



**Computer Science EN.601.433/633  
Introduction to Algorithms  
Fall 2020 (3 credits, EQ)**

**Instructor**

Professor Michael Dinitz, [mdinitz@cs.jhu.edu](mailto:mdinitz@cs.jhu.edu), <https://www.cs.jhu.edu/~mdinitz/>  
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**Teaching Assistant**

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Office: TBD  
Office hours: posted on course webpage

**Meeting**

Tuesday, Thursday 12:00–1:15 pm, <https://wse.zoom.us/j/97254488127>

**Textbook**

Required: Cormen, Leiserson, Rivest, and Stein, *Introduction to Algorithms, Third Edition*, MIT Press (2009).

**Online Resources**

Course webpage: <http://www.cs.jhu.edu/~mdinitz/classes/IntroAlgorithms/Fall2020/>  
Online discussion: <http://piazza.com/jhu/fall2020/601433633>  
Homework submission and grading: Gradescope (<https://gradescope.com>). Entry code: 9RP8X4.

**Note:** Please use your six-character JHU ID as your ID when you sign up for Gradescope, rather than your JHED ID. This makes grading significantly easier.

**Course Information**

- This course concentrates on the design of algorithms and the rigorous analysis of their efficiency. Topics include the basic definitions of algorithmic complexity (worst case, average case); basic tools such as dynamic programming, sorting, searching, and selection; advanced data structures and their applications (such as union-find); graph algorithms and searching techniques such as minimum spanning trees, depth-first search, shortest paths, design of online algorithms and competitive analysis.
- **Prerequisites**  
Data Structures (EN.601.226 or equivalent)  
Discrete Mathematics (EN.550.171 or equivalent) OR Automata and Computation Theory (EN.601.231 or equivalent)

- **Required, Elective or Selective Elective**

### **Course Goals**

Specific Outcomes for this course are that

- Students will learn the basic definitions of algorithmic complexity, and how to analyze the complexity of algorithms.
- Students will learn basic algorithmic tools used to design efficient algorithms.
- Students will learn how to design efficient algorithms and to recognize situations where this is not possible.

This course will address the following Criterion 3 Student Outcomes

Graduates of the program will have an ability to:

- (1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- (2) Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- (3) Apply computer science theory and software development fundamentals to produce computing-based solutions.

### **Course Topics**

- Basic definitions of algorithmic complexity (worst case, average case).
- Basic tools such as dynamic programming, sorting, searching, and selection.
- Advanced data structures and their applications (such as union-find).
- Graph algorithms and searching techniques such as minimum spanning trees, depth-first search, and shortest paths.
- Design of approximation and online algorithms.

### **Course Expectations & Grading**

There will be 8 homework assignments (approximately one each 1.5 weeks), each of which will be worth 6.25% of your grade. You will be allowed 120 late hours (equivalent to 5 late days) for the semester without penalty. Gradescope keeps track of your total late time. Homeworks turned in with no remaining late days will not be accepted (and will be scored as a 0). Exceptions and extensions can be given in exceptional circumstances; please contact the course instructor to discuss your circumstances.

There will also be one take-home midterm and a final exam. Grades will be calculated as follows:

Homeworks: 50%

Midterm: 15%

Final exam: 35%

This class will be graded on a curve, but not a strict one. That is, the correspondence between numeric and letter grades will be determined by the final distribution of numeric grades, but there is no specific letter grade distribution that will be targeted.

You are free to work on the homework in groups of up to 3, but you must write up your solutions entirely on your own. That is, collaboration is limited to discussing the problem, and does not include writing down the solution. Please list the members of your group on your submission, which must be submitted as a typeset (*not* handwritten) PDF using Gradescope.

## Key Dates

Midterm: TBD

Final Exam: TBD

These dates are subject to change. If they do change, new dates will be announced online and in class.

## Assignments & Readings

These will be posted on the course webpage.

## Ethics

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful, abiding by the *Computer Science Academic Integrity Policy*:

Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.

Academic honesty is required in all work you submit to be graded. Except where the instructor specifies group work, you must solve all homework and programming assignments without the help of others. For example, you must not look at anyone else's solutions (including program code) to your homework problems. However, you may discuss assignment specifications (not solutions) with others to be sure you understand what is required by the assignment.

If your instructor permits using fragments of source code from outside sources, such as your textbook or on-line resources, you must properly cite the source. Not citing it constitutes plagiarism. Similarly, your group projects must list everyone who participated.

Falsifying program output or results is prohibited.

Your instructor is free to override parts of this policy for particular assignments. To protect yourself: (1) Ask the instructor if you are not sure what is permissible. (2) Seek help from the instructor, TA or CAs, as you are always encouraged to do, rather than from other students. (3) Cite any questionable sources of help you may have received.

On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials or device. [Signed and dated]". Your course instructors will let you know where to find copies of old exams, if they are available.

In addition, the specific ethics guidelines for this course are:

- (1) Homeworks may be done in groups of up to three, but you must list your group members on the first page of your submission.
- (2) On all assignments each person should hand-in their own writeup. That is, collaboration should be limited to talking about the problems, so that your writeup is written entirely by you and not copied from your partner. In addition, list all members of your group.
- (3) While you are allowed to use outside resources to help your understanding and knowledge of course material, you *must not* go looking for outside resources to get answers for homework questions.

That is, you can look up concepts that you do not understand, but you cannot simply go looking for solutions.

