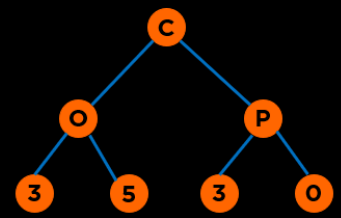
Data Structures & Algorithms

COP 3530 : Spring 2022



Data Structures & Algorithm

About Me: Amanpreet Kapoor

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

kapooramanpreet@ufl.edu

Course Staff

Katie
(Teaching Lead)

Andrew
(Slack Lead)

Rob
(Infrastructure Lead)

Ayswarya

Andrew

Dhruv

Dustin

Julia

Kunyao

Robin

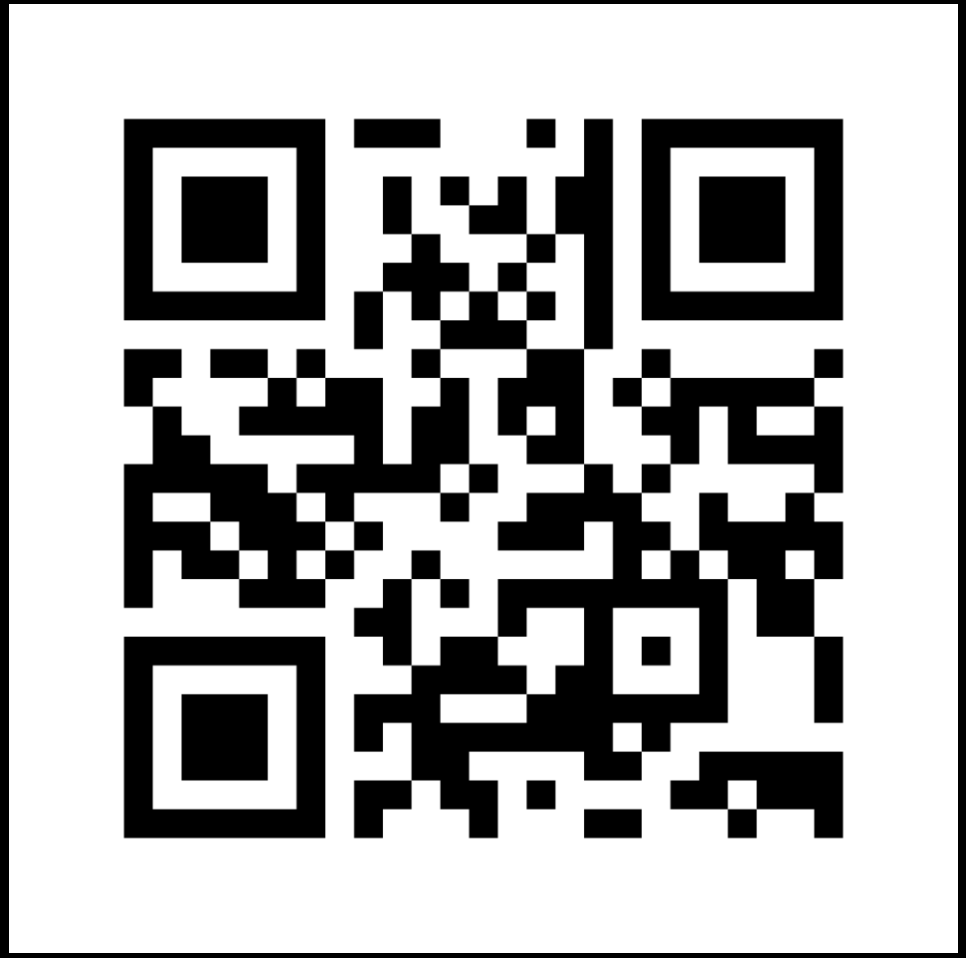
Victoria

Michael

Learners: Let's Get to Know You

Go To Menti.com

Code: 8343 0152



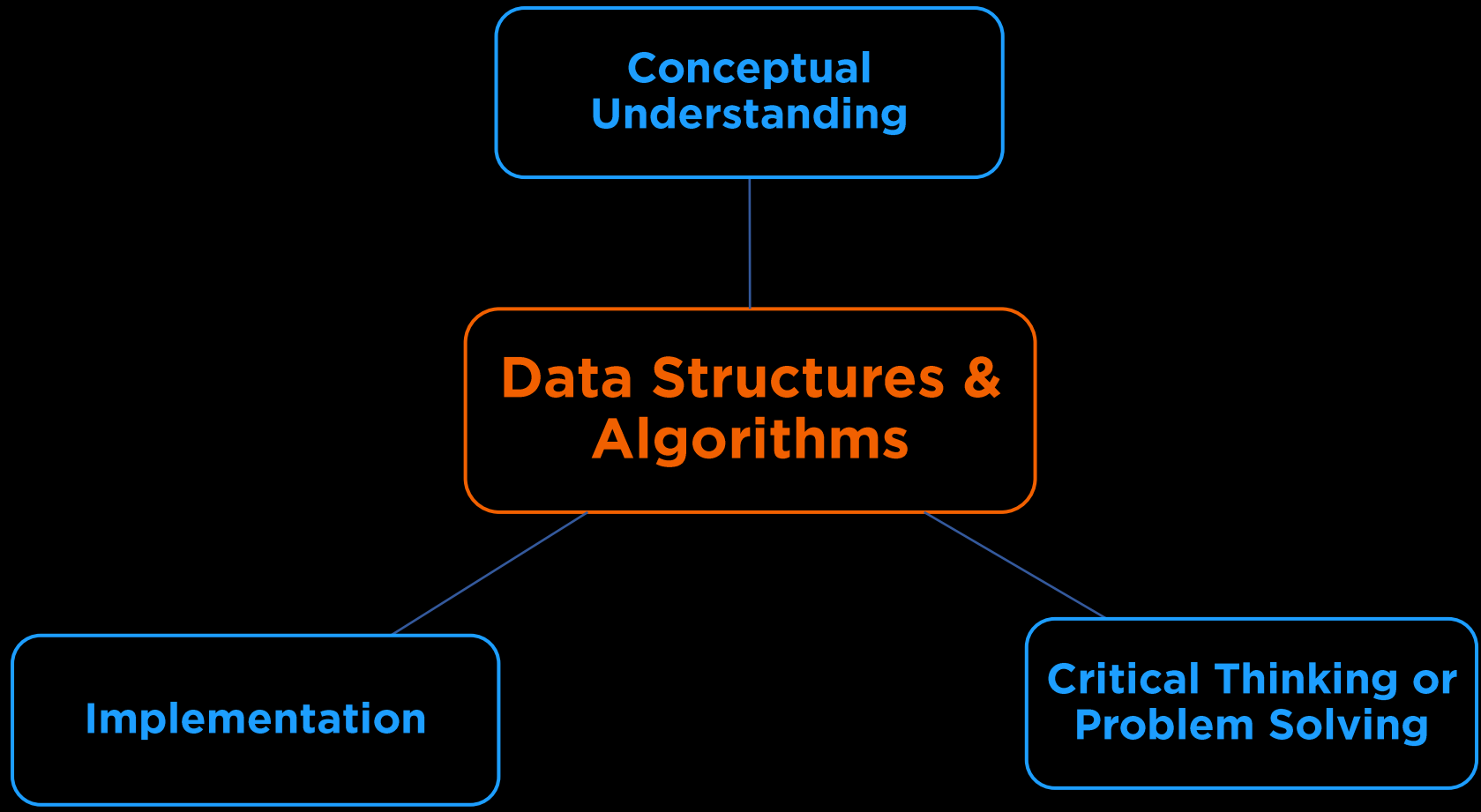
Course Objectives

What is this Course About?

This course covers algorithm development using

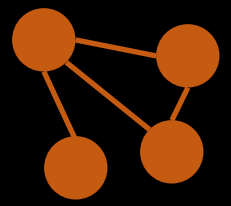
- pseudo languages
- basic program structures
- program design techniques
- storage and manipulation of basic data structures
- 3 Credit Hours

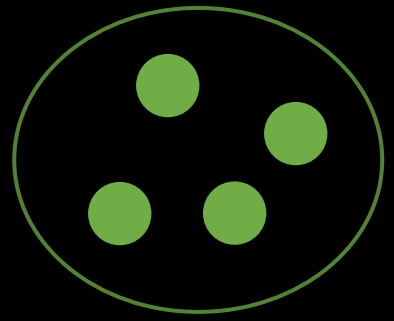
What is this Course About?



Categories of Data Structures

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





Categories of Algorithms

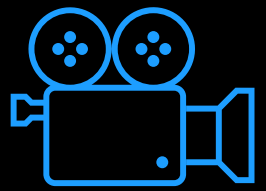
Brute Force	Divide & Conquer	Greedy	Dynamic Programming
Selection Sort	Binary Search	Minimum Spanning Tree	Knapsack
Bubble Sort	Merge Sort	Shortest Paths	Fibonacci
Insertion Sort	Quick Sort		
NP Complete Problems			

Logistics & Policies

Format

Action Items by Monday morning

Optional: Attend synchronous discussions on Tue.



