INTRODUCTION TO PROJECT MANAGEMENT

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PHYS 523 - FALL 2023

LECTURE I

UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN

WHAT WE WILL COVER IN THE NEXT 2 WEEKS TOGETHER

- **Introduction to Project Management: why we do it - how we do it**

- **Tasks, depedencies, milestones**

- **How to setup a project in Microsoft Project from scratch**

- **How to setup our PHYS523 project in Microsoft Project**

- **Projects in the real world: risk analysis**

- **Budgeting a project: cost estimates, contingencies, schedule loading**

WHAT IS A PROJECT?

Let's start from the most general concept: what is a project?
A project is a set of activities and tasks defined to lead to a specific goal that is not part of the routine

Example: I want to re-paint the fence of my garden. I need to buy the brushes and the paint. I need to have full access to the fence. I need to have a way to restrict access to the area when the paint will be applied. I need help from someone (family, or friends) etc etc.

Example II: I want to build a small PCB where I use a microcontroller to control a BME680 to readout pressure, temperature, humidity, and gas in this room. I need to find a suitable microcontroller. I need to procure both the microcontroller and the BME680. Maybe I also need an external LCD screen where I can visualize in real-time the readout. I need to test the whole circuitry before designing a PCB. I need to design the PCB (am I able to? Shall I learn? Or shall I ask someone who knows how to do it for me?), order the PCB, solder the parts on it, design and print a case for it, test that it behaves as expected, calibrate the sensor.... Etc
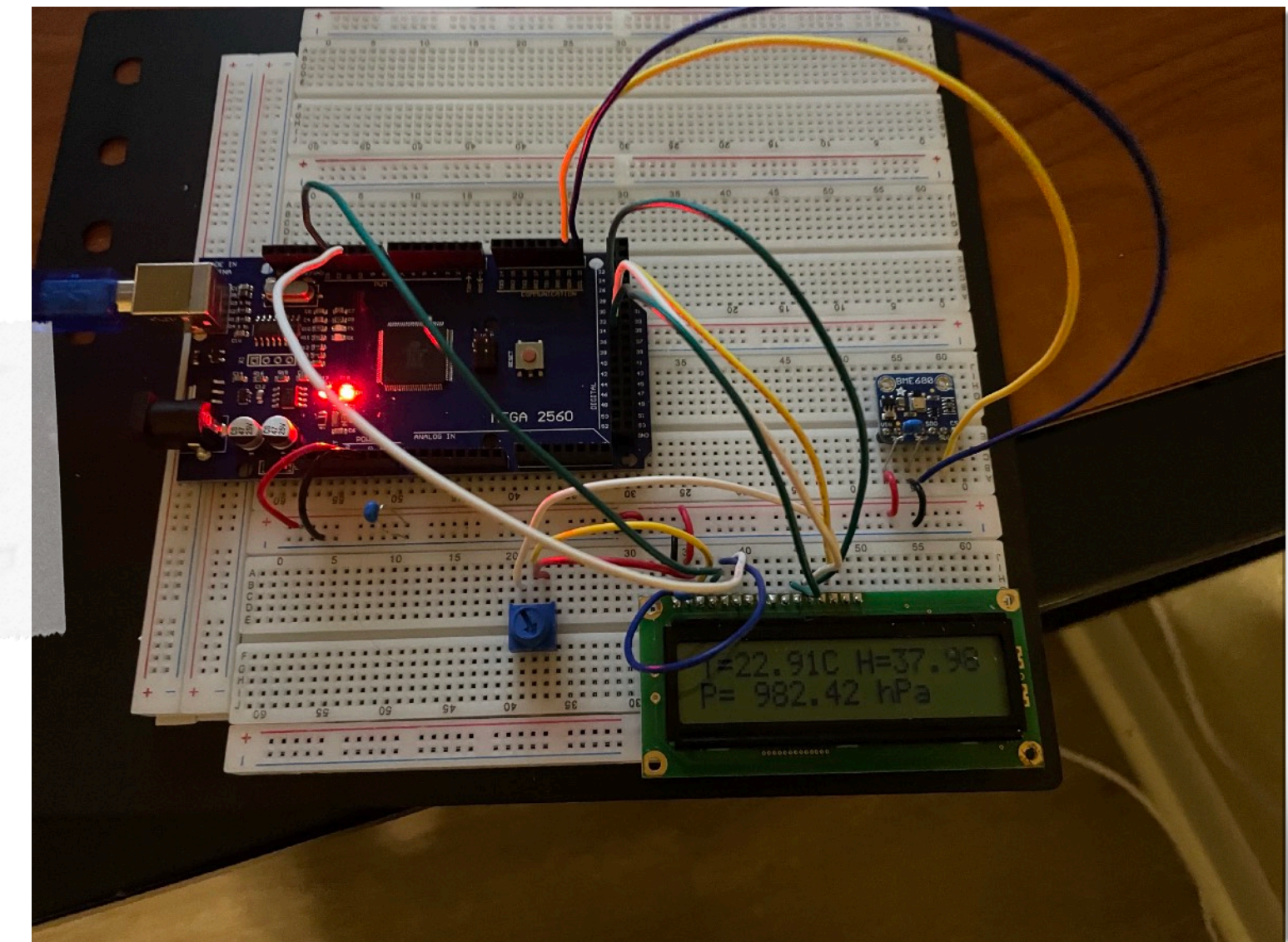
WHAT ARE THE CORE COMPONENTS OF A PROJECT?

