

MORE ON RESOURCES: BUDGET & CONTINGENCIES

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PHYS 523 - FALL 2023

LECTURE III



**UNIVERSITY OF
ILLINOIS**
URBANA-CHAMPAIGN

WHERE WE LEFT OFF ON THURSDAY

My files > PHYS523_ClassOf2023-2024 > GroupProjects

Name	Modified	Modified By	File size	Sharing
FlowMeterProject	Yesterday at 9:41 PM	Longo, Riccardo	0 items	Shared
KrannertProject	Yesterday at 9:40 PM	Longo, Riccardo	0 items	Shared
PulseOximetryProject	Yesterday at 9:41 PM	Longo, Riccardo	0 items	Shared
SparkfunProject	Yesterday at 9:41 PM	Longo, Riccardo	0 items	Shared

- Every group should have got an invitation for a **dedicated folder on OneDrive**
- Please **create your project file there** and start editing together!
- Sketch the first two weeks of your project - with proper dependencies - maybe a couple of milestones - and person-power resources (you!)

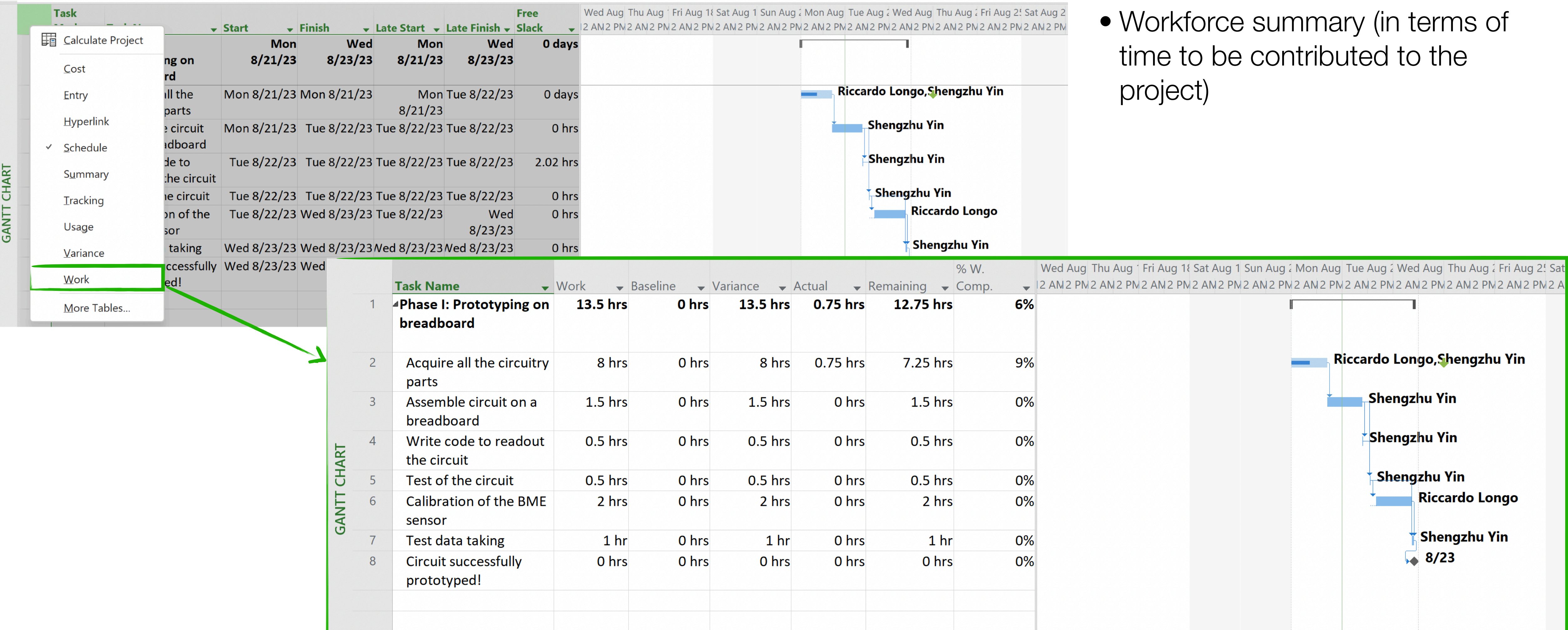
How far did you get with this exercise?

I will come to check in with you and discuss your implementations after today's lecture - but do you have any specific questions before moving forward?

PROJECT RESOURCE OVERVIEW

- There are further ways to visualize resources allocated for the project. From the Gantt chart:

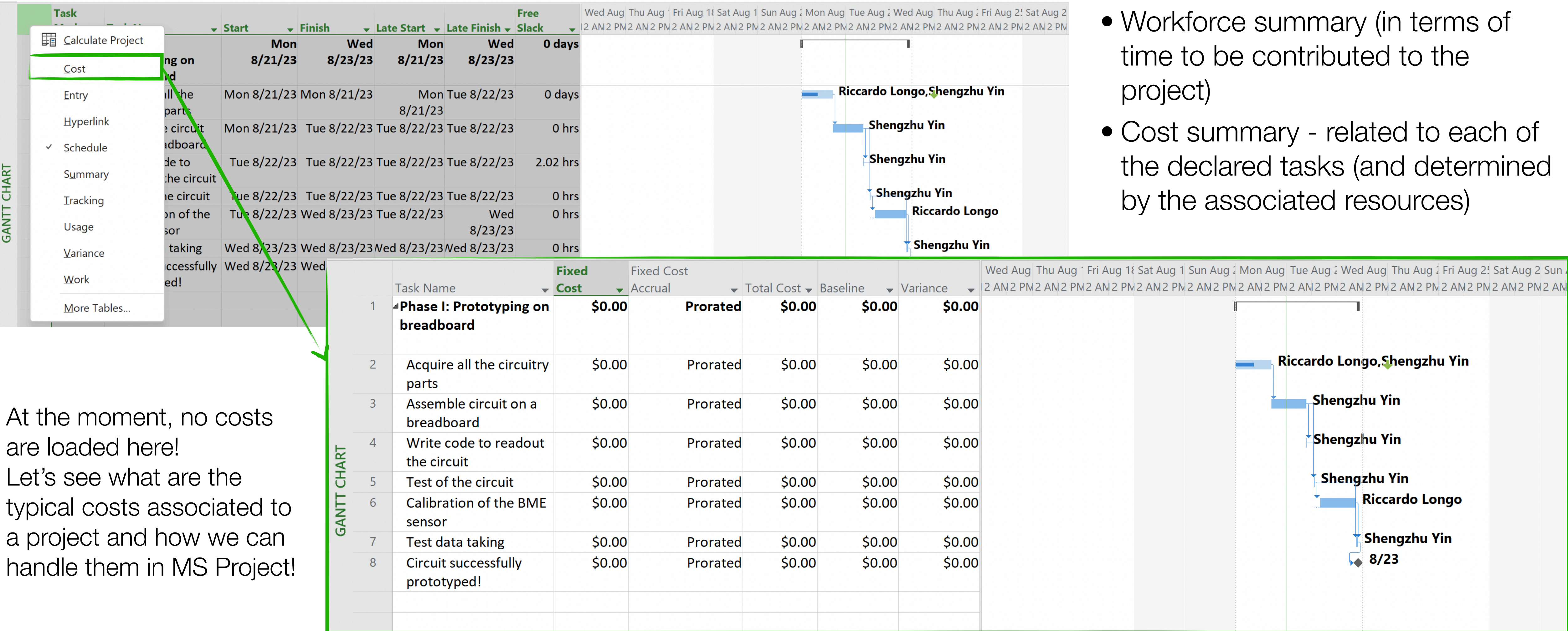
- Workforce summary (in terms of time to be contributed to the project)



