CS325 – Analysis of algorithms

Credits: 4

Instructor's name: Joseph Jess **Instructor's email: jessjo@eecs.oregonstate.edu**

OSU catalog course description, including pre-requisites/co-requisites:

Recurrence relations, combinatorics, recursive algorithms, proofs of correctness.
PREREQS: CS 261 and (MTH 232 or CS225)

Course content: Topics covered in the course include:

1) In the first half of this course we will study:
   a) **analyzing algorithms** for correctness and running time,
   b) **divide and conquer** and use **recurrence relations** to analyze recursive algorithms,
   c) **project 1** will involve implementing and analyzing iterative and recursive algorithms,
   d) the **midterm** will cover this earlier material,
2) In the second half the course we will be approaching much more difficult problems, we will study:
   a) **dynamic programming,**
   b) **linear programming,**
   c) **project 2** and **project 3** looking at these methods in more depth,
   d) then we will characterize the difficulty of problems by way of **NP completeness**.
   e) throughout the second half of the course, we will develop **heuristics** for solving the **travelling salesperson problem**,
   f) The **final** will mostly cover this later material,

Blackboard — This course will be delivered via Blackboard, your online learning community, where you will interact with your classmates and with me. Within the course Blackboard site you will access the learning materials, tutorials, and syllabus; discuss issues; submit assignments; take quizzes; email other students and the instructor; participate in online activities; and display your projects. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, Blackboard and otherwise, see http://ecampus.oregonstate.edu/services/technical-help.htm.

Measurable student learning outcomes:

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

1. **Use** O, Ω, Θ 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.

Learning resources:

- All learning materials will be made freely available on the course website.

Evaluation of student performance:

Scores for labs, quizzes, assignments, and exams will be posted on Blackboard as they are graded.

Grading

participation (approx. 10%)

projects – will be completed in groups of 2 or 3 (approx. 40%)
midterm exam (approx. 25%)
final exam (approx. 25%)

* REMINDER: A passing grade for core classes in CS is a C or above. A C-, 72 or below, is not a passing grade for CS majors.

* NOTE: Exams will be proctored, so you should schedule your exams as soon as possible. There is generally a small fee associated with exam proctoring. For more information please visit:
http://ecampus.oregonstate.edu/services/proctoring/

Projects

- Must be submitted in Blackboard **before 23:59 (Pacific Time Zone)** on the due date.
- Include a comment at the top of all of your assignments that contains your name and the names of anyone you worked with during the assignment.
- A project must be in a language that a TA or I can run, so if you plan to use a language, then you need to be sure that I can compile and run it.
    - This easily includes: Python 2, Python 3, Java, C, C++, Go, Matlab (but your code must work with a fairly small number of recursions (500 last I checked on our school server for the default settings))
    - You also need to be sure that the functions, methods, and libraries are ones I can easily get a copy of. This means you need to include the headers, the library, or other access to the functions you use that are non-standard! (**this is especially important for external libraries or non-Linux build environments since I will be running your code on a Linux desktop or a school's Linux server**)

Course Policies:

Makeup Exams – Exams take a considerable effort to schedule, so they will not be given under normal circumstances. If you learn about an event that may cause you to need to alter your exam scheduling, then contact me and any proctor as soon as you can so that accommodations can be attempted.

Incompletes — In this online program, there should rarely be a case where an incomplete is appropriate. I will only consider giving an incomplete grade for emergency cases such as a death in the family, major disease, or child birth, while also having completed at least 50% of all coursework. If you have a situation that may prevent you from completing the coursework, let me know as soon as you can.

Late work, extra credit, and coursework problems –

1. Late assignments will not be graded without consent of the instructor or a TA,
2. Your code must compile on OSU's servers or it may not get graded,
3. I **may** provide extra credit opportunities during the course, so you can make up lost points by proving you have mastered the topics after they were initially proposed or by showing that you are willing to learn new or advanced topics,
4. If you have a problem with a coursework grade, then you must contact your grader (or instructor if the TA is unresponsive) by email within **one** week of receiving your grade or your request will very likely be ignored.

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS) 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 541-737-4098.