A project can be dissected into a series of specific actions/endeavors - that from now we will commonly refer to as **Tasks.** Task can have different statuses, depending on the stage of the project (not yet started, X% completed, or completed)

Tasks
Examples: acquire all the components to test my circuit on a breadboard, write code to readout the sensors and display data on the LCD display, design the container for the PCB …

A project doesn't always progress on a straight line, tasks can be developed in parallel and by more than one person. Some task must be accomplished to enable others to start. This naturally introduces the concept of **Dependencies**

Dependencies
Examples: acquiring the BME, the microcontroller (which one?), and the LCD display, as well as the adequate tooling, are all steps that are needed in order to start assembling your circuit on a breadboard

It is usually convenient to group tasks and dependencies in a project that belong to a well-defined phase of work - and mark their completion with a **Milestone.** You usually define milestones when you draw the project - setting a target date for them.

Milestones
Example: once you have acquired all the components, assembled them on a breadboard, and successfully read them out with your DAQ program, you can mark the "prototyping phase" milestone as achieved! Were you in time?

WHAT ARE THE CORE COMPONENTS OF A PROJECT?

A project is established in order to deliver one or more products or results. Such items are usually called **Deliverables**. The project is completed when all the deliverables have been produced.

Deliverables
Examples: your fully calibrated PCB is a deliverable. The analysis software you wrote to take the data, can also be seen as a deliverable.

Note
The completion of a deliverable can easily be considered a Milestone of the project. On the other hand, Milestones can be associated to accomplishments that are not required to be a deliverable.

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WORK BREAKDOWN STRUCTURE

All the tasks constitute a **Work Breakdown Structure (WBS).**

The WBS is characterized by different **Levels**
- **Level 1 (L1) elements** group the tasks in a more general way, lower levels get more and more specific

The WBS can be organized in different ways - for example:

- **Deliverable-based WBS:** the WBS clearly defines the relationship between the **project deliverables** and the scope
Example: in the PCB project discussed before, one can identify 3 deliverable-based L1 items: PCB design, PCB construction and test, Data Taking & Analysis

- **Phase-based WBS:** each of the WBS main elements represents a phase of the project.
Example: in the PCB project discussed before, one can identify 3 phase-based L1 items: PCB design and prototyping, PCB construction, test and calibration, Data taking & Analysis.

How to structure the WBS is your choice (e.g. there is no golden rule on how to do it - it is part of the discretionary power of the project manager). I would suggest a Phase-based WBS, since it better matches the structure of the project within the course.

TASKS+DEPENDENCIES+MILESTONES+WBS = GANTT CHART

The Dependencies between the Tasks, as well as the Milestones, are displayed by a **Gantt chart.**

The WBS dictionary and the dependencies seed the logic connections of the tasks in the Gantt chart.

The Gantt chart is the principal tool used to monitor the progress of your project!
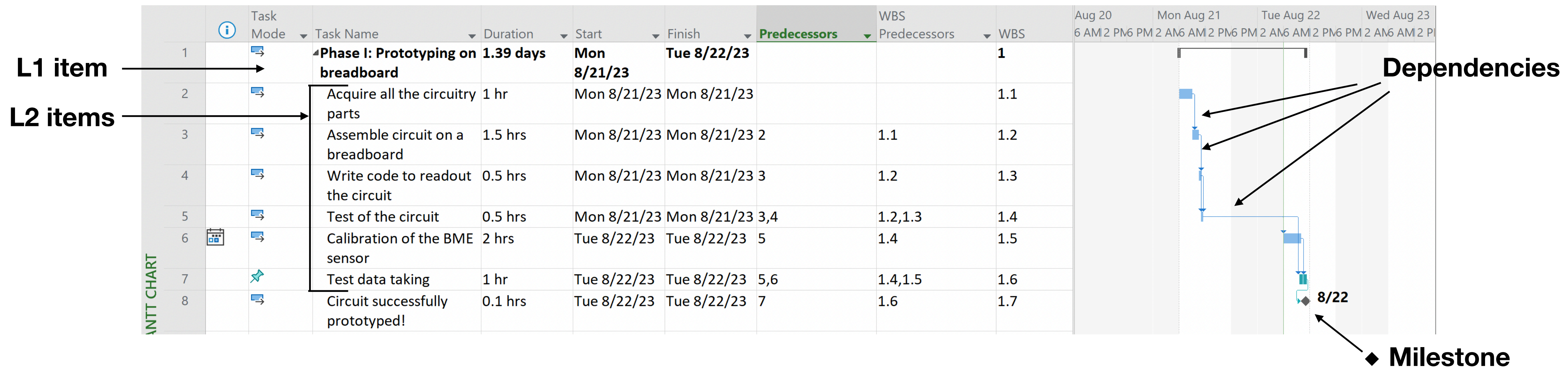
NB: This particular chart is named after Henry Gantt, who came up with this concept around 1910 to measure productivity levels of employees and gauge their performance.

