your preferred (5) topics
(in MyCourses)**

20.1.2023

Project groups are revealed

24.1.2023

1st Lecture about project planning

Meet the group & the instructor

31.1&7.2.2023

Lectures about project planning & management etc.

9.2.2023 @23:59

DL to submit Project plans

... See MyCourses for more ...

Project Topics

EEA Research Groups have provided **31** Project Topics

- 17 CRAS, 8 EDS & 6 EPEE
- The projects are designed for groups of ~4 students
- Each project has an official instructor (staff of department)
- Own project topics are not possible

Project topics are related to research activities of EEA dept.

- Your instructor helps you in project related matters
- Budget for required parts etc. is available

Which will be your Project topic?

Each offered Project topic

- is related to a certain Study path/ Research group,
- requires certain pre-knowledge and
- offers specific learning opportunities.

Our aim is to offer you a Project topic

- which you are interested in,
- is suitable for your studies and
- allows you to develop your skills and get experience.

The project groups are formed by a teachers' board

Project Topics

A? MyCourses SCHOOLS MY RECENT COURSES CORONAVIRUS INFO SERVICE LINKS ALLWELL? (EN) Vesa Vuorinen Student

ELEC-E8004 - Project work, Lecture, 10.1.2023-9.6.2023

Grades

Sections

- » General
- » Lectures
- » **Project topics**
- » For Aalto users
- » Final gala

Dashboard / Courses / school of ele... / department of... / elec-e8004 - ... / Sections / Project topics

Syllabus

Project topics

In this section you

- find the [project topics](#) with descriptions,
- state your choice of project topics in your preferred order by the deadline 16.1.2022 12:00

Each project has its own document with a description, a table indicating required skills and relevant study paths.

Project topics are denoted considering the [AEE majors](#)

CRAS_XX title denotes Control, robotics and autonomous systems
EDS_XX title denotes Electronic and digital systems
EPE_XX title denotes Electrical power and energy engineering

However, a topic may be suitable to more than one major! See the majors and study paths in the topic files!

After studying the [project topics](#), do the five selections of [project topics](#) below! Give your motivation and skills by using the [motivation letter](#) template and uploading it in the submission box.

FOLDER
Project topics

Here you find the project topics with descriptions!

Latest announcements

(No announcements have been posted yet.)

Upcoming events

- Motivation letter is due**
Monday, 16 January, 12:00
- My number 1 project topic closes**
Monday, 16 January, 12:00
- My number 5 project topic closes**
Monday, 16 January, 12:00
- My number 4 project topic closes**
Monday, 16 January, 12:00
- My number 3 project topic closes**
Monday, 16 January, 12:00
- My number 2 project topic closes**
Monday, 16 January, 12:00
- Feedback on the Final gala closes**
Sunday, 4 June, 23:59

[Go to calendar...](#)

Project Topics

ELEC-E8004 - Project work, Lecture, 10.1.2023-9.6.2023

Dashboard / Courses / school of ele... / department of... / elec-e8004 - ... / Sections / Project topics / Project topics

Grades

Sections

» General

» Lectures

» **Project topics**

» For Aalto users

» Final gala

Dashboard

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Calendar

Learner Metrics

Teacher Metrics

Project topics

Here you find the project topics with descriptions!