1. Attend or watch lectures synchronously on Mon, Wed, and Fri.
2. Optional: Watch recorded lectures asynchronously later.

1. Quiz due on Tue and Fri.
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

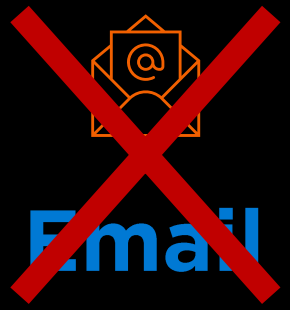
- TBD
- By Appointment (24 hours in advance)
- 11 am – noon on Thursday this week

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	Programming / HTG Quizzes (11, drop two lowest scores)	1% x 9	9%
	Conceptual Quizzes (11, drop two lowest scores)	1% x 9	9%
	Exam 1	14%	14%
	Exam 2	14%	14%
	Exam 3 (Final Exam - Cumulative)	14%	14%
	Project 1	10%	10%
	Project 2	10%	10%
Collaborative[#]	Final Project (Individual or Group: 3a & 3b)	2% + 6% + 2*%	10%
	Preassigned Stepik Questions (18, Drop six lowest scores)	0.83% x 12	10%
Individual	Extra Credit Opportunities & Bug Bounty Program	Up to 2%	2%
			Total: 102%
	* Denotes peer-graded components. 2% of your grade will be evaluated by your peers. # You are allowed to collaborate on preassigned stepik problems, but you must cite the peer who you worked with.		

Timeline

Week	Dates		Topic	Deadlines
0	5-Jan	7-Jan	Course Introduction	
1	10-Jan	14-Jan	Algorithm Analysis	Q_1
2	17-Jan	21-Jan	List, Stacks, & Queues	Q_2
3	24-Jan	28-Jan	Trees & Traversals	Q_3
4	31-Jan	4-Feb	Balanced Trees 1 / Project 1	Q_4
5	7-Feb	11-Feb	Balanced Trees 2	Q_5, Q_6
6	14-Feb	18-Feb	Heaps & Priority Queues	P_1
7	21-Feb	25-Feb	Exam 1 / Sorting	E_1
8	28-Feb	4-Mar	Sets, Maps, & Hashing	Q_7, P_{3a}
	7-Mar	11-Mar	Spring Break	
9	14-Mar	18-Mar	Graphs 1 / Project 2	Q_8
10	21-Mar	25-Mar	Graphs 2	Q_9
11	28-Mar	1-Apr	Greedy Algorithms	Q_{10}, P_2
12	4-Apr	8-Apr	Exam 2 / Project 3 work week	E_2
13	11-Apr	15-Apr	Dynamic Programming	Q_{11}
14	18-Apr	20-Apr	Complexity Theory	P_{3b}
15	22-Apr	28-Apr	Final Exam	E_3
Legend: Q_N = Programming and Conceptual Quiz N, P_N = Project N, E_N = Exam 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/Edugator

IDE

- OnlineGDB
- Visual Studio Code
- Clion

Textbook (Optional)

- **Data Structures and Algorithm Analysis in C++**
  - Mark Allen Weiss
  - Fourth edition, 2014, ISBN 9780132847377
- **OpenDSA Book**
  - 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
  - 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

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:

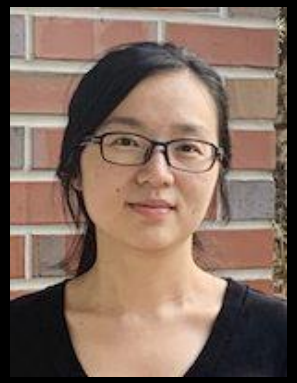
- It is fine to collaborate with peers. You must make sure you are not blindly copy-pasting another student's code. Also, you must cite the peer you worked with at the code level or conceptually.