523 - A PROJECT FROM ZERO TO HERO

523 is the perfect playground for you to become familiar with a project
You have just picked a project to address a real-life research issue - that you will address starting from essentially nothing

How do I start?
Prof. Gollin got you covered! The list of topics compiled on the website of PHYS523 is a perfect straw man to use to build your project!
Check it out at **https://courses.physics.illinois.edu/phys523/fa2023/topics.asp**

How do I know what I will be doing 9 months from now? We just started!
We will learn together that managing a project requires a high level of planning but on reasonable time scales - and that a schedule has to be precise with tasks that are relatively close in time (e.g. you don't need to have precise planning for May 2024 now, instead a more tentative straw man structure that will grow in detail with time). Usually, if your project has a duration of X, is good practice to have a detailed list of tasks for the project in the upcoming X/4 or X/3 period.

PROJECT MANAGEMENT SOFTWARE ZOO

- Different software is available on the market to carry out project management & associated task tracking

- All of them provide a compatible set of main functionality - and differ mostly in interface and specific capabilities
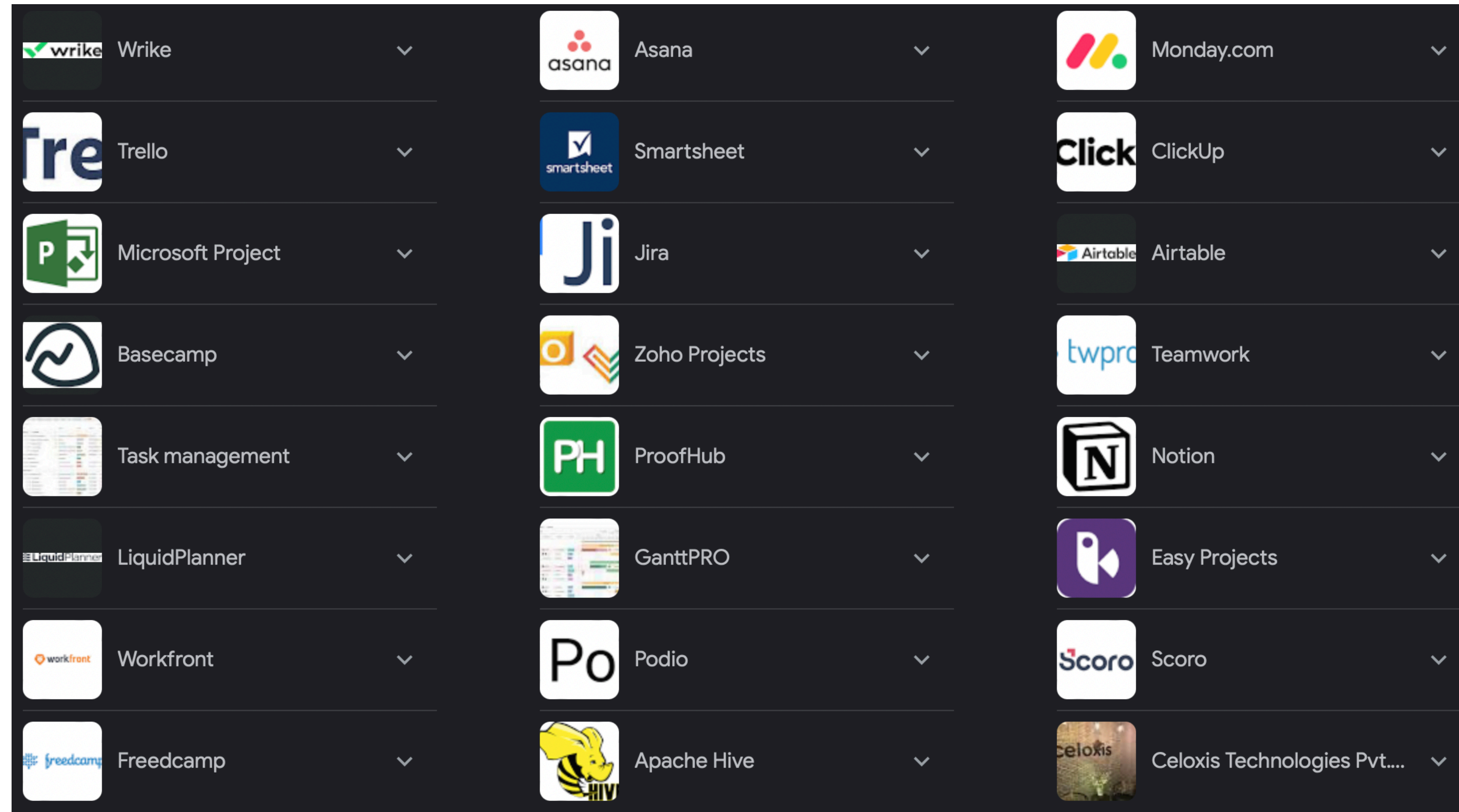
MICROSOFT PROJECT

