

ME-410 Mechanical Product Design & Development

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By this week : Actuator and sensor solutions

- Slide 1: **Choose your product** what problem does it solve? Why has it not been solved yet? How does it work?
- Slide 2: **3 different combinations of solutions (motor & sensor choices)**
- Slide 3: **What will you measure ?** and how will it impact your functionality?
 - Not off/ on (i.e. need to be modulated with a force feedback)
 - Could the values be measured ? (can you measure comfort? Easiness? Intuition ? If not, what can be measured?)

Until today you should be done with

- **Clear motivation / problem statements** – stick to a VERY specific scenario and purpose, 3 solutions should be varied for a single application.
- **Primary functionality** – identify clearly. Do not let it get muddled by 2,3rd functions.
- **Quantifiable Engineering Specifications** - specific range that fits your main purpose → make sure these are specific enough that i) they are not part of a code/ obvious ii) they can differentiate 3 solutions
- **3 solution directions** - show how they are all satisfying the motivation and functionality of the proposed product
- **Motor and sensor type selection** (may not be the specific models but at least the types of motors and sensors)

Until today you should be done with

- Clear motivation / problem statements
- Engineering specifications,
- Metric values that are independent from manufacturing accuracy, component choice, materials. (I.e. cost, weight, etc.)
- 3 solution options

Until today you should be done with

- Engineering specifications,
- Metric values
- 3 solution options

Engineering specification	values	Solution A	Solution B	Solution C
Range of motion	end effector hinge range Vertical displacement Personalization etc			
Overall payload	Vertical / dynamic /continuous load etc			
Bandwidth	motor bandwidth Control bandwidth Feedback speed etc			

By next week (prepare 3 slides to present)

- Slide 1: Updated motivation functionality definition with the updated state of the art (more details due to the solutions)
- Slide 2: Three solutions comparison Back hand calculation for all three solutions
- Slide 3: Final solution slide decide on the final solution direction and the motor and sensor types.

By next week

- Slide 1: Updated motivation slide:
 - Clear functionality definition
 - What will it do? Is it necessary for a certain demographic, does it need to be motorized?
 - Could it have objective performance?
 - What would be the “cost” of the automation? Is it justified? i.e. weight/ cumbersomeness/ volume/ usability/ hinderance of other functions → think: updated the scenario accordingly – instead of for roads, for collecting data/ rehab/ diagnosis etc.
 - Updated state of the art (SoA) – customized toward your 3 solutions
 - Make a family tree of hierarchical SoA

By next week

- Slide 2: Three solutions comparison slide: Back hand calculation for all three solutions
- Solutions that vary in performances not on design or motivations (e.x. as below)

Engineering specification	values	Solution A	Solution B	Solution C
Range of motion	$90 < \text{hinge range} < 300$	$90 < r < 100$	$200 < r < 300$	$40 < r < 41$
Overall payload	$10\text{N} < \text{load}$	13N	20N	50N
Bandwidth rpm	$100 < \text{rpm}$	101	200	100

By next week

- Slide 3: Final solution decide on the motor and sensor
 - show the decision process from the engineering specification (ES)
 - Choose the appropriate motor and sensor according to their capacity
 - Run a quick calculation based on the chosen motor and sensor and show it is still meeting the ES
 - Add the safety factor at last or accordingly to your application – show and justify

Deadline: Oct. 1

Total budget: 250 CHF

Venders:

Digikey.ch

(Electronic components)

(Mixed/specialty electronics, motors)

mouser.ch

(Mixed/specialty electronics, motors)

digitec.ch or galaxus.ch

(General components)

distrelec.ch

(Special Electronic components)

uk.misumi-ec.com/

(Materials)

tme.eu

(Electronic components, motors)

uk.rs-online.com

(Development shields and other components)

How to order

- Google Sheet order form will be sent out later
 - Orders due by 15:00 on the dates (**strictly**)
 - Will place orders same day
- Will only process valid components
 - Parts *must* come from the previous suppliers
 - e.g., **digikikey.ch**, *not* digikikey.com
 - Part numbers must match their description or link
- Form will track budget for each group

Shipping considerations

- Groups will be charged for shipping, unless:
 - Total from all groups over “Free shipping amount”
- Example:
 - Group 1 wants components from Mouser.ch, <54 CHF
 - Group 2 wants from Digikey.ch, <60 CHF
 - Group 1 changes their order to Digikey
 - The order is now over 60 CHF, and the shipping will be free for both groups
- Work with other groups!
- Note: Distrelec has free shipping to EPFL