

# CS 325-400 Analysis of Algorithms

4 credits

Spring 2020

**OSU catalog course description including pre-requisites/co-requisites:** Recurrence relations, combinatorics, recursive algorithms, proofs of correctness. **Pre-requisites:** CS 261 and (MTH 231 or CS225)

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**Textbook:** *Introduction to Algorithms* by Cormen, Leiserson, Rivest, Stein, 3<sup>rd</sup> Edition.

**Canvas:** Announcements, office hours, weekly homework assignments, group activities, readings and other course information will be placed on Canvas. For technical assistance see <http://ecampus.oregonstate.edu/services/technical-help.htm>

## **Course Content:**

- Analyzing algorithms for the correctness and running time.
- Divide and Conquer and the use of recurrences to analyze recursive algorithms.
- Dynamic Programming
- Greedy Algorithms
- Linear programming
- NP-Completeness
- Heuristics and Approximation Algorithms

## **Measurable Student Learning Outcomes:**

After this course, students will be able to:

1. Use  $O$ ,  $\Omega$ ,  $\Theta$  and simple recurrences to analyze the time complexity of iterative and recursive algorithms.
2. Prove the correctness of algorithms.
3. Implement recursive, iterative and heuristic algorithms.
4. Prove that a problem is NP-complete using reductions.

## **Course Policies:**

**Makeup Exams** – Makeup exams take a considerable effort to schedule, so they will not be given under normal circumstances. Any requests for makeup exams must occur in the first week of classes to be considered.

**Incompletes** – In this online program, there will rarely be cases where an incomplete is appropriate. Giving an incomplete grade will be only considered for emergency cases such as a death in the family, significant disease, or childbirth, while also having a passing grade. If you have a situation that may prevent you from completing the coursework, let the instructor know as soon as you can.

**Grade Evaluation:** Scores for coursework items will be posted on Canvas as they are graded. Feedback will be provided when available. Your course grade will be based on the following:

Homework	40%
Group Discussion	5 %
Quizzes	15%
Mid-term Exam	15%
Final Exam	25%

### **Homework Assignments:**

There are eight individual homework assignments. The assignments are a combination of *written problems* and short *programming exercises*. The written solutions are submitted to Canvas, and the code is submitted to TEACH **by 11:59 pm** on the due date (generally Sunday). Programs can be written in C, C++ or Python, but all code must run on the OSU Engr servers. With each code submission to TEACH, you must include a README file that explains how to compile/run the code.

### **Grading Policies:**

- 1) Assignments that are not neatly written up using a word processor/text editor will not be graded.
- 2) If the README file is missing or the code does not compile or run according to the instructions provided, you will receive a 0 for the programming portion of the assignment.
- 3) Homework submitted up to 24 hours late will receive a 10% penalty.
- 4) Any **disagreement in scoring** must be addressed within one week of the work being graded. All questions about grading must be placed in the "Assignment Comments" section of the Canvas submission for that assignment. If a response to your comment is not posted within 48 hours, you can email your TA requesting that they review the comments.

Note: Your lowest homework score will be dropped.

### **HW Group Discussion:**

Students will be randomly placed into Homework Group Discussion on Canvas of 7 - 10 students to discuss the homework problems and other discussion questions (not submitted for grading). For each discussion topic (such as Homework 1), students will be graded on a 0 to 3 scale. To receive a 3/3 score, a student must contribute to the discussion in a "meaningful way" by submitting at least three posts on at least two different days. The discussion group is the first place to go to get help on homework.

### **Quizzes:**

There are eight weekly quizzes. The quizzes are open book/notes. Each quiz consists of 5-10 multiple choice, T/F, fill-in the blank type of questions. The quizzes are due on Saturday at 11:59 pm. **No late** quizzes or extensions are allowed. However, your low quiz score will be dropped.

**Exams:**

There are two exams for this course, a mid-term exam in Week 5 and the final exam in Week 10. You will have 110 minutes to complete each exam.

**REMINDER:** A passing grade for classes in CS is a C or above. A C- in a CS course is not considered a passing grade toward a CS degree.

**Grading Scale:**

Grade	Average
A	93 or greater
A-	90 - 92
B+	87 - 89
B	83 - 86
B-	80 - 82
C+	77 - 79
C	73 - 76
C-	70 - 72
D+	67 - 69
D	63 - 66
D-	60 - 62
F	less than 60

**Students With Disabilities:**

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

**Expectations for Student Conduct:**

**Academic Integrity:** Students in academic studies are expected to demonstrate their own knowledge and capabilities. This means that a student will be graded on the work that is clearly their own work and that additional materials will be excluded from consideration of the grading of that submission. Work that is not created by the student or cited by the student, but still submitted will be considered plagiarized material and may result in a failed submission and may result in administrative action.

- You may openly discuss the presented learning materials and participation category materials at any time with any party as long as they explicitly know that it is for an academic assignment.
- You may openly discuss the demonstration category of coursework and exams category of coursework after grading of the item is complete with any party as long as they explicitly know that it is an academic assignment and that the discussion is accompanied by an explanation of any materials presented.