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- In this course, we are going to use **Microsoft Project!**
  - Please do not focus on the interface, but on the concepts we will explore together
  - In your next adventure after this master program, either in Industry or in a National Lab, you will likely use different tools, but it will be easy to adapt if you have a good idea of what needs to be done!
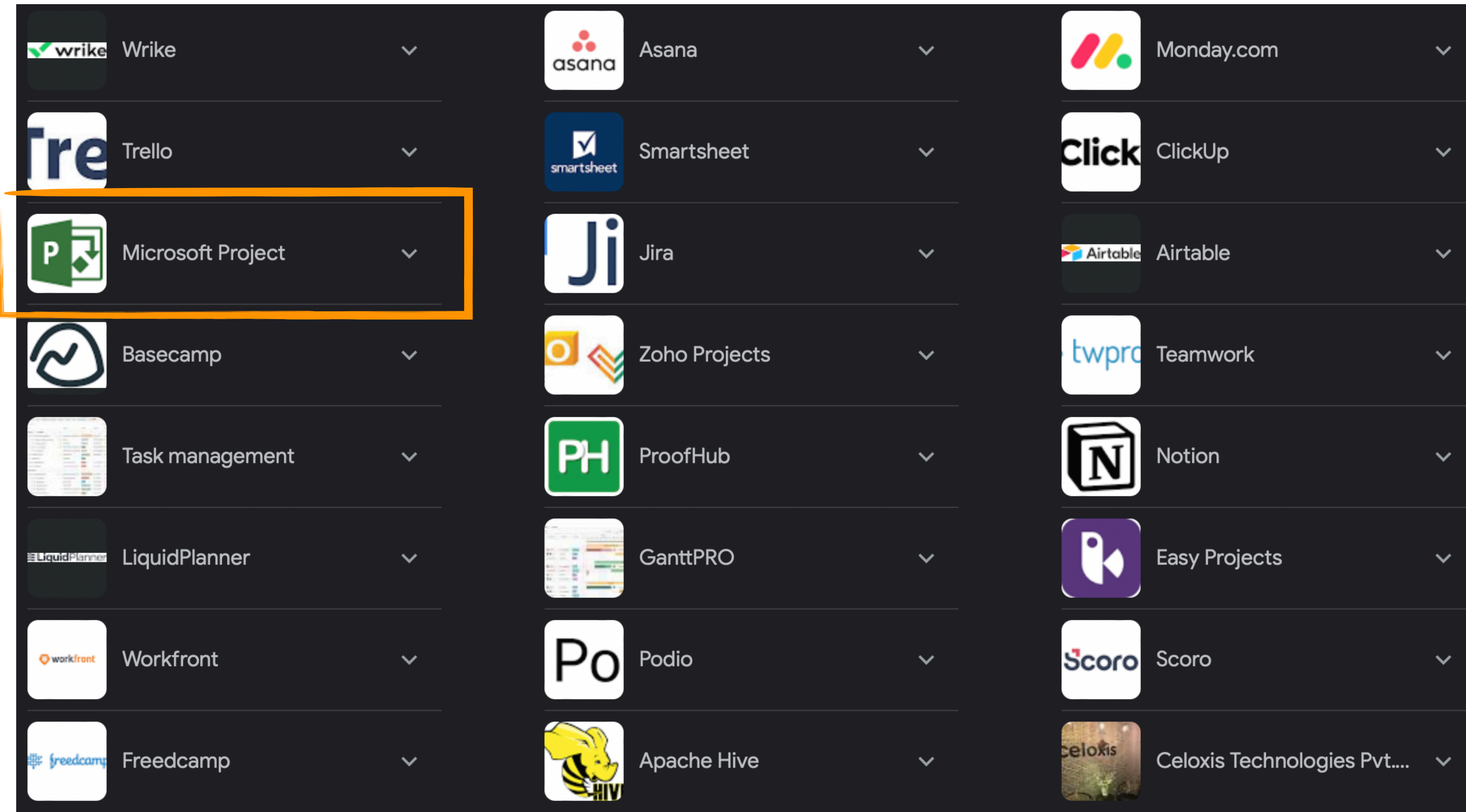
Please note that the MS Project app runs only on Windows

OH NO: I DON'T HAVE WINDOWS!

- I share the feeling - I don't have it too!
- If, by chance, you are using Mac OS and you have **Parallels** - you are all set.
- If not - or if you use Linux - no problem - the University provides a program that prevents the need for for partitioning or other time-consuming and disruptive actions on your laptop!

UIUCAnyWare: virtual desktop environment allowing students to access software whether remote, on campus, or in class.

