Programming Abstractions in Python

CSE30 UCSC

INSTRUCTOR: DR. LARISSA MUNISHKINA

LECTURE: INTRO TO CLASS

Agenda

1. Syllabus
2. Class Policies
3. Assignments (Notebooks) and Quizzes
4. Discussion Sections, Office Hours, Ed Forum
5. What you should know
6. What you will learn
7. Class Resources

Part 1. Syllabus

canvas

- All class material will be posted on Canvas https://canvas.ucsc.edu
- **Canvas is the class primary resource**: you have to use it everyday
  - to check notifications
  - to access class material
    - lecture slides and movies
    - class webpages
    - lab assignments and notebooks
    - quizzes
    - surveys
  - to download and submit assignments
  - to participate in forums
  - to keep track of your grades!!!

Syllabus

1. **Part 1**
    1. Data Types
    2. NumPy and Matplotlib
    3. Data Collections
2. **Part 2**
    1. Classes
    2. Generators
    3. Recursion
3. **Part 3**
    1. Stacks and Queues
    2. Trees
    3. Graphs

Class Policies and Grading

There are:

- 5 notebook assignments (NB)
- 10 quizzes

Extra Credit:

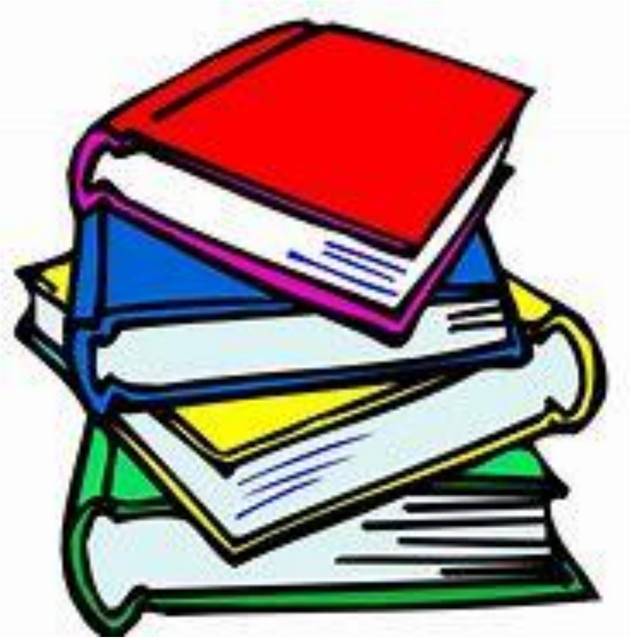
- TA/tutor sections (2 points each)
- extra credit labs/projects
- surveys

Notebook Assignments	50%
Quizzes	50%
Discussions and Extra Credit Labs	20%

The Class Teaching Group

Instructor:	Larissa Munishkina (mlarissa@ucsc.edu)	
Office Hours:	WF at 3:00 pm - 4:00 pm https://ucsc.zoom.us/j/3928413932	
Lectures:	MWF 9:20AM-10:05PM Humanities Lecture Hall	
Teaching Assistants:	Alexei	apelyush@ucsc.edu
	Jesh	jbheeman@ucsc.edu
	Nayan	nbhatia3@ucsc.edu
Tutors:	Leo	bli312@ucsc.edu
	Aryan	akhande1@ucsc.edu
	Sruthi	slaravin@ucsc.edu
	Chloe	cwong771@ucsc.edu
	Waylon	wowillia@ucsc.edu
	Daniel	dhong12@ucsc.edu

Textbooks



Main Textbooks:

Programming Abstractions in Python | abstractions-in-python

CSE 30 Google Colab

Optional Textbooks:

Problem Solving with Algorithms and Data Structures using Python

Python Cookbook, 3rd Edition
Introducing Python, 2nd Edition
Fluent Python, 2nd Edition
Learning the Unix Operating System

Additional Resources

The Python Standard Library — Python 3.8.9 documentation

NumPy

SciPy

TkDocs Tutorial

Gallery — Matplotlib 3.4.1 documentation

turtle — Turtle graphics — Python 3.8.9 documentation

Pygame Front Page — pygame v2.0.1.dev1 documentation

UNIX / Linux Tutorial for Beginners (surrey.ac.uk)

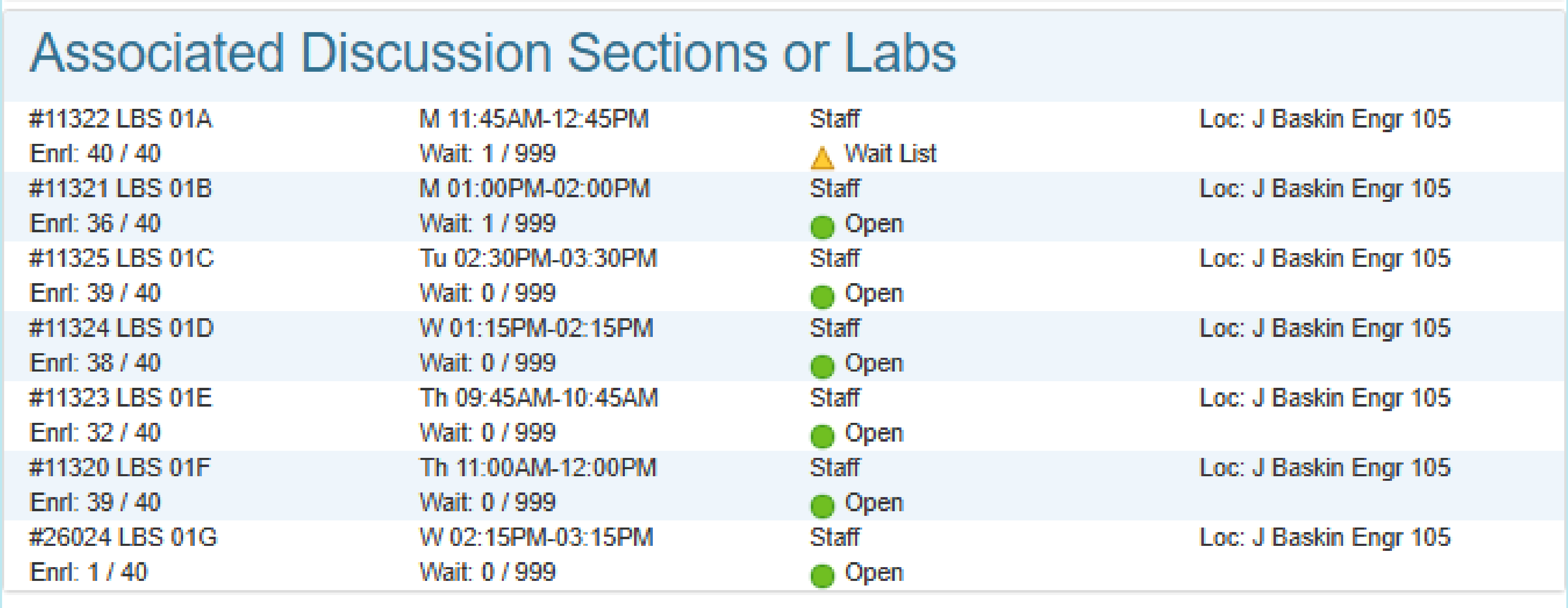
Part 2. Getting Help

ED AND NOTEBOOK GRADER

Getting Help!!!