If you have any emergency medical information let me know before the end of the first week of classes. If you have any personal difficulties that are not registered disabilities, then contact me so we can discuss your options.

Expectations for Student Conduct:

Student conduct is governed by the university's policies, as explained in the Office of Student Conduct: information and regulations.

In an academic community, students, faculty, and staff each have responsibility for maintaining an appropriate learning environment, whether online or in the classroom. Students, faculty, and staff have the responsibility to treat each other with understanding, dignity and respect. Disruption of teaching, administration, research, and other institutional activities is prohibited by Oregon Administrative Rule 576-015-0015 (1) and (2) and is subject to sanctions under university policies, OSU Office of Student Conduct.

Academic Dishonesty

The following three policies apply:
OSU policy: http://oregonstate.edu/studentconduct/achon.htm
College of Engineering policy: http://engr.oregonstate.edu/students/advising/policy.html#honesty
CS policy: http://eecs.oregonstate.edu/undergraduate/cs/dishonesty.html

- You **MAY** discuss the meaning of assignments, general approaches, and strategies with other students in the course.
- You **MAY** show your work to the TAs 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 indicate the source of any help you received (listing TAs, the instructor, or the required textbook are not necessary).
- You **MUST ALSO** include a citation if you collaborated with any other student in any way (both the giver and receiver).
- ~~You **MAY NOT** share work, pseudocode, or documentation of any kind with any other student in the course that is not in your assigned group.~~
- ~~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.~~
- Groups **MUST** write your own work for your projects.

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

We may use plagiarism-detection software check your work against the work from other students. It is quite sophisticated and can easily see through variable name changes and formatting differences.

If you are found in violation of any of the above policies, whether you are the giver or receiver of help, you will receive a zero on the assignment or fail the course (Instructor's discretion). The academic dishonesty charge will be documented and sent to your school's dean and the Office of Student Conduct. The first offense results in a warning; the second offense results in an academic dishonesty charge on your transcript, a disciplinary hearing, and possible expulsion.

Conduct in this online classroom — 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. Students will be expected to treat all others with the same respect as they would want afforded themselves. Disrespectful behavior to others (such as harassing behavior, personal insults, and inappropriate language) or disruptive behaviors in the course (such as persistent and unreasonable demands for time and attention both in and out of the classroom) is unacceptable and can result in sanctions as defined by Oregon Administrative Rules Division 015 Student Conduct Regulations.

(Adapted from statements provided by Becky Warner, SOC)

Communications:

Ground Rules for Online Communication & 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 instructor sees your communication, send it to me by email, and be sure to identify yourself and the class.
- Posting of personal contact information is discouraged (e.g. telephone numbers, address, personal website address).
- *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. Here are a couple of references that discuss
  - writing online: http://goto.intwg.com/
  - netiquette: http://www.albion.com/netiquette/corerules.html.
- Please check the Announcements area and the course syllabus before you ask general course "housekeeping" questions (i.e. how do I submit assignment 3?). If you don't see your answer there, then please contact me.

(Adapted from Jean Mandernach, PSY)

Guidelines for a productive and effective online classroom

- 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 a mature and respectful fashion.
- 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 insulting comments at all.
- Be open to be challenged or confronted on your ideas or prejudices.

(Adapted from a statement provided by Susan Shaw, WS)

Student Assistance:

Contacting the instructor and other classroom assistants

- Contacting me by email is the best way to ask a question of me.
- We will have constant TA support, so it should be possible to get help at any time.
- I will have virtual office hours based on student needs. We should discuss this early in the course.
- Blackboard has several methods of communicating, but I would prefer we use a discussion board so that we can refer back to our previous discussions.
- We may use teleconferencing technologies such as Skype, Google's various sharing and conferencing products, or other collaboration technology as needed to share ideas beyond the discussion boards of the Blackboard course site.

Technical Assistance — If you experience computer difficulties, need help downloading a browser or plug-in, 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 or visit the OSU Computer Helpdesk online.

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:

I hope to have a location in the discussion boards for evaluation of the course, where any student will be able to, anonymously, make comments, requests, or suggestions in regards to the design and implementation of the content of the course.

OSU Student Evaluation of Teaching — Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. Results from the 19 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 login 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.