Design Thinking and Advanced Prototyping

ELEC-C9821 – Technical Arguments

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**Aalto University
School of Electrical
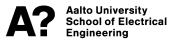Engineering**

Salu Ylirisku

1.3.2023

Today's agenda

09:15 - 10 Lecture (provided online too https://aalto.zoom.us/j/63310384655)

1. Recap of learning goals, course structure & evaluation criteria + explanations
2. Technical arguments

10:15 - 12 Workshop
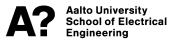
3. Feedback on the Proto V1 requirements
4. Discussion

Recap + explanation

Learning goals of the course
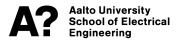
1. **Improving practical design thinking <u>project skills</u> and teamwork skills**

2. **Learn advanced <u>prototyping techniques</u> in the context of IoT product design**

Activities to achieve the goals

1. **Improving practical design thinking <u>project skills</u> and teamwork skills**

    -> Lectures, project work, presentations, reporting and reflection

2. **Learn advanced <u>prototyping techniques</u> in the context of IoT product design**

    -> Exercises and project work

How is the learning evaluated?

1. **Presence tracking (lectures)**

2. **Progress tracking (weekly deliverables)**

3. **Deliverable review and grading (group, individual)**

Presence tracking – Why?

- **This is an interactive course**

- **Interaction & teamwork is the most effective (in this course's context) when you are physically present**

- **Encourages dialogue between you and me**
  - Lower the threshold for asking questions
  - Sharing thoughts/feedback with the whole class

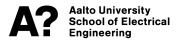- **Presence tracking serves as additional incentive to come here**

Presence tracking – How?

- **80% presence required**
  - If more, compensatory essays min. 1000 words required / missed session
  - Can be about the topic of the missed session or project related literature
  - Deadlines in the end of each period
  - Missing the deadline -1pt in final grade (this deadline negotiable in advance for personal/medical reasons, not after the deadline)

Progress tracking – Why?

- **Weekly deliverables are there to encourage teams to keep progressing and documenting the progress each week**

- **This is expected to contribute to teams being able to meet the important deadlines**
    - Especially the prototype requirements

Progress tracking – How?

- **The weekly deliverables are listed in the course leaflet**

- **Prototype requirements are important and must be approved ("pass")**
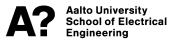
- **Some are graded (see next)**

Deliverables
Mind map + Team Agreement
User study plan
User study report
List of early ideas
Design Concept Draft
Proto V1 goals & reqs + Learning Diary – 1/3
Proto V1 images
Proto V1 test photos
Proto V2 goals & reqs
Proto V2 images
Proto V2 images
Proto V2 test photos + Learning Diary – 2/3
Proto V3 goals & reqs
Proto V3 images
Proto V3 images
Proto V3 images
Proto V3 test photos
Design Concept Poster
Final report + repo + Learning Diary – 3/3

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Graded deliverables

- **Group deliverables**
  - Final presentation
  - Poster
  - Report
  - Demo
  - Custom topic session (V8) ["done/not"]
- **Individual deliverables**
  - Learning diaries

Final Presentation – Why?

- To show what you have achieved in the course in terms of a concrete conceptual design project outcome as well as an interactive demonstrator

- To enforce a strict deadline for the project work, and thus, to facilitate the learning of project management and teamwork skills

- To rehearse your presentation skills and visual communication

Final Presentation – How?

Concept, +2pt

Process, +1pt

Demo, +1pt

Show, +1pt

Final Presentation

Concept argumentation, +2pt

- **Name, Purpose, Unique value**

- **Desirability:** Why should we believe that this is what users want/helps them to achieve what they want?

- **Feasibility:** What makes it technically feasible (CAPE aspects covered)?

- **Viability:** What would be the price point, and why would it make sense in terms of the cost of goods sold (COGS) and Cloud service costs?

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Final Presentation

Process explanation, +1pt

- **Research/exploration**
    - User research
    - Technology research
    - Viability research

- **Justification for your design choices based on above research**

Final Presentation

Demo, +1pt

- **Does the demonstrator (proto or video of it) work as intended**
- **NOTE: Video of the demonstrator will be required for the report**

Final Presentation

Show, +1pt

- **Coherence**
  - Does it look like a sensible whole or like a mess?

- **Clarity**
  - Does the presentation progress clearly?
  - Do we see and hear what is intended?
  - (Presentations are in the Atrium)

Poster – Why?

1. The name and the main purpose of the design concept are shown, +1pt

2. The unique quality/value of the design is communicated, + 1pt

3. An image of the 'IoT product concept' is shown, +1pt

4. An image of the overall product architecture is shown (e.g. in Cloud, App, Physical, Embedded style), +1pt

5. The poster follows (i.e. does not conflict) with the visual design principles given in the 'visual design' lecture, +1pt

Poster – How?

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4. An image of the overall product architecture is shown (e.g. in Cloud, App, Physical, Embedded style), +1pt

5. The poster follows (i.e. does not conflict) with the visual design principles given in the 'visual design' lecture, +1pt

Report – Why?

- **To leave a shareable online document of your project, which is usable, e.g. in your own CV**

- **To show inspiring examples to DTAP students when they start this course**

- **The report will be public by default and set out online**
  - You may opt out and leave your name unmentioned, if you wish
  - If you are not happy to publish your work, we can discuss

Report – How?