- **Office Hours:**
  - WF at 3:00 pm - 4:00 pm
  - https://ucsc.zoom.us/j/3928413932
  - Meetings will be one-on-one
  - You should wait in the waiting room to be admitted
- **Discussion Sections – Secondary Labs**
  - Are posted on Canvas
  - You should attend 1 section a week
- **Canvas Posts**
- **Ed Forum**

TA Sections



Associated Discussion Sections or Labs

#11322 LBS 01A Enrl: 40 / 40	M 11:45AM-12:45PM Wait: 1 / 999	Staff ⚠ Wait List	Loc: J Baskin Engr 105
#11321 LBS 01B Enrl: 36 / 40	M 01:00PM-02:00PM Wait: 1 / 999	Staff ● Open	Loc: J Baskin Engr 105
#11325 LBS 01C Enrl: 39 / 40	Tu 02:30PM-03:30PM Wait: 0 / 999	Staff ● Open	Loc: J Baskin Engr 105
#11324 LBS 01D Enrl: 38 / 40	W 01:15PM-02:15PM Wait: 0 / 999	Staff ● Open	Loc: J Baskin Engr 105
#11323 LBS 01E Enrl: 32 / 40	Th 09:45AM-10:45AM Wait: 0 / 999	Staff ● Open	Loc: J Baskin Engr 105
#11320 LBS 01F Enrl: 39 / 40	Th 11:00AM-12:00PM Wait: 0 / 999	Staff ● Open	Loc: J Baskin Engr 105
#26024 LBS 01G Enrl: 1 / 40	W 02:15PM-03:15PM Wait: 0 / 999	Staff ● Open	Loc: J Baskin Engr 105

Ed Discussion Forum

We will be using Ed https://edstem.org/us/courses as a question-answering forum.

If you have questions concerning your homework, programming assignments, exams, or lecture material or want to share your ideas or information, post it on Ed.

The instructor, teaching assistants (TAs) and tutors will answer them ASAP.

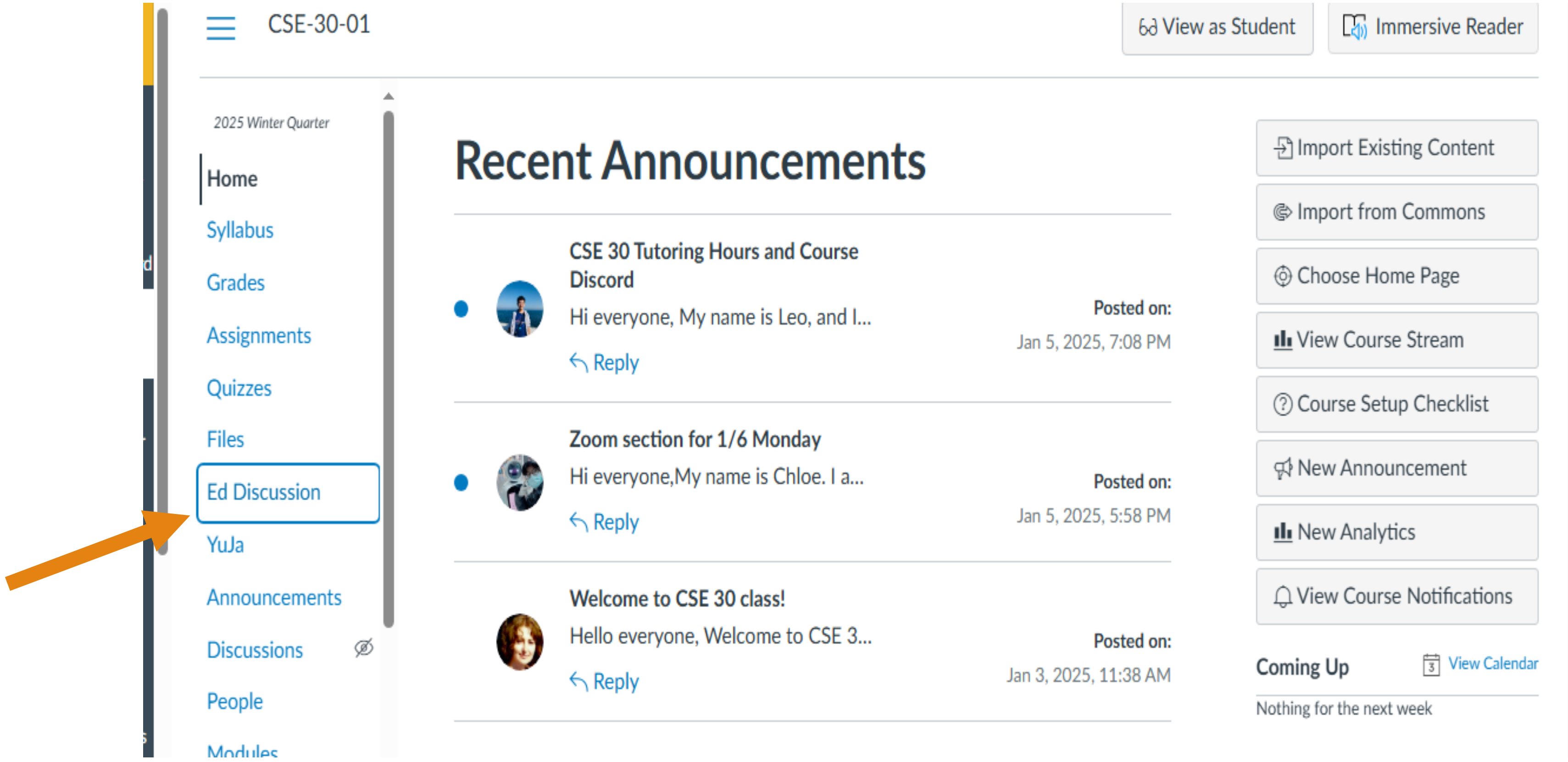
If you know the answer to other student’s question you can also post your answer.

