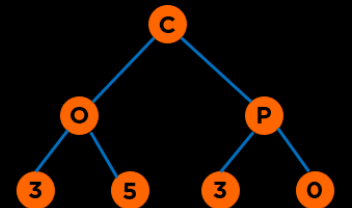


# Data Structures & Algorithms

## COP 3530 : Fall 2024



# About Me: Amanpreet Kapoor

- Educator
- CS Education Researcher
- Mentor
- Software Engineer
- Lifelong Learner



[kapooramanpreet@ufl.edu](mailto:kapooramanpreet@ufl.edu)

# Course Staff



Emily

(Teaching Lead)



Matthew

(Content Lead)



Lauren

(Communications Lead)



Amay



Brian



Karen



Ananya



Prayuj

(Infrastructure Lead)



Alexa



Jackie



Daniel



Anthony



Tavienne



Manav



Dogan



Emma



James

- Santiago (Bug Manager)
- Paul (Build Tools Lead)
- Daniel M (Gradescope Lead)

- Chase
- Tina
- Alex

- Maximilian
- Evan (Partner Disputes Lead)
- Nikhil

- Declan
- Sai
- Coleton

# Learners: Let's Get to Know You

**Go To Menti.com**

**Code: 6782 0953**

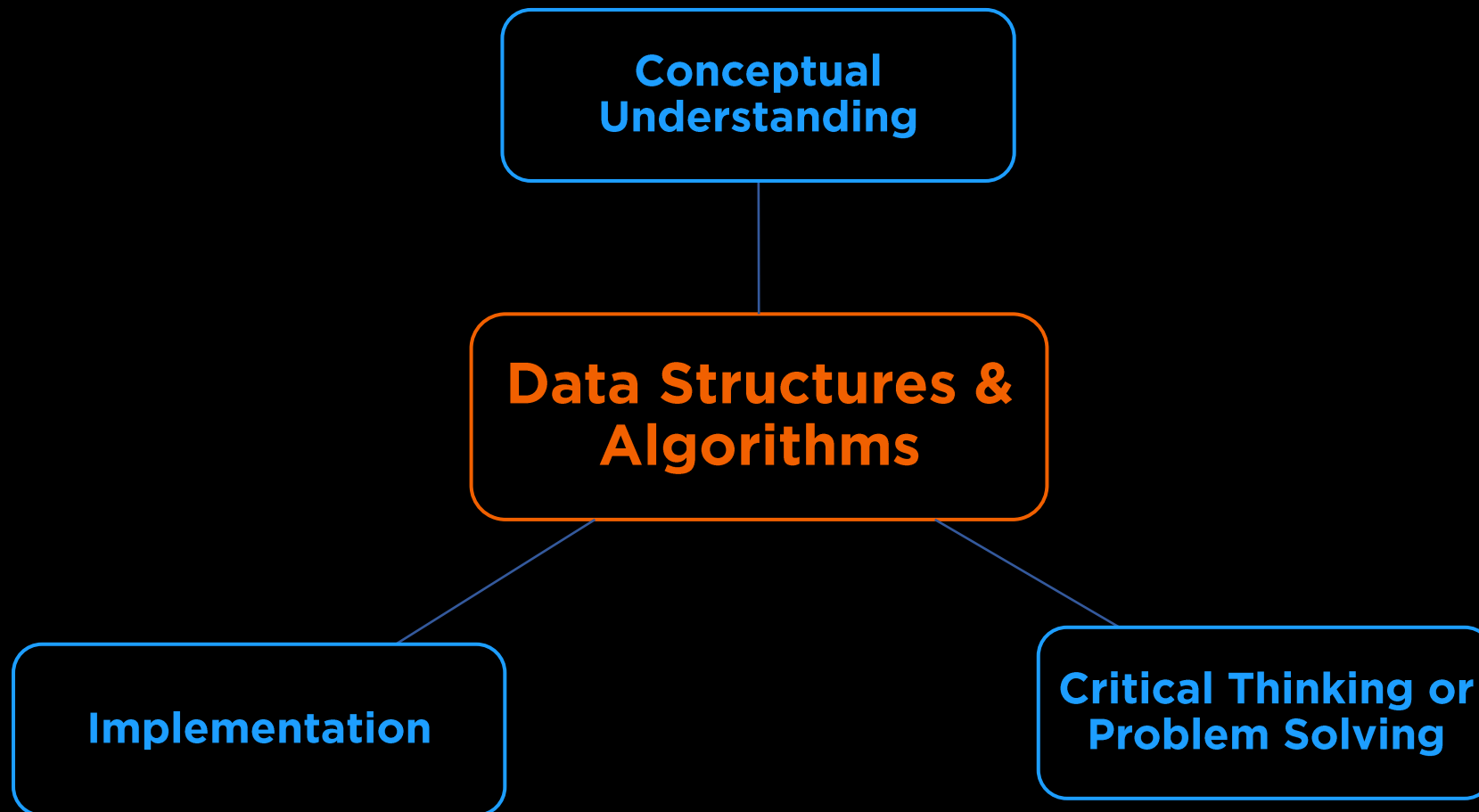
# Course Objectives

# What is this Course About?

**This course covers algorithm development using**

- pseudo languages
- basic program structures
- program design techniques
- storage and manipulation of basic data structures
- **3 Credit Hours**

