Oregon State University
Ecampus

Course Name: ALGORITHMS: DESIGN, ANALYSIS, AND IMPLEMENTATION
Course Number: CS 514-400/401
Credits: 4
Instructor name: Samina Ehsan (ehsans@onid.oregonstate.edu)
Graduate Teaching Assistant Name and Contact Info: See Canvas

Explores sorting and selection algorithms including divide-and-conquer, quicksort/quick select, merge sort, binary search trees, memorization, heaps and heapsort, priority queues, hashed heaps; asymptotic complexity analysis including the Master equation, tree method; Dynamic Programming on sequences, graphs, trees, and intervals; Graph algorithms including breadth-first search, depth-first search, topological sort, shortest path, minimum spanning tree, network flow. NP-hard and NP-Complete problems and approximation algorithms.

Prerequisites or Corequisites
Knowledge of Data Structure and programming experience in a high level language (Python)

Communication
This course will be conducted via Canvas, Ed Discussion, Zoom and MS Teams.

- Within the course Canvas site you will access the learning materials, and syllabus; submit assignments, take quizzes/exams, get announcements from the instructors and receive your grades. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, Canvas and otherwise, see http://ecampus.oregonstate.edu/services/technical-help.htm.
- Ed Discussion site will be used as your online collaboration medium. You will be able to communicate with the instructors, graduate teaching assistants(GTAs), and your peers.
- Zoom and MS Teams will be the primary mode of conducting office hours by the Instructors and GTAs unless specified. At the beginning and end of each office hour session (whether or not it is held using MS Teams), the GTAs would put up a message on the MS Teams channel informing so. Your instructors also check MS Teams frequently outside their designated office hours so you can tag or DM them if required.
- Sending an email at ehsans@onid.oregonstate.edu is a preferred way only for a matter of a personal nature related to the course, or scheduling a meeting outside the fixed office hour timings, or if you haven't received a reply to your post/message on Ed Discussion/ MS Teams within 24 hours (please include the prefix CS514_40X_F23 in the subject). Please resend the email to the instructors if you haven't received a response within 24 hours.

Time Expectations

This course combines approximately 120 hours of instruction, online activities, and assignments for 4 credits.

Technical Assistance

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the Service Desk online.

Learning Resources

No specific textbook is required for the course. For a few sections, you would refer to the following resources. Additionally, you would use these resources for the optional readings.

- Introduction to Algorithms by Cormen, Leiserson, Rivest, Stein, 3rd Edition. The ebook is available at https://ebookcentral.proquest.com/lib/osu/detail.action?docID=3339142
- Algorithms by S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani (full text online via berkeley)
- Algorithm Design by Kleinberg and Tardos, The DP chapter is available at https://bohr.wlu.ca/hfan/cp412/16/notes/ch6.pdf and lecture slides online at https://www.cs.princeton.edu/~wayne/kleinberg-tardos/
- Algorithms by Jeff Erickson, 1st Edition.The ebook and lecture notes are available at http://jeffe.cs.illinois.edu/teaching/algorithms/
- The programming assignments needs to be submitted in Python language. Python language can be learnt or revised at: https://openbookproject.net/thinkcs/python/english3e/ or https://www.pythoncheatsheet.org/
- Python Tutorial by by Dr. Liang Huang (provided on Canvas)

Note: Check with the OSU Beaver Store for up-to-date information for the term you enroll (OSU Beaver Store website or 800-595-0357). If you purchase course materials from other sources, be very careful to obtain the correct ISBN.

Measurable Student Learning Outcomes

At the completion of the course, students will be able to …

- Describe classic algorithms for problems such as sorting, searching, and optimization and prove their correctness
- Analyze the complexity of algorithms

- Develop algorithms for new problems based on standard algorithmic schemas such as dynamic programming, greedy and divide-and-conquer
- Implement and test algorithms in a high level programming language
- Give simple proofs of NP-completeness

Evaluation of Student Performance

Scores for quizzes, assignments, and discussion grade will be posted on Canvas. If you want to know your grade, use the following weights:

- Homework Assignments 50%
- Quizzes 28%
- Discussion 2%
- Final Exam 20%

This course has one proctored exam - the final exam. You can find out more about proctoring at the central Ecampus page on tests and proctoring. The final exam window will run from 12:01 am Sunday, December 10, 2023 to 11:59 pm Saturday December 14, 2023. If you are unable to take the exam in that window, you must make arrangements prior to the end of the 2nd week of classes. Beyond this deadline, only emergency situations will be considered for alternate testing times. This course will use an automated online proctoring system called Proctorio, where your exam session is recorded for instructor review. You will not need to schedule proctoring appointments, and there is no cost to you to use Proctorio. Please note that a functioning webcam and microphone are required for using Proctorio. If you do not have these, you will need to locate and submit an alternative proctor through the exams and proctoring form and pay for any associated proctoring fees.

Letter Grade

We will use the following grading scheme to calculate the final grade:

Grade
100 >= A >= 92.5
92.5 > A- >= 89.5
89.5 > B+ >= 86.5
86.5 > B >= 82.5
82.5 > B- >= 79.5
79.5 > C+ >= 76.5
76.5 > C > 72.5
72.5 > C- >= 69.5
69.5 > D+ >= 66.5
66.5 > D >= 62.5
62.5 > D- >= 59.5
59.5 > F

REMINDERS:

- A passing grade for core classes in CS is a C or above. A C-, below 72.5, is not a passing grade for CS majors.
- Final grades will not be curved.