- CRAS_01 Stable Diffusion for Robot Grasping in Cluttered Environments.pdf 119.5KB
- CRAS_02 3D modeling of pipeline sections within a building by means of inertial navigation methods.pdf 118.5KB
- CRAS_03 Developing an automated instrument for elastic material characterization.pdf 120.4KB
- CRAS_04 Underwater robot control.pdf 119.4KB
- CRAS_05 Boston Dynamics Spot robot avoids disturbing humans.pdf 121.4KB
- CRAS_06 Vision based Detection and Tracking of Swarms of Droplets and Particles.pdf 119.9KB
- CRAS_07 Sim2Real Robotized Object Manipulation.pdf 125.1KB
- CRAS_08 Plug and play solution for vertical farming.pdf 119.7KB
- CRAS_09 Dynamic execution of automation scenario based on agents.pdf 118.4KB
- CRAS_10 Smart Vibration Sensor.pdf 120.5KB
- CRAS_11 3D-printed robotic manipulator.pdf 119.7KB
- CRAS_12 Plug-and-play for automated guided vehicle (AGV) and IEC 61499-based automation systems via ROS-MQTT and AIML.pdf 123.7KB
- CRAS_13 Human-Centric Production Operator Digital Twin.pdf 121.6KB
- CRAS_14 Creating a robotic surrogate for co-evolving behaviour and design in the real world.pdf 124KB
- CRAS_15 Application for predictive sensing in indoor environment.pdf 124KB
- CRAS_16 Teleoperation of off-terrain vehicles.pdf 122.1KB
- CRAS_17 Train Driver Display Test Robot.pdf 121.3KB
- EDS_01 Smart Diaper Sensor System.pdf 120.7KB
- EDS_02 Energy Harvesting Circuit for Smart Diaper.pdf 122.3KB

ELEC-E8004 Kick-off Lecture
10.1.2023

Stable Diffusion for Robot Grasping in Cluttered Environments

Instructor - Oliver Struckmeier (oliver.struckmeier@aalto.fi)

Abstract

The proposed project is titled "Stable Diffusion for Robot Grasping in Cluttered Environments". This project aims to explore the use of stable diffusion for generating synthetic data to train an object detector that can be used to control a robot arm in cluttered environments. By training an object detector on synthetic data generated using stable diffusion, we aim to improve the performance of the object detector and make it more robust to real-world variations such as clutter.

This project is well-suited for students with experience in programming, preferably in python. Experience with [PyTorch](#), C++ and the Robot Operating System (ROS) can be helpful. The students will have the opportunity to work with a state-of-the-art machine learning method with good documentation and get hands-on experience with a real robot.

Business Aspect

One potential way to take business possibilities into account in the proposed project is to focus on applications of the object detector in industries or sectors that have a need for robots that can operate in cluttered environments often shared with humans. For example, the object detector could be used in warehouses or factories to help robots pick and place items from shelves or conveyor belts. It could also be used in healthcare settings to assist robots in performing tasks such as delivering medication or assisting with medical procedures.

Skills Levels (0-5)

These keywords represent skills/knowledge that are relevant to this project

Skill	Level
C/C++ programming	2.0
Python Programming	5.0
Linux	3.0
Mechatronics	2.0
Deep Learning	5.0
Robotic Manipulation	3.0
Machine Learning	5.0
Image processing	5.0
Control engineering	4.0
Graphical user interface design	1.0
Robot Operating System (ROS)	3.0
Working in laboratory	1.0

Study Path

Automation Software Engineering, Factory Automation, Robotics and Autonomous Systems

Which will be your Project topic?

ELEC-E8004 - Project work, Lecture, 10.1.2023-9.6.2023

Dashboard / Courses / school of ele... / department of... / elec-e8004 - ... / Sections / Project topics

- Grades
- Sections
 - General
 - Lectures
 - Project topics**
 - For Aalto users
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- Teacher Metrics

? CHOICE
My number 1 project topic

Select the project topic that is your choice number 1.

? CHOICE
My number 2 project topic

Select the project topic that is your choice number 2.

? CHOICE
My number 3 project topic

Select the project topic that is your choice number 3.

? CHOICE
My number 4 project topic

Select the project topic that is your choice number 4.

? CHOICE
My number 5 project topic

Select the project topic that is your choice number 5.

Which will be your Project topic?

ELEC-E8004 - Project work, Lecture, 10.1.2023-9.6.2023

Dashboard / Courses / school of ele... / department of... / elec-e8004 - ... / Sections / Project topics

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Select the project topic that is your choice number 2.

? CHOICE
My number 3 project topic

Select the project topic that is your choice number 3.

? CHOICE
My number 4 project topic

Select the project topic that is your choice number 4.

? CHOICE
My number 5 project topic

Select the project topic that is your choice number 5.

? ASSIGNMENT
Motivation letter

Please give your motivation and skills by using the given template.