Ed is a place to get help, help others, or discuss ideas, projects, etc.

☺

Posting Code on Ed

1. On Canvas, select Ed Discussion.



Recent Announcements

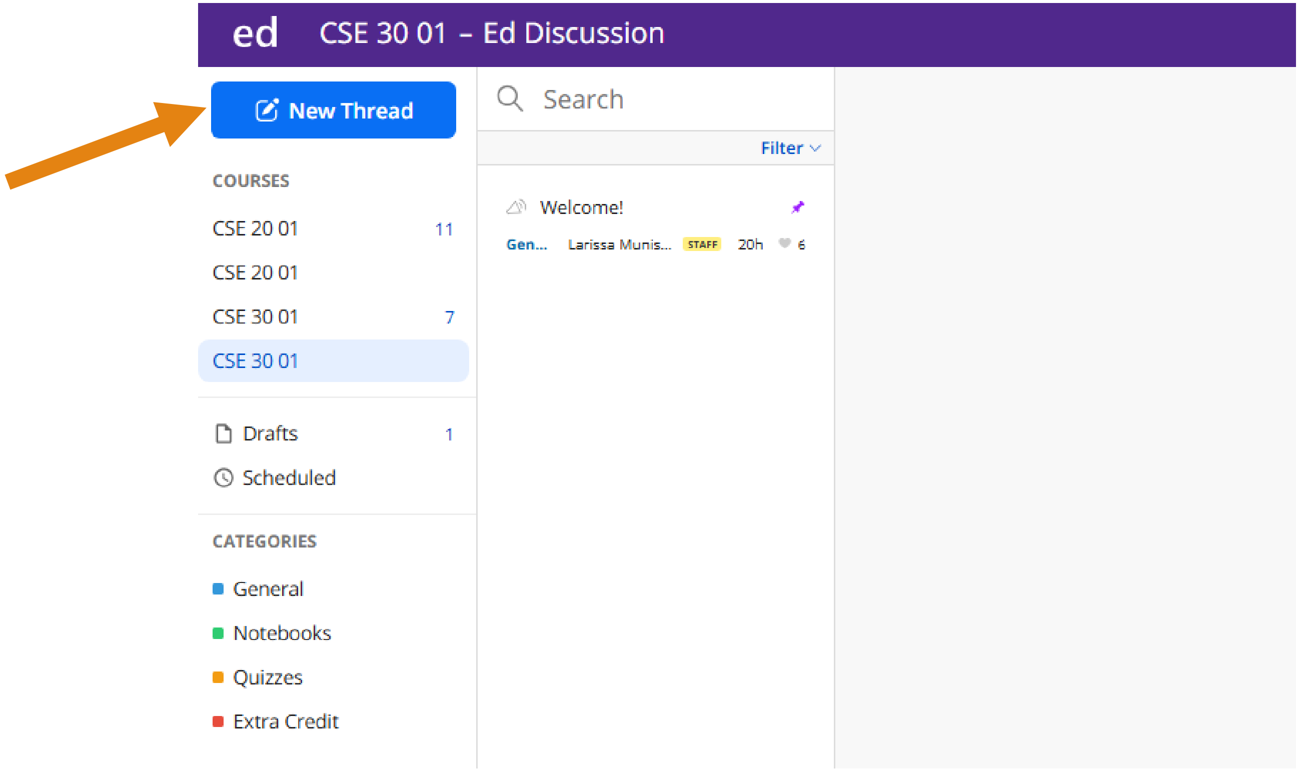
CSE 30 Tutoring Hours and Course Discord
Hi everyone, My name is Leo, and I...
Reply
Posted on: Jan 5, 2025, 7:08 PM

Zoom section for 1/6 Monday
Hi everyone,My name is Chloe. I a...
Reply
Posted on: Jan 5, 2025, 5:58 PM

Welcome to CSE 30 class!
Hello everyone, Welcome to CSE 3...
Reply
Posted on: Jan 3, 2025, 11:38 AM