PROJECT RESOURCE OVERVIEW

- There are further ways to visualize resources allocated for the project. From the Gantt chart:

- Workforce summary (in terms of time to be contributed to the project)
- Cost summary - related to each of the declared tasks (and determined by the associated resources)



At the moment, no costs are loaded here!
 Let's see what are the typical costs associated to a project and how we can handle them in MS Project!

PROJECT COSTS

- Up to now - we have talked only in terms of tasks and resources - but projects also have associated **costs**.
- Costs can be of different nature, for instance:
 - Workforce salaries
 - Equipment
 - Materials & supplies
 - Professional services
 - Computing services
 - Travel
 - ...

I have a brilliant idea and I would like to draw a project plan to request funding.
How do I assess these costs?



PROJECT COSTS ESTIMATES


- There are several different ways to assess costs for a project
 - Electronic catalogs or online shops [please note the restrictions that may apply if you are asking for federal money to fund your project]
 - Previous purchases
 - Official quotes
 -
- Your estimates have an associated quality factor (QF), i.e. an estimate of the goodness of the estimates you have made
- Depending on different funding sources - you may have different QF criteria.
- Below is an example of CERN QF criteria [according to 2022 guidelines]:

When outlining a project, is very common to have coarse ideas of certain steps and associated costs. It's good to start with those and then refine the estimates (e.g. improve the QF) with time.

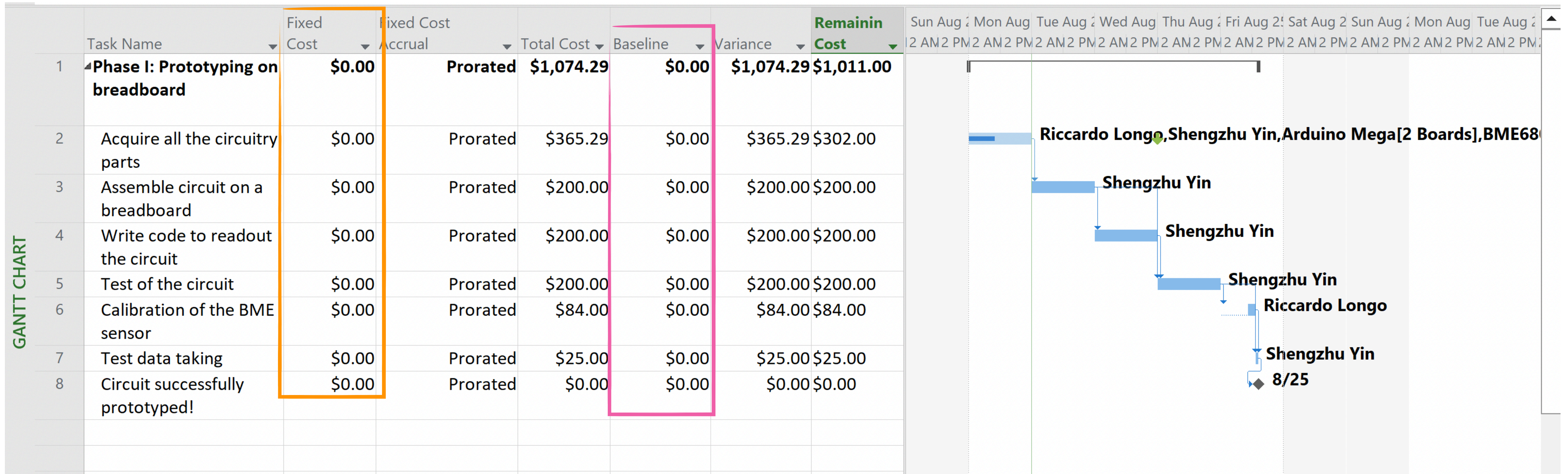
QF1	Items for which there is a recent (< 1 year) catalog price or quote on a nearly completed design and for which there is more than one potential vendor. –OR-- Items that are a copy or almost identical to an existing design for which there is a recent (< 1 year) catalog price or quote and for which there is more than one potential vendor.
QF2	Items that just fall short of satisfying the QF1 criteria: <ul style="list-style-type: none">• Items that have only one potential vendor –OR--• Estimate that are based on a detailed but not completed design --OR--• Items that were adapted from an existing design with minor modifications –OR--• Items having quotes > 1 year but are deemed to still be sufficiently reliable based on experience.
QF3	<ul style="list-style-type: none">• Items with quotes > 2 years –OR--• Items whose cost estimates are based on a conceptual design or adapted from existing design with extensive modifications –OR–• Items whose costs are estimated using physicist or engineering experience regardless of the maturity of the design.
QF4	Items that have unproven fabrication yields or for which there are unique issues e.g. a special-order item and/or a single preferred vendor
QF5	<ul style="list-style-type: none">• Items that are still in a conceptual stage with no detailed specifications or design.

