# Fall 2024 COSC 336 Data Structures and Algorithms Analysis

**Syllabus**

**Instructor:**  Marius Zimand

**Room:** YR466

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**Phone**: 410 704 4967

**Class Hours:** Section 001**:** Tue.-Thurs. 10– 11:50 am, room YR 201.

Section 002: Tue-Thurs. 2:30– 4:20pm, room YR 201.

**Office Hours:**  Tue. and Thurs. 4:30 – 5:30 pm, my office. The TA is Nachiketh Agganoor. The TA’s office hours: Mon Wed 12 – 1, in suite 206. The TA’s email: [naggano1@students.towson.edu](mailto:naggano1@students.towson.edu)

**Web page**: Class info and materials will be posted on Blackboard. Visit Blackboard often for assignments, grades, notes, last-minute announcements.

**Text Book:**

* “An Introduction to Algorithms” by Cormen, Leiserson, Rivest and Stein, 4th edition. The textbook is available electronically through Cook Library at

<https://usmai-tu.primo.exlibrisgroup.com/permalink/01USMAI_TU/dg0og1/alma990063504360108249>.

* Java How to Program, By Harvey, M. Deitel, Paul J. Deitel, 6/e, Edition 7, Prentice Hall, 2008 (or some other Java book that you like)

**Course Description**: This is a required course for computer science majors. The course covers the fundamental data structures used in programming and the basic techniques used to design and analyze algorithms. The assumption is that you know already to program. Some basic elements of Java will be presented in class, but you are supposed to do individual reading on Java. The course focuses on algorithms, and their analysis. It is *not* about better coding and consequently

does not deal with coding details. The course will enhance your “computer science maturity” because the knowledge that you will acquire here is used throughout CS.

COSC 237 is a prerequisite for the course. MATH 274 is a co-requisite.

**Course Objective**: At the end of the course:

* Students will be familiar with the fundamental data structures in computer science: lists, stacks, queues, hash tables, several types of binary search trees, several types of heaps.
* Students will improve their ability to solve problems abstractly
* Students will know the most important data structures and the main methods used in algorithm design.
* Students will improve their ability to analyze algorithms in order to

– prove their correctness

–estimate their time complexity

**Grading Policy:**

Assignments 20%

Quizzes (lowest score is dropped) 20%

Test1 (mid term) 30%

Test2 (final) 30%

There will be several chances to get extra credit. Class participation will be considered as well. If the average for the two exams is < 60, then the grade is F (regardless of assignments and quizzes). If the average is at least 60, then the grade is calculated according to the following schema:

**A**: 93-100, **A-:** 90- 92.99

**B+**: 87-89.99, **B**: 83-86.99, **B-**: 80-82.99

**C+**: 75-79.99, **C**: 70-74.99

**D+**: 67-69.99, **D**: 63-66.99, **D-:** 60-62.99

**F**: <60 (but also if test average < 60 , see above.)

**Course Outline (timing is tentative and minor changes are likely)**

1. Introduction and basic ideas in the design of algorithms (1 week)

A few examples of algorithms and their runtime analysis. Intro to first paradigms: divide-and-conquer, dynamic programming

1. Mathematical concepts for algorithm analysis (2.5 weeks)

asymptotic notation: big-Oh, little-Oh, Omega, etc.

common functions in the analysis of algorithms

methods for evaluating the rate of growth of functions (sums, integrals, limits)

analysis of divide-and-conquer algorithms, other examples

1. Lists, Stacks, Queues (0.5 week):

abstract data type characterization,

implementations, applications

1. Trees (2 weeks)

binary trees

applications: Huffman compression algorithm

binary search trees

Red-black trees

B-trees (just a sketch)

1. Priority Queues (1 week):

abstract model,

binary heaps and applications,

1. Hashing (1 week)

hash functions, open hashing,

close hashing, rehashing,

universal hashing (tentative)

1. Sorting Algorithms (1.5 weeks):

Comparison-based sorting: review of bubble sort, select sort and insertion sort,

Heapsort, Mergesort, Quicksort

Selection problem, randomized algorithm, deterministic algorithm

radix sort and counting sort

1. Graph Algorithms: (3.5 weeks)

General notions, graph representations (adjacency matrix, adjacency list)

breadth-first search and depth-first search, applications (checking connectedness, finding the strongly connected components)

topological sorting,

shortest-path algorithms (Dijkstra, Bellman-Ford, Floyd)

minimum spanning trees (MST), Kruskal and Prim’s algorithms for finding a MST.

