

# Student Bootcamp

A Friendly Guide for Your Fab Academy Journey

FAB ACADEMY

A decorative graphic consisting of a row of ten vertical elements. The first seven are teal vertical bars of varying heights, and the last three are red circles of varying diameters.

# FAB ACADEMY



## GENERAL TIPS

# IMPORTANT LINKS

- [Fab Academy 2023](#)
- [Schedule](#)
- [Inventory](#)
- [Assessment - Nueval](#)
- [Tutorials](#)
- [Fab Academy Student Agreement](#)
- [Projects](#)
- [Programmers](#)
- [Image compression](#)
- [Video compression](#)
- [Videos of Reviews, classes, recitations](#)

<https://fabacademy.org/2024/>



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# Schedule

Info of the class (links, tutorials...)

The Fab Academy  
2022 Schedule

- Jan 10- [instructor boot camp](#)
- Jan 17- [student boot camp](#), project presentations
- Jan 26: [principles and practices \(video\)](#), [project management \(video\)](#)
- Jan 31 [recitation: version control \(video\)](#)
- Feb 02: [computer-aided design \(video\)](#)
- Feb 09: [computer-controlled cutting \(video\)](#)
- Feb 14 [recitation: parametric+ design](#)
- Feb 16: [electronics production \(video\)](#)
- Feb 23: [3D scanning and printing \(video\)](#)
- Feb 28 [recitation: debugging](#)
- Mar 02: [electronics design \(video\)](#)
- Mar 09: [computer-controlled machining \(video\)](#)
- Mar 14 [recitation: programming](#)
- Mar 16: [embedded programming \(video\)](#)
- Mar 23: [molding and casting \(video\)](#)
- Mar 28 [recitation: machine building](#)
- Mar 30: [output devices \(video\)](#)
- Apr 06: [mechanical design, machine design \(video\)](#)
- Apr 13: break
- Apr 18 [recitation: fab ecosystem](#)
- Apr 20: [input devices \(video\)](#)
- Apr 27: [networking and communications \(video\)](#)
- May 02 [recitation: education](#)
- May 04: [interface and application programming \(video\)](#)
- May 11: [wildcard week \(video\)](#)
- May 16 [recitation: DEI+](#)
- May 18: [applications and implications \(video\)](#)
- May 25: [invention, intellectual property, and income \(video\)](#)
- May 30 [recitation: start-ups](#)
- Jun 01: [project development \(video\)](#)
- Jun 08- [project presentations](#) (08,10,13,15)
- July 25- FAB17

Video of the class

Recitations: 1 every 2 weeks

[Search your global time](#)

Global lectures happen on Wednesdays at 9:00 on the US East Coast (ranging from 6:00 on the West Coast to 23:00 in Japan). Recitations happen on Mondays at the same hour, and global lab sections and regional reviews are scheduled throughout the week.

# Class

## Computer-Aided Design

### 2D design

#### raster

[scan](#)  
[GIMP](#) [BMP](#) [pixels](#)  
[Photoshop](#)  
[Pixlr](#)  
[MyPaint](#)  
[Krita](#)  
[ImageMagick](#) [GraphicsMagick](#) [Converseeen](#) [encoding](#)  
[Geeqie](#) [gThumb](#)

#### vector

[Potrace](#) [mods](#)  
[Inkscape](#) [shapes](#) [Booleans](#) [clones](#)  
[Iodraw](#)  
[Illustrator](#)  
[Sketchpad](#)  
[CorelDRAW](#)  
[Scribus](#)  
[QCAD](#)  
[FreeCAD](#) [constraints](#)  
[Layout](#)

### 3D design

#### types

design past, present, future  
project complexity, collaboration  
volume (VRep), boundary (BRep), function (FRep) representations  
GUIs, scripting, hardware description languages  
imperative, declarative, generative, optimization, Multidisciplinary Design Optimization

#### programs

[SketchUp](#) [Tinkercad](#)  
[Shapemith](#) [Flood](#)  
[Blender](#) [Sverchok](#)  
[sculpting](#) [rendering](#) [animation](#)  
[ZBrush](#)  
[Rhino](#) [Grasshopper](#) [Kangaroo](#)  
[OpenSCAD](#)

Links, tutorials, files...

Inventory

Fab Lab/Class Inventory (incomplete draft)  
[full inventory](#)

*Computer-Aided Design, Project Management*

quantity	item	description	list unit price	extended price
Amazon				
	<u>videoconference</u>			
3	<a href="#">CS20x</a>	Logitech HD Pro Webcam, Full HD 1080p/30fps	\$56.99	\$170.97
1	<a href="#">Speak 510</a>	Jabra Wireless Bluetooth Speaker for Softphone and Mobile Phone	\$149.00	\$149.00
		<b>total</b>		\$319.97

total: \$319.97

# Assignments

## **assignment**

model (raster, vector, 2D, 3D, render, animate, simulate, ...) a possible final project,  
compress your images and videos,  
and post a description with your design files on your class page

## **assignment**

*group assignment:*

- test the design rules for your 3D printer(s)

*individual assignment:*

- design and 3D print an object (small, few cm<sup>3</sup>, limited by printer time)  
that could not be made subtractively
- 3D scan an object (and optionally print it)



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# Labs



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Aalto Fablab (Espoo, Finland)

AgriLab (Beauvais, France)

Al Jazri Lab (Sharjah, UAE)

Fab Lab Amsterdam - Waag (Amsterdam, Netherlands)

Fab Lab Bangalore (Bangalore, India)

Fab Lab Barcelona (Barcelona, Spain)

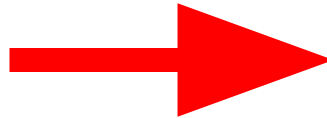
Fab Lab Benfica (Lisboa, Portugal)

Berytech Fab Lab (Beirut, Lebanon)

BOLD Lab Seoul (Seoul, Korea)

Fab Lab Bhutan (Thimpu, Bhutan)

C. Fabrication Laboratory (Chengdu, China)



Websites of the different Fab Labs:  
Student website, Group Assignments,  
Machine...

