Carnegie Mellon University
Master of
Software Engineering

17-615: Data Structures and Algorithms
MW 1:30 -2:50pm, Remote (recorded)
F 8:00 – 9:00am, Remote (live)
[A1, Fall 2020, 6 Units]

Last Update: 9/2/20

Instructor	Email	Office Location & Hours
Prof. Matthew Bass	mbass@andrew.cmu.edu	SCR 267 (currently remote) Zoom ID: 3609899473 By appointment

Teaching Assistants
Nitish Kundala nkundala@andrew.cmu.edu

Course Description. The primary objective of the course is to provide students a solid background in the key principles of data structures and algorithms and introduce algorithmic thinking. This course is designed to complement the experience that students may already have with formal, yet practical underpinnings in computer science. Students will be better equipped for job interviews and more capable practicing software engineers. Specific learning objectives include:

- provide students with an thorough understanding of basic static and dynamic data structures and the relevant algorithms for operating on them
- provide students with a framework to analyze and characterize those factors influencing algorithmic performance and memory utilization
- develop the student's ability to recognize and analyze critical computational problems, recognize alternative algorithms and data structures to solve the problems, and apply critical judgement to select among them
- improve the student's ability to performed detailed, code-level design and document the design in an understandable way
- provide students with a hands on working knowledge of fundamental machine learning and data science concepts
- provide immediate competency enabling students to directly apply course material in real world situations
- provide hands-on opportunities to write software and repair debug programs to practice with data structures and algorithms

Prior Knowledge. Students are expected to be familiar with programming in at least one programming language. Formal programming language training is not required. Students may not have any formal background in algorithms, data structures, analysis, or detailed design techniques and methods.

Previous coursework in computer science (such as data structures or algorithms) is not necessary. However, students should have some experience writing small programs or software applications. Students in doubt regarding their experience should obtain instructor's permission.

Learning Objectives. After completing this course, you will be able to:

- Understand the basic static and dynamic data structures and the relevant algorithms for operating on them
- Analyze and characterize those factors influencing algorithmic performance and memory utilization
- Recognize and analyze critical computational problems, recognize alternative algorithms and data structures to solve the problems, and apply critical judgement to select among them
- Perform detailed, code-level design and document the design in an understandable way
- provide students with a hands on working knowledge of fundamental machine learning and data science concepts

Learning Resources. The course and all course materials will be distributed via Canvas.

Assessments. Students learn more by applying and explaining ideas to others, thus, the course requires the following activities:

- **Lecture and Reading Assessments:** These are short online questions derived from the readings and lectures
- **In-class Exercises:** Exercises students will do in pairs or small groups to practice applying the concepts learned in the course
- **Individual Homework Assignments:** These will be primarily programming assignments based on the concepts learned throughout the course
- **Final Exam**

Assessment	Final Grade %
Lecture & Reading Activities	20%
Individual Homework's	30%
Final Exam	30%
Class participation	20%

Course and Grading Policies

- **Late-work policy**: All work is expected to be handed in at the indicated due date and time. For fairness to the whole class, no late submissions or makeups will be accepted for the Lecture & Reading Activities. We will, however, drop the lowest grade. The penalty for turning in Individual Homeworks late is 10%/day. In the first week of classes, you should receive a course schedule for each course; please use them to plan ahead. If you have any questions you should raise them immediately rather than waiting for conflicts to arise.
- **Participation policy**. Class participation will be graded by in-class engagement, including asking relevant questions based on a critical review of required readings and lectures, preparation for any in-class exercises, and responses on the class discussion board. The lack of attendance and participation, will count against your participation grade.

Course Schedule. The following schedule provides a general overview of topics and assignments. Please refer to the syllabus online in Canvas for specific lecture topics, reading assignments and due dates.

Class	Lectures (questions due at 1:30 EST pm on date listed)	Assignments
8/31		
9/2	L01 – Course Introduction L02 – Interview Strategies	
9/7	No Class (Labor Day)	
9/9	L03 – Good Coding Practices L04 – Measurement & Analysis of Algorithms	A1 due
9/14	L05 - Recursion	
9/16	L06 – Arrays & Lists	A2 due
9/21	L07 – Searching and Sorting	

Class	Lectures (questions due at 1:30 EST pm on date listed)	Assignments
9/23	L08 – Stacks & Queues	A3 due
9/28	L09 – Trees I L10 – Trees II	
9/30	L11 – Heaps	A4 due
10/5	L12 – Hash Maps	
10/7	L13 - Graphs	A5 due
10/12	L14 – Searching and Sorting Revisited	
10/14	L16 – Review for Final	A6 due
10/19	Final Exam	

Accommodations for Students Disabilities. If you have a disability and have an accommodations letter form the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

Academic Integrity. Honesty and transparency are important to good scholarship. Plagiarism and cheating, however, are serious academic offenses with serious consequences. If you are discovered engaging in either behavior in this course, you will earn a failing grade on the assignment in question, and further disciplinary action may be taken.

For a clear description of what counts as plagiarism, cheating, and/or the use of unauthorized sources, please see the University's Policy on Academic Integrity.

If you have any questions regarding plagiarism or cheating, please ask me as soon as possible to avoid any misunderstandings. For more information about Carnegie Mellon's standards with respect to academic integrity, you can also check out the Office of Community Standards & Integrity website.

Student Wellness. As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. CMU services are available, and treatment does work. You can learn more about confidential mental health services available on campus at the Counseling and Psychological Services website. Support is always available (24/7) from Counseling and Psychological Services: 412-268-2922.