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?)

All proposed products are ok (potentially)

BUT ! Must streamline the 5 points.

- Clear motivation / problem statements
- Primary functionality
- Engineering specifications,
- Metric values
- 3 solution options

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 differentiates 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< hinge range <300	90<r<100	200<r<300	40<r<41
Overall payload	10N < load	13N	20N	50N
Bandwidth rpm	100<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