

# Course Syllabus

## CS575: Design & Analysis of Algorithms

### Spring 2025

#### **Instructor and Teaching Assistants**

**Instructor:** Weiyang Dai

**Office:** N18, Engineering Building

**Lecture hours:** 10:50am – 11:50am (MWF)

**Office hours:** 9:30am – 10:30am on Monday & Wednesday, or by appointment

**Office hours zoom link:** <https://binghamton.zoom.us/j/91740175822>

**Email:** [wdai@binghamton.edu](mailto:wdai@binghamton.edu)

**Webpage:** <http://www.cs.binghamton.edu/~wdai>

**Research interests:** Brain Mapping, Biomedical Image Processing, Clinical Application of Medical Imaging, Neuroimaging, Blood flow imaging, Pattern Recognition, Computer Vision, Information Retrieval

#### **Teaching assistants:**

Yakun Zhang

**Office:** N00, Engineering Building

**Office hours:** 4:00pm – 6:00pm Thursday or by appointment

**Office hour zoom link:** <https://binghamton.zoom.us/j/7477594084>

**Email:** [yzhan401@binghamton.edu](mailto:yzhan401@binghamton.edu)

#### **Course Description**

Analysis and comparison of algorithms for sorting, searching, processing strings, trees, graphs and networks. Algorithm design strategies: divide and conquer, dynamic, greedy, back tracking, branch and bound, introduction to NP-completeness.

#### **Credit Hours and Contact Hours**

- Credit hours: 3
- Contact hours: 3
- This course is a 3-credit course, which means that in addition to the scheduled meeting times, students are expected to do at least 6.5 hours of course-related work outside of class each week during the semester. This includes time spent completing assigned readings, studying for tests and examinations, preparing written assignments, completing programming projects, and other course-related tasks.

#### **Learning Objectives**

This course is designed to build a solid foundation in designing and analyzing algorithms. In particular, upon successful completion of this course, you will be able to:

- Learn how to formulate a problem (Understand a real-world problem and translate it into a computational problem)

- Learn how to choose an appropriate approach to design an efficient algorithm to solve the problem
- Learn how to design an algorithm
- Learn how to analyze algorithms and compare their time complexity

### **Prerequisites**

- CS375 or equivalent (undergraduate algorithms and data structures)

### **Relationship to ABET**

- N/A

### **Text Book & Lecture Notes**

- Richard Neapolitan and Kumarss Naimipour, Foundations of Algorithms, 5th edition (ISBN: 978-1284049190)
- Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithm", McGraw-Hill, 2009.
- S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, "Algorithms", available at <http://higher.ed.mheducation.com/sites/0073523402/index.html>
- Lecture Notes (PowerPoint Slides) will be posted in the course folder on Brightspace

### **Main Topics**

- Time Complexity Analysis and Growth Functions
- Divide and Conquer
- Dynamic Programming
- Greedy Algorithms
- Backtracking
- Branch and Bound
- Hashing
- Theory of NP
- Parallel Algorithms (if time permits)

### **Assignments**

- Four Theoretical Homework Assignments: Each homework assignment consists of a set of questions whose solution require the understanding of algorithm design and algorithm complexity analysis.
- Four Programming Assignments: You will create programs by applying the algorithm designing approaches to solve several real-life problems using C/C++ or Java.
- Quizzes: Each quiz consists of multiple-choice questions to check your understanding of basic concepts on algorithm design and algorithm analysis.

### **Grading**

Your grade will be based on

- Four Theoretical Homework Assignments: 20%
- Quizzes & Attendance: 5% (each)
- Midterm: 25%
- Final: 25%
- Four Programming Assignments (implemented in C/C++/Java): 20%
- All late homework and projects will be penalized 10% per day (including weekends and holidays) and no assignment will be accepted, if it is more than 3 days late. Sometimes no late assignment will be accepted.
- Neither the TA nor instructor will debug or review your code.
- If re-grading is requested, the entire assignment, project, or exam will be re-graded. As a result, your grade may decrease, increase, or stay the same.
- The Final Exam will primarily cover the materials that were not covered in the Midterm Exam. However, for the Final Exam, even if we do not explicitly test the materials covered by the Midterm Exam, we expect that you can recall and utilize the most fundamental and important information introduced in earlier chapters. You must take each exam during the one time that we give it; we will not give makeup exams unless there is a very compelling reason.

