

Design and Innovation - CI3-

Introduction to the design of mechatronic systems

MdC. Fabio Cruz MdC Alaa Hassan

Université de Lorraine | ENSGSI

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Organisation de la présentation I

1 Introduction

2 CI3 – design of mechatronic systems

Introduction

Engineering and Mechanics

What is the meaning of “Engineer” for you ?

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The word **Engineer** (Latin *Ingeniator*) is derived from the Latin words **Ingeniare** (“to contrive, devise”) and **Ingenium** (“cleverness”).

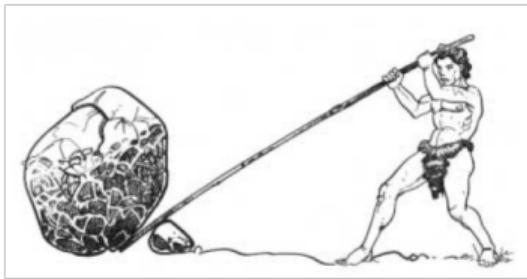


Illustration de Jean-Marie Michaud, tirée de *Aux temps anciens, les machines* de Michael et Mary Woods

© Flammarion, 2001, coll. «Castor Poche ».



What is the meaning of “Mechanics” for you ?

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Mathematics + Physics → Force, Matter, and Motion.

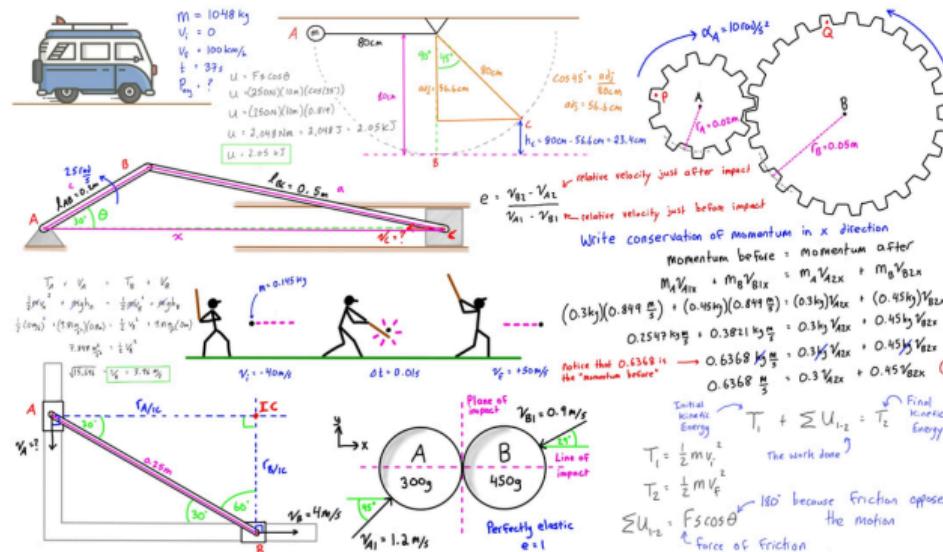


Image source: engineer4free

Challenge

Challenge

Formez des équipes de quatre/cinq personnes

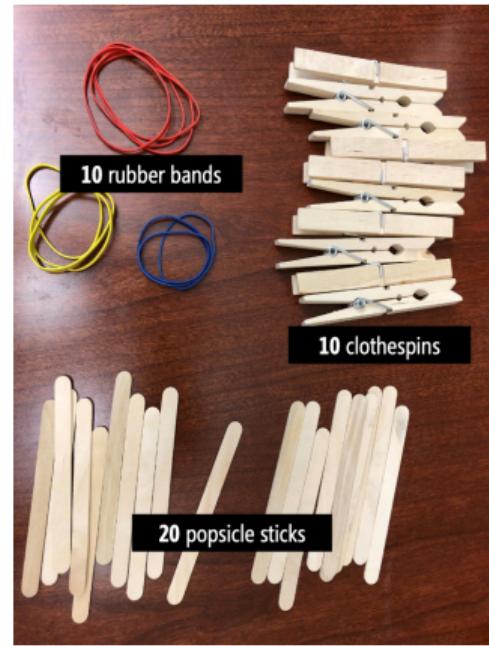
- De préférence, avec vos voisins entre les rangs.