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

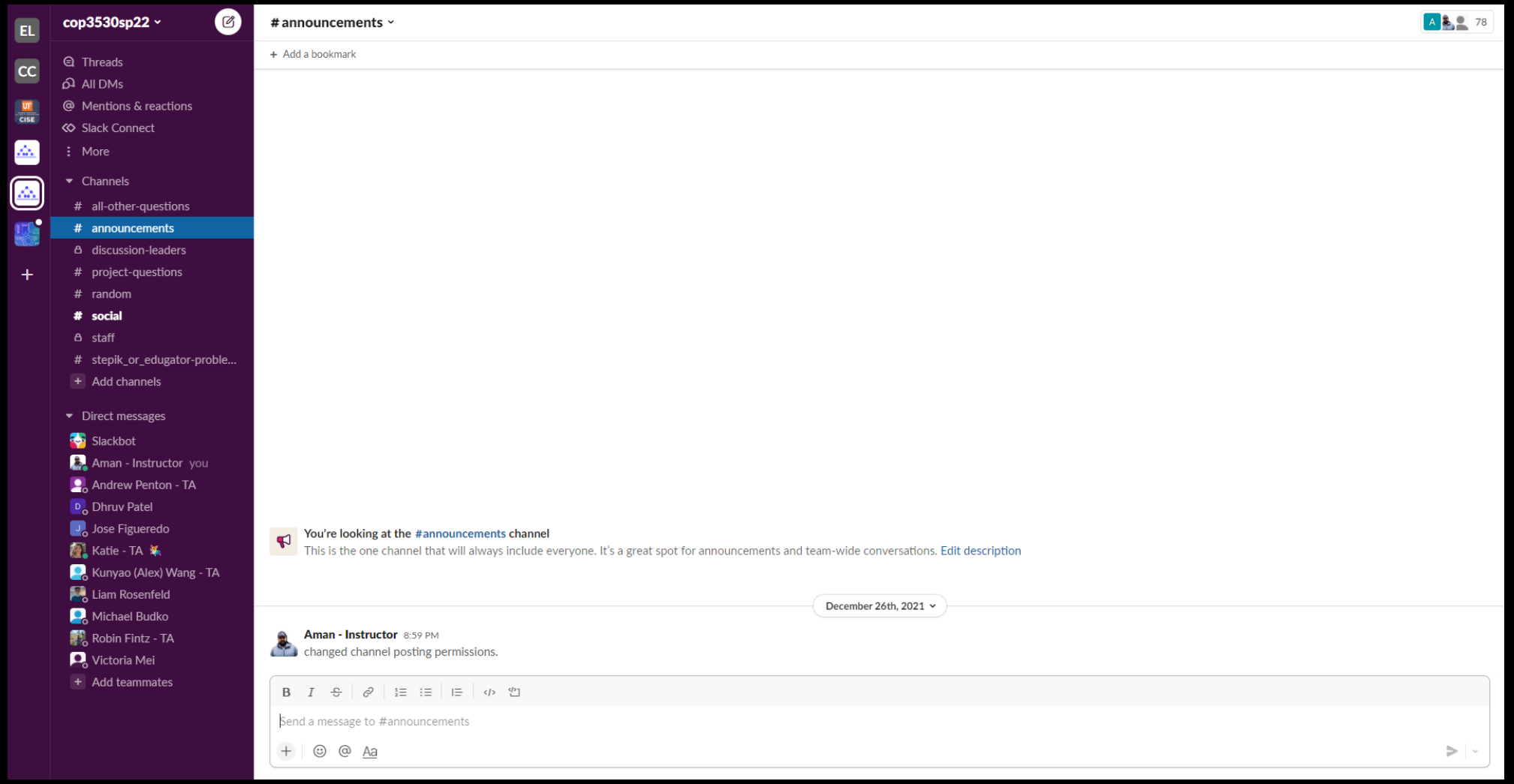
- Books/Notes
  - Dr. Sartaj Sahni
  - Dr. James Aspen
  - Dr. Mark Weiss
  - OpenDSA
  - Dr. Cathy Hughes
- Videos Authority
  - Dr. Josh Hug
  - MIT OCW 6.006: Dr. Erik Demaine and Dr. Srini Devadas
  - Dr. Robert Sedgewick
- Videos Youtube
  - HackerRank: Data Structures
  - HackerRank: Algorithms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

Walkthrough

Walkthrough

- Canvas
- OpenDSA
- Slack
- Stepik/Edugator

Slack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Threads
All DMs
Mentions & reactions
Slack Connect
More
Channels
all-other-questions
announcements
discussion-leaders
project-questions
random
social
staff
stepik_or_edugator-proble...
Add channels
Direct messages
Slackbot
Aman - Instructor you
Andrew Penton - TA
Dhruv Patel
Jose Figueredo
Katie - TA
Kunyao (Alex) Wang - TA
Liam Rosenfeld
Michael Budko
Robin Fintz - TA
Victoria Mei
Add teammates
announcements
78
Add a bookmark
You're looking at the #announcements channel
This is the one channel that will always include everyone. It's a great spot for announcements and team-wide conversations. Edit description
December 26th, 2021
Aman - Instructor 8:59 PM
changed channel posting permissions.
Send a message to #announcements

To Do

Next Steps

- Join Slack and greet your peers
- Complete Stepik Invite Request
- Complete Office hours poll

Questions