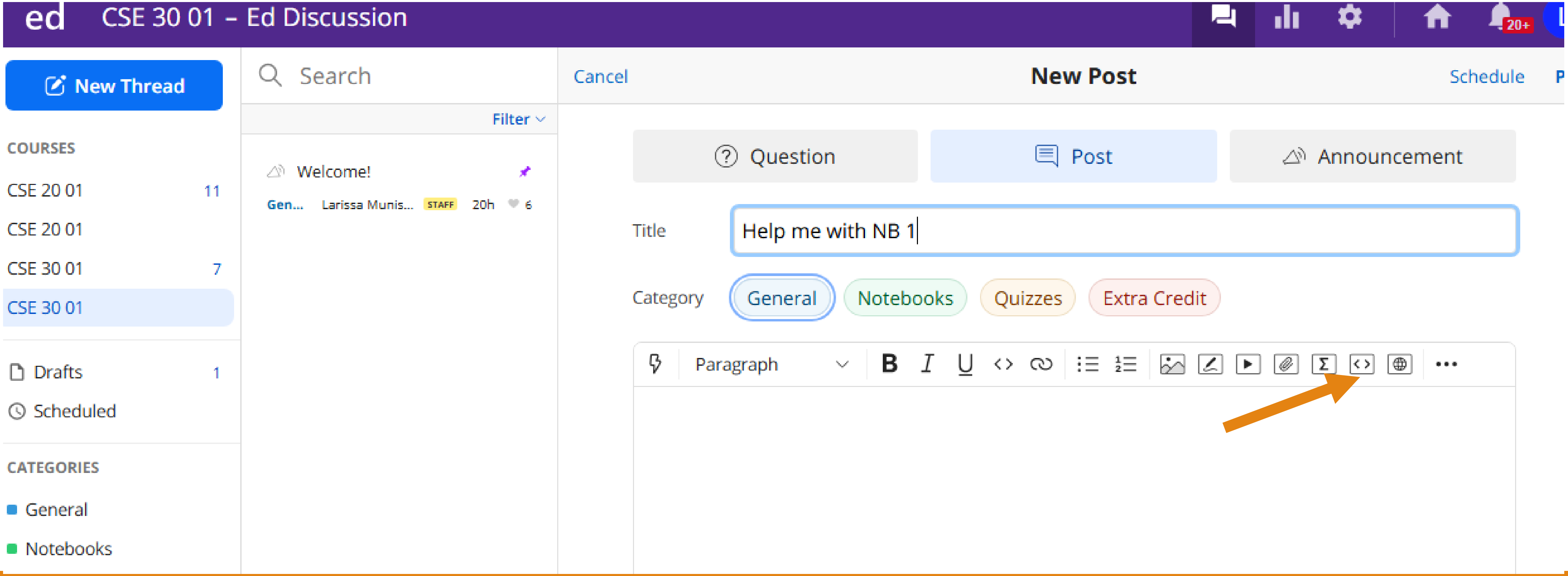
Posting Code on Ed

2. On Ed Discussion (Ed), select New Thread.



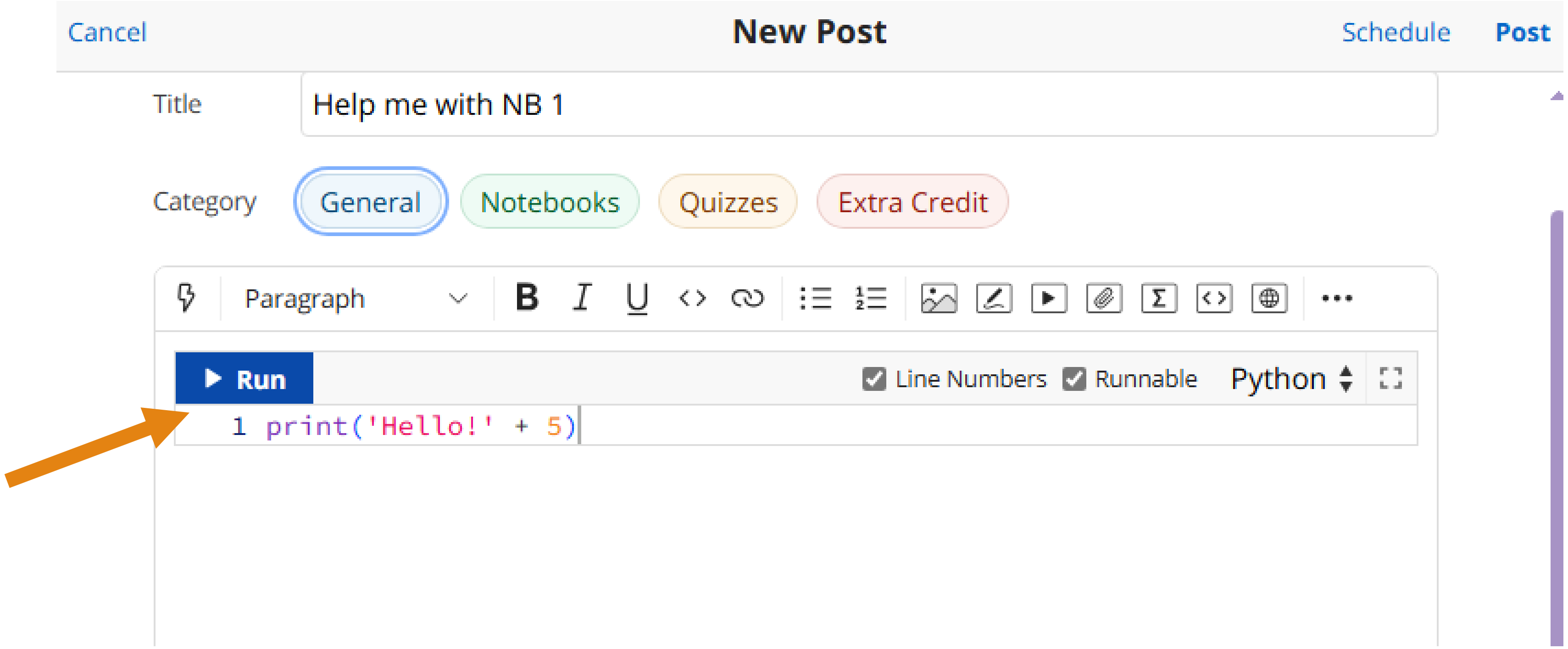
Posting Code on Ed

3. In a New Post, select the Code Snippet



Posting Code on Ed

4. Write (type or paste) your code in the code window.
5. You can run the code (notice that the code generates an error, do you know why ?)



Title: Help me with NB 1

Category: [✓ General] Notebooks Quizzes Extra Credit

☑ Line Numbers ☑ Runnable Python

```
print('Hello!' + 5)
```

Notebooks and Notebook Grader Website

All required assignments should be done on the notebook grader website:

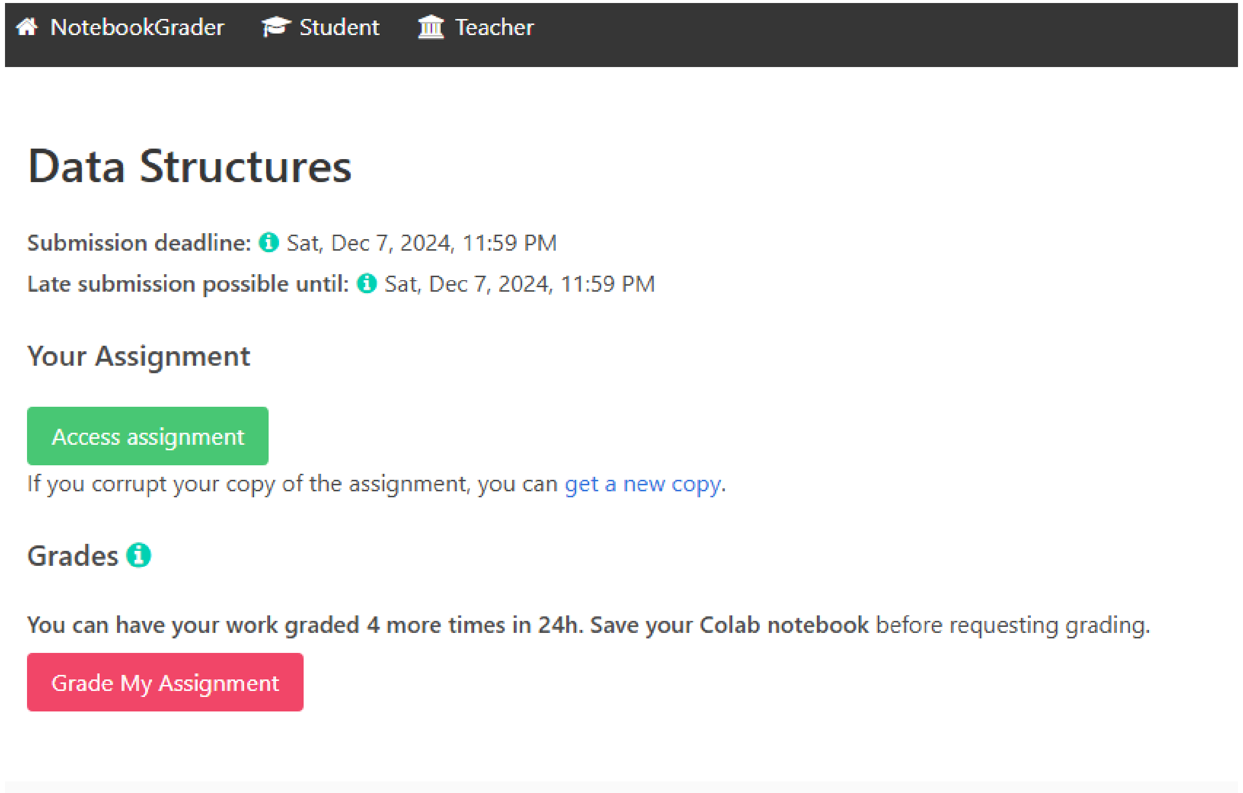
https://notebookgrader.com/

The assignments are in the format of Jupiter notebooks (NB) with the file extension ipynb.

The assignments are automatically loaded into your Google drive, so you can access them directly through the Google drive.

The assignments are autograded on the notebook grader website.

You need to submit your notebook, so your grade is recorded on the website (Click the button Grade My Assignment).



Data Structures

Submission deadline: Sat, Dec 7, 2024, 11:59 PM

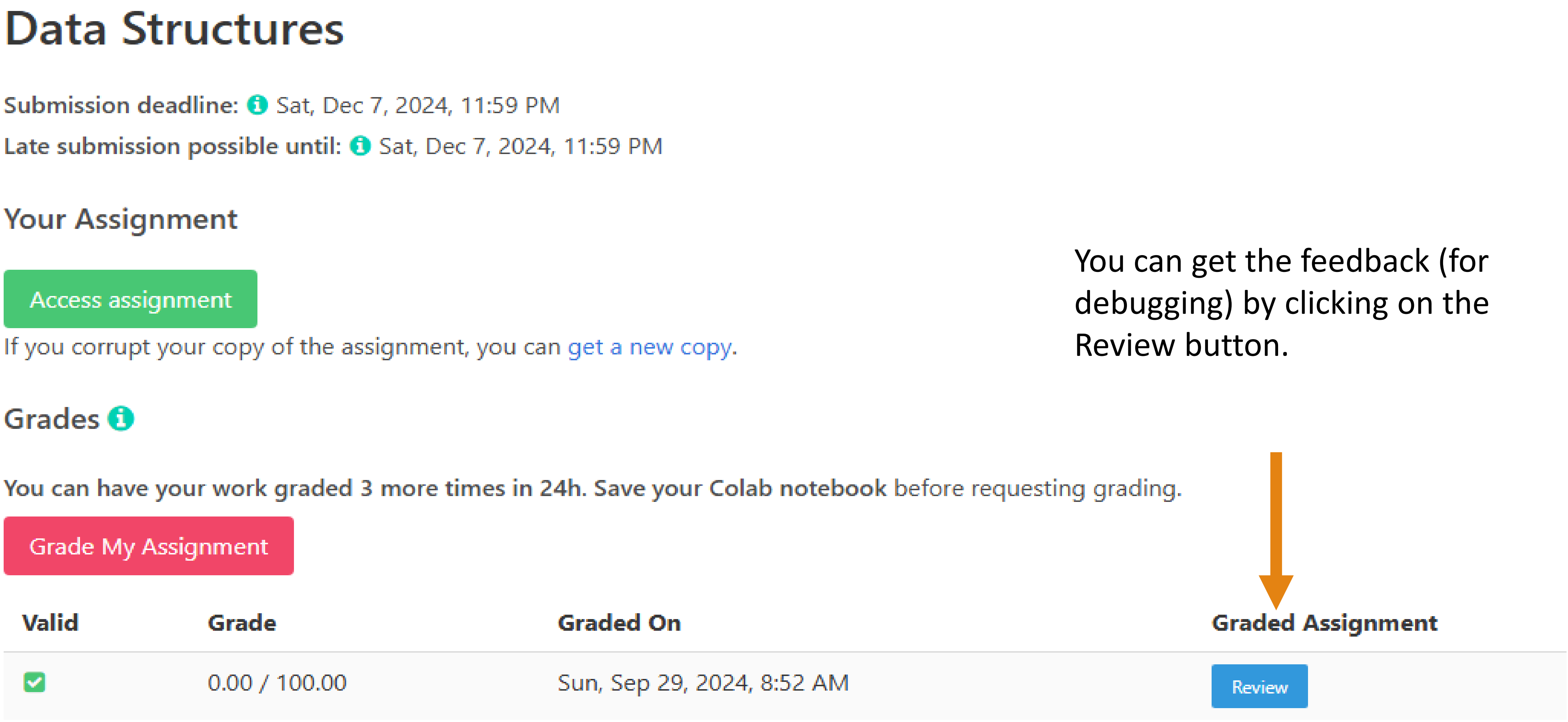
Late submission possible until: Sat, Dec 7, 2024, 11:59 PM

Your Assignment

If you corrupt your copy of the assignment, you can get a new copy.

Grades

You can have your work graded 4 more times in 24h. Save your Colab notebook before requesting grading.



Data Structures

Submission deadline: ℹ Sat, Dec 7, 2024, 11:59 PM

Late submission possible until: ℹ Sat, Dec 7, 2024, 11:59 PM

Your Assignment

Access assignment

If you corrupt your copy of the assignment, you can get a new copy.

Grades ℹ

You can have your work graded 3 more times in 24h. Save your Colab notebook before requesting grading.