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# Students



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2022

## Aalto (Espoo, Finland)



Website of the Fab Lab

- [Alexander Andrew McVicker](#)
- [Matti Niinimäki](#)

## AgriLab (Beauvais, France)

- [Aurore Kubica](#)
- [Christophe Chamot](#)
- [jules topart](#)



Website of the students

## Amsterdam - Waag (Amsterdam, Netherlands)

- [Bas Pijls](#)
- [Benjamin Doerig](#)
- [Bente van Bourgondiën](#)
- [Joany Beer](#)
- [Jonathan Blok](#)
- [Paola Zanchetta Muñoz](#)
- [Saco Heijboer](#)
- [Sander Blom](#)

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# Documents

Assessment

Tutorials

Agreements: labs instructors students

**\*\*Fab Academy Student Agreement\*\***

\*The Fab Academy is responsible for:\*

- Teaching principles and practices of digital fabrication
- Arranging lectures, recitations, meetings, and events for the class
- Evaluating and providing feedback on student work
- Offering clear standards for completing assignments
- Certifying and archiving student progress
- Supervising class preparation
- Reviewing prospective students, instructors, and labs
- Providing central staff and infrastructure for students, instructors, and labs
- Fund-raising for costs not covered by student tuition
- Managing and reporting on the program's finances, results, and impacts
- Publicizing the program
- Promoting a respectful environment free of harassment and discrimination

\*I am a Fab Academy student, responsible for:\*

- Attending class lectures and participating in reviews
- Developing and documenting projects assigned to introduce and demonstrate skills
- Allowing the Fab Academy to share my work (with attribution) in the class for purposes compatible with its mission
- Honestly reporting on my work, and appropriately attributing the work of others
- Working safely
- Leaving workspaces in the same (or better) condition than I found them
- Participating in the upkeep of my lab
- Ensuring that my tuition to cover local and central class costs is covered
- Following locally applicable health and safety guidance
- Promoting a respectful environment free of harassment and discrimination

Signed by committing this file in my repository,

(your name goes here)

## Fab Academy 2022 Documents

- The assignments (what you'll do)
- What we want you to learn each week (why you're doing it)
- The base-line evidence/proof/things you need to show about what you've learnt each week (what you did and how you did it).

## CRITERIA FOR NUEVAL

Tutorials created by  
Fab Academy  
instructors/students

You should **read it**, and **upload a copy signed** to your repo.

# Assessment

Type to search

Introduction

General Essentials

Commercial Board Policy

Principles and Practices, project man...

Computer-Aided Design

Computer-Controlled Cutting

Electronics Production

3D Scanning and Printing

Electronics Design

Computer-Controlled Machining

Embedded Programming

Mechanical Design, Machine Design

Input Devices

Molding and Casting

Output Devices

Networking and Communications

Interface and Application Programming

Wildcard Week

## Fab Academy 2023 Assignments and Assessment

🚧 This document is under maintenance

*Created by Anna Kaziunas France & Bas Withagen (2015)*

*Maintained by Jani Ylloja, Steven Chew, Duaa Alaali, Ahmed Abdellatif, Rico Kanthatham and Pablo Nuñez*

### What is this document

During Fab Academy, you will learn how to envision, prototype and document your ideas through many hours of hands-on experience with digital fabrication tools. **This document outlines:**

- The assignments (what you'll do)
- What we want you to learn each week (why you're doing it)
- The base-line evidence/proof/things you need to show about what you've learnt each week (what you did and how you did it).

### Beware the changes

This is a living document. **Minor changes** will be made to this document soon **after each** Fab Academy **class**. You will find a mark at the top of each page stating:

CRITERIA FOR  
YOUR  
EVALUATION:  
NUEVAL

You have a  
section for each  
assignment

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# Projects

pub

**P** **pub**  Group ID: 1484 [Request Access](#)  

public, publication

Subgroups and projects		Shared projects	Archived projects	Search by name	Last updated
>	 <b>P</b> <b>programmers</b> 				 0  8  3
>	 <b>T</b> <b>Tools</b>  Various software tools to make ones Fab life easier.				 0  1  1
>	 <b>I</b> <b>Inventory</b>  The Fab inventory				 0  1  1
>	 <b>P</b> <b>projects</b>  Subgroup for shared public projects				 2  3  4
>	 <b>L</b> <b>libraries</b>  Group for shared libraries				 1  1  1
>	 <b>H</b> <b>hello world</b>  Group for hello-world projects and documentation				 0  2  1
	 <b>T</b> <b>Tutorials</b>  Tutorial repository to be updated continuously.			 0	1 week ago
	 <b>P</b> <b>project index</b>  <span>Maintainer</span>				

You will find the new programmers, libraries, hello world, Resources...