# What is this Course About?



# Categories of Data Structures

Linear Ordered

Lists

Stacks

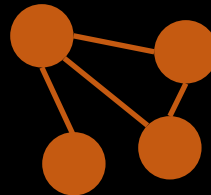
Queues



Non-linear Ordered

Trees

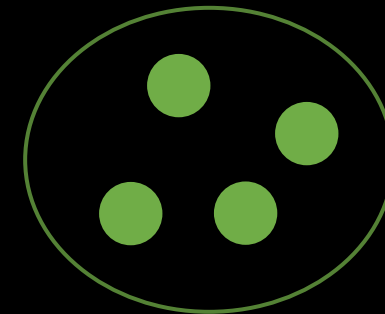
Graphs



Not Ordered

Sets

Tables/Maps





# Categories of Algorithms

**Brute Force**

**Selection Sort**

**Bubble Sort**

**Insertion Sort**

**NP Complete Problems**

**Divide & Conquer**

**Binary Search**

**Merge Sort**

**Quick Sort**

**Greedy**

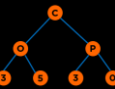
**Minimum Spanning Tree**

**Shortest Paths**

**Dynamic Programming**

**Knapsack**

**Fibonacci**

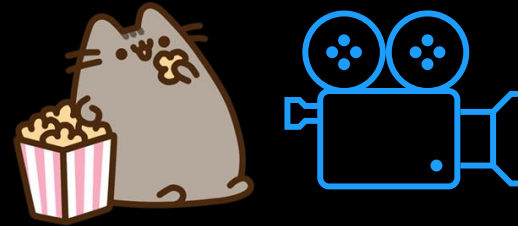


# Logistics & Policies

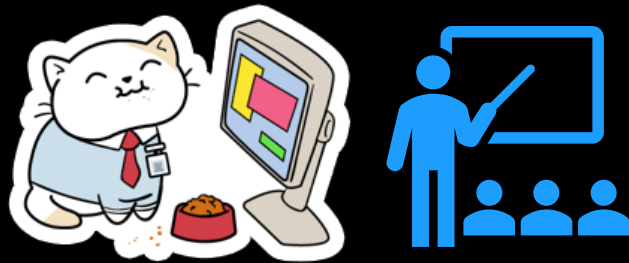
# Format



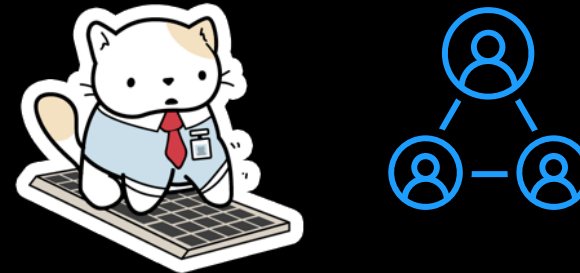
Action Items by  
Monday morning



Watch lectures synchronously on  
Tue/Thu live or via Zoom.



Attend discussions on  
Tue/Wed.



1. Conceptual Quiz due on Fri.
2. Programming Quiz due on Fri.

# Communication

## Discord



- Everything!
  - for all question related to the course
  - for communicating with peers
  - one-to-one communication with me
- Use Appropriate Tags
- Response in < 48 business hours

## Office Hours



- Tuesday, P10, 5:10-6 pm
- Friday, P5, 11:45-12:35 pm
- By Appointment (24 hours in advance)

# Communication



**Email**

**Fine for**

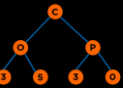
- **Personal**
- **Accommodations**
- **Emergencies**



**Email**

**Not okay for**

- **Questions regarding logistics**
- **Questions on coding**
- **Fixing bugs**



# Communication

  
~~Canvas Messages~~

  
~~Phone Call~~



# Debugging

- Students should visit the course staff during scheduled office hours for help and provide context for help.
- Debugging requests for projects/quiz questions must first go through the TAs or peer mentors. This is strongly encouraged given we have a large class and several of you might have similar questions.
- If your problem is not fixed, then start a conversation with both the Instructor and the TA/Peer mentor who you asked for help. Debugging requests to the Instructor as a Discord direct message or an email will be ignored if you do not follow the above protocol.