Grade My Assignment

Valid	Grade	Graded On	Graded Assignment
☑	0.00 / 100.00	Sun, Sep 29, 2024, 8:52 AM	Review

You can get the feedback (for debugging) by clicking on the Review button.

Part 3. What You Will Learn

LABS AND PROJECTS

PROGRAMMING ENVIRONMENT

CODING ANTIPATTERNS

What You Should Know

Data Types

- Primitive Data Types
  - None
  - Boolean
  - Integer
  - Float
  - Complex
  - String
- Data Collections
  - Lists
  - Arrays
  - Dictionaries
  - Tuples
  - Sets
  - Frozensets

Control Flow

- Conditional Statements
  - if
  - if-else
  - elif
  - nested conditional statements
- Loops
  - for
  - while
  - nested loops
- Functions

OOP

- Classes
- Encapsulation
- Inheritance
- Polymorphism

What You Will Know

Abstract Data Types

- Stack
- Queue
- Deque
- Priority Queue
- Hash Table
- Heap
- Tree
- Graph

Control

- Generators
- Recursion
- (Optional)Functional Programming
- (Optional)Event-Driven Programming
- (Optional)Threading

(Optional) Algorithms

- Big O Notation
- Sorting
- Search
- Optimization
- Divide-and-Conquer
- Greedy
- Flow Network
- Dynamic Programming
- Linear Programming

ADTs

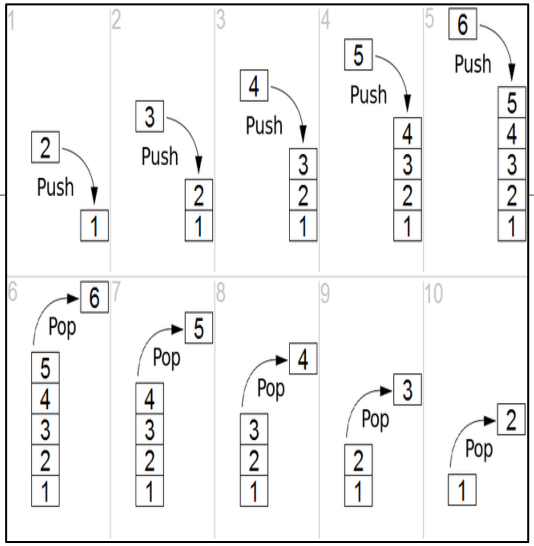
Graphs

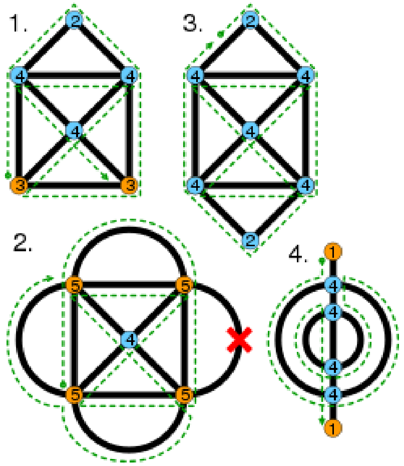
Plotting

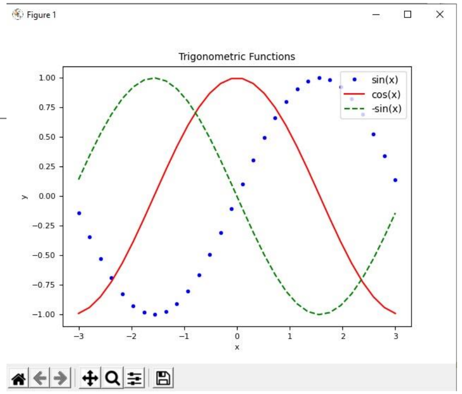
Big O

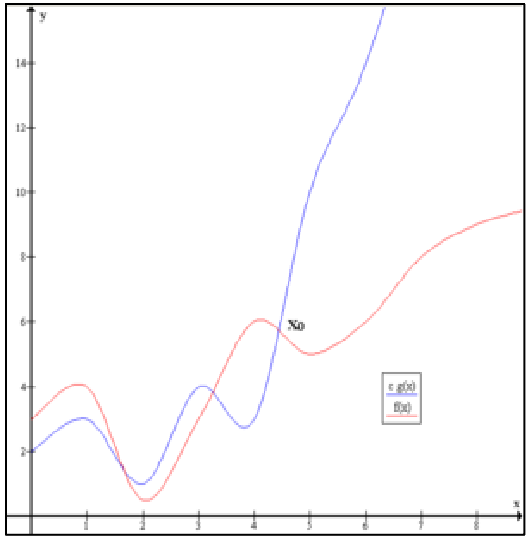
Events

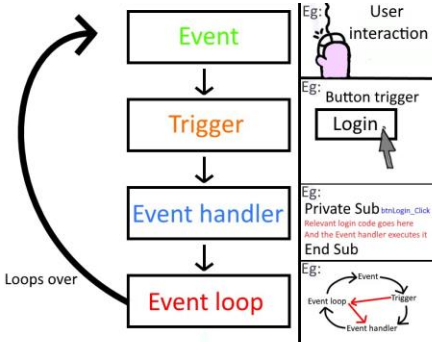
Recursion



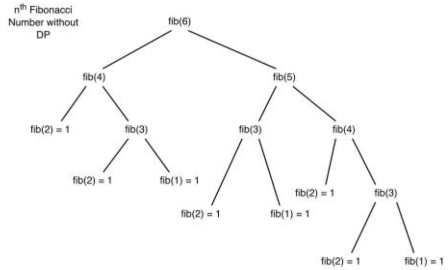




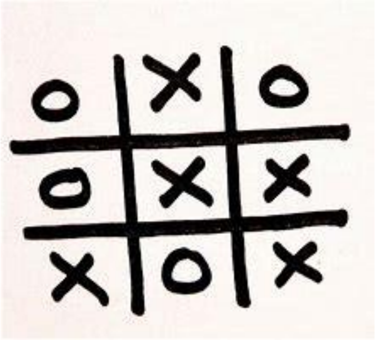




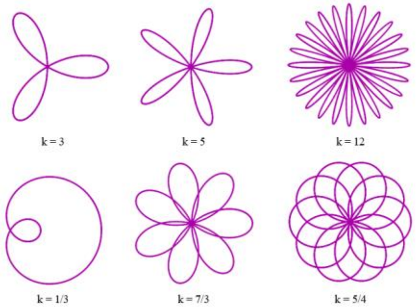
```
Private Sub btnLogin_Click
Relevant login code goes here
And the Event handler executes it
End Sub
```