Challenge

Vous avez 18 minutes pour construire une **tour autoportante** qui supporte des poids calibrés avec les matériaux listées ici →

Nous noterons les tours en fonction de:

- 1 Il résiste à au moins un poids: Oui / Non
- 2 $Score = height_{weight} * weight$



18 Minutes

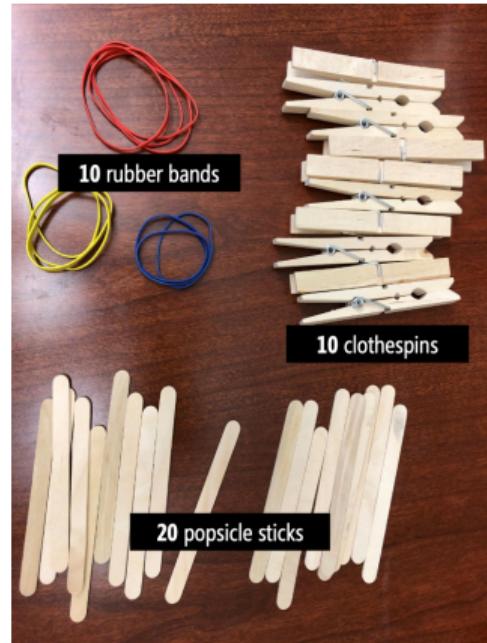


Figure 1: Timer

Reflecting on the design process

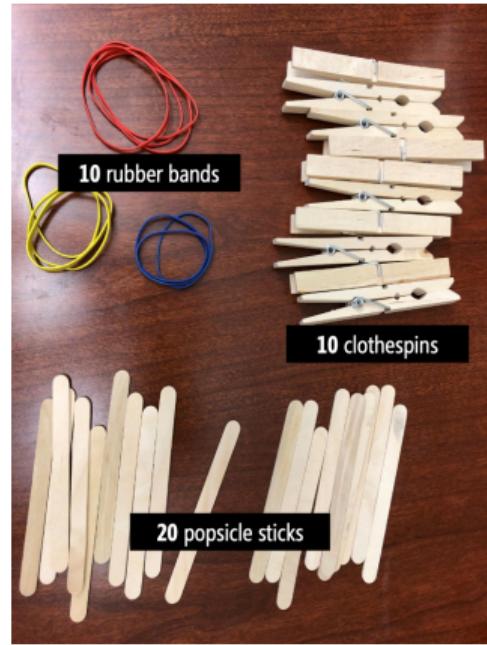
Reflecting on the design process

- What strategies did you use to make your towers?
- How many towers did you make?
- How did you learn?

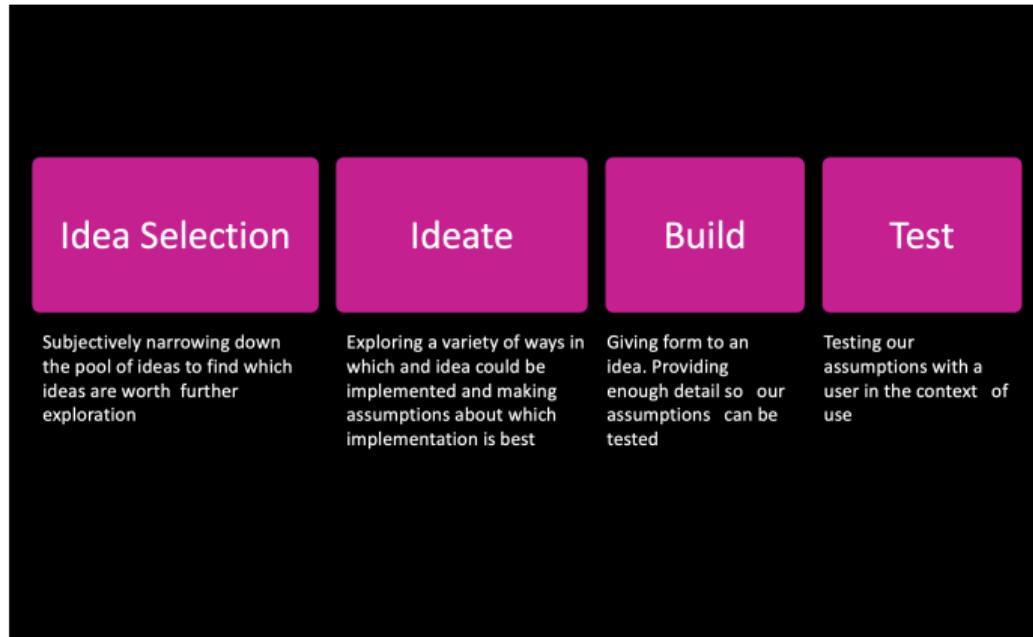


Reflecting on the design process

- How many teams sketched out ideas first before starting to build?
- How many teams tried multiple ideas before settling on a final design?
- How many teams tried to use the weights during the prototyping process?
- How many teams used parts in unintentional ways (took apart clothespins)?

