Data Structures & Algorithms

COP 3530 : Fall 2021
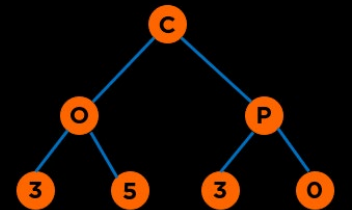

Data Structures & Algorithm

About Me: Amanpreet Kapoor

- Educator

- CS Education Researcher

- Mentor

- Software Engineer

- Ph.D. Student

- Lifelong Learner

kapooramanpreet@ufl.edu

Course Staff

Alex

Andrew

Andrew

Dhruv

Dom

Dustin

Hamish

Jahdiel

Josh

Katie

Kunyao

Marc

Paul

Robin

Rob

Victoria

Xiao

Learners: Let's Get to Know You
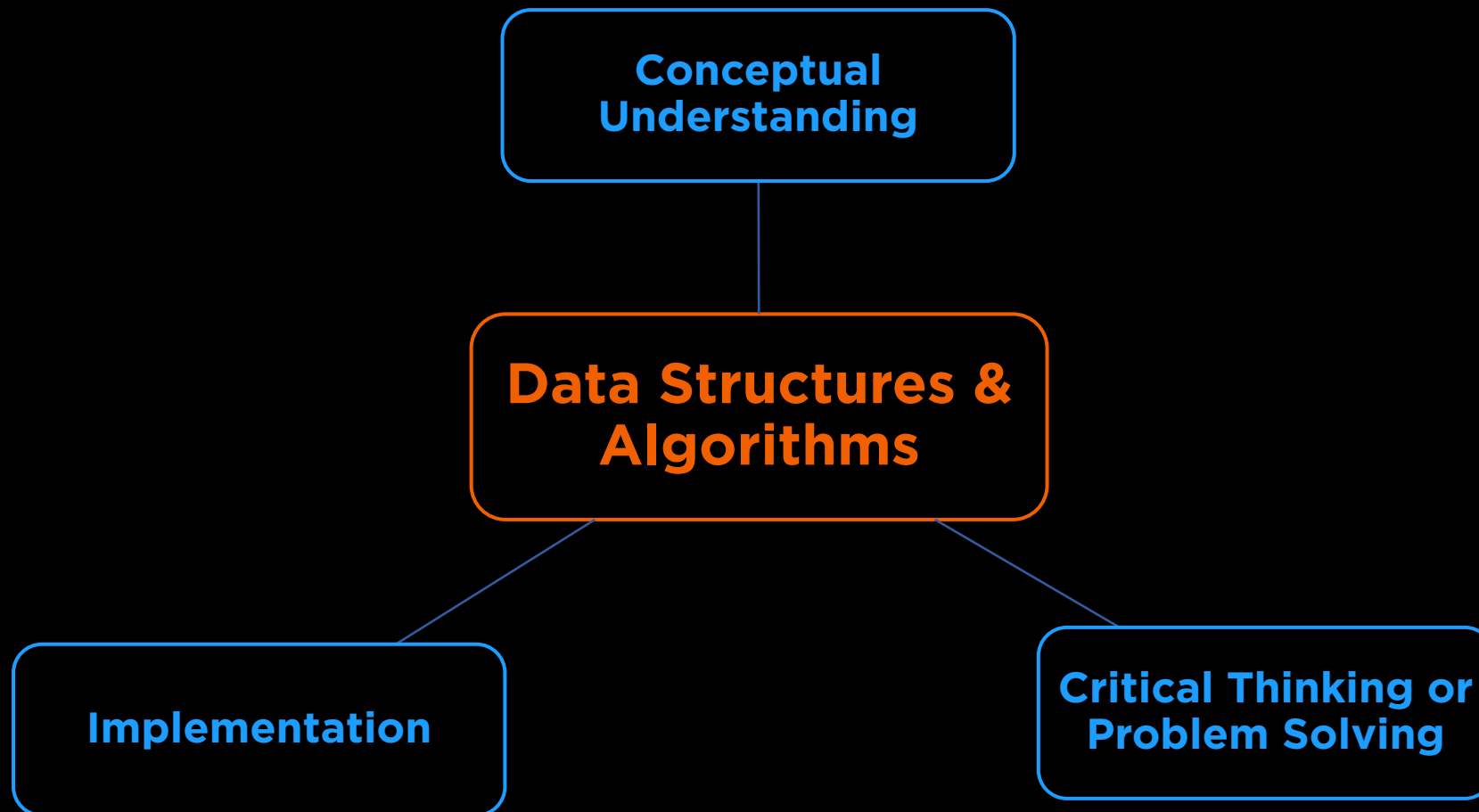
Go To Menti.com