- Provides remote access to Windows Desktop from anywhere - w/o need for VPN access or other restrictions that may apply to UIUC computing resources

- Loads environment according to your UIUC NetID - and keeps memory of your user's space

Instructions on how to install the Citrix Workspace app

Instructions on how to setup the Citrix Workspace app for UIUCAnyWare

CITRIX + PROJECT

- Because of a recent (< 2 weeks) change, the "App" installation by the user is not possible anymore
- Once you have booted Citrix and logged in UIUC AnyWare, select the **General Purpose desktop** option and log-in.
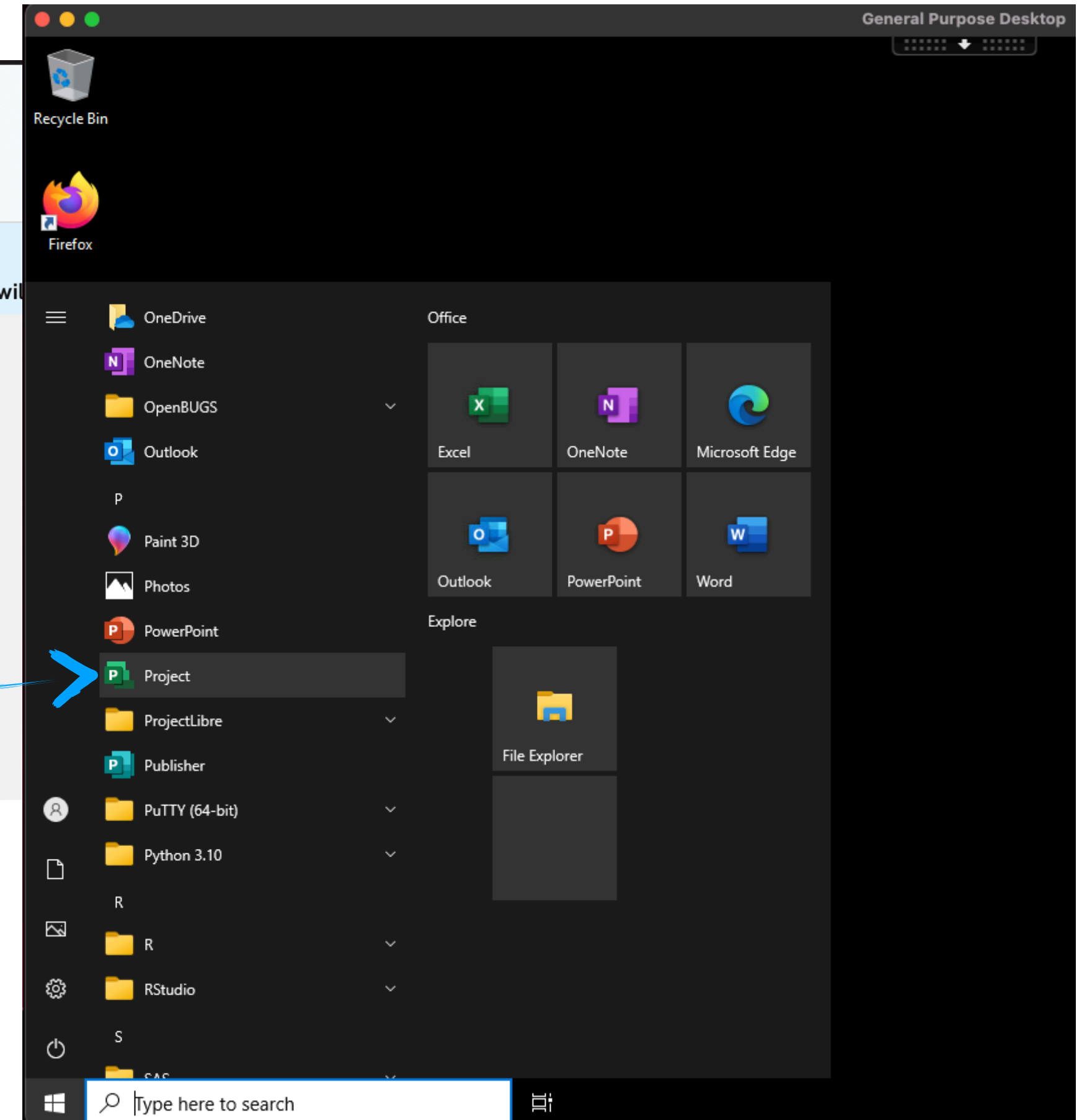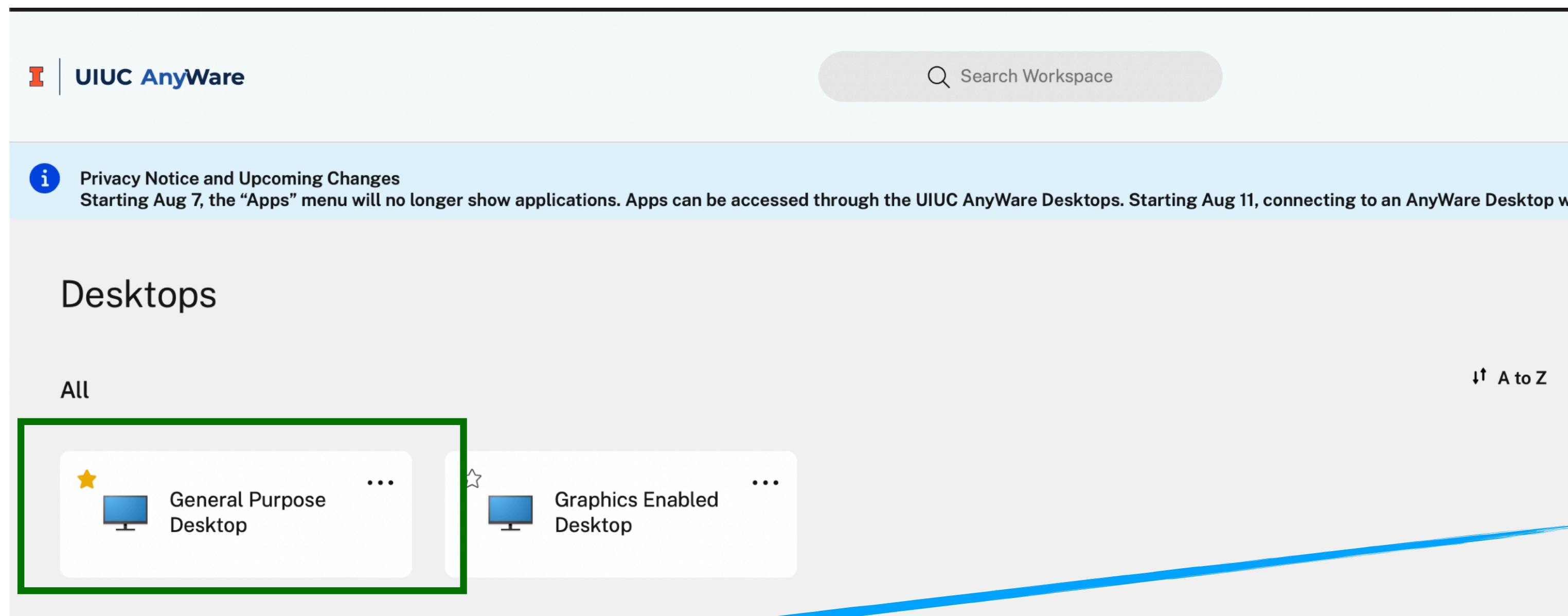
- The **Project app** will be already available in the Windows menu
- The version of the software is not the latest (2021), but this should not affect the work for the class!