COSTS IN MS PROJECT

- Costs in MS Project are loaded via three main type of **resources**
 - **Work:**
 - The amount needed for work is determined on an hourly basis. You want to quote all the costs that are associated to the resource that you will need to cover
 - Accrue: prorated makes the most sense for work, since you want cost related to labor flowing with the project and not being dumped out at the start or at the end of the project.
 - **Material:**
 - The amount needed for materials and equipment is declared as **material** and is a one-time cost
 - Materials are mostly paid at purchase, so they can be accrued at start. A label is usually requested to indicate the unit associated to the cost indicated
 - **Cost:**
 - The amount needed for subcontracts or external services is declared as a **cost**
 - For contractors, and services, the best is to accrue at the end (since one pays once the service is provided)

		Resource Name	Type	Material Label	Initials	Group	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base
1		Riccardo Longo	Work		RL	PHYS523 T	50%	\$42.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
2		Shengzhu Yin	Work		SY	PHYS523 T	100%	\$25.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
3		Arduino Mega	Material	Number of boards	AM			\$48.40		\$0.00	Prorated	
4		BME680	Material	Number of sensors	B			\$18.40		\$0.00	Prorated	
5		MRL Machine Shop	Work		M	Sub	100%	\$60.00/hr	\$85.00/hr	\$0.00	End	Standard
6		3D printing	Work		3DP	Sub	100%	\$4.00/hr	\$4.00/hr	\$0.00	End	Standard

COSTS OVERVIEW



- You set the **baseline** at the initial cost you foresee at the beginning of your project - and the variance will indicate the difference between actual costs across the project and the baseline estimates