# Grading

Modality	Assignment	% of Final Grade
Individual	Programming / HTG Quizzes (drop two lowest)	12%
	Conceptual quizzes (drop two lowest)	10%
	Exam 1	20%
	Exam 2 (Cumulative)	20%
	Project 1	14%
	Project 2	10%
	Discussion participation activities (drop four lowest)	4%
Collaborative	Final Project (Individual or Group: 3a & 3b)	10%
Individual	Extra Credit Opportunities & Bug Bounty Program	Up to 3%
		Total: 103%

Total assessments: 26 excluding extra credit and class participation



# Timeline

Week	Dates		Topic	Deadlines
1	22-Aug	25-Aug	Course Introduction/Algorithm Analysis	
2	26-Aug	1-Sep	Algorithm Analysis / List, Stacks, & Queues	$Q_1, Q_2$
3	2-Sep	8-Sep	List, Stacks, & Queues / Trees	$Q_3$
4	9-Sep	15-Sep	Trees / Balanced Trees 1	$Q_4$
5	16-Sep	22-Sep	Balanced Trees 2	$Q_5$
6	23-Sep	29-Sep	Heaps & Priority Queues	$P_1$
7	30-Sep	6-Oct	Sorting	$Q_6$
8	7-Oct	13-Oct	Exam 1 (Oct 10)	$E_1$
9	14-Oct	20-Oct	Sets, Maps, & Hashing	$P_{3a}, Q_7$
10	21-Oct	27-Oct	Graphs 1	$Q_8,$
11	28-Oct	3-Nov	Graphs 2	$P_2$
12	4-Nov	10-Nov	Greedy Algorithms	$Q_9$
13	11-Nov	17-Nov	Dynamic Programming	$Q_{10}$
14	18-Nov	24-Nov	Exam 2 (Nov 21)	$E_2$
15	25-Nov	1-Dec	Thanksgiving Break	
16	2-Dec	4-Dec	Complexity Theory	$P_{3b}$
Legend: $Q_N$ = Quiz N, $P_N$ = Project N, $E_N$ = Exam N Note: The instructor will be traveling for official work on Sep 17 and this lecture will be prerecorded.				

# Programming Language

**Default (Project 1 & 2, Stepik/Edugator, Quizzes):**

**C++14**

Compilation command:

```
g++ -std=c++14 -Werror -Wuninitialized -o EXECUTABLE_NAME YOUR_FILE.cpp
```

**Project 3 or Final Project:**

**Any Language**

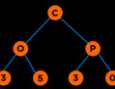
# Tools

## Compiler

- G++
- Stepik/EduGator/Gradescope

## IDE

- OnlineGDB
- Visual Studio Code
- Clion

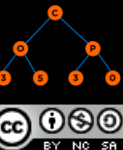


# Tools

## Directory Structures

- `src` – includes `.h` and `.cpp` files  
(You can use `lib/` too for separating interfaces - `.h`)
- `test` – contains test files
- `build` – contains executables (e.g. `.exe`)
- Know basic commands on compilation through command line:
  - `cd`, `ls`, `mv`, `g++`, `pwd` ...

<https://cplusplus.com/forum/beginner/261697>  
<https://stackoverflow.com/questions/2360734/whats-a-good-directory-structure-for-larger-c-projects-using-makefile>



# Textbook (Optional)

- **Data Structures and Algorithm Analysis in C++**

- Mark Allen Weiss
- Fourth edition, 2014, ISBN 9780132847377

- **OpenDSA Book**

- <https://opensa-server.cs.vt.edu/OpenDSA/Books/Everything/html/index.html>

# Feedback

- COP 3530 Feedback Form
- Bug Bounty Program
  - Quiz is not accessible due to a locked module
  - Typo in one of the quizzes/project descriptions
  - Incorrect solution in a certain test case
  - An accessibility bug such as no headings in documents for screen-readers
  - the algorithm has an off-by-one error

# Expectations

- **We want you to focus on**
  - Correctness
  - Clean, readable, tested, and documented code
  - Secondary focus on optimization
- **The course will not cover**
  - Mathematical Proofs
  - Design Patterns
  - Competitive Programming

# Expectations

## Conceptual Quizzes and Exams:

- Work independently
- No discussion at the conceptual level
- You are allowed to
  - discuss solutions after the due date and late days have passed.



