



CS 590 A– Algorithms

Stevens Institute of Technology
Schaefer School of Engineering & Science
Spring 2022

Instructor: In Suk Jang

Course Web Address: <https://sit.instructure.com/courses/56570>

Contact Info: ijang@stevens.edu

Virtual Office Hours: Monday 1-2 PM or by appointment

Regular Office Hour Zoom Link: <https://stevens.zoom.us/j/5516841287>

Class Period: Wednesday 6:30 – 9:00 PM

Classroom Location: Edwin A. Stevens 230

COURSE DESCRIPTION

This is a course on more complex data structures, and algorithm design and analysis, using one or more modern imperative language(s), as chosen by the instructor. Topics include: advanced and/or balanced search trees; further asymptotic complexity analysis; standard algorithm design techniques; graph algorithms; complex sort algorithms; and other “classic” algorithms that serve as examples of design techniques.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to:

- **Complexity** – Explain the meaning of big-O, Theta, and Omega notations. Calculate the asymptotic running time of standard algorithms, and use it to compare efficiency.
- **Master Theorem** – Use the Master Theorem to prove asymptotic assumptions
- **Sorting** - Compare and analyze basic and advanced sorting algorithms.
- **Trees** - Implement advanced search trees such as Binary Search Trees, and Red-Black Trees.
- **Graphs** - Implement standard algorithms using graphs and weighted graphs in C++ (e.g., DFS, BFS, MST, topological sort).
- **Shortest Paths** – Implement standard algorithms to solve the shortest path finding problem. (Dijkstra, Bellman-Ford, Floyd-Warshall)
- **Algorithmic Design** - Apply standard algorithm design techniques such as the greedy technique, dynamic programming, hashing, and space/time trade-offs.

TENTATIVE COURSE SCHEDULE

Week	Day	Topics Covered	Reading	Assignments
1	1/19	Introduction & Overview of the language C++	Week 1 Lecture Notes	
2	1/26	Advanced C++ review	Week 2 Lecture Notes	
3	2/2	Sorting, and computational complexity	Chapter 2	Assignment 1 Quiz 1
4	2/9	sorting, and computational complexity (II)	Chapters 3,4	Quiz 2
5	2/16	Sorting Algorithms	Chapters 6,7,8	Assignment 2 Quiz 3
6	2/23	Introduction to trees, binary search trees	Chapter 12	Quiz 4
7	3/2	Red black trees	Chapter 13	Assignment 3 Quiz 5
8	3/9	Dynamic Programming	Chapter 15	Quiz 6
9	3/16	Spring Recess – No Class		
10	3/23	Greedy Algorithms	Chapter 16	Assignment 4 Quiz 7
11	3/30	Introduction to graphs, DFS, BFS	Chapter 22	Quiz 8
12	4/6	Topological ordering, MST	Chapter 23	Assignment 5 Quiz 9
13	4/13	Shortest paths I (Online)	Chapters 24,25	Quiz 10
14	4/20	Shortest paths II	Chapters 24,25	
15	4/27	Overview (Online)		
16	5/11	Final Exam		

COURSE MATERIALS

Textbook(s): Introduction to Algorithms, 3rd Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein

Other Readings: Course Lecture Notes, available on Canvas

COURSE REQUIREMENTS

- **Homework:** The programming assignments will be done individually. No collaboration is allowed between students. No code from online resources is allowed to be used besides the code that I will share with you. Any sign of collaboration will result in a 0 and being reported to the Honor Board. Programming assignments might be tested for similarity using the MOSS, or similar software, and any sign of collaboration will be reported to the HONOR board. Students who are caught collaborating for a second time, they will receive a failing grade (F) in the course.
- **Quizzes:** A short quiz will be given every week, after the end of the add/drop period, starting on week 4. The quizzes will be given on Canvas using the Respondus LockDown browser.

- **Exams:** The final exam will be given during the final exam period. An announcement will be posted with more details on week 13. The exam will be a paper exam in classroom.

TECHNOLOGY REQUIREMENTS

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Canvas

Required Equipment

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection

Required Software

- Microsoft Word

GRADING PROCEDURES

Grades will be based on:

Quizzes	20%
Assignments	50%
Exam	30%

Any complaint regarding a grade must be presented no later than **7 weekdays** following the publication of grades of respective assignments. Penalties for specific mistakes that are applied to exams, assignments and quizzes are equal for all students in the course. If you contact me to negotiate these penalties, I will not respond.

Late Policy

Late assignment (even by 2 seconds) will be given a -25% decrease penalty per day, for the first 2 days after the deadline. So, if you send an assignment 1 second late, you will receive 75% of your grade for the assignment. If you send it, 24 hours, and 1 second late, you will receive 50% of your grade for the assignment etc. After 48hrs from the deadline there will be a -90% decrease penalty, so you will receive 10% of your grade.

Academic Integrity

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and

adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

EXAM CONDITIONS

The following procedures apply to quizzes and exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Conditions on the quiz or exam.

1. Students may use the following materials during quizzes and/or exams. Any materials that are not mentioned in the list below are not permitted.

Material	Permitted?	
	Yes	No
Handwritten Notes Conditions: i.e. size of note sheet		x
Typed Notes Conditions: i.e. size of note sheet		x
Textbooks Conditions: i.e. specific books		x
Readings Conditions: i.e. specific documents		x
Other (specify)		x

2. Students are not allowed to work with or talk to other students during quizzes and exams.
3. Students are not allowed to use any other device to access the internet besides the computer that is used to access the LockDown Browser.

For all quizzes students will be required to use the LockDown browser. Please see below for more details.

Using LockDown Browser and a Webcam for Online Exams

This course requires the use of LockDown Browser for online quizzes. Download and install LockDown Browser using the Stevens Respondus LockDown Browser Link:

<https://www.respondus.com/lockdown/download.php?ID=389551528> (Don't Google for a download link — it will be for the wrong school!)

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services>. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY

Name and Pronoun Usage

As this course includes class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression) and who can visit

the office in person. CAPS is open from 9:00 am – 5:00 pm Mondays, Wednesdays, Thursdays and Fridays and from 9:00 am – 7:00 pm on Tuesdays during the Fall and Spring semesters; appointments are highly encouraged. For those students who cannot visit the Stevens campus for an in-person appointment, you can contact a local mental health care provider for an in-person appointment, or if you are enrolled in the Stevens Student Health Insurance, you may call Care Connect for 24/7 mental health support at 1-888-857-5462.

For further information please visit the CAPS webpage on Seeking Help Off-Campus:
<https://www.stevens.edu/directory/counseling-and-psychological-services/seeking-help-campus>

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.