- **Fixed costs** are usually for administrative fees or other fixed costs associated to tasks that you don't load through resources

SETTING BASELINE

The screenshot shows the Microsoft Project interface with the 'Project' tab selected. The ribbon includes options like 'Set Baseline', 'Calculate Project', and 'Move Project'. A tooltip for 'Set Baseline' is displayed, explaining that it takes a snapshot of the schedule and allows for comparison of multiple baselines over time. Below the ribbon, a task list is visible with columns for Task Name, Fixed Cost, Fixed Cost Accrual, Total Cost, Baseline, and Variance.

Task ID	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance
1	Phase I: Prototyping on breadboard	\$0.00	Prorated	\$1,074.29	\$0.00	\$1,074.29
2	Acquire all the circuitry parts	\$0.00	Prorated	\$365.29	\$0.00	\$365.29
3	Assemble circuit on a breadboard	\$0.00	Prorated	\$200.00	\$0.00	\$200.00
4	Write code to readout	\$0.00	Prorated	\$200.00	\$0.00	\$200.00

- **Baseline** costs are frozen once the project is approved and is starting - and will be used to provide differential budgets across the project
- The **Baseline** can be set from the Project tab with a simple action

CONTINGENCIES

- When you outline a (multi-year) project, you sketch the overall cost based on estimates you have at hand at the given moment.
- Independently of the quality of the estimates you make, there will always be an irreducible probability of unexpected events that alter your estimates (most of the time driving them up ↑).

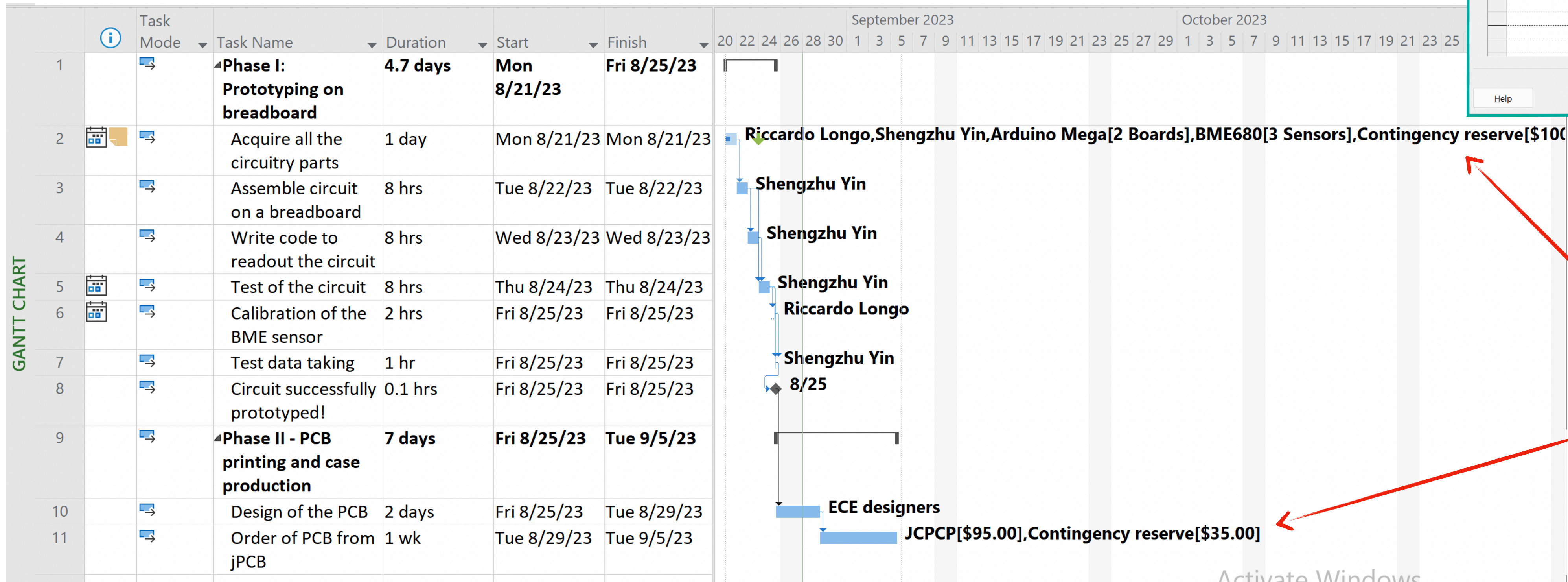
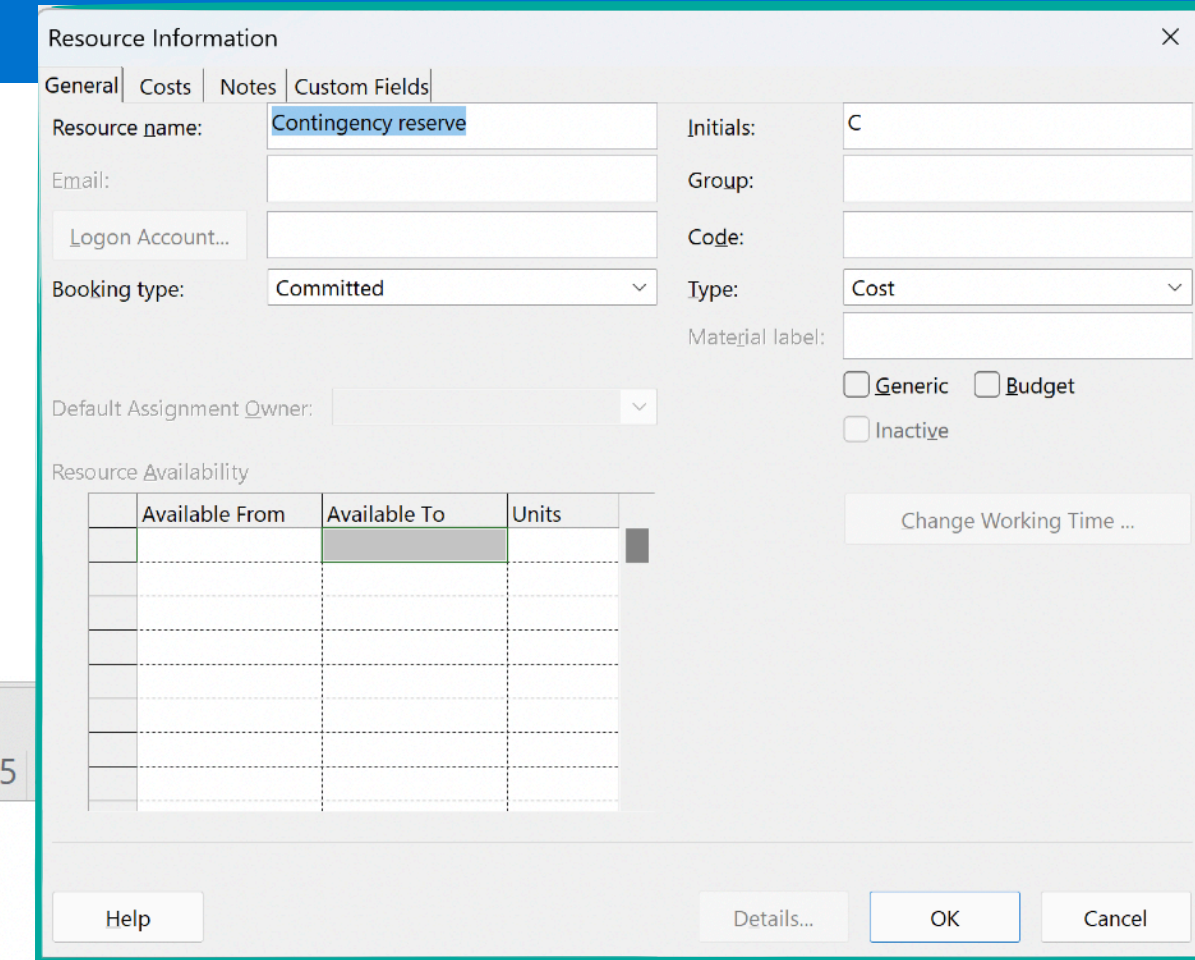
For this reason, for projects, we define **contingencies**.