Code: 6873 9177

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

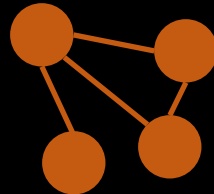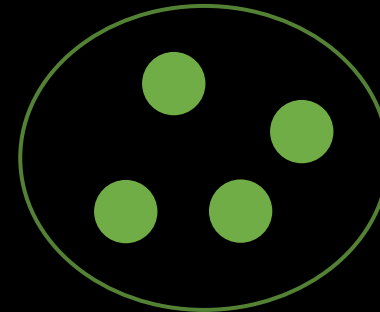| Linear Ordered	Non-linear Ordered	Not Ordered
Lists	Trees	Sets
Stacks	Graphs	Tables/Maps
Queues		

Categories of Algorithms

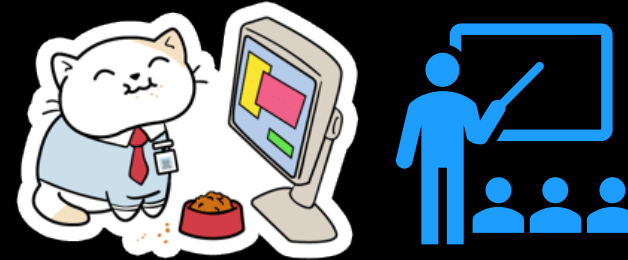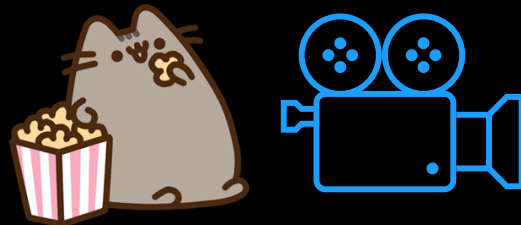| Brute Force	Divide & Conquer	Greedy	Dynamic Programming
Selection Sort	Binary Search	Minimum Spanning Tree	Knapsack
Bubble Sort	Merge Sort	Shortest Paths	Fibonacci
Insertion Sort	Quick Sort		
NP Complete Problems			

Logistics & Policies

Format

Action Items by
Monday morning

Optional: Attend
synchronous discussions
on Zoom on Tue/Wed.

1. Attend or watch lectures synchronously
   on Tue and Thu.
2. Optional: Watch recorded lectures
   asynchronously later.

1. Quiz due on Wed
2. Stepik questions due on Sun

Attending Campus Lectures

- You are recommended to wear approved face coverings at all times during class and within buildings even if you are vaccinated. If you are sick, stay home and self-quarantine. You could attend the lecture via zoom instead.

- Those who attend should be cleared to attend campus on one.uf

- Attendance is optional and you do not have to inform the Instructor or the course staff that you are not attending the campus class but instead the online lecture any day throughout the semester

Communication

Slack

- 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

- Monday, (10 – 11 am) (via Zoom)

- Thursday, (5 – 6 pm) (via Zoom)

- 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 Slack direct message or an email will be ignored if you do not follow the above protocol.

Grading

Modality	Assignment	Weightage	% of Final Grade
Individual	Quizzes (12, Drop two lowest scores)	2% x 10	20%
	Exam 1	20%	20%
	Exam 2 (Cumulative)	20%	20%
	Project 1	10%	10%
	Project 2	6% + 2*% +2*%	10%
Collaborative#	Final Project (Individual or Group: 3a & 3b)	2% + 6% + 4*%	12%
	Preassigned Stepik Questions (22, Drop six lowest scores)	0.5% x 16	8%
Individual	Extra Credit Opportunities & Bug Bounty Program	Up to 2%	2%
			Total: 102%
	* Denotes peer-graded components. 8% of your grade will be evaluated by your peers. # You are allowed to collaborate on Stepik problems, but you must cite the peer who you worked with.		