network flows: max flow min cut theorem, Floyd-Fulkerson scheme

1. General techniques in the design of algorithms (covered in parallel with some of the other topics)

dynamic programming

divide-and-conquer

greedy strategies

10 Elements of Computational Complexity (if time allows, 1 week)

reductions

complexity classes P, NP

NP-complete problems

**Class Policy:**

**Student Code of Conduct** <https://www.towson.edu/studentaffairs/policies/documents/code_of_student_conduct.pdf>

1. Significant responsibility falls on you, the student, to keep up with the work and not fall behind. I will post the agenda of each meeting ahead of time, and you should do (before we meet) the recommended reading from the textbook, lecture notes, other sources that I will indicate. I also keep a Class log, where I list what was covered in each class.
2. We will use Blackboard for all materials related to this course. Log into Blackboard course site on a daily basis and check your TU email regularly. It is your responsibility to keep track of deadlines for assignments and scheduled exams.
3. Roll attendance will be taken. Class attendance is expected. If you miss a class, you are responsible for the material presented in the lecture and for obtaining information about assignments. No makeup test will be given, unless you prove that a real emergency situation has impeded you to attend.
4. There will be 4-6 quizzes testing basic understanding of the material done in the previous 2 weeks. You should expect a quiz about every other week (although they will not be that often). No makeup test will be given, unless you prove that a real emergency situation has impeded you to attend.
5. Assignments will be done in teams. A team has 3 to 4 students, and a team will turn one assignment with the names of all the team members that have worked on it.
6. Assignments are to be handed in on the due date on Blackboard. The assignments will involve both theoretical questions and programming. Delay from *1 minute up to 24 hours* will be penalized with 30%, and delay from *24 hours 1 minute up to 48 hours* is penalized with 60%. Assignments will not be accepted if they are submitted more than 48 hours after deadline.
7. Assignments should be typed nicely. I recommend using Latex via Overleaf (which facilitates collaboration). Programming projects should have complete documentation. Read the instructions for each assignment and follow them closely. Sloppiness will cost you points.
8. Studying together and collaboration is encouraged. However, all the assignments you turn in should be your own writing or your teammates writing.
9. I and the TA will try to provide feedback on all written assignments within a week and I will try to respond to all emails within 24 hours on weekdays. Due to my own work schedule, I am not online 24x7, so I may not respond to email questions instantly. Please don’t expect me to answer any emails over the weekend or holidays.
10. Copying and cheating will be harshly reprimanded. See the next section and also the Student Handbook for the Academic Integrity Policy. Please read carefully the handout on plagiarism.
11. The Student Handbook specifies that students may not repeat a course more than once without prior permission of the Academics Standards Committee.
12. The final exam is scheduled by the administration as follows: Section 001 – Dec 12, 2024, 8 - 10 am.

Section 002 – Dec 12, 2024, 3-5 pm.

## **Academic Integrity Policy**

COSC 336 has very strict rules about academic integrity and student collaboration on all assignments.  Cases of academic dishonesty will be dealt with *severely*.  If your graded work is found to be "substantially similar" to that of another student (except of course if both students are on the same team, and ``graded work” refers to a team assignment/project), both you and the other student will receive a **grade of 0** for that assignment and will be reported to the Office of Student Conduct. Furthermore, all parties concerned will have their prior assignments/quizzes/tests more closely examined for cheating. A second incident will result in a grade of **‘F’** for the semester. Academic misconduct is unacceptable and will result in disciplinary action, including suspension or dismissal.

Students are responsible members of the academic community. You are therefore obligated not to violate the basic standards of integrity. You are also expected to take an active role in encouraging other members of the community to respect those standards. Should you have reason to believe that a violation of academic integrity has occurred, you are encouraged to make the suspicion known to a member of the faculty or University administration.

The [University's Academic Integrity Policy](https://www.towson.edu/about/administration/policies/documents/polices/03-01-00-student-academic-integrity-policy.pdf) is published in the Towson University Undergraduate Catalog and is available online at the web site of [Student Affairs](https://www.towson.edu/studentaffairs/policies/).

Academic dishonesty specifically includes acts of plagiarism, fabrication and falsification, cheating, abuse of academic materials, and dishonesty, but also includes helping other students commit acts of academic dishonesty by allowing them to obtain copies of your work. In short, all submitted work must be your own.

The following are some examples of academic misconduct that are not tolerated and will be reported:

* Unauthorized communication of information during a quiz or exam
* Sharing assignments/quizzes/exams information before, during, or after the deliverable in written, electronic, video, or verbal form.
* Copying someone else’s work
* Giving (or receiving) a detailed explanation of a solution
* Looking at someone else’s solution on their screen, with/without their permission
* Two (or more) people writing a single solution to an assignment (unless team work specifically assigned)
* Collaborating with someone who is not a current student in this class (this includes siblings, parents, and students from past semesters.)
* Using a substitute to take an exam
* Helping or attempting to help another student commit an act of academic misconduct.
* Lack of truthfulness or sincerity when interacting with the faculty member regarding an academic exercise.
* Re-using work submitted in previous or other classes.
* Using solutions manuals, providing exam and assignment questions to student websites or using such a website to complete an assignment and/or exam (including free or pay websites that maintain textbook and/or instructor solutions).
* Looking for solutions or help online. Using any code available on the internet/web or any other source.
* Purchasing online solutions (this includes paying a tutor to help solve your assigned work or hiring any online service to complete an assignment/quiz/exam for you.)
* Posting your implementation of any work on the internet/web.
* **NOTE:** It is quick and easy to do a web search on the text of an assignment/quiz/exam question and find web pages where students, tutors and even instructors, have posted solutions. To copy and paste these solutions into your assignment/quiz/exam is plagiarism. As a warning, this type of plagiarism is very easy to discover because I can easily perform the same web search. Also, I will use special software to check for cheating. The software is quite sophisticated and has surprised many students in the past.  There is no difficulty in comparing every pair of assignments, or comparing assignments submitted to other sections of this course (current or previous semesters), or code found online.