- There are different ways to define contingencies - not universal!
 - You can assign contingencies on a case-by-case basis (not effective for large projects)
 - You can assign contingencies based on the QF of your cost estimates (higher QF - larger contingencies)
 - You can assign contingencies based on the time that will have to pass before the purchase
 -
- How can we handle contingencies in MS Project?

Contingency: an event you can't be sure will happen. Can be used to describe an event or situation that is a possible outcome but one that's impossible to predict with certainty.

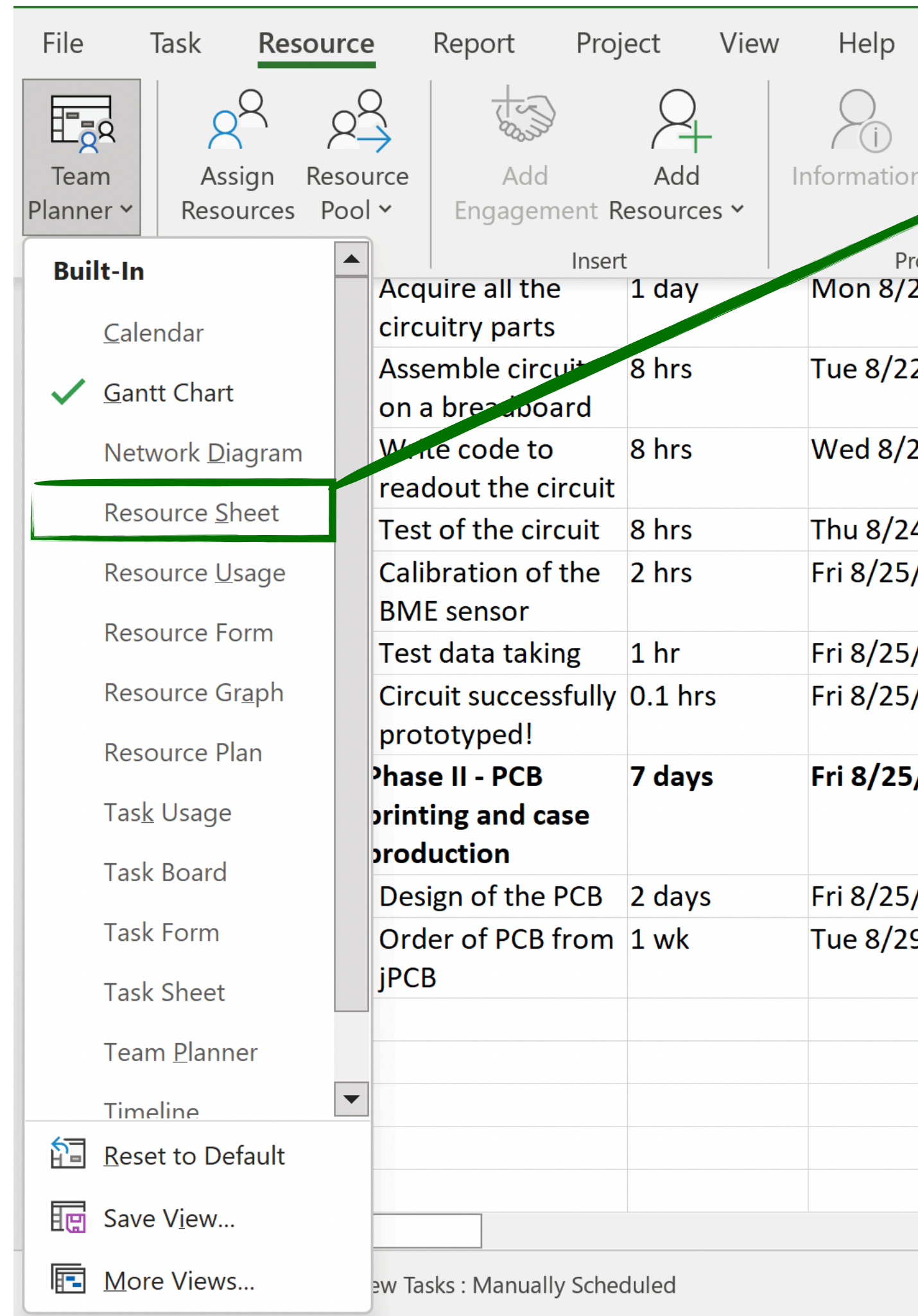
CONTINGENCIES IN MS PROJECT

- You can add to the resources a new entry - e.g. “**Contingency Reserve**”
- Please select the type of the resource as “Cost”
- Add the resource to each of the items where you would like to assign the contingency



Added Contingency Reserve entries to a couple of tasks here

CONTINGENCIES IN MS PROJECT: OUTLOOK



You can select the Resource Sheet from the resource panel

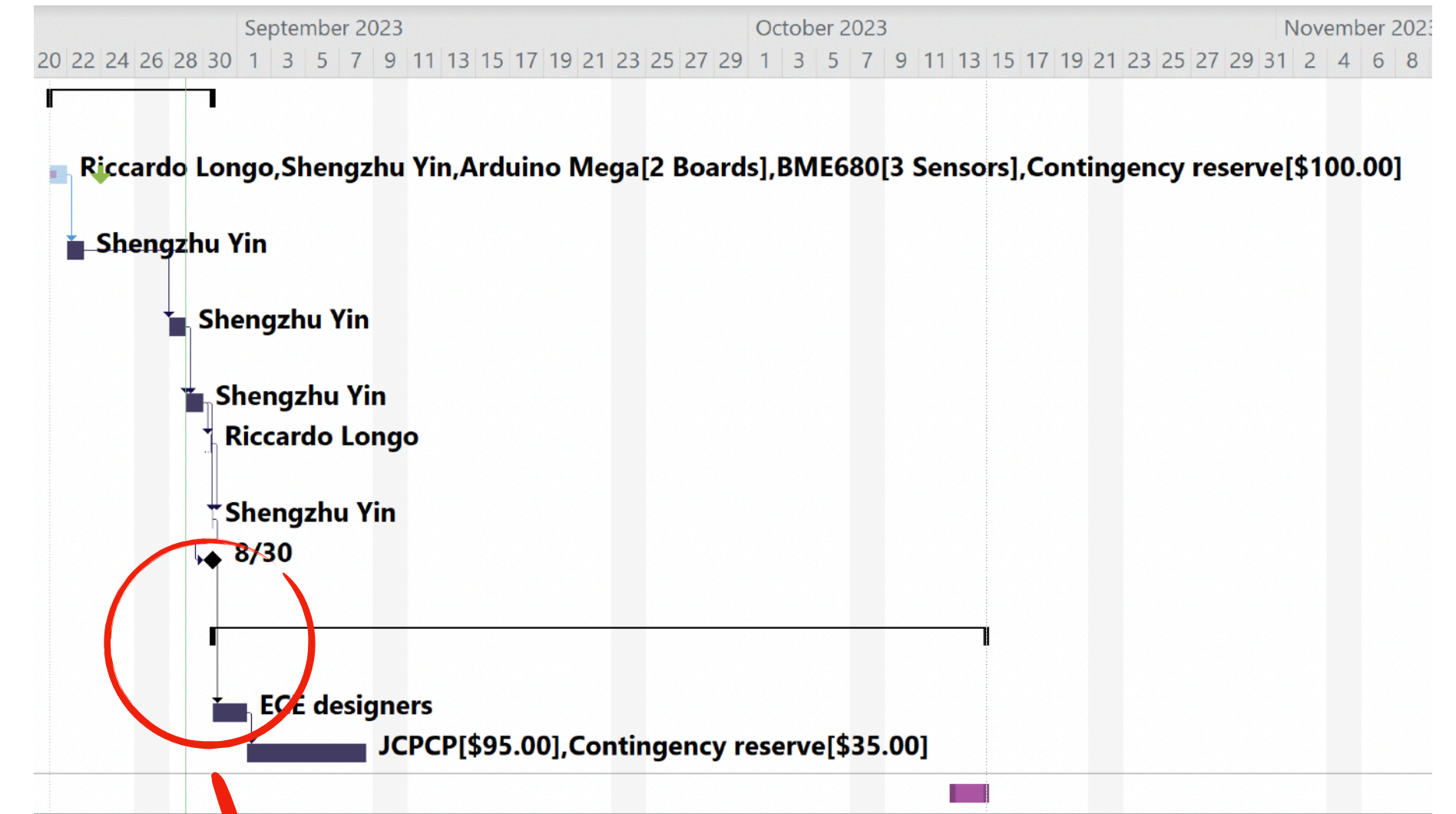
	Resource Name	Cost	Baseline Cost	Variance	Actual Cost	Remaining	Cost	Type
1	Riccardo Longo	\$115.50	\$115.50	\$0.00	\$31.50	\$84.00	\$115.50	Work
2	Shengzhu Yin	\$806.79	\$806.79	\$0.00	\$31.79	\$775.00	\$806.79	Work
3	Arduino Mega	\$96.80	\$96.80	\$0.00	\$0.00	\$96.80	\$96.80	Material
4	BME680	\$55.20	\$55.20	\$0.00	\$0.00	\$55.20	\$55.20	Material
5	MRL Machine Shop	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Work
6	3D printing	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Work
7	Contingency reserve	\$135.00	\$0.00	\$135.00	\$0.00	\$135.00	\$135.00	Cost
8	ECE designers	\$1,200.00	\$0.00	\$1,200.00	\$0.00	\$1,200.00	\$1,200.00	Work
9	JPCPC	\$95.00	\$0.00	\$95.00	\$0.00	\$95.00	\$95.00	Cost