Timeline

Week	Dates		Topic	Deadlines
1	23-Aug	29-Aug	Algorithm Analysis	
2	30-Aug	5-Sep	List, Stacks, & Queues	Q_1, Q_2
3	6-Sep	12-Sep	Trees & Traversals	Q_3
4	13-Sep	19-Sep	Balanced Trees 1	Q_4
5	20-Sep	26-Sep	Balanced Trees 2	Q_5
6	27-Sep	3-Oct	Heaps & Priority Queues	Q_{H6}, P_1
7	4-Oct	10-Oct	Sorting	Q_7
8	11-Oct	17-Oct	Exam 1 – October 14	E_1
9	18-Oct	24-Oct	Sets, Maps, & Hashing	Q_8
10	25-Oct	31-Oct	Graphs 1	P_2
11	1-Nov	7-Nov	Graphs 2	Q_{H9}
12	8-Nov	14-Nov	Greedy Algorithms	Q_{10}, P_{3a}
13	15-Nov	21-Nov	Greedy Algorithms / Dynamic Programming	Q_{11}
14	22-Nov	28-Nov	Dynamic Programming	Q_{12}
15	29-Nov	5-Dec	Exam 2 – December 2	E_2
16	6-Dec	12-Dec	Complexity Theory	P_{3b}
Legend: Q_N = Quiz N, P_N = Project N, E_N = Exam N, Q_{HN} = Hire Thy Gator Quiz N				

Programming Language

Default (Project 1 & 2, Stepik Exercises, Quizzes):

C++11

```
g++ -std=c++11 your_file.cpp -o your_program
```

Project 3 or Final Project:

Any Language

Tools

Compiler

- G++

- Stepik

IDE

- <u>OnlineGDB</u>

- Visual Studio Code

- Clion

Textbook (Optional)

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

    o Mark Allen Weiss

    o Fourth edition, 2014, ISBN 9780132847377

- **OpenDSA Book**

    o https://opendsa-server.cs.vt.edu/OpenDSA/Books/Everything/html/index.html

Feedback

- [COP 3530 Feedback Form](#)

- [Bug Bounty Program](#) : Upto 1% EC in Range 0.2-1% per Bug

  o Quiz is not accessible due to a locked module
  o Typo in one of the quizzes/project descriptions
  o Incorrect solution in a certain test case
  o An accessibility bug such as no headings in documents for screen-readers
  o 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

Academic Dishonesty

Quiz questions on Stepik, Quiz questions on Canvas, 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.
    - 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, Stepik weekly assigned questions, 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

  - zero on that assignment and a two-letter final grade decrement for a first offense
  - E grade for second offence
  - For both offenses, you will be reported to the Honor Court

Acknowledgements

Cheryl Resch
Lecturer,
Dept. of Engineering Education,
University of Florida
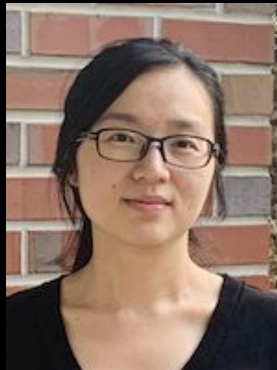
Lisha Zhou
Lecturer,
Dept. of Engineering Education,
University of Florida

References

- Books/Notes
  - [Dr. Sartaj Sahni](#)
  - [Dr. James Aspen](#)
  - Dr. Mark Weiss
  - OpenDSA
  - [Dr. Cathy Hughes](#)
- Videos Authority
  - [Dr. Josh Hug](#)
  - [MIT OCW 6.006](#): Dr. Erik Demaine and Dr. Srini Devadas
  - [Dr. Robert Sedgewick](#)
- Videos Youtube
  - [HackerRank: Data Structures](#)
  - [HackerRank: Algorithms](#)
  - [Back To Back SWE](#)
  - [MyCodeSchool](#)
  - [Abdul Bari](#)
- GeeksforGeeks

Walkthrough

Walkthrough

- **Canvas**

- **OpenDSA**

- **Slack**

- **Stepik**

Slack

To Do

Next Steps

- **Join Slack and greet your peers**

- **Complete Stepik Invite Request**

- **Complete Quiz 1**

Questions