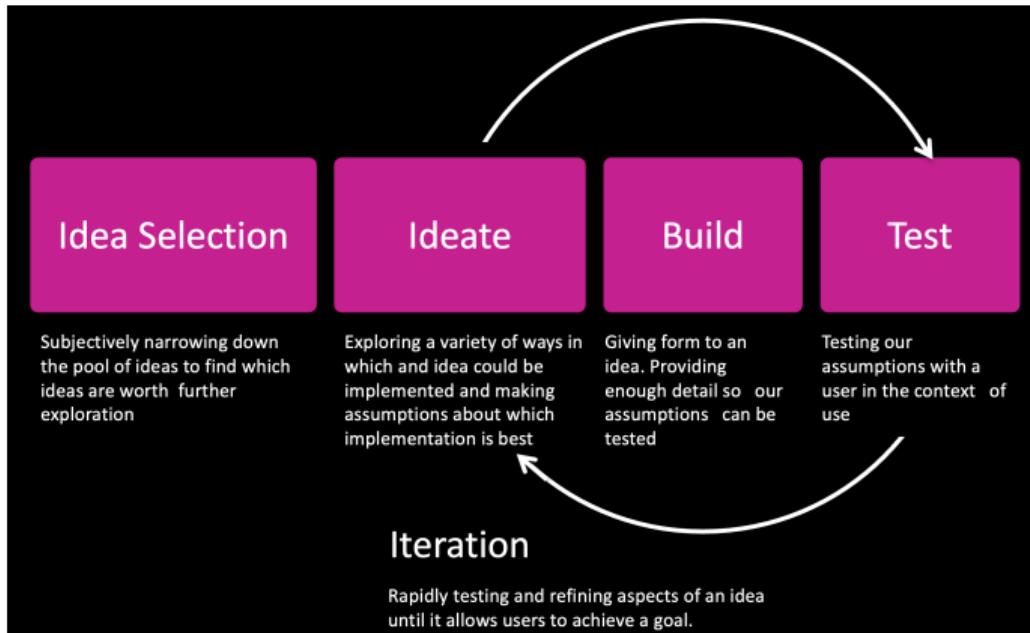


Reflecting on the design process



Prototyping is about failure !

Having the audacity to dream, experiment, and fail - is required.



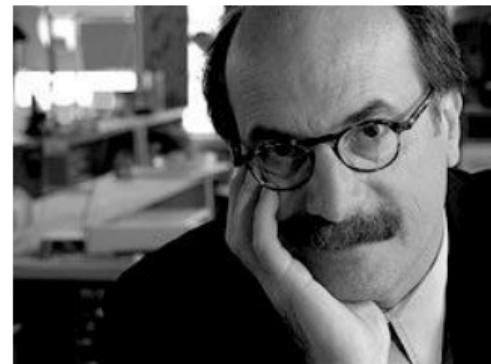
CI3 – design of mechatronic systems

Why is it important?

Why is it important for you as future Engineers in Innovation ?

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“Humans are really interesting. If you show them your idea in a prototype form, **very few people will tell you what's right about it. But everybody will tell you what's wrong with it.**”



David Kelly, IDEO

Why is it important for you as future Engineers in Innovation?

- 1 Idea → Mock-up → Proof-of-Concept → Prototype



Source : (Kattan, 2009)

Why is it important for you as future Engineers in Innovation?

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- 2 To be able to **choose the most appropriate** design tools.



Source : (Kattan, 2009)

Why is it important for you as future Engineers in Innovation?

- 1 Idea → Mock-up → Proof-of-Concept → Prototype
- 2 To be able to **choose the most appropriate** design tools.
- 3 Fail as soon as possible.



