

# CS 225 DISCRETE STRUCTURES IN COMPUTER SCIENCE



Oregon State  
University

**CS225 - Discrete Structures in Computer Science**

**Credits: 4**

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

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The subjects covered in this course include formal approach to the logic of Computer Science, including set theory, methods of proof, sequences, recurrence relations, combinatorics and graph theory.

**PPREREQS:** MTH 112

**Course content:** Topics covered in the course include:

- Logic Expressions
- Non-Inductive Proof Techniques
- Sets, Sequences and Summations
- Inductive Proofs
- Recursive Definitions
- Combinatorics
- Graphs

**Canvas, Piazza and Slack**— This course will be conducted via Canvas, Piazza and Slack. Within the course Canvas site you will access the learning materials, and syllabus; submit assignments, take quizzes/exams, get announcements from the instructor 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>. Piazza site will be used as your online collaboration medium. You will be able to communicate with the instructor, TAs and your peers via Piazza. Slack is the primary mode of conducting office hours by the Instructor and TAs unless specified. At the beginning and end of each office hour session (whether or not it is held using Slack), the TA would put up a message on the Slack channel informing so.

## **Measurable student learning outcomes:**

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

1. **Construct** and **interpret** propositions expressed using logic expressions.
2. **Define** properties of and operations on sets, functions and sequences.
3. **Determine** the correctness of and **construct** non-inductive proofs.
4. **Determine** the correctness of and **construct** inductive proofs.
5. **Construct** recursive definitions and proofs involving them.
6. **Apply** basic counting arguments on combinatorial objects.
7. **Define** and **prove** properties of graphs and trees.

**Course syllabus :**

**CLO - Course Learning Outcome**

Week	Course Topics ( followed the 4 <sup>th</sup> edition of the required textbook )
#1	<ul style="list-style-type: none"> <li>• Chapter 2: Section – (2.1 and 2.2) Compound and Conditional Statements</li> <li>• Chapter 3: Section -(3.1 and 3.2) Predicates and Quantified Statements</li> </ul> <p style="text-align: right;"><b>CLO #1</b></p>
#2	<ul style="list-style-type: none"> <li>• Chapter 4: Section – (4.1 to 4.4) Direct Proof and Counterexample</li> <li>• Chapter 4: Section – 4.6 Indirect Argument: Contraposition</li> <li>• Chapter 4: Section – (4.6 and 4.7) Indirect Argument: Contradiction and Two Classical Theorems</li> </ul> <p style="text-align: right;"><b>CLO #3</b></p>
#3	<ul style="list-style-type: none"> <li>• Chapter 6: Section - 6.1 Set Theory: Definitions and Element Method of Proof</li> <li>• Chapter 6: Section – (6.2 and 6.3) Properties of Sets and Disproofs, Algebraic Proofs and Boolean Algebras</li> <li>• Chapter 5: Section - (5.1 and 5.2) Sequences and Summations</li> </ul> <p style="text-align: right;"><b>CLO #2</b></p>
#4	<ul style="list-style-type: none"> <li>• Chapter 5: Section - (5.2 and 5.