- (4) Moreover, you are not allowed to upload, download, or access solutions to homework or exam questions, *including homeworks or exams from previous semesters that are not explicitly released by the instructor*. In particular, you are not allowed to get old tests from other students or use “backtest” websites, Chegg, Course Hero, etc.

Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- For undergraduates:  
<http://e-catalog.jhu.edu/undergrad-students/student-life-policies/>
- For graduate students:  
<http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/>

### **Personal Wellbeing**

- If you are sick please notify me by email so that we can make appropriate accommodations should this affect your ability to attend class, complete assignments, or participate in assessments. The Student Health and Wellness Center is open and operational for primary care needs. If you would like to speak with a medical provider, please call 410-516-8270, and staff will determine an appropriate course of action based on your geographic location, presenting symptoms, and insurance needs. Telemedicine visits are available only to people currently in Maryland. See also <https://studentaffairs.jhu.edu/student-life/student-outreach-support/absences-from-class/illness-note-policy/>
- The Johns Hopkins COVID-19 Call Center (JHCCC), which can be reached at 833-546-7546 seven days a week from 7 a.m. to 7 p.m., supports all JHU students, faculty, and staff experiencing COVID-19 symptoms. Primarily intended for those currently within driving distance of Baltimore, the JHCCC will evaluate your symptoms, order testing if needed, and conduct contact investigation for those affiliates who test positive. More information on the JHCCC and testing is on the coronavirus information website.
- All students with disabilities who require accommodations for this course should contact me at their earliest convenience to discuss their specific needs. If you have a documented disability, you must be registered with the JHU Office for Student Disability Services (385 Garland Hall; 410-516-4720; <http://web.jhu.edu/disabilities/>) to receive accommodations.
- Students who are struggling with anxiety, stress, depression or other mental health related concerns, please consider connecting with resources through the JHU Counseling Center. The Counseling Center will be providing services remotely to protect the health of students, staff, and communities. Please reach out to get connected and learn about service options based on where you are living this fall at 410-516-8278 and online at <http://studentaffairs.jhu.edu/counselingcenter/>.
- Student Outreach & Support will be fully operational (virtually) to help support students. Students can self-refer or refer a friend who may need extra support or help getting connected to resources. To connect with SOS, please email [deanofstudents@jhu.edu](mailto:deanofstudents@jhu.edu), call 410-516-7857, or students can schedule to meet with a Case Manager by visiting the Student Outreach & Support website and follow [?Schedule an Appointment?](#).

### **Classroom Climate**

I am committed to creating a classroom environment that values the diversity of experiences and perspectives that all students bring. Everyone here has the right to be treated with dignity and respect. I believe fostering an inclusive climate is important because research and my experience show that students who interact with peers who are different from themselves learn new things and experience tangible educational outcomes.

Please join me in creating a welcoming and vibrant classroom climate. Note that you should expect to be challenged intellectually by me, the TAs, and your peers, and at times this may feel uncomfortable. Indeed, it can be helpful to be pushed sometimes in order to learn and grow. But at no time in this learning process should someone be singled out or treated unequally on the basis of any seen or unseen part of their identity.

If you ever have concerns in this course about harassment, discrimination, or any unequal treatment, or if you seek accommodations or resources, I invite you to share directly with me or the TAs. I promise that we will take your communication seriously and to seek mutually acceptable resolutions and accommodations. Reporting will never impact your course grade. You may also share concerns with the Department Head (Randal Burns, [randal@cs.jhu.edu](mailto:randal@cs.jhu.edu)), the Director of Undergraduate Studies (Joanne Selinski, [joanne@cs.jhu.edu](mailto:joanne@cs.jhu.edu)), the Assistant Dean for Diversity and Inclusion (Darlene Saporu, [dsaporu@jhu.edu](mailto:dsaporu@jhu.edu)), or the Office of Institutional Equity ([oie@jhu.edu](mailto:oie@jhu.edu)). In handling reports, people will protect your privacy as much as possible, but faculty and staff are required to officially report information for some cases (e.g. sexual harassment).

### **University Policy on Incompletes**

The university recognizes that the Fall 2020 semester is surrounded with uncertainty and many students may find themselves in unexpected situations where study is difficult if not impossible. Students who are confronted with extraordinary circumstances that interfere with their ability perform their academic work may request an incomplete grade from the instructor. While approval of such a request is not automatic, it is expected that faculty will make every effort to accommodate students dealing with illness in the family and other pandemic-related hardships. The instructor and student must establish a timetable for submitting the unfinished work with a final deadline no later than the end of the third week of the Spring 2021 semester (February 12, 2021). Exceptions to this deadline require a petition from the instructor to the student's academic advising office by February 12, 2021. When entering an Incomplete grade in SIS, faculty must include a reversion grade which represents the grade the student will receive if s/he does not complete the missing work by the agreed-upon deadline.

### **Deadlines for Adding, Dropping and Withdrawing from Courses**

Students may add a course up to September 11, 2020. They may drop courses up to October 12, 2020 provided they remain registered for a minimum of 12 credits. Between October 12 and November 13, 2020, a student may withdraw from a course with a W on their academic record. A record of the course will remain on the academic record with a W appearing in the grade column to indicate that the student registered and then withdrew from the course.

For more information on these and other academic policies, see <https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/undergraduate-policies/academic-policies/grading-policies/>