Project manager

Each project must have a Project manager

- Besides working as a team member to solve technical challenges, the project manager is responsible for the planning of work, using resources and reporting the progress, etc.

The project group selects one member as project manager

- The project manager is named in the submitted Project plan, therefore the DL is the same as for the Project plan: 9.2.2023

A certificate is given to all students that complete the course. The role of a Project manager is stated in the certificate.

Project plan

The Project plan is an important document

- it presents a realistic planned schedule
- it serves as an agreement with you and the instructor

About the Project plan

- Typical length is about 15-20 pages
- Template for the Project plan is given, it will be published and presented in the next lecture
- Deadline is **9.2.2023** but it must be pre-accepted by the instructor
- Requires a lot of communication with the instructor.
- We will continue from this on Tuesday 24.1

Business case exercise

Lauri Palva is the responsible teacher for this part.

As a part of your Project, you need to do a business case exercise

- The exercise can be directly based on the topic, as a product or service
- or it can be indirectly based on the topic, a side-plan originated from some theme related to the topic.

It is recommended that weeks 9-11 (starting 28.2.) are reserved for this activity

- that is, not too many parallel activities in your project (you define your schedule in Project plan)

Business aspects events

Kick-off lecture Tuesday 28.2.2023

- The lecture will start the Business case exercise, you will hear about document template, general requirements and procedures for seminar. Value proposition canvas is introduced.

Lecture Thursday 2.3.2023: Business concept

- A development path from science to a sellable product is described. Participating into the lecture and reflecting what you have heard to your own project should make compiling the Business case document easier.

Lecture: Tuesday 7.3.2023: Intellectual property rights

- Includes copyrights, patents, trademarks, etc.

Personal meeting with a teacher (optional): Thursday 9.3.2023

- The idea of this session is to give each project group a chance for a personal meeting with one of the teachers of the course.

Business pitches

The seminar is on Tuesday 14.3.2023

- The purpose of the seminar is that the project groups get experience of making and giving a business pitch. Furthermore, feedback is given for each group after their presentation in order to support the making of the final business case document.
- A template is given for the business pitch on MyCourses.
- Further instructions and schedule will appear on the “Project tasks” section on MyCourses before the business case kick-off lecture
- There will be three sessions, the sessions are preliminary scheduled for time slots 8:15-10:00, 10:15-12:00, 12:15-14:00.
- You **must participate on your own session**, participation to other sessions is optional.

Business case document

Business case document

- Typical length is about 10-15 pages.
- There will be a template for the document in MyCourses.
- Feedback is given in the Seminar and in the personal meetings.
- Submit the Business case document to MyCourses by 17.3.2023

We will continue from this on Tuesday 28.2.