<https://fabacademy.org/2024/>



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# Prior Years

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## Prior Years

[2021](#)

[2020](#)

[2019](#)

[2018](#)

[2017](#)

[2016](#)

[2015](#)

[2014](#)

[2013](#)

[2012](#)

You can find other students from other years, projects... all the documentation from past years.

<https://fabacademy.org/2024/>



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Search:

Search tool for any project, tool, machine, student... It's super powerful.

# Vimeo: Videos

vimeo

Why Vimeo? ▾

Features ▾

Resources ▾

Watch

Pricing

Search videos, people, and more



Log in

Join

New video ▾



**Academy**

📍 Boston, MA, USA

This channel shows the videos of the Fab Academy as recorded at Fablab Amsterdam and the course...[Read more](#)

Create a free Vimeo Basic account to view Academy's contact details

Join

**Activity**

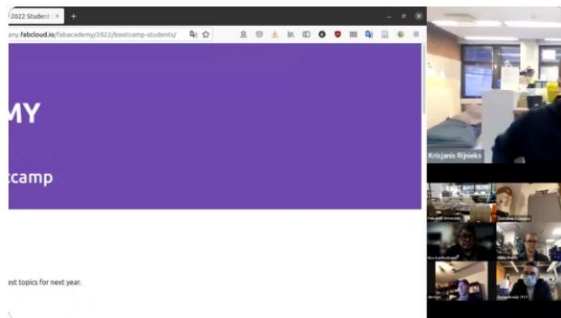
Showcases

1

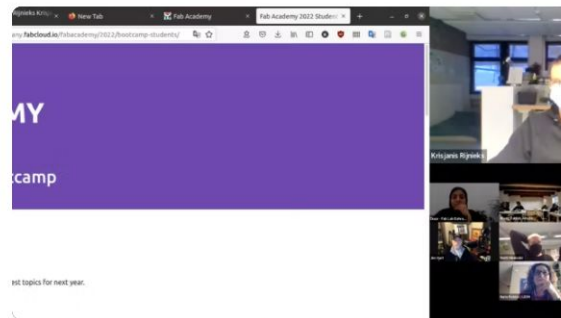


637 videos

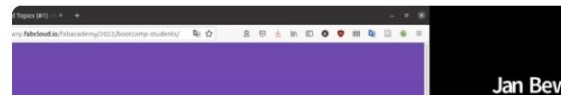
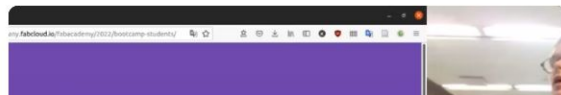
2022- Students Bootcamp



FA2022\_StudentBootcamp\_Day5.mp4



FA2022\_StudentBootcamp\_Day4.mp4



**FAB ACADEMY**  
|||||●●●

# Image compression

## GIMP

compress

resize

batch

## ImageMagick

list formats:

convert -list format

JPG: compressed

PNG: uncompressed

convert PNG to JPG:

convert input.png output.jpg

convert all PNGs to JPGs:

mogrify -format jpg \*.png

convert SVG to PNG at 1000 DPI:

convert -density 1000 -units PixelsPerInch input.svg output.png

compress JPG to quality 50% width 1000:

convert input.jpg -quality 50% -resize 1000 output.jpg

compress all JPGs to quality 50% width 1000:

mogrify -quality 50% -resize 1000 \*.jpg

# Video compression

HTML5 MP4 ffmpeg encoding

variable bit rate 1080p MP3:

```
ffmpeg -i input_video -vcodec libx264 -crf 25 -preset medium -vf scale=-2:1080 -acodec libmp3lame -q:a 4 -ar 48000 -ac 2 output_video.mp4
```

fixed bit rate 1080p MP2:

```
ffmpeg -i input_video -vcodec libx264 -b:v 1000k -vf scale=-2:1080 -acodec mp2 -b:a 256k -ar 48000 -ac 2 output_video.mp4
```

no audio:

```
ffmpeg -i input_video -vcodec libx264 -b:v 1000k -vf scale=-2:1080 -an output_video.mp4
```

crop size (width:height:xoffset:yoffset):

```
ffmpeg -i input_video -vf crop=1500:800:200:100 -vcodec libx264 -b:v 1000k -an output_video.mp4
```

trim time (-ss start time, -t duration):

```
ffmpeg -i input_video -vcodec libx264 -b:v 1000k -an -ss 00:00:10 -t 00:00:10 output_video.mp4
```

mix audio and video:

```
ffmpeg -i input_video -vcodec libx264 -b:v 1000k -vf crop=1120:876:0:100 -i input_audio -acodec mp2 -b:a 256k -ar 48000 -ac 2 -ss 00:00:20 -t 00:00:20 output_video.mp4
```

crop, pan, composite:

```
ffmpeg -i input_video_1 -i input_video_2 -filter_complex '[1:v]crop=175:95:930:860[cropout];[cropout]scale=350:190[scaleout];[0:v][scaleout]overlay=10:10[outv]' -map '[outv]' -vcodec libx264 -b:v 1000k -map 0:a
```

numbered images to video:

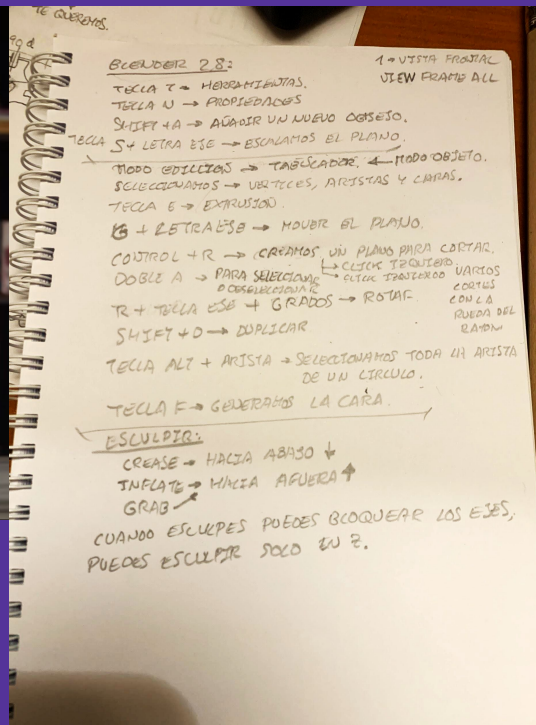
```
ffmpeg -r 30 -i %04d.jpg -vcodec libx264 -b:v 1000k -vf scale=-2:1080 -an output_video.mp4
```

# Keep and Write Notes In A Small **Notebook**



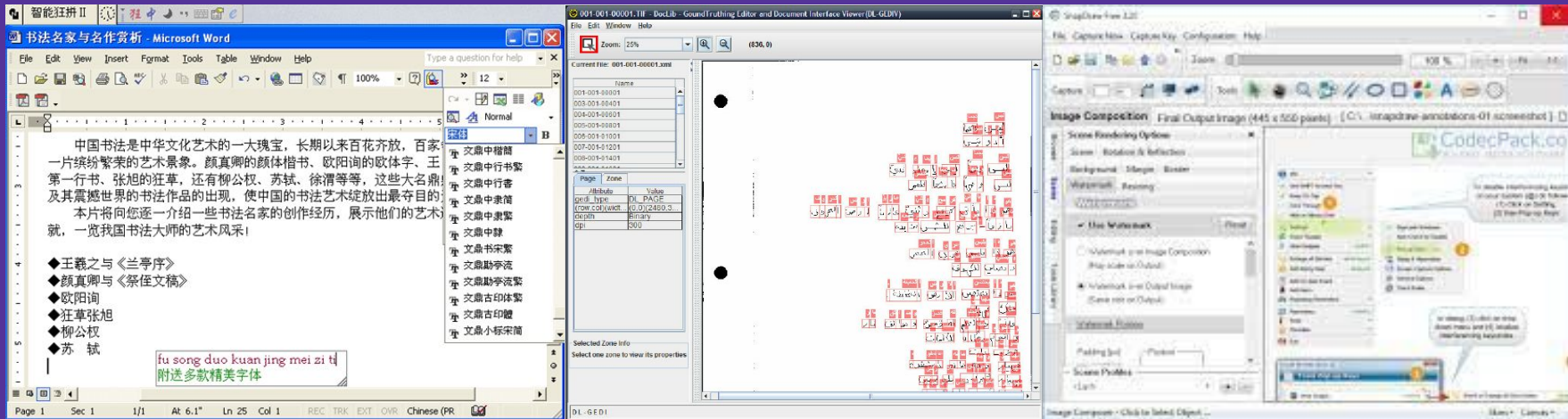
## Youtube: Surviving Fab Academy

- **Fast. Convenient. Better for memory recall**
- Supplement to digital documentation
- Document as you go
- Quick sketches





# English for Documentation...Please



**General Recommendation: Switch Software to English** for documentation. If not possible, **clarify images with detailed English explanations** describing the procedural steps you made.

**English is the communication standard** for Fab Academy...and **required for Global Evaluation.**

# The Assessment Book



**FAB ACADEMY**



# ¿Whats is this document for?

## The Assessment Book

- The assignments (what you'll do)
- What we want you to learn each week (why you're doing it)
- The base-line evidence/proof/things you need to show about what you've learnt each week (what you did and how you did it).

<https://fabacademy.org/2024/nueval/>

**NUEVAL**

**FAB ACADEMY**



# Communicate...to Make Progress

It's a tool for all the people involved in the Fab Academy learning environment: Student, Local instructor and Global Evaluator.  
The only way to keep tracking of the learning path.

- Give feedback to both your **local** evaluator as well as your **global** evaluator.
- Work with evaluators toward graduation success!

The screenshot displays the Fab Academy 2020 interface. On the left is a navigation sidebar with links for Home, Final Projects, Local Evaluation, and Global Evaluation. The main content area is titled 'Local Assessment & Evaluation' and features a table of course units. The 'Electronics production' unit is highlighted in blue and marked as 'Completed' with a green checkmark. To the right of the table is a chat window showing a message from 'adriantrains' dated 2020-03-30 07:07, stating 'Week 04, Electronics Production is finished.' and 'Dear Nuria. Week 04, Electronics Production is finished, you can start correcting whenever you want'. Below this is a message from 'nunuromi' dated 2020-04-22 06:51, saying 'Hi Adrian,' and providing advice on group assignments.

Local evaluation	2020-01-01	Instructor (nunuromi)
Principles and Practices		✓
Project Management		✓
Computer-Aided Design		✓
Computer-controlled cutting		✓
Electronics production		✓
3D scanning and printing		✓
Electronics design		✓
Computer-controlled machining		✓
Embedded Programming		✓
Input Devices		✓
Applications and Implications		✓

**OVERALL PROGRESS**

Completed [Leave Feedback](#)

**UNIT DESCRIPTION**

**Task: Electronics Production**

Group assignment:

- Characterize the **design rules** for your PCB pro...