My project now has a \$135 built-in contingency

If it will not be needed - I will not load the actual cost associated to the contingency reserve for a given item

NOTE: ALSO TASKS NEEDS SOME CONTINGENCY

- During the first two classes - we have discussed dependencies between tasks
- So far - we have operated in the ideal world in which every task is accomplished in time and followed by its successor.
 - Unluckily - that's utopia 😞
- It's best practice not to schedule tasks in close connection w/o allowing for some delay - since this may lead you to shift your schedule multiple times afterward
 - For instance, you definitively don't want to arrange for a paid service according to a schedule that's shifting every day
- For this reason, dependencies can be dressed with "lag"
 - It's usually convenient to have a good tradeoff between lag and deadlines - to minimize the changes in the schedule and optimize the efficiency of the project



Lag can be added on a task basis or - if the schedule is particularly detailed - on different level items (to build an overall lag for the full list of tasks)

Also here - it has to be evaluated on a per-case basis!

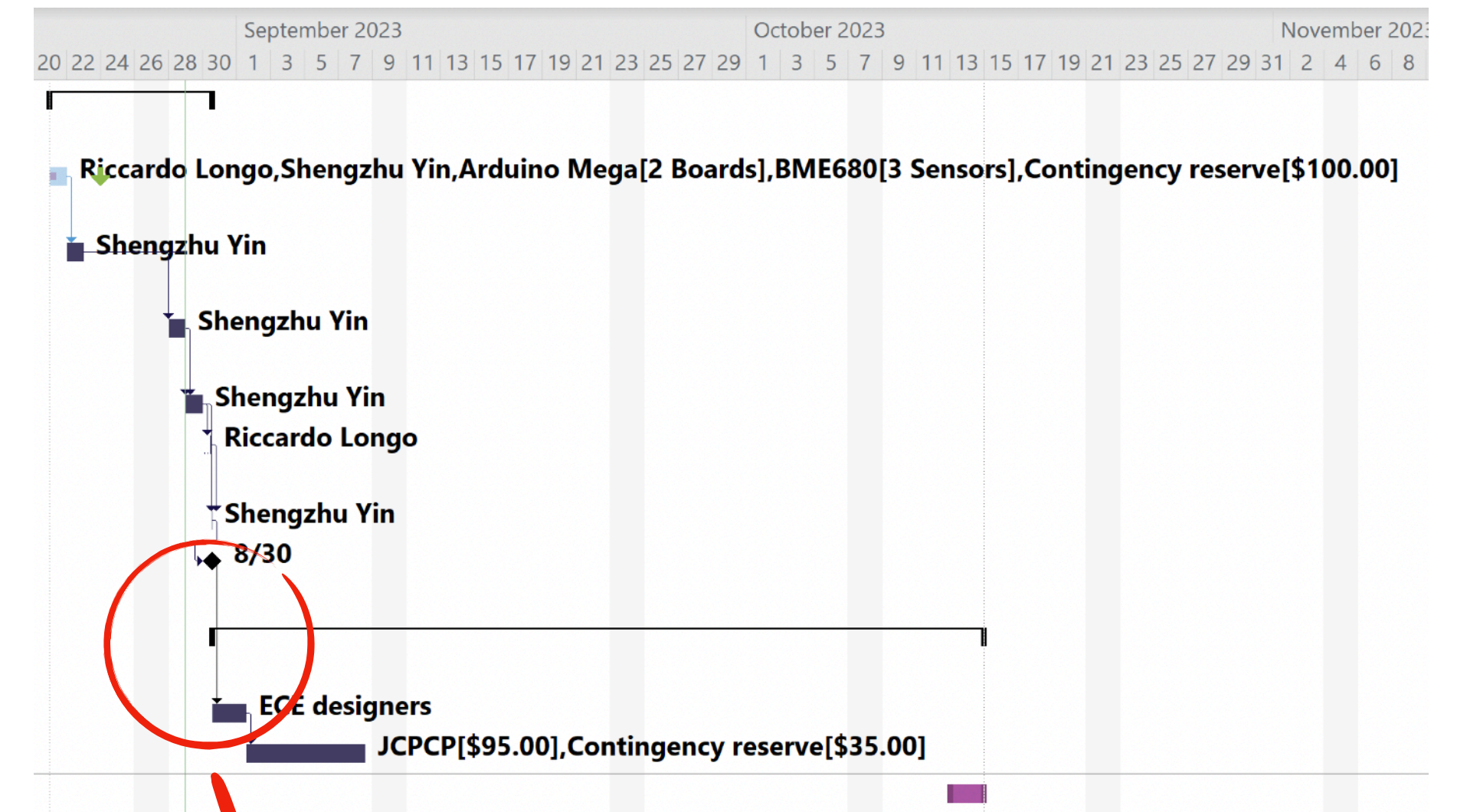
NOTE: ALSO TASKS NEEDS SOME CONTINGENCY

Task Information

Name: Design of the PCB Duration: 2 days Estimated

Predecessors:

ID	Task Name	Type	Lag
8	Circuit successfully prototyped!	Finish-to-Start (FS)	4d



Lag can be added on a task basis or - if the schedule is particularly detailed - on different level items (to build an overall lag for the full list of tasks)

Also here - it has to be evaluated on a per-case basis!

The lag is set starting from the successor task
Double click on the task - > Predecessor interface -> Lag