		-	GRADE 3 (good)	+
Sections		Characteristics lowering the grade	Characteristics for grade 3	Characteristics improving the grade
Reaching goals	This section is intended to assess how each feels succeeded in its share of the completion of the work and the success of the success of the intermediate milestones or objectives.	In spite of failing the deadline, the work was never completed at desired level set as a goal. Reduced or poor quality.	All main goals completed at desired quality.	Good quality, extensive and complete documentation, novel results.
Meeting deadlines	The project is divided into sections (as you defined in the Project plan). In addition, the schedule defined in the joint meetings. At this point, a measure of how the project group members feel they have achieved pre-defined milestones and the schedule was adhered to.	Often failing the deadlines agreed together, including both with and without instructor. For project manager: overall management of project schedule not successful.	Work is usually completed on time, according to the common plan agreed.	Never failing any deadlines. Completing tasks earlier than planned. For project manager: well managed scheduling of the project.
Participation in group work	Working in a project requires solving and constructing things in many fields, together as a team. In any group work, every team member has had equal input to the shown tangible/intangible final result, even if every team member has spent equal number of hours for the project. Thus, the final result is not the only thing that matters. In this part, you measure how each team member including yourself has participated in the team-work and made it possible to reach the common goal.	Avoiding duties.	Active participation in group work. Attending group meeting, active participation in discussions in the meetings.	Taking responsibility on own duties. Helping other team member besides own duties is a clear plus.
Commitment	In the development of a new product or other expected output, there are often situations where due to unforeseen difficulties, it is necessary to do some things again and a part of the design/construction work is lost. Commitment means, above all, the ability to find new solutions until the technology is at adequate level, once again.	Losing interest of solving (technical) problems after unexpected/expected risks happened. Leaving fixing the problems for the others. Attitude to let the others down.	Committed to the common goals of the project. Taking part into meetings and training the instructor has organized.	Willing to go back to the drawing board, to redo certain parts unless frustrated. Willing to find flexibility to fix things to get back on the track, including schedule.
Quality	In this section, the quality of various deliverables within the project matters. Excellent quality means for instance a well tested and well documented 100% working part/subsystem that another team member may integrate. The part may be CAD model, mathematical equation, software code, manufactured piece, or piece of documentation.	Poor quality in deliverables. Often 90% completed parts. Poor documentation. Lack of quality can be identified when the other team members get frustrated on half-finished or nonfunctional parts.	The deliverables, intermediate products, tasks are done according to the quality plan the project agreed. The systems are 100% operational. The documentation is at the desired level the instructor has required.	The deliverables are 100% working, reliable and robust.
Proactivity	Project based work often involves parallel tasks that can be done at the same time. Sometimes unexpected risks may delay progress in one task, for instance due to delay in the delivery of a certain component, or a device failure. However, in the meantime other duties may be completed in the project. Proactivity means an attitude to actively work towards the common goal.	A passive team member that does not carry out duties until reminded by the project manager is a counter example of proactive team member.	Working according to the common plan at project plan level and at interpersonal daily agreements.	Willing to seek new duties after completing own tasks earlier than expected. Willing to proactively influence to reach the common goals.
Learning	How has the knowledge of person developed compared to the start time of the project? At this point, it is measured, how much knowledge is developed and how important the new knowledge is for the project.	In spite of the instructor has organized training, demonstrations or teaching, the knowledge/skills did not develop during the project. Only skills/knowledge attained before the project were utilized in the project.	Learning new skills and adapting new knowledge compared to the starting point of the project.	Remarkable development compared to the starting point. Demonstrating using new skills/knowledge for the benefit of the project.

Student 1 name															
	SELF A	SELF B	My Group Member 1 (A)	My Group Member 1 (B)	My Group Member 2 (A)	My Group Member 2 (B)	My Group Member 3 (A)	My Group Member 3 (B)	My Group Member 4 (A)	My Group Member 4 (B)	My Group Member 5 (A)	My Group Member 5 (B)	PEER AVG	INSTRUCTOR	AVERAGE
Reaching goals	3	5	2	4	4	5	3	5	3	5	3	5	3,9	5	4,48
Meeting deadlines	2	4	1	3	3	5	2	4	2	4	2	4	3,0	4	3,50
Participation in group work	2	4	1	3	3	5	2	4	2	4	2	4	3,0	4	3,50
Commitment	2	4	1	3	3	5	2	4	2	4	2	4	3,0	4	3,50
Quality	3	3	2	2	4	4	3	3	3	3	3	3	3,0	3	3,00
Proactivity	2	4	1	3	3	5	2	4	2	4	2	4	3,0	4	3,50
Learning	3	5	3	5	4	5	3	5	3	5	3	5	4,1	5	4,53
Final results														4	4
Documentation														5	5
														Weighted AVG	3,9
	The Final Decision A (5cr)														2
	The Final Decision B (5cr)														4
<u>Reasoning for grade</u>	Participation and commitment in the beginning was quite poor but increased drastically during the project. Aslo proactivity and learning improved significantly as project proceeded.														