- You may openly discuss the meaning of assignments, general approaches, and strategies with other students in the course; you may do this even before the grading date of the assignment has passed.
- You may (and should) use the Internet and other resources to research how to solve a problem, and you should share what you find for others in the course to learn from, but be sure to cite your sources!
- You may share source code, but only if an explanation accompanies it on how each piece of code works.
- You **MUST** include a citation in the form of a comment in your source code to indicate the source of any help you received (otherwise you will be claiming that you authored the work, and that is unfair and possibly a misrepresentation of your own direct skills); you should do this even if the source is an instructor or TA. This means that a citation will save you from most situations that may get you in trouble with plagiarism, but that we will exclude any work by others from grading consideration.
- You **MUST** write your own code for your assignments; this means that you should take notes on anything you do with others and use your notes instead of any shared code when working on the assignments at hand. If you cite your sources, then instead of confronting you about possible plagiarism, we will grade you based on the work that you authored.

**In this online program, we want to encourage collaboration and building upon the work of others in an honest way. This means that instead of strictly disallowing working with others (or their work), we will primarily be using your exams as a gauge of your individual work and the other coursework (lectures, assignments, quizzes, and homework discussions) should be viewed as preparatory material for the exams.**

We may use plagiarism-detection software to check your code against other code-bases, reduce the likelihood that we will use these tools by citing your sources and recreating the desired behavior by recreating the code you learn from (in the very least it will give you more practice)!

If you are found in violation of any of the above policies, whether you are the giver or the receiver of non-cited help, you may be given a zero on the assignment, failed from the course, or receive higher administrative action. The academic dishonesty charge will be documented and sent to your school's dean and the Office of Student Conduct.

**EECS Code Sharing Policy webpage:** <http://eecs.oregonstate.edu/online-cs-students/current-students/class-resources/policies>

## **Communications:**

### **Ground Rules for Online Communication and Participation:**

- Online threaded discussions are public messages, and all writings in this area will be viewable by the entire class or assigned group members. If you prefer that only the instructors see your communication, then use email, and be sure to identify yourself and identify the class in the subject line.
- Posting of personal contact information is discouraged (e.g. telephone numbers), but not forbidden.
- Online Instructor Response Policy: We will check email somewhat frequently and will respond to course-related questions within 48 hours if possible. For the fastest response, use email.
- Observation of “Netiquette”: All your online communications need to be composed with fairness, honesty and tact. Spelling and grammar are very important in an online course. What you put into an online course reflects on your level of professionalism.
- Check the Announcements area (Announcements in Canvas and the #announcements channel in Slack) and the course syllabus before you ask general course “housekeeping” questions (i.e. how do I submit assignment 3?).

### **Guidelines for a productive and effective online classroom**

- This program strives to prepare students for careers in computer science, which includes preparing students to communicate professionally. Therefore, students in this class are expected to communicate professionally in discussion forums, email messages and all communications for this course. Critiques, disagreements, problems, or other topics of a sensitive nature can be addressed but should be addressed civilly and professionally. If a student's communications become unprofessional, disruptive, abusive, inflammatory, or if they otherwise obstruct the learning process of the class, the instructors may restrict the student from participating in the electronic forums associated with the class and notify Ecampus and the OSU Office of Student Conduct and Community Standards. Productive learning communities and workplaces depend on civil, professional discourse. We hope that this policy strengthens your learning community and prepares you for the professional workplace.
- The discussion board is your space to interact with your colleagues related to current topics or responses to your colleague’s statements. It is expected that each student will participate in maturely and respectfully.
- Participate actively in the discussions, having completed the readings and thought about the issues.
- Pay close attention to what your classmates write in their online comments. Ask clarifying questions, when appropriate. These questions are meant to probe and shed new light, not to minimize or devalue comments.
- Think through and reread your comments before you post them.
- Assume the best of others in the class and expect the best from them.
- Value the diversity of the class. Recognize and value the experiences, abilities, and knowledge each person brings to class.
- Disagree with ideas, but do not make personal attacks. Do not demean or embarrass others. Do not make sexist, racist, homophobic, victim-blaming, or other discriminatory comments at all.

### **Student Assistance: How to get assistance?**

- Your first line of assistance should be to take a break, skim through the book, lectures, notes, and the Internet. If you cannot find the answer yourself after some searching, you should then communicate with your fellow classmates.
- If you and your classmates cannot find a solution, then asking the TAs or instructor by discussion board.
- Traditional students form study groups for a reason; we strongly encourage you to find people to support you throughout the class and throughout the other classes that you take in our online program.
- We will have virtual office hours via Zoom.
- We have several methods of communicating, but we would prefer using a discussion board so that we can refer back to our previous discussions and citations and build upon our previous learning.
- If you have any issue with your exam, email the instructor and do not post it on any discussion board.

**Technical Assistance** – If you experience computer difficulties, need help downloading a browser or plugin, assistance logging into the course, or if you experience any errors or problems while in your online course, contact the OSU Help Desk for assistance. You can call (541) 737-3474, email [osuhelpdesk@oregonstate.edu](mailto:osuhelpdesk@oregonstate.edu) or visit the OSU Computer Helpdesk online. You can also clearly ask in discussion with the class, and we can try to work through it for the benefit of the class as well!

**Tutoring** – Effective fall term 2009, we went to a new online Tutoring Service - NetTutor to meet the needs of Ecampus students. NetTutor is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Students connect to live tutors from any computer that has Internet access. NetTutor provides a virtual whiteboard that allows tutors and students to work on problems in a real-time environment. They also have an online writing lab where tutors critique and return essays within 24 to 48 hours.

### **Course Evaluation:**

**OSU Student Evaluation of Teaching** – Course evaluation results are extremely important and are used to help us improve this course and the learning experience of future students. Results from the multiple-choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions through ONID. You will log in to "Student Online Services" to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.