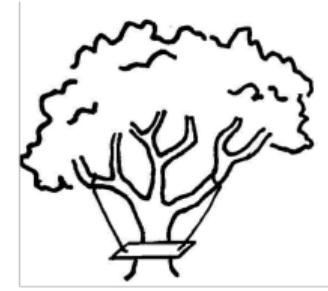
Source : (Kattan, 2009)

Fail with purpose !!

Validation of the design hypothesis



what marketing suggested...



what was manufactured...



as maintenance installed it...



what the customer wanted...

Learning goals of the module

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- 1 Give you the basic skills to be able to materialize a conceptual idea into an intermediate mechatronic design object for a given concept.

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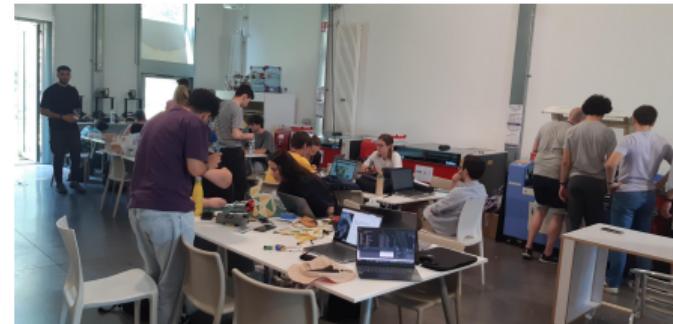
- 1 Give you the basic skills to be able to materialize a conceptual idea into an intermediate mechatronic design object for a given concept.
- 2 Learn the prototyping technologies available at the Lorraine Fab Living Lab.
- 3 A scientific and technical baseline to independently design and build a prototype.
-Do-It-Yourself-

Specific learning goals

- 1 Prototyping phases and techniques.
- 2 Mechatronics design:
 - CAD Modeling
 - Description of a Kinematic chain
 - Control
 - Simulation of a simple movement transformation system
- 3 Fablabs and the social innovation approach.



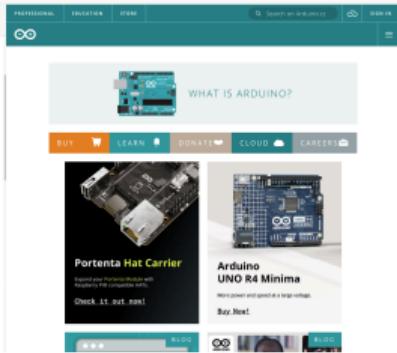
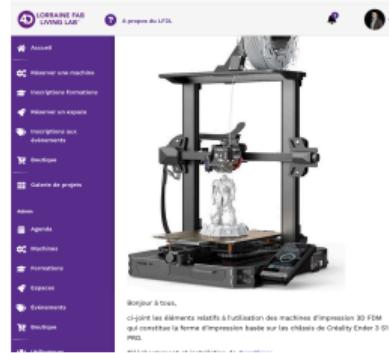
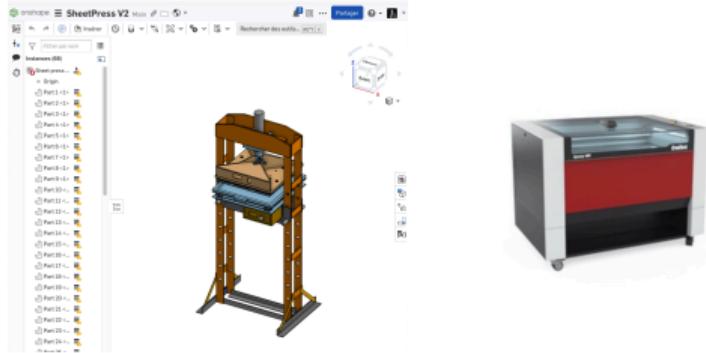
Learning by Doing !



Organization of the Module Planning

Time	Activity
7 CM	Introduction to Mechatronic Design
2 TD	Application of theory
TP 1-4	Learn Design Tools: CAD, Laser Cut, 3D Printing
TP 5-9	Project developed by you

Technologies at LF2L.



Documentation: <https://fabmanager.lf2l.fr/>

Evaluation of the Module

Individual

- Individual test (**Weight: 2/3**)

Group

- Presentation of the mechanism
- Documentation of the mechanism on
<https://fabmanager.lf2l.fr/>

Compromises

What We expect from you

What do you expect from us

Thanks

Next time: 11/03/2024