ACCESS TO MICROSOFT PROJECT VIA UIUC

- **Microsoft Project** is available for free for UIUC students via the UIUC webstore
- You can download it through **https://azureforeducation.microsoft.com/devtools**

Step 1
Download and install **Project Professional 2021** on your windows machine (or VM)

Step 2
Save your **Product Key**

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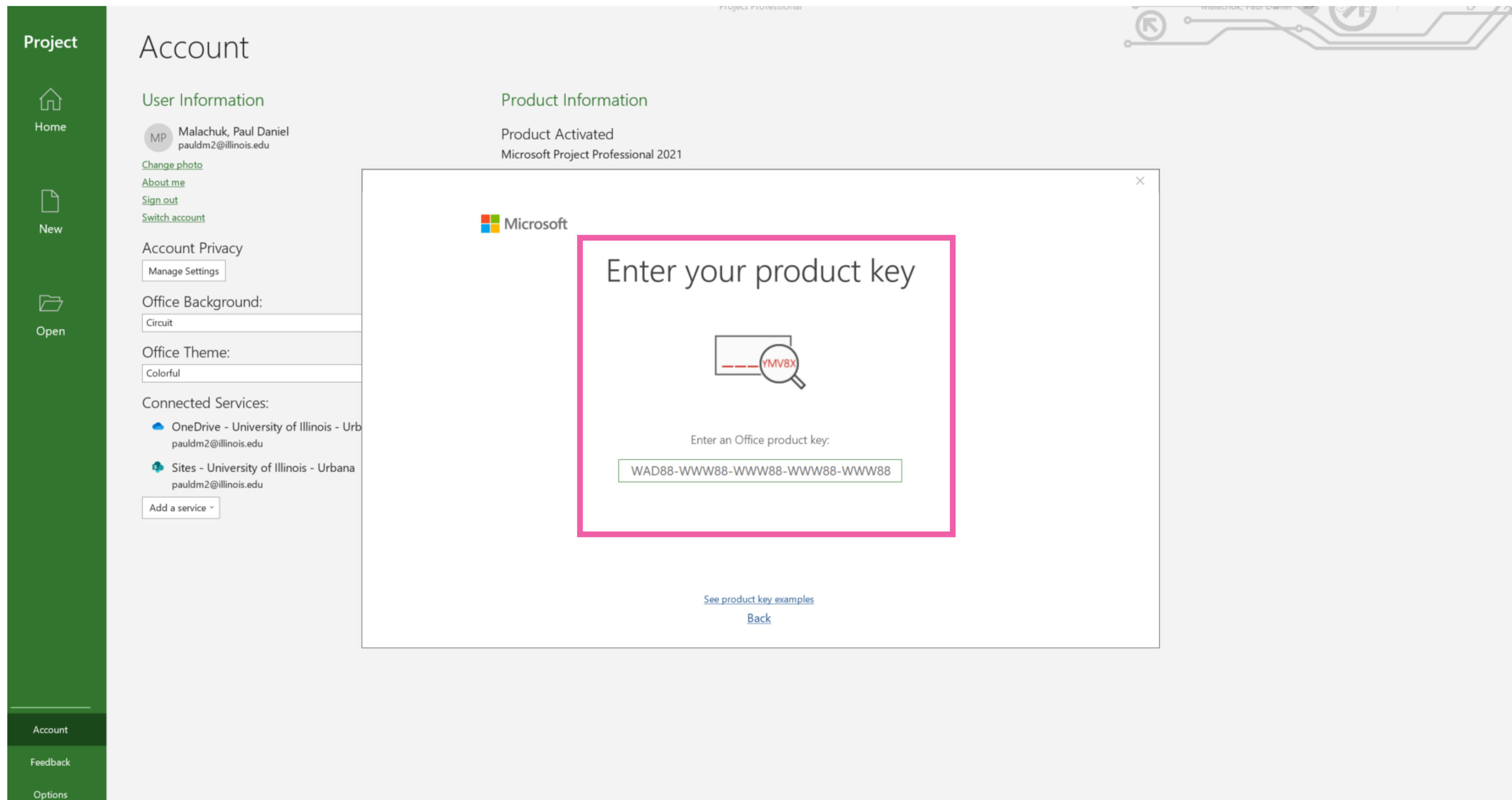- You can download it through **https://azureforeducation.microsoft.com/devtools**