# Expectations

## Programming Quiz questions:

- Work independently or as a pair (Select a buddy in Week 1).
- The buddy must remain the same for the entire course.
- The course staff can help you on syntax issues, but we will not help you with semantic and logic issues for quizzes.
- Cite that you worked with a buddy in Line 1 of your code and add their name.
- You are allowed to
  - discuss solutions after the due date and late days have passed.
  - search for C++ syntax or refer to definitions of standard functions in the C++ library. For example, using the documentation listed here is fine:  
<https://www.cplusplus.com/reference/> or <https://en.cppreference.com/w/>

# Academic Dishonesty

Project 1 and 2:

- Work independently
- Discussion at the conceptual level is fine if you are stuck with no sharing/viewing of code
- You are allowed to
  - discuss conceptually without discussing any code with a peer provided you cite the peer with who you discussed it. Such discussions should be held on a whiteboard using explanation figures/pseudo-codes or through talking.
  - discuss solutions after the due date and late days have passed.
  - search for C++ syntax or refer to definitions of standard functions in the C++ library.

For example, using the documentation listed here is fine:

<https://www.cplusplus.com/reference/> or <https://en.cppreference.com/w/>

# Academic Dishonesty

Project 3 and Stepik ungraded questions:

- It is fine to **collaborate with peers**. You must make sure you are not blindly copy-pasting another student's code. Also, **you must cite the peer you worked** with at the code level or conceptually.

# Academic Dishonesty

- Sharing/copying, “borrowing” of code structure, looking at code from another student or providing such code, and plagiarism, in addition to other dishonest behaviors, are all considered to be academic dishonesty.
- No information regarding the project 1 and 2, quiz, and exam solutions may be shared by students. We strongly encourage that if you have doubts, visit the course staff in-office hours. Looking at any piece of your peer’s code, sharing files, searching for solutions found online, or using someone else to code your solution is strictly prohibited.
- Penalty
  - reported to the Honor Court
  - E grade for the course
- Regret Clause:
  - If you submit an assignment, in which you engaged in some of the unacceptable practices, you may bring it to my attention by emailing me and withdrawing your assignment within 48 hours of the submission. If you do so, I will assign a failing grade of 0 for the assignment, and you will not be reported to the administration.

# Request for Extensions

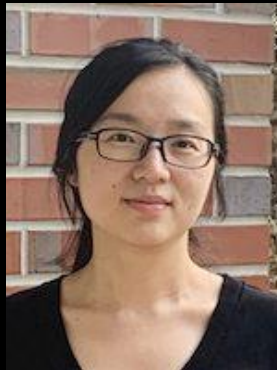
- Any request for assessment extensions should be backed by official documentation (e.g., from a medical professional, etc.) and should be sent over email. Requests without documentation will be ignored. The following reasons deem ineligibility for extensions or regrades:
  - **Failure to submit on Canvas by due date/late date.** Example: If a quiz is due at 11:59 pm, and you send the file at 12:01 am, the file will not be graded. Note that most assessments are open for 4 or more days and you must start early and submit it on time. In case you miss an assignment, treat it as a learning activity and avoid that in the future.
  - **Forgetting to turn in an assessment on time.**
  - **File naming issues or feedback issues on projects.** Gradescope gives you feedback and please read it and fix your file and resubmit. Note that you have unlimited attempts on Gradescope for everything and we will not grade your files if you do not adhere to instructions on file submissions and/or if the Gradescope scores your file to 0. It is your responsibility to read the feedback and fix your code. In case you miss reading the feedback, treat it as a learning activity and avoid that in the future.

# Acknowledgements



**Cheryl Resch**

**Lecturer,  
Dept. of Engineering Education,  
University of Florida**



**Lisha Zhou**

**Lecturer,  
Dept. of Engineering Education,  
University of Florida**

# References

- Books/Notes

- [Dr. Sartaj Sahni](#)
- [Dr. James Aspen](#)
- Dr. Mark Weiss
- [Dr. Clifford Shaffer](#)
- [OpenDSA](#)
- [Dr. Cathy Hughes](#)

- Videos Authority

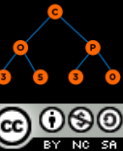
- [Dr. Josh Hug](#)
- [MIT OCW 6.006](#): Dr. Erik Demaine and Dr. Srinivas Devadas
- [Dr. Robert Sedgewick](#)

- Videos Youtube

- [HackerRank: Data Structures](#)
- [HackerRank: Algorithms](#)
- [Back To Back SWE](#)
- [MyCodeSchool](#)
- [Abdul Bari](#)

- GeeksforGeeks

# Walkthrough





# Walkthrough

- Canvas
- OpenDSA
- Discord
- Stepik/Eduigator
- Gradescope

# Questions