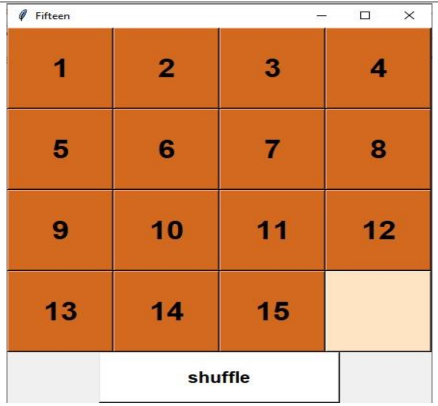
Projects and Labs



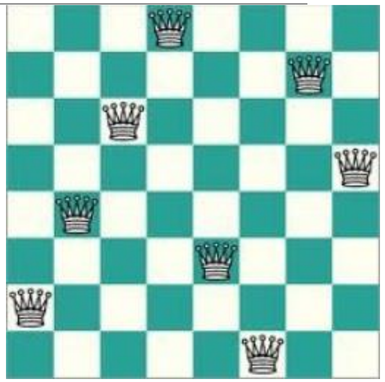
Tic Tac Toe



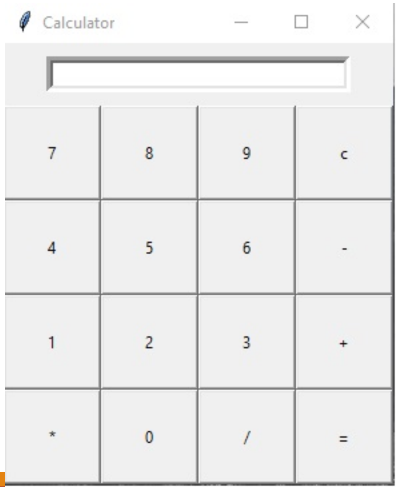
Rose Curve



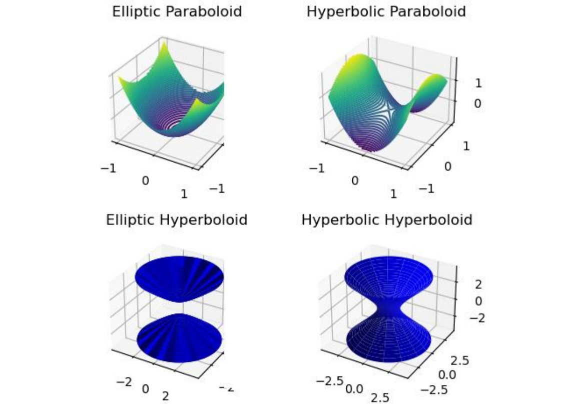
Fifteen Puzzle



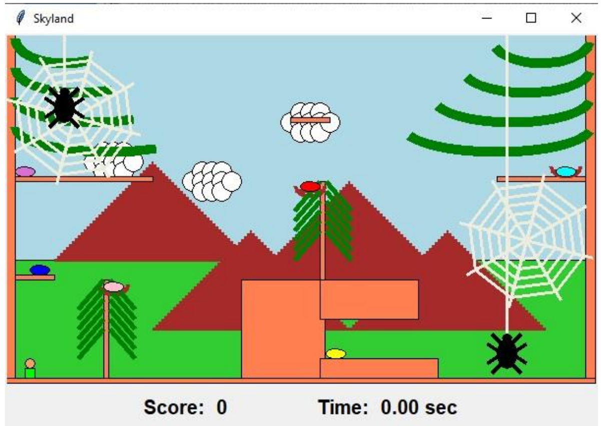
n-Queens Problem



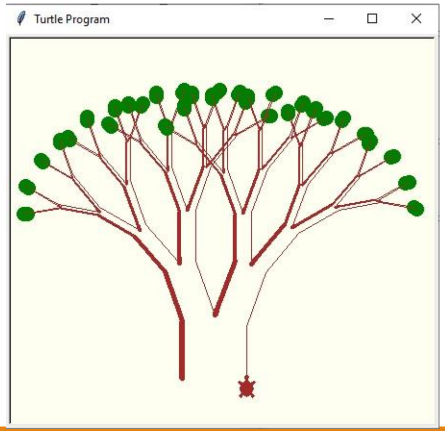
Calculator



Quadric Surfaces



Video Game



Tree Fractal

What Platform to Choose?

- zyBooks, Codio, coding online

- Notebooks or Colab

- IDLE

- Professional IDE

- What programming platform to choose is a difficult question.
- As a beginner, you may need to ride a tricycle – you may learn a simple IDE such as IDLE.
- If you like the virtual reality, you may prefer coding online.

Programming Platforms

Simple IDE such as IDLE, Notepad ++, TextPad

- easy to handle and learn, no help on managing projects

Professional IDE such as PyCharm, VSCode, Eclipse, Atom, Sublime, Vim, Emacs

- difficult to learn, can help to manage projects

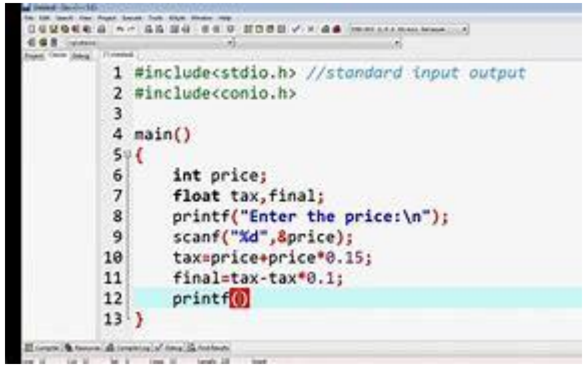
Interactive shells such as iPython, Jupyper Notebook, or Colab

- nice interfaces, easy or difficult to learn depending on your task, the only problem is that it is a shell, not an IDE

Online coding platforms such as zyBooks, Codio,or Codeacademy

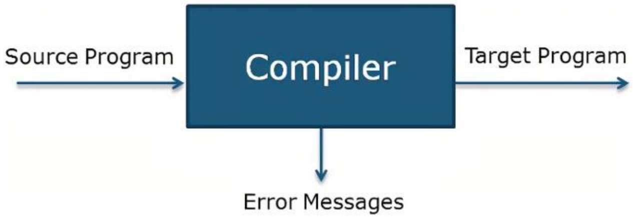
- nice interfaces, easy or difficult to learn depending on your task, the only problem is that it is not an IDE

