

Algorithm Analysis and Data Structures

CSCI 7432

Fall 2022

Instructor:	Dr. Yao Xu Assistant Professor from Department of Computer Science
Office:	IT 2321, Statesboro Campus
Email:	yxu@georgiasouthern.edu
Class schedule:	TR: 3:30 PM - 4:45 PM, IT 2202 or via Folio Zoom.
Office hours:	Please email me to make an appointment at least one day in advance to meet either in my office or online via Zoom.
Course Materials:	Go to: CSCI 7432 course website (updated weekly). All other materials will be posted in Folio. Please check it frequently for updates.
Important Dates:	Aug 10 – Classes begin Aug 10-15 – Drop/Add ends at 11:59 PM on Aug 15th. – Attendance Verification should be completed via Folio. Sep 5 - Labor Day Holiday – Administrative offices closed - No classes Oct 6 – Last day to withdraw without academic penalty. Nov 21-26 – Thanksgiving Holidays for students (No classes) Nov 30 – Last day of classes Please go to Academic Calendars and click “Fall 2022” for more details.

Catalog Course Description:

Advanced topics in algorithm design and analysis and data structures for implementing these algorithms. Problems considered from areas of information storage and retrieval, graph theory, cryptology and parallel processing. **Credits:** 3.0 credit hours

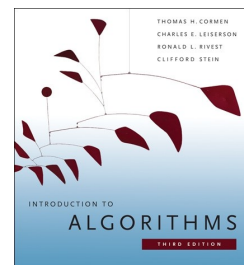
Prerequisites

- A minimum grade of “C” in CSCI 5330 (Algorithm Analysis and Design) or Permission of Instructor.
- Students taking this course should be **proficient in Java programming**.
- Students taking this course should be familiar with the following topics:
 - Asymptotic notations: O , Ω , Θ ;
 - Basic data structures: stacks, queues, linked lists, heaps, binary search trees;
 - Sorting algorithms: selection sort, insertion sort, mergesort, heapsort, quicksort;
 - Algorithm design techniques: divide and conquer, greedy approach, dynamic programming;
 - Graph algorithms: BFS and DFS, minimum spanning trees (Prim and Kruskal), some shortest paths algorithms.

Recommended Textbook

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein. *Introduction to Algorithms*, Third Edition, MIT press.

You may find an ebook version online via [University Libraries](#).



Course Topics

- Mathematical elements: solving recurrences, probability theory
- Algorithm design approaches: divide and conquer, randomized algorithms, dynamic programming, greedy algorithms
- Data structures: priority queues, balanced binary search trees
- Graph algorithms: DFS related algorithms, shortest paths, flow networks
- Concepts of NP-related problems
- Advanced topics (subject to change): parallel algorithms, approximation algorithms

Course Objectives and Outcomes

Upon completion of this course, the successful students will be able to do all of the following tasks.

- Demonstrate an understanding of some important advanced algorithms and data structures.
- Analyze a given problem and identify the computing requirements appropriate for its solution.
- Apply appropriate algorithmic design paradigms and data structures for solving a given problem.
- Reason about the correctness and performance of the resulting algorithms.

Assessments and Grading

- **Problem Sets (5% \times 4 = 20%) – Individual work**

Each problem set will involve theoretical problems, algorithm design, mathematical analysis or proofs. Detailed requirements will be specified on the first page of each problem set.

- **Programming Assignments (10% \times 4 = 40%) – Individual work**

Each programming assignment will involve writing one or more **Java programs** to solve a problem related to the topics that have been covered in this course. In addition to coding, you will also be required to submit a write-up, including explanations of how your programs work, some testing results, the correctness, and the running time. Detailed requirements will be specified in the document of each programming assignment.

- **Term Project (40%) – Group work (size \leq 3)**

You will be working in teams of up to three students to do a research project. The project should focus on an algorithmic problem beyond what has been covered in class. It can be either a fundamental theoretical problem or one well-motivated by an application. A document of detailed requirements for the term project will be posted later. Here is a **tentative** timeline for completing your term project.

1. Oct 3rd - 7th: Teams and project topics should be finalized.
2. Oct 9th: **Project Proposal** due. One for each team.
3. Nov 29th: **Project Presentations**. One for each team.
4. Dec 2nd: **Final project paper with code** due. One for each team.