To clarify, copying or collaborating with other students or using external resources, including other people, on any type of assignments/quizzes/exams that are expressly designed to be completed individually is cheating.

During the semester, every graded work will assume your commitment to the following Honor Statement, as it describes the high standards to which everyone is held:

“I will not cheat, fabricate materials, plagiarize, or help another to undertake such acts of academic dishonesty, nor will I protect those who engage in acts of academic dishonesty.

I pledge on my honor as a student, that I have not received or provided any unauthorized help on this assignment/test/quiz.”

# Technology Use & Requirements

## Blackboard

* [Blackboard](http://blackboard.towson.edu.) is Towson’s Learning Management System.
* Complete the [browser check](https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support/Browser_Checker) to ensure your computer will be compatible with all Blackboard tools.
* The [Blackboard App](https://www.blackboard.com/mobile-learning/blackboard-app.html) gives students and instructors access to their courses, content and organizations. Available in your phone's market place.
* View [Blackboard help resources](http://www.towson.edu/technology/training/blackboard/students.html) for students (e.g., tutorials) to get started.
* Students should call Blackboard support if they are experiencing issues: 410-704-5151 (Choose Option 1, then Option 5)

## WebEx

* [WebEx Meetings](https://towson.webex.com/) is a web-based collaborative technology service that allows users to share resources (documents, desktop, web browser, applications, etc.) remotely and communicate with each other using voice, video and text chat. Participants must have a headset with a microphone, or speakers with a microphone.
* [Quick Reference Guide](https://www.towson.edu/technology/training/resources/webconferencing/webex/documents/wx51-webex-quick-reference-guide-reformatted.pdf)

## Technical Support

* The Office of Technology Services (OTS) has a limited number of laptops to loan to students whose personal computers are unable to run Blackboard, WebEx, Zoom or applications required by the curriculum. The Towson University Foundation has created the Student Emergency Fund, which has some funds available to assist students in purchasing hotspots, upgrading home internet, and other necessary technologies. For more information, see their[website](https://www.towson.edu/studentaffairs/care/student-emergency-fund.html)*.*
* [Student Computing Services](http://www.towson.edu/scs) (SCS) is your campus resource for technology questions including Blackboard. You can [email SCS](mailto:scs@towson.edu), call them at 410-704-5151, chat in the lower right corner of any SCS webpage, text at 410-324-7271, or [submit a service request](http://techhelp.towson.edu/). You may also visit the Student Computing Services labs in Cook 35 and Towson Run 123.
* If you attempt to access Blackboard and it is unavailable beyond a scheduled maintenance, please view the [OTS Alerts](http://wp.towson.edu/otsalerts) to find out further information about the system outage.
* Students should also use the CIS-TechHub SharePoint site for connectivity and software help: [CIS-TechHub](https://tu.sharepoint.com/sites/cis-techhub/SitePages/Home.aspx). The CIS-TechHub web site provides specific instructions for connecting with lab admins and tutors, installing development environments, connecting to database engines, downloading and running VMs, connecting to the Virtual Workspace "CIS developer’s desktop", and accessing other course resources for Windows, Linux, and MacOS. The lab admins are using the "Discord" service to respond to student’s technical questions and to share the screen to step through setup processes. The Discord CIS-TechHub server link is: <https://discord.gg/aRUhZcg>

# Student Support Services & Resources

## Tutoring

* [CIS tutoring](https://www.towson.edu/tutoring-learning/course-support/tutoring/computer-science.html) (online using Blackboard Collaborate Ultra)
* CIS [drop-in tutoring](https://tu.sharepoint.com/sites/CIS-techHub/Shared%20Documents/Drop-in%20Tutoring/cis-drop-in-tutoring-on-blackboard.pdf) on Blackboard (self-enrollment)

## Academic Advising

* The mission of the [Academic Advising Center (AAC)](https://www.towson.edu/academicadvising/) is to ensure that informed, effective, and easily accessible [academic advising](http://www.towson.edu/academicadvising/intentionaladvising/index.asp), which addresses individual needs and interests, is available to every undergraduate student at Towson University. Students who have questions about changing majors or have an Academic Warning Hold on their account should contact AAC: email [advising@towson.edu](mailto:advising@towson.edu) or call 410-704-2472
* FCSM Academic Advisor (Denise McGill): Students who are struggling academically, have repeatedly missed advising sessions, or need additional academic resources should contact Denise McGill: email [dmcgill@towson.edu](mailto:dmcgill@towson.edu) or call 410-704-3027
* Questions about your major: email [CISAdvising@towson.edu](mailto:CISAdvising@towson.edu)