NOTE: ALSO TASKS NEEDS SOME CONTINGENCY

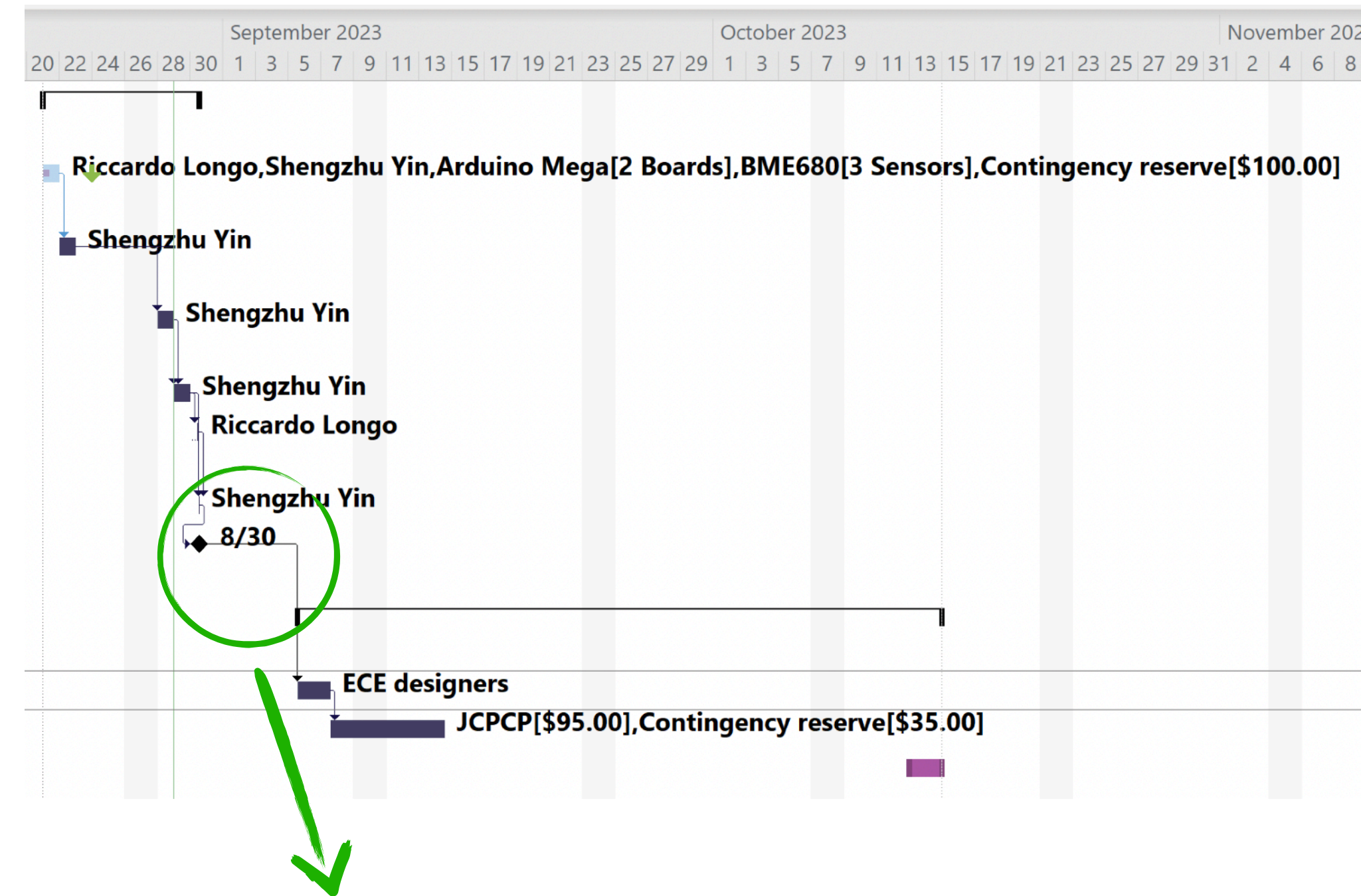
The screenshot shows a Gantt chart software interface with a task list on the left and a 'Task Information' dialog box open. The task list includes:

Task ID	Task Name	Fixed Cost	Fixed Cost Accrual
1	Phase I: Prototyping on breadboard	\$0.00	Prorated
2	Acquire all the circuitry parts	\$0.00	
3	Assemble circuit on a breadboard	\$0.00	
4	Write code to readout the circuit	\$0.00	
5	Test of the circuit	\$0.00	
6	Calibration of the BME sensor	\$0.00	
7	Test data taking	\$0.00	
8	Circuit successfully prototyped!	\$0.00	
9	Phase II - PCB printing and case production	\$0.00	
10	Design of the PCB	\$0.00	
11	Order of PCB from jPCB	\$0.00	
12		\$0.00	

The 'Task Information' dialog box shows the following details for 'Design of the PCB':

- Name: Design of the PCB
- Duration: 2 days
- Predecessors: Circuit successfully prototyped! (ID: 8, Type: Finish-to-Start (FS), Lag: 4d)

The lag is set starting from the successor task
Double click on the task - > Predecessor interface -> Lag



4 days of lag now implemented on the last task in this L1 group. It makes sense since there are no services or other external factors involved in this schedule

YOUR PROJECT COST ESTIMATES

- The next step to grow your project implementation in MS Project is to add the costs
- Most of them - if not all - will be purely figurative
- Still - it's useful for you to have an outlook of the tentative cost of the project, accounting for
 - Sensors & electronics
 - 3D printing
 - PCB production
 - Other tooling & materials
 -
- Please assemble a sketch of this semester's "budget" for the next class! We will have a look at it together
 - It will for sure evolve as long as you are prototyping on the breadboard. Please keep it up-to-date!
- Please produce for each item listed in the budget a "basis of estimate", e.g. documentation that substantiates your cost estimate and associated contingencies
 - You can put this piece of information in the "Notes" associated to the corresponding task where the cost is loaded

CHECKPOINT BEFORE THURSDAY CLASS

- Thursday will be the last lecture on MS Project and project management!
- You have just started working with Arduino and the various sensors. Therefore it would not be realistic to ask you to come up with a full project plan until the end of the year at the moment.
- The main goal now is to exercise as much as you can with the software and get proficient while you are wrapping up your mind around your project. Build short term plans - and start composing, brick-by-brick, the big picture
- You should be able to come up with a full project (at least for the semester) - around **week 4-5**
 - At this stage - you will need to include in the MS Project file all the features we have learned together!