Course Content

Week	Topic	Reading Assignments	Learning Activities
1	Efficiency and Correctness of Algorithms	Readings and Videos in Canvas module Practice problems on Canvas	Required Assignment Introductory Discussion
2	Recursion, Recurrence Relations and Divide & Conquer	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Assignment Required Quiz
3	Heaps and Priority Queues	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Assignment
4	Graphs	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Assignment Required Quiz
5	Greedy Algorithms	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Assignment
6	Dynamic Programming	Readings and Videos in Canvas module Practice coding problems and practice quiz questions on Canvas Review materials from week 1-6 Explorations, videos, quizzes and assignments.	Required Assignment
7	Dynamic Programming	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Quiz
8	Network Flow and Linear Programming	Readings and Videos in Canvas module Practice coding problems and practice quiz on Canvas	Required Assignment

9	NP-completeness and Approximation Algorithms	Readings and Videos in Canvas module Practice problems and practice quiz on Canvas	Required Assignment Required Quiz
10	Review of Week 1-9	Practice coding problems and practice quiz on Canvas	
Finals	Final's Week	Review materials from all Explorations, videos, quizzes and assignments.	FINAL EXAM

Course Policies

Proctored Exams
This course requires that you take the final exam under the supervision of an approved proctor. Proctoring guidelines and registration for proctored exams are available online through the Ecampus testing and proctoring website.

Makeup Exams
Makeup exams will be given only for missed exams excused in advance by the instructor. Excused absences will not be given for airline reservations, routine illness (colds, flu, stomach aches), or other common ailments. Excused absences will generally not be given after the absence has occurred, except under very unusual circumstances.

Incompletes
Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don't wait until the end of the term; let me know right away.

Statement Regarding Religious Accommodation
Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs. It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the Religious Accommodation Process for Students.

Guidelines for a Productive and Effective Online Classroom
(Adapted from Dr. Susan Shaw, Oregon State University)
Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility. Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively,

civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.
- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

Expectations for Student Conduct

Student conduct is governed by the university's policies, as explained in the Student Conduct Code (https://beav.es/codeofconduct). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

Academic Integrity

Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University Ecampus students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness across the globe.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

You will find an entire module on academic integrity policies on Canvas. Please read the module carefully. The course-specific policies are given below:

- You **MAY** discuss the meaning of assignments, general approaches, and strategieswith other students in the course.

- You **MAY** show your work to the GTAs or instructor for feedback and help.

- You **MAY** use the Internet to research how to solve a problem.

- You **MUST** include a citation in the form of a comment in your homework to indicatethe source of any help you received (listing GTAs, the instructor, or the required textbook are not necessary).

- You **MUST ALSO** include a citation if you collaborated with any other student in anyway (both the giver and receiver). This means that you can give and accept assistance in the form of general advice and discussions, but not blatantly share your work or documentation. Also, you are encouraged to talk about the theory behind a homework question but not "how do/did I do problem 2c" with your peers.

- You **MAY NOT** share work documentation of any kind with any other student in thecourse.

- You **MAY NOT** show your work to another student in the course for any reason.

- You **MAY NOT** use or copy work from any other source, including the Internet.

- You **MUST** write your own work/code for your assignments.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a [tutorial on academic misconduct](), and you can also refer to the [OSU Student Code of Conduct]() and [the Office of Student Conduct and Community Standard's website]() for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Accessibility of Course Materials

All materials used in this course are accessible *with the exception of (list items that are not accessible)*. If you require accommodations please contact [Disability Access Services (DAS)]().

Additionally, Canvas, the learning management system through which this course is offered, provides a [vendor statement]() certifying how the platform is accessible to students with disabilities.

Tutoring and Writing Assistance

The College of Engineering (COE) offers a variety of academic support resources for students. There are remote tutoring services available through the COE by appointment anddrop-in. There are also tutoring services available through the College of Science. More information about these and other academic support services can be found on the COE's Academic Support website. For writing assistance, the Oregon State Online Writing Suite is a great resource for students enrolled in Ecampus courses. If you have additional tutoring needs, or have questions about these services, please contact Casey Patterson at casey.patterson@oregonstate.edu.

The Oregon State Online Writing Support is also available for students enrolled in Ecampus courses.

Ecampus Reach Out for Success

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success.

Ecampus students are always encouraged to discuss issues that impact your academic success with the Ecampus Success Team. Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals.

If you feel comfortable sharing how a hardship may impact your performance in this course, please reach out to me as your instructor. (Instructors: consider tailoring this statement to your personal voice.)

- **For mental health:**
  Learn about counseling and psychological resources for Ecampus students. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

- **For financial hardship:**
  Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

Academic Calendar

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: https://registrar.oregonstate.edu/osu-academic-calendar.

Student Learning Experience Survey

During Fall, Winter, and Spring term, the online Student Learning Experience surveys (formerly known as eSET) open to students the Wednesday of week 8 and close the Sunday before Finals Week. Students will receive notification, instructions and the link through their ONID email. They may also log into the system via Online Services. Survey results are extremely important and used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity for written comments) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.

I also hope to have a location on Ed Discussion for evaluation of the course, where any student will be able to, anonymously, make comments, requests, or suggestions in regardsto the design and implementation of the content of the course.