**Chat Conversation:**

**adriantrains** (2020-03-30 07:07): Week 04, Electronics Production is finished.  
Dear Nuria. Week 04, Electronics Production is finished, you can start correcting whenever you want

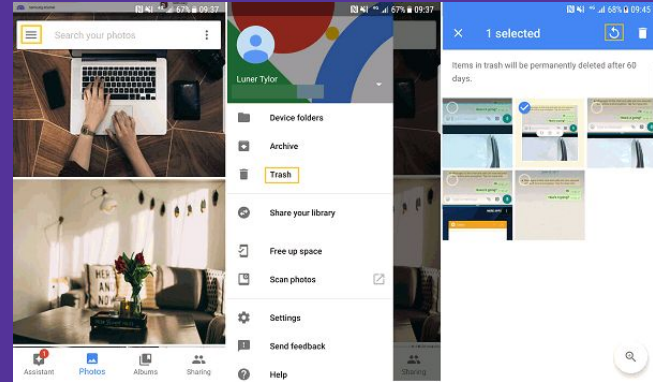
**nunuromi** (2020-04-22 06:51): Electronics Production  
Hi Adrian,  
Although you are the only student in your fablab, maybe its worth to create a separate page for the group assignments. It is not strictly mandatory because you documented the group assignment in your personal webpage, but recomendable

# How to make (almost) good photos and video

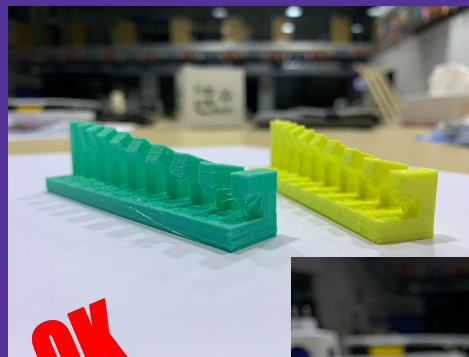
FAB ACADEMY  
|||||||○|○○○

# Prepare you **camera**, **smartphone** and your **computer**

- **Smaller Image Size**
  - Open the **Camera** app on your device
  - Tap on the **Settings** icon which should look like gear as always
  - Select **Picture Quality**
  - Choose a reasonable image **File Size** > 1MB
- Compress **Photo** size -> **Image Magick**
- Compress **Video** size -> **FFMPEG**
- **Canva**
  - Templates.
  - Compress image
  - Video editing



# One Good Photo is Worth 1000 Words



**OK**

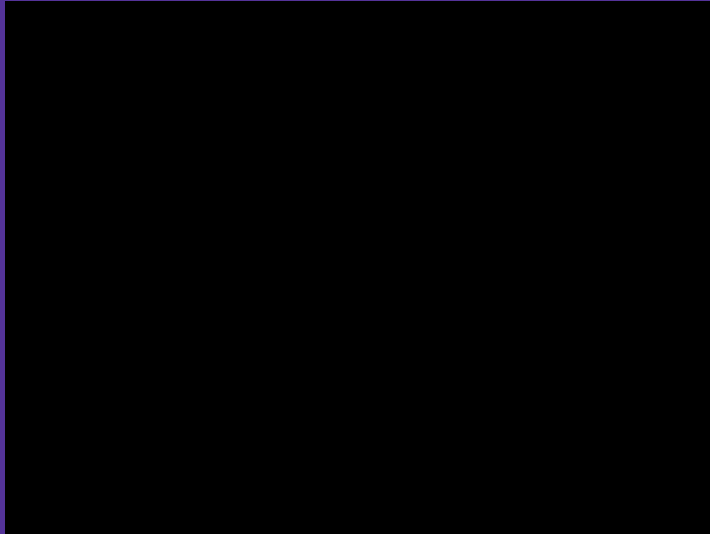


**HERO SHOT!**

- Good light. Good focus. Horizontal.
- YOU making things



# Save Videos In the Repository



- Horizontal
- Short
- No watermark



Week 10: Input Devices

Search

**Assignments**

- Week 1: Project Management & Web Development
- Week 2: Computer-Aided Design
- Week 3: Computer Controlled Cutting
- Week 4: Electronics Production
- Week 5: 3D Printing & Scanning
- Week 6: Electronic Design
- Week 7: Computer-Controlled Machining
- Week 8: Embedded Programming
- Week 9: Mechanical Design & Machine Design
- Week 10: Input Devices
- Week 11: Molding and Casting
- Week 12: Output Devices
- Week 13: Networking and Communications
- Week 14: Interface and Application Programming
- Week 15: Wildcard Week
- Week 16: Applications and Implications
- Week 17: Invention, Intellectual Property, and Income

**Table of contents**

- Apr 7
- Apr 8
- Apr 9
- Apr 10
- Apr 11
- Apr 29
- May 8

The sketch worked, but not quite exactly as intended. When the magnet waved over the sensor, the light changed state, and stayed that state until the magnet was flipped back over and waved over the sensor again. For the sake of the pill case, I want the state to flip only when

# Time Management

**FAB ACADEMY**  
|||||●|○○○

# Time Management: The Weekly Marathon

## Wednesday

- \*Neil Class
- Materials

## Friday

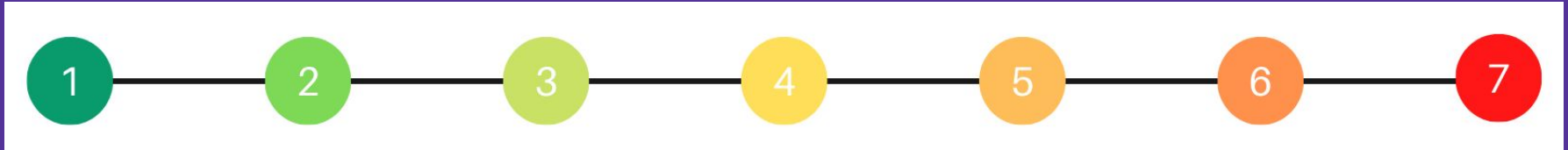
- \*Group Assignment Work
- \*Individual Assignment Work

## Sunday

- Final Assignment Work
- Documentation

## Tuesday

- Regional Review
- Finalize Weekly Documentation



## Thursday

- \*Local Review with your instructor
- Research
- \*Design work

## Saturday

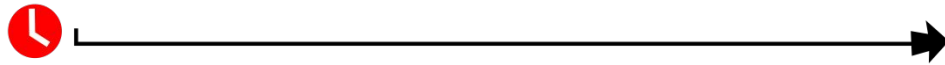
- \*Individual Assignment work
- Documentation
- > Global Open Time

## Monday

- \*Recitation
- Local Review

# Parse Your **Available Work Time**

## Demand-side Time Management



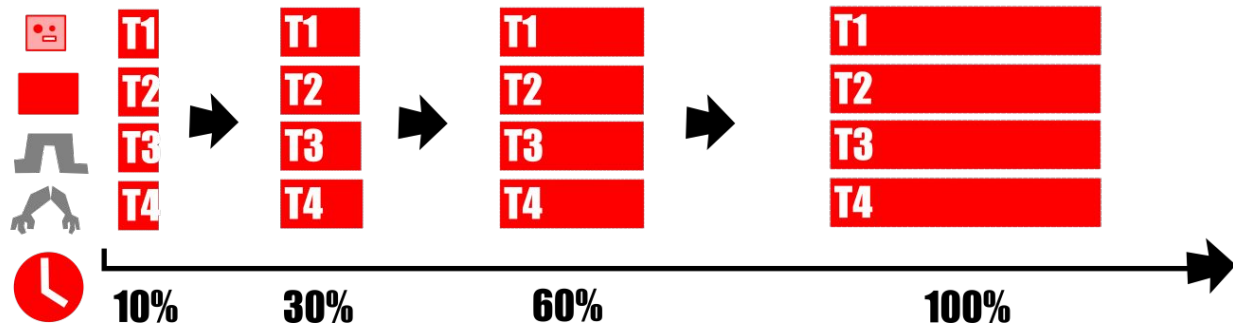
## Supply-side Time Management



- Use **Supply-Side** not Demand-Side
- Assess available **time...not tasks**
- Fit tasks into available time

# Parallel not Series

## Parallel Development



- Progress **all tasks** at a **parallel pace**
- Don't finish one before starting the next task

# Global Open Time

**Friendly Guides** for Your Fab Academy Journey



**Pablo** Nuñez

**Rico** Kanthatham

**Adrián** Torres

**FAB ACADEMY**  
|||||○○|○○○

**You Are Not Alone.**

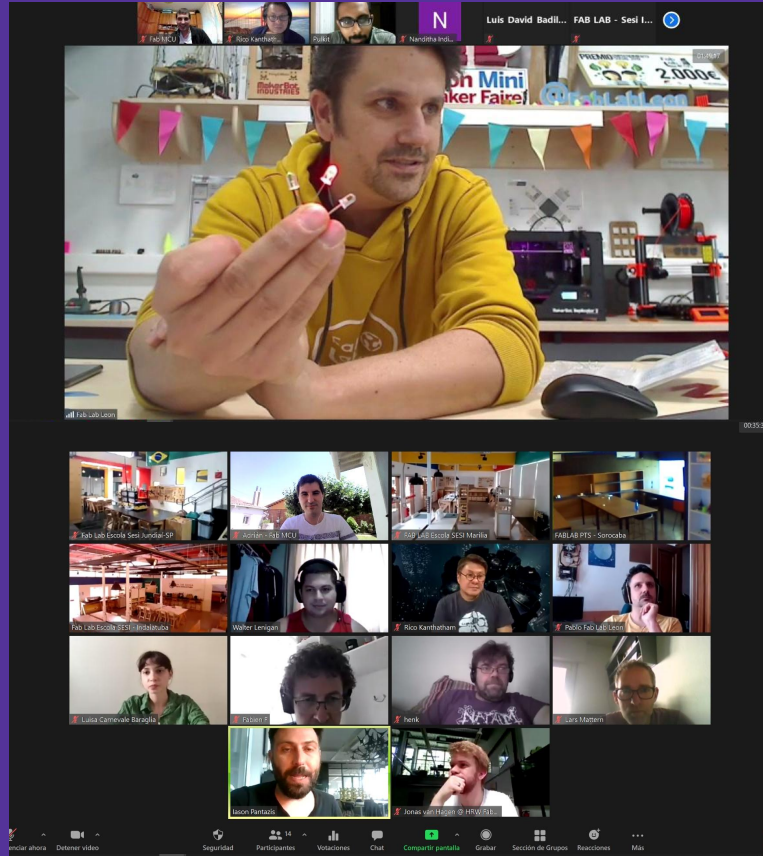


Where **everybody**  
knows your  
name...

and your face :)



# What is **Global Open Time**?



**10:00AM - 12:00AM EDT**  
**Saturday**  
**Zoom MCU Room**

- Get together with **friends**...in a **fun** place
- **Discuss questions and concerns**...find answers...most of the time :)
- Seek advice to **focus and redirect** assignments or Final Project

Enjoy every moment of your  
Fab Academy journey...  
We are here for you.



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|||||||○|○○○

# FINAL PROJECT

## FAB ACADEMY



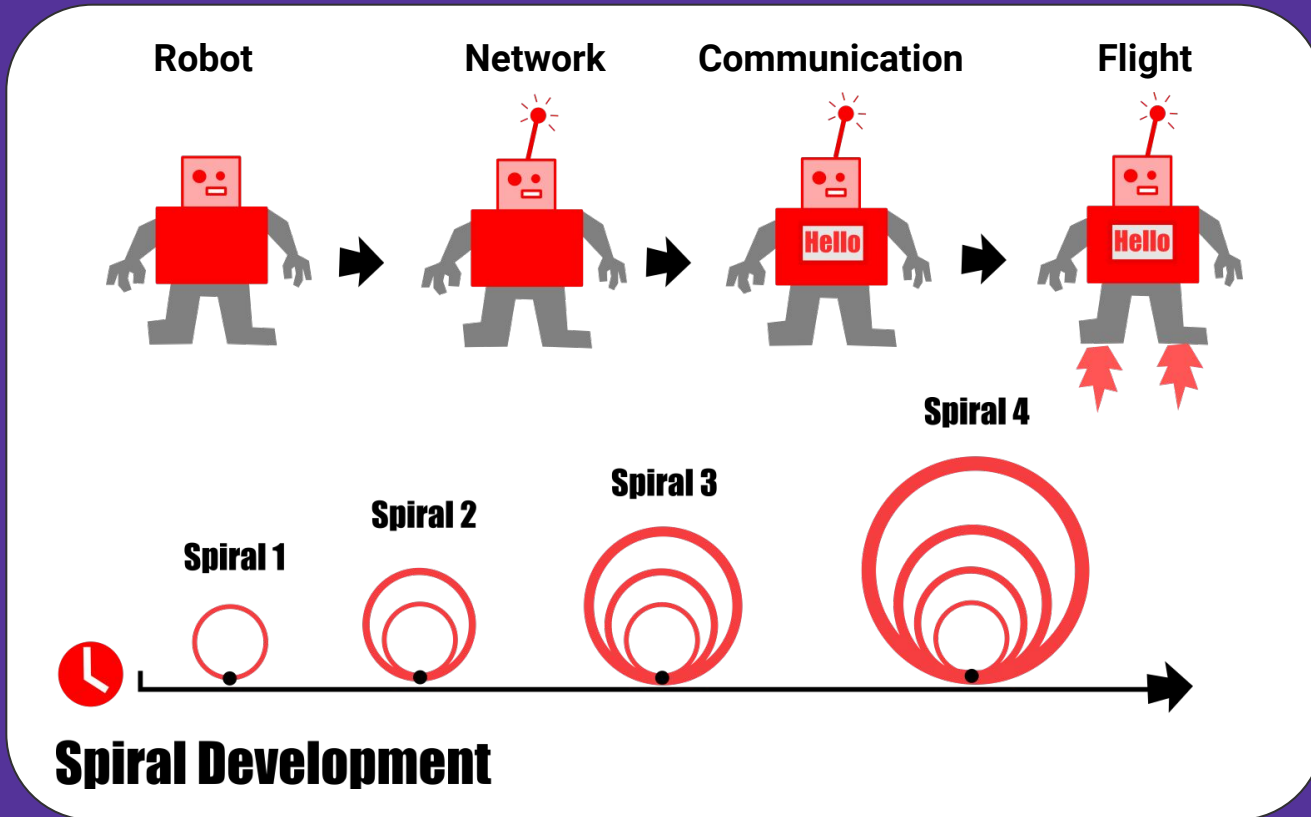
# Fab Academy Final Project Requirements

- Incorporate 2D and 3D design
- Additive and subtractive fabrication processes.
- Electronics design and production
- Embedded microcontroller design, interfacing and programming
- System integration and packaging

Align your personal goals with the final projects requirements.

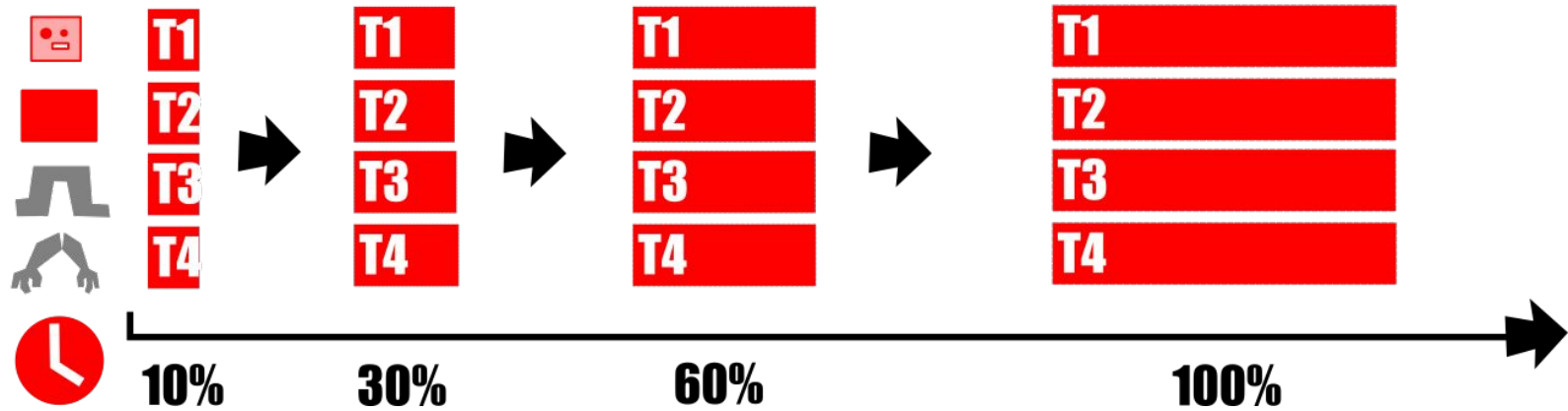
**Motivation >> Success.**

# Make Complete Incremental Project Versions



# Complete Sub-Systems In Parallel

## Parallel Development



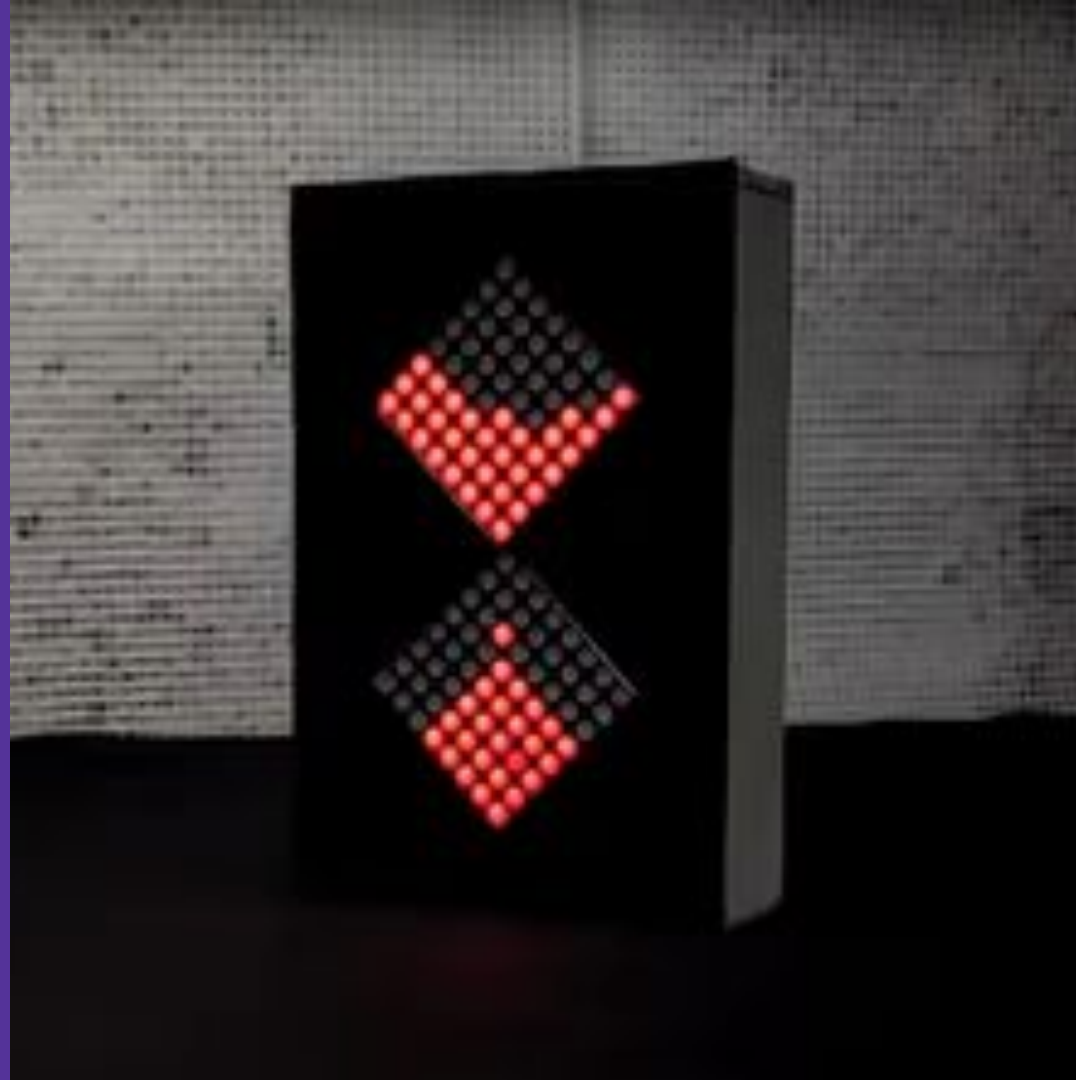
# Final project: The Good, the Bad and the Ugly



# THE GOOD ONE

- Simple (KISS)
- Clear Purpose (its clear what should do)
- Nice Designed (not a box)

...it's your objective.





# THE BAD ONE

- Complex
- Unclear Purpose
- Awkward Design

...but it still does what it's supposed to do.



## THE UGLY ONE

- Doesn't Work
- Doesn't Meet Requirements
- Hard to watch

...it does not show  
your mastery in  
anything