### **Program grading**

- You will get a grade of at most 10% if your code does not compile. If the program compiles but it has runtime errors or bugs, your grade will be based on the severity of the bugs.
- Please make every effort to program and debug your code on your own. Use gdb, valgrind, IDE debuggers, and other tools. Use Google to learn about compiler and runtime error messages. Consult [stackoverflow.com](http://stackoverflow.com) and other useful programming websites. As a last resort, please email questions to TA or visit office hours. We may ask for output from debuggers and we may or may not decide to help push you in the right direction toward solving your programming problem. We will do whatever we think will help you become an excellent independent programmer, not what we think will help you get the program done most quickly. Please begin your assignments early and expect to encounter challenges.
- Late assignments may sometimes be accepted with penalty, which will be 10% per day late. We will not accept assignments more than 2 days after the due date.

### **Grading disputes and missing grades**

- In this course, we commonly give partial credit to partially correct answers. Should you dispute a partial credit, please be aware that we will not re-grade a single question in a homework, quiz or exam. ALL partial credits of the work will be re-examined. The new grade may be higher, lower, or stay the same.
- Your grades will be posted on Brightspace. Please check your status on Brightspace periodically and make sure that there are no missing grades or errors. A missing grade at the end of the semester will indicate that the work has NOT been done.

### **Basis of Grade Determination**

The final grade for this course is largely based on your performance relative to the performance of other students in the class. As a reference, the approximate breakdown of grades from a previous class is summarized into the following table:

| Grade | Overall Score              |
|-------|----------------------------|
| A     | $\geq 90$                  |
| A-    | $\geq 85 \text{ \& } < 90$ |
| B+    | $\geq 80 \text{ \& } < 85$ |
| B     | $\geq 75 \text{ \& } < 80$ |
| B-    | $\geq 70 \text{ \& } < 75$ |
| C+    | $\geq 67 \text{ \& } < 70$ |
| C     | $\geq 64 \text{ \& } < 67$ |
| C-    | $\geq 60 \text{ \& } < 64$ |
| D     | $\geq 55 \text{ \& } < 60$ |
| F     | $< 55$                     |

### **Academic Honesty Expectations**

Please review the academic honesty document and make sure that you understand it! The link is at: <http://www.binghamton.edu/watson/about/honesty-policy.pdf>. Cheating and copying will NOT be tolerated.

- Each programming or theoretical assignment should start with the following statement:  
 “I have done this assignment completely on my own. I have not copied it, nor have I given my solution to anyone else. I understand that if I am involved in plagiarism or cheating I will have to sign an official form that I have cheated and that this form will be stored in my official university record. I also understand that I will receive a grade of **0** for the involved assignment for my first offense and that I will receive a grade of **“F” for the course** for any additional offense.”
- Each exam and quiz will have a first page with the following statement:  
 “I understand that if I am caught copying or talking during the exam/quiz I will have to sign an official form that I have cheated and that this form will be stored in my official university record. I also understand that I will receive a grade of 0 for the involved exam/quiz.”

Your homework assignment, quiz or exam will not be graded unless the statement above is followed by your signature.

### **Collaboration on Assignments**

Students are encouraged to help one another and to form study groups. In Computer Science, you

can learn more from your peers than from your instructors and teaching assistants. As long as the help is appropriate, please be generous with your time and expertise when helping fellow students. Doing so is good for you and good for them. You are free to discuss assignments in general terms with one another. However, please do not show your work directly to other students. Each student must complete your assignments individually (unless indicated otherwise by the instructor). Each of you must write your own code, and you must write up all solutions individually. Students submitting solutions (including code) that are determined to be “too similar” are likely to be punished equally and harshly. We can tell whether you have done the work on your own, so please do the work on your own.

### **Managing Stress**

If you are experiencing undue personal or academic stress at any time during the semester or need to talk with someone about a personal problem or situation, I encourage you to seek support as soon as possible. I am available to talk with you about stresses related to your work in my class. Additionally, a wide range of campus resources is available to provide help, including:

- Dean of Students Office: 607-777-2804
- University Counseling Center: 607-777-2772
- Interpersonal Violence Prevention: 607-777-3062
- Office of International Student & Scholar Services: 607-777-2510

### **Class Attendance**

Attendance is required and attendance will be checked regularly. If you are not present when attendance was checked it will be counted as missing the class. If you arrive late to a quiz you will not be able to take it. You may miss a total of three classes without a verifiable valid excuse. After that your final grade will be reduced 5% for each missing class. If you miss six or more additional (beyond three) classes you automatically fail the class. Please inform the instructor ahead of time by email for any expected or excused absence. You may not “make up” a class by attending the other section; we will take attendance only for our own section.

### **Computers and Other Electronic Devices**

You are allowed to use your laptop/notebook/tablet computers to take notes only (not for any other purposes) during class. Cell phones must be turned off or in vibrate alert mode during class.