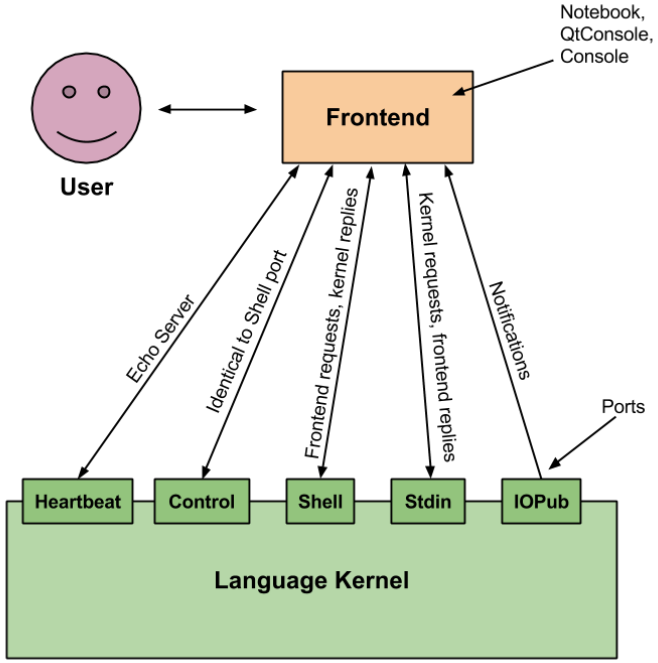
Programming Process



```
#include<stdio.h> //standard input output
#include<conio.h>

main()
{
    int price;
    float tax,final;
    printf("Enter the price:\n");
    scanf("%d",&price);
    tax=price+price*0.15;
    final=tax-tax*0.1;
    printf()
}
```





Shells are used for interactive programming or command executions.

Compilers are used to create a standalone application that can run in the OS shell.

Jupyter, Colab, Codio have a webpage interface to provide interactions with the user – they are not designed for generating a standalone application.

Programming vs Scripting

You can watch the video about programming languages vs scripting languages here: https://youtu.be/g0Q-VWBX5Js .

Programming usually means to write a program, whereas scripting means to write a script.

Scripts are usually smaller in size and based on libraries, whereas programs are long and divided into modules.

Scripts usually do not have sophisticated control flow structures (people try to avoid them), whereas program are based on control flow structures.

Scripts depend on the parental application (their kernel), whereas programs are standalone and written from scratch – you can write a program that is a shell for scripting, you cannot do it with scripts.

Bad Coding Practices - Coding Antipatterns

You can read about coding antipatterns here:

- 8 Coding Antipatterns Every Web Developer Should Avoid in Web Development Process (dngwebdeveloper.com)

Spaghetti Code

- usually means disorganized or incorrectly organized code that is difficult to read and understand

Hard Coding

- means embedding data into source code

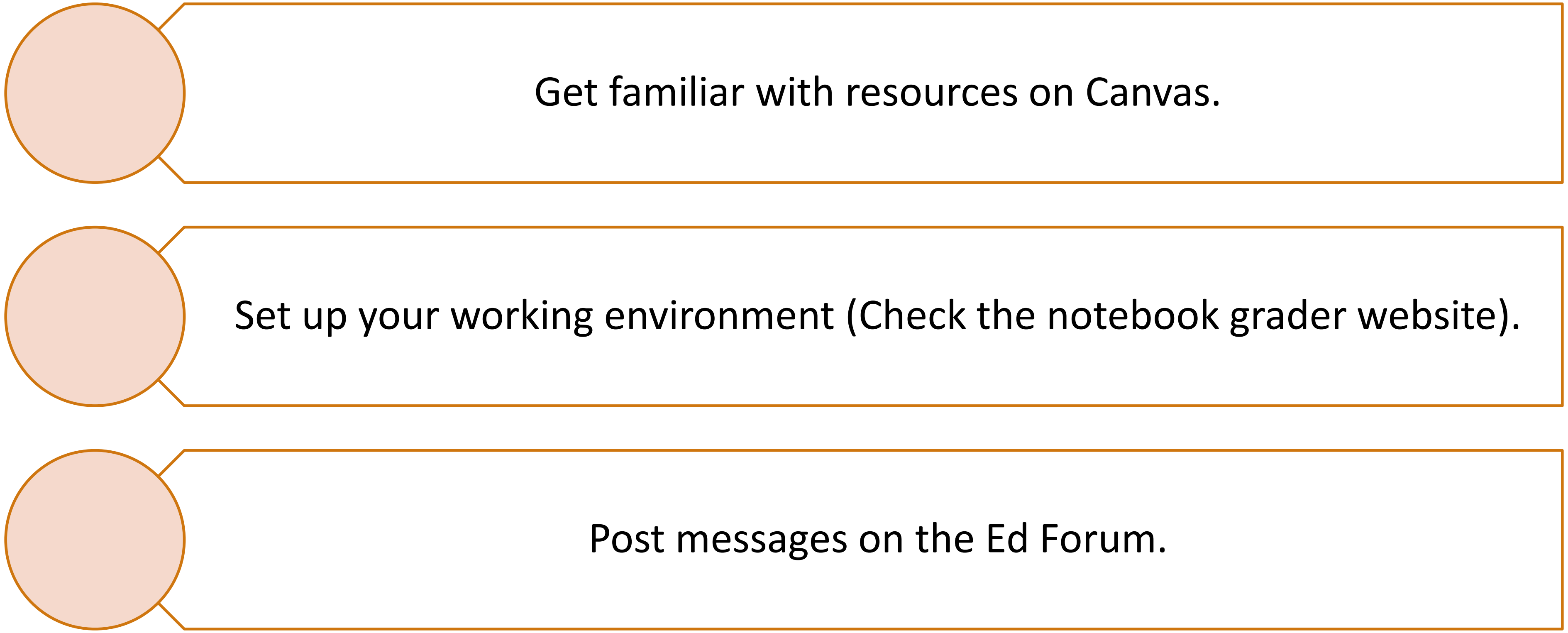
Golden Hammer

- means overusing a platform or approach for all tasks

Boat Anchor

- means designing code that is not needed

Homework & Assignments



Get familiar with resources on Canvas.

Set up your working environment (Check the notebook grader website).

Post messages on the Ed Forum.