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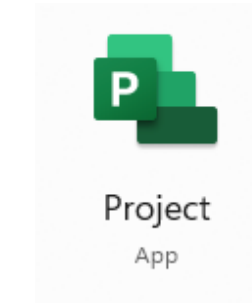
Step 2
Save your **Product Key**

Step 3
Once installed, launch Project and insert your **Product Key**

MS PROJECT - A FIRST LOOK

- Once you get your MS project setup - you can open the MS Project App ➜

Project App
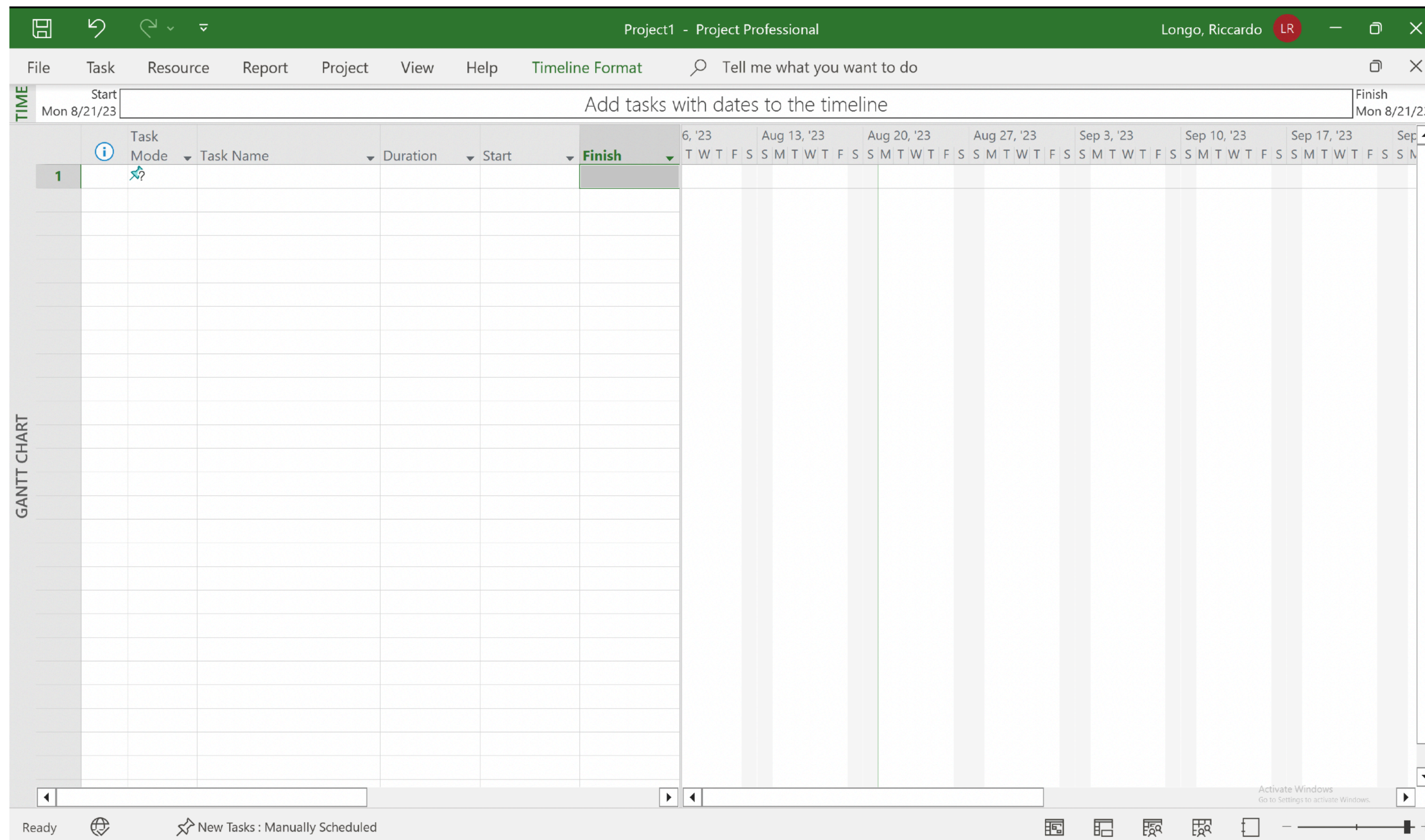
- Let's start with a simple example - e.g. not immediately your group project