- **+0.5pt to your overall grade**

- **Wiki page that contains a simpler version of your Final Presentation**
    - The information is presented as text, images and video
    - Purpose, value, architecture and demonstrator must be included
    - Source code & 3D models are optional
    - See example: https://wiki.aalto.fi/display/DTAP/Example+DTAP+Project+Report+Page

Custom topic session – Why?

- **To improve your conceptual thinking, presentation and facilitation abilities**

- **To encourage to dig a bit deeper into a specific topic of your own interest (related to IoT innovation / Design Thinking)**

- **The underlying process is similar to design thinking**
  - You will need to 'have a point' (i.e. do research and present)
  - You will need to argue that 'this point is important'
  - You will facilitate discussion/activity about 'how should we think or deal with this issue/point'

Custom topic session – How?

- **10% of grade for V8 teams, +0.5pt for final grade**

- **Pass/Fail**
  - Team will get a 'pass' (=+0.5pt) if you at least try this

- **Presentation 10-15 mins + dialogue (maybe activity together), from 15 min up to 45 min in total**
  - Less than initially introduced on lecture 1

Reflective learning diary – Why?

- Design thinking is essentially a form of reflective thinking, and thus, when you write reflective text, you are at the same time rehearsing design thinking skills.

- Through reflective writing in the given format, you will also learn and become more fluent in academic writing – and this will help you a lot in the phase of final thesis writing.

- Reflective writing also helps you to improve your generic English writing skills.

Reflective learning diary – How?

- **Returned periodically, i.e. in the end of the week 6 of each period (before the exam week)**

- **Graded 0-5/5**

- **Length 2400-3600 words (~400-600 words per week)**

- **Proper academic citing and use of images required**

- **Reflection on experiences and on literature required**

The grading emphases

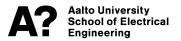- **How do all the partial grades add up to your course grade**

Grading V5

The course is graded on the 6-point scale: 0-5

Grade is based on:

1) Learning diaries, 40%
2) Project work (weekly deliverables), 30%
3) Final presentation, demo + poster, 20%
4) Project documentation, 10%

Teacher's overall evaluation of your active performance (+/-)

Grading V8

The course is graded on the 6-point scale: 0-5

Grade is based on:

1) Learning diaries, 30%
2) Project work (weekly deliverables), 30%
3) Custom topic session, 10%
4) Final presentation, demo + poster, 20%
5) Project documentation, 10%

Teacher's overall evaluation of your active performance (+/-)

Teacher's +/- evaluation – Why?

- **Imagine a student who does not do anything in the course. No diaries, no presentations, nothing. Simply sits silent in lectures.**
  - They must not pass!

- **Imagine a very active and engaged student, but who has special needs that are poorly supported by the course design**
  - Special arrangements can be negotiated, i.e., extending personal learning diary deadlines or providing (unfinished) slides ahead of the lectures

Example grades

How to get 5/5?

- **Be active throughout the course**

- **Show that you are learning**

How to pass with 1/5?

- **Be present in lectures**

- **Return the diaries with at least 1/5 grade**

Exercises in Period IV
Mini project

Exercises in Period IV

- **Exercises in Period IV are intended to support learning skills and tools in four specialisations: Cloud, App, Physical and Embedded Design**

- **The exercises are voluntary, but likely to be very helpful**

- **Exercises will start this Friday**

Period IV exercises form a mini project

- **The mini project creates a wireless remote control for online content**

- **You will create (i.e., this is what we help with in exercises)**
    - a custom Cloud service on a Raspberry Pi
    - a Web App GUI with ProtoPie (and maybe Rive)
    - a custom 3D-printed case
    - a custom PCB with an ESP32 microcontroller on board.

- **The mini project also helps in making cost calculations**

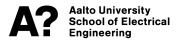# Technical arguments for a design concept

Main arguments for a design concept

- **Desirability – Value for users**

- **<u>Feasibility – Technically sensible</u>**

- **Viability – Monetarily competitive**

What are technical arguments

1. Explanation of the design problem in terms of the technical performance, i.e., main requirements for the technology

2. Evidence that you have in order to claim that your design concept is technically possible

3. Further evidence that you have suggest an sensible overall solution to the design problem

The challenge

- How to tell the key points on the proper level of abstraction

- You know 'too much' to tell it all in the concept presentation

- Remember, design concept is a management tool

- What does a 'manager' or 'stakeholder' want and need to hear?

Dedicated assistants

Each team has an assistant

1. Shahram

2. Carl

3. Aleksi

4. Shahram

5. Carl

6. Aleksi

7. Shahram

8. Carl

9. Aleksi

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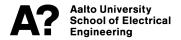School of Electrical
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-- Presence Check --

Feedback on V1 Reqs

Overall impression

- **Quite time-optimistic for the Proto V1 which is due next week (Report Friday 10.3. by midnight)**
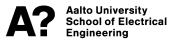
Circuit Shop Schedule

We have a scheduler on MyCourses to help you to distribute across the week so that the small space does not get too full.

Circuit Shop (piiripaja) is located in front of the Electronics Workshop (Sähköpaja).

Available times are during the regular exercise times (may be adjusted if needed)

This week

- **Project: Start creating your Proto V1**

- **Write your weekly diary and submit it**

- **Exercises (Fri 14-16, Mon 14-16, Tue 10-12)**
    - There are VOLUNTARY