Final Gala (if Covid restrictions allow)

The Final Gala will take place in TUAS building 25.5.2023

- An "all day" activity, **mandatory**, mark in your calendar the date and hours 8-18!
- Projects are presented to visitors in the exhibition lobby and the highlights are presented in the lecture room

Each project has its own stand

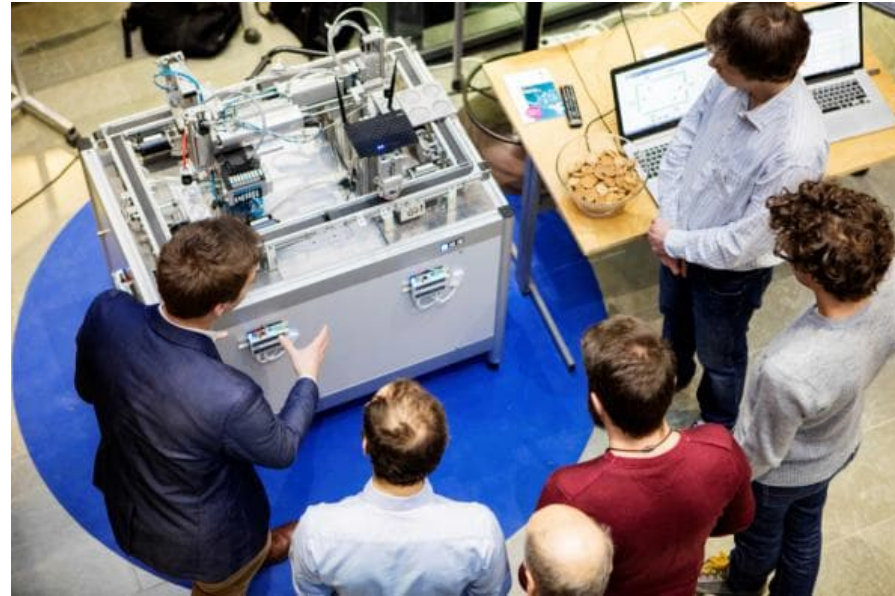
- with 32" display and a table.

The Final Gala is your target date to have all development ready

- If you have equipment to show, make a plan how to present it.
- After the Gala, you still have some days to complete the Final report.



Final Gala



Substitutive courses in AEE Program

At least these courses could be used to replace this course

- JOIN-E3000 Life Science Technologies Project, 10 cr
- MEC-E3001 Product Development Project (PDP), 10 cr
- MEC-E5002 Mechatronics Project, 10 cr
- ELEC-E4930 Space technology project, 10 cr
- AAE-E3000 - Advanced Energy Project L, 10 cr.

Note: Check whether it is possible for you to participate!

Other possible project work courses as a substitute

- If you are aware of similar 10 credit M.Sc level courses organized in Aalto University with similar learning outcomes, let us know and we will discuss with their course staff, to see the equivalence

Note: ELEC-D0301 Protopaja (B.Sc level) cannot be used as substitutive!

You need to get approval from the head of the major i.e. justification for the substitution is needed!

Conclusions - The urgent ones!

- Check through the Project topics (in MyCourses)
- **Submit your five 5 preferred project topics (in MyCourses)**
DL 16.1.2023 @12:00
- 20.1 project groups are revealed
- 24.1 @12:15-14:00 Project planning lecture, meet your group and instructor

- **NB: About e-mail: we will communicate directly with you occasionally during the course, e.g., grading etc.**
- Make sure your AALTO e-mail is operational and you use it!

Developing communication competence

- **Communication teachers collaborating: Sanna Franck, Henriette Kervinen, Rinna Toikka**
- **Learning objectives: teamwork / group communication competence / presenting your project / evaluation**
- **Essential working life skills....**

How do we develop these skills?

Our job...

- to support the group process + presentations
- 7.2. Lecture on group communication / project work skills
- Visiting the groups before midterm evaluation
- Pitching seminar – feedback
- Peer feedback later.. (non-mandatory)

Something to think about..

- Define your goals: what's the effort?
- Check your schedule
- Define your competence / what do you want to learn?
 - - - regarding the project & communication competence
- Something to unlearn?

Check: [aalto teamwork first-aid kit](#)

Other services and support

- Speech clinic: rinna.toikka@aalto.fi

Courses this spring:

LC-0550 Communication skills

LC-0320 Public speaking skills

LC-0530 Public speaking and stage fright

LC-0330 Leadership communication

LC-0340 Working life communication skills

LC-0520 Impact and argumentation