BACKUP SLIDES

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 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](#)

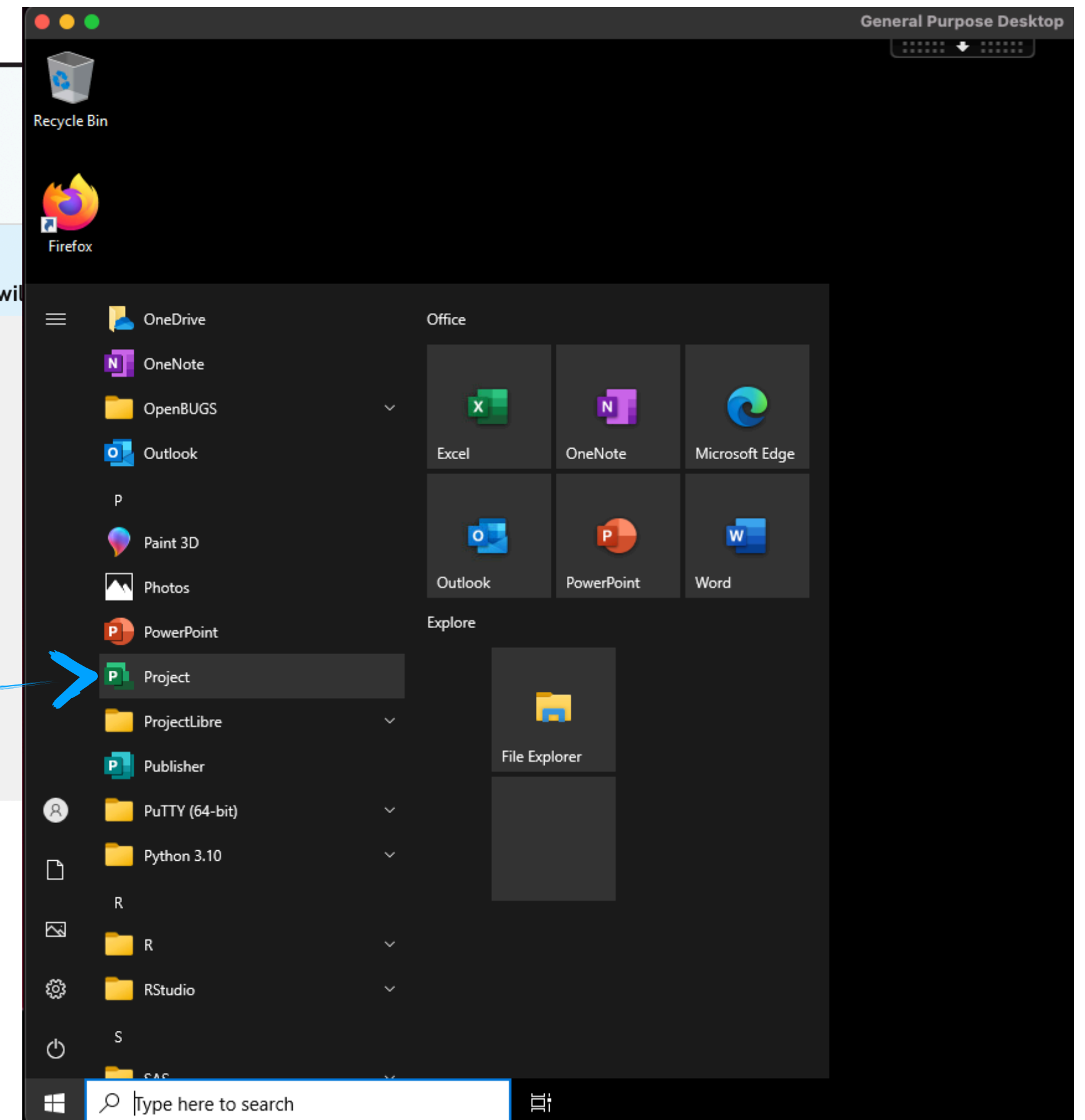
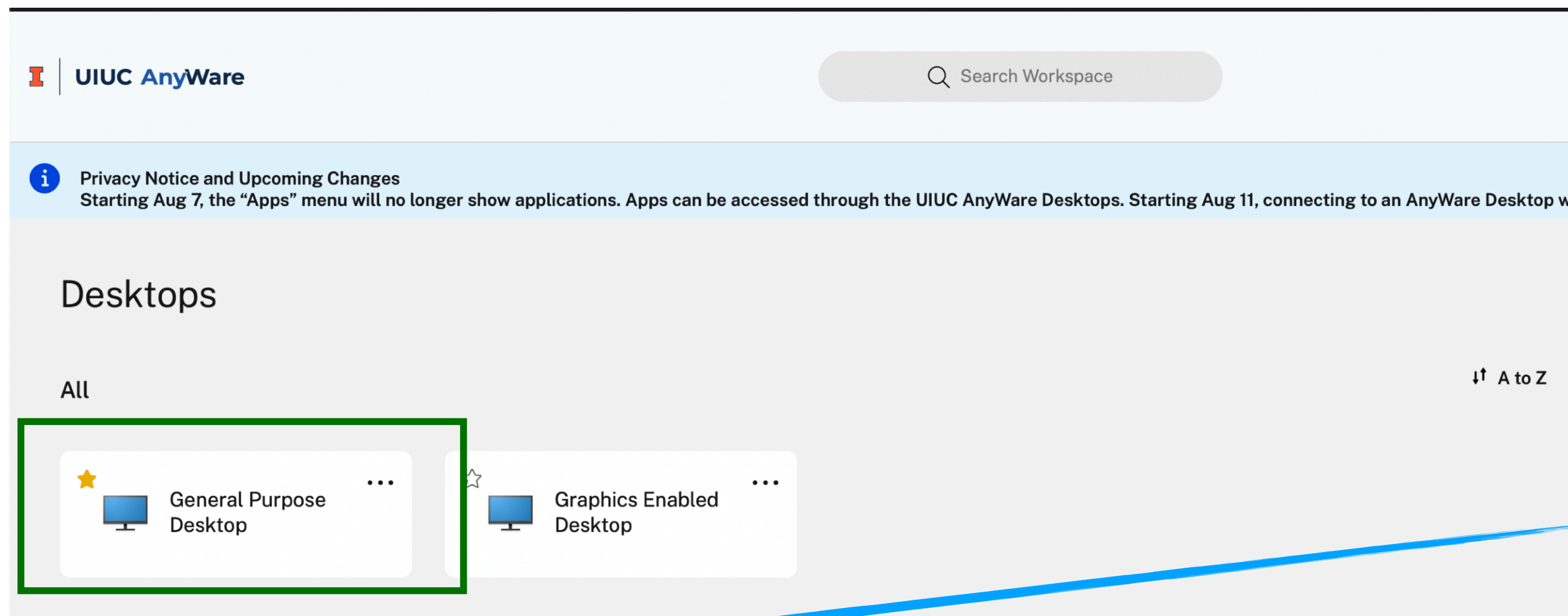
[Instructions on how to setup the Citrix Workspace app for UIUCAnyWare](#)



Citrix Workspace app

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!