Your final letter grade will then be determined based on the following standards:

$A : \geq 90\%$ $B : 80\% - 89.99\%$ $C : 70\% - 79.99\%$ $D : 60\% - 69.99\%$ $F : \leq 59.99\%$

Course Policies

- **Attendance:** Students are expected to watch the uploaded lectures in time. Each lecture will build on the previous lectures. Once you start slipping behind it is very hard to catch up. You are responsible for any material covered and announcements made in class or posted as news in Folio.
- **NO Late Work or Make-up Work/Exams:** All assignments should be submitted to Folio and must be turned in by the specified time on the due date. It is your responsibility to ensure that you are aware of dropbox's lock times. **Late or missed assignments will automatically be assigned with a grade of zero.** With the possible exception of valid excuses documented through the Dean of Students Office, make-up work and/or exams will NOT be given.
- **Academic Integrity:** Everyone has a stake in academic honesty. Students are encouraged to discuss assignment problems with classmates, but each student **MUST** complete all the individual assignments independently. **Cheating and/or plagiarism on any course work from any sources (including internet sources) will result in a failing grade regardless of performance.** Please refer to Academic Dishonesty for more information.
- **Distribution of Course Materials:** Lecture slides, assignments, sample solutions, lecture recordings, as well as everything else available in Folio are prepared for students taking this course only. Any other use, distribution, or posting in places outside this course are prohibited without written permission from the instructor.

Code of Student Conduct

Please refer to the Code of Student Conduct for a full list of student conduct expectations.

Disability-related Accommodations

Georgia Southern University is committed to providing reasonable accommodations to students with documented disabilities as required under federal law. Disabilities may include ADD or AD/HD, autism spectrum disorders, brain injuries, chronic medical conditions, communication disorders, hearing impairment, learning disabilities, mobility impairment, psychological disorders, and visual impairment. The purpose of disability accommodation is to provide equal access to the academic material and equal access to demonstrate mastery of the material.

If you have a disability and need accommodations, please contact the Student Accessibility Resource Center (SARC). You will need to meet with a SARC staff member who can help you gather documentation of your disability or refer you to an appropriate resource for assessment. Once documentation of the disability is approved, SARC staff will provide you with an accommodation letter detailing the approved accommodations **which you should present to me** so we can discuss and implement your accommodations. Disability accommodations work best starting at the beginning of the semester, but can be approved and started at any point in the semester. Accommodations start at the time the accommodation letter is presented to faculty within reasonable timelines; accommodations are not given retroactively.

SARC on the Statesboro campus is located on the second floor of Cone Hall and the phone number is (912) 478-1566. SARC for Savannah and Liberty campuses is located on the second floor of Memorial College Center and the phone number is (912) 344-2572.

Web site: Student Accessibility Resource Center

Equal Opportunity & Title IX

The Office of Equal Opportunity & Title IX administers the University's Equal Opportunity and Affirmative Action and Sexual Misconduct policies.

- **Reporting:** Georgia Southern University does not discriminate on the basis of sex, race, color, sexual orientation, gender identity or expression, national origin, religion, age, veteran status, political affiliation, or disability. While students are encouraged to share with faculty any issues or concerns they may be having, please be aware there are reporting requirements which are a part of the job requirements at Georgia Southern University. For example, if you disclose an issue of sexual misconduct, the information will be kept as private as possible but faculty and staff are required to bring it to the attention of the institution's Title IX Coordinator/Director of Equal Opportunity and Title IX.
- **Pregnant & Parenting:** Georgia Southern University does not discriminate on the basis of legally-protected status, including pregnancy, childbirth, false pregnancy, termination of pregnancy, or recovery therefrom. Students should work with their faculty as soon as possible to arrange appropriate accommodations based on this status. Delays in making a request may impact available accommodations. Students will be treated consistently with other similarly situated students. Absences from class may be excused for as long as medically necessary. Students will be allowed to return to the same academic status following any accommodation that includes leave. Medical certification may be requested from the student by the Office of Equal Opportunity and Title IX. Both students and faculty are able to consult with the Title IX Coordinator regarding any questions or issues that arise.

Website: [Equal Opportunity & Title IX](#)

COVID Information

The university will continue to provide free COVID-19 testing and vaccines to our faculty, staff and students. This offering includes primary doses and booster doses. Remember, COVID-19 vaccines are safe, effective, and free, and help protect people from getting severely ill or hospitalized with COVID-19, as well as protect those around them.

If a student is experiencing any symptoms of COVID-19, they should get tested immediately.

- If you test positive for COVID-19, please complete the university's online Health Reporting Form, located within the MyGS portal. The form will provide appropriate next steps for your isolation AND alert your professors.
- If you are notified you are a close contact of a positive case, please submit a Health Reporting Form as well. You will receive information regarding whether to quarantine and the next steps.
- Questions should be submitted to the Dean of Students office:
 - Statesboro Campus: (912) 478-3326, deanofstudents@georgiasouthern.edu
 - Armstrong Campus: (912) 344-2514, armdeanofstudents@georgiasouthern.edu

Remember, you can help prevent the spread of COVID-19 – and many other communicable diseases – by washing your hands thoroughly, covering your cough and sneezes, cleaning high-touch surfaces regularly, and avoiding close contact with people who are sick.

For more information, please refer to [COVID-19 Information](#).