- Select "**Blank Project**"!

MS PROJECT - YOUR FIRST PROJECT!

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- Select "**Blank Project**"!

- Now - let's save this project. You should all have received an invitation for a UIUC OneDrive folder called "PersonalTestProjects". Save your project there with the following name format NameSurname2023Test

- To save - go to File > Save As > OneDrive - University of Illinois - Urbana > Phys523_ClassOf2023-2024 > PersonalTestProjects > YourNetID

TIME TO DEFINE YOUR FIRST TASK!

- Let's start together and try to replicate the simple WBS shown in this Gantt chart

L1 item →

L2 items →

#	Task Mode	Task Name	Duration	Start	Finish	Predecessors	WBS Predecessors	WBS
1		Phase I: Prototyping on breadboard	1.39 days	Mon 8/21/23	Tue 8/22/23			1
2		Acquire all the circuitry parts	1 hr	Mon 8/21/23	Mon 8/21/23			1.1
3		Assemble circuit on a breadboard	1.5 hrs	Mon 8/21/23	Mon 8/21/23	2	1.1	1.2
4		Write code to readout the circuit	0.5 hrs	Mon 8/21/23	Mon 8/21/23	3	1.2	1.3
5		Test of the circuit	0.5 hrs	Mon 8/21/23	Mon 8/21/23	3,4	1.2,1.3	1.4
6		Calibration of the BME sensor	2 hrs	Tue 8/22/23	Tue 8/22/23	5	1.4	1.5
7		Test data taking	1 hr	Tue 8/22/23	Tue 8/22/23	5,6	1.4,1.5	1.6
8		Circuit successfully prototyped!	0.1 hrs	Tue 8/22/23	Tue 8/22/23	7	1.6	1.7

Dependencies

♦ Milestone

- Let's take it to the **interactive mode** from now on!

- Next step is to define Phase II - design and production of PCB and its 3D-printed case

- Then you can go with Phase III - Assembly, Test and Data taking

- The time between tasks at the moment is not crucial - we will discuss this in the next lectures! Focus on dependencies and milestones

TAKE HOME WORK AND NEXT CLASS

- You should try to complete the pilot task by the next class! We will have a brief Q&A session before starting with the next lecture on Thursday.

- I am available for **walk-in office hours tomorrow**, Wednesday August 23rd, **from 3:30 to 5:30 PM**. You will find me in **Loomis 481**. If you plan to stop by, please send me a message in advance to <u>rlongo@illinois.edu</u>, such that we coordinate and avoid pile-up and long waiting times for everyone!

- In the next lecture, we will start working on your class project! How will you collaborate on a MS Project? What are the different roles in a project? Who is in charge of keeping the others on track? **Spoiler alert**: everyone will be (in rotation). Taking charge is an essential aspect of successful project management!

BACKUP SLIDES

PROJECTS IN INDUSTRY & RESEARCH

Let's now take it to the next step - What is a project in the industry?

In industry, a project is a temporary and one-time exercise which varies in duration. It is undertaken to address a specific need in an organization, which may be to create a product or service or to change a business process.

Example: a company manufacturing electric trucks would like to develop a new recharging system for their vehicles. The R&D division is asked to formulate a project to achieve this goal in the shortest and most cost-effective way possible.

...and in research
A project is a typical working package proposed to advance research/develop technology in a specific field. Usually starts with an innovative idea, formulated into a project on a (multi-)year basis. The project is submitted to a funding agency/University/Federal government department/etc. in response to a specific funding opportunity announcement (FOA)

Example: the CERN Large Hadron Collider (LHC) will be upgraded to High-Luminosity LHC (**1 B$++**). The experiments detecting the collisions at the accelerator will also upgrade their detectors in order to take advantage of the new machine capabilities. Several M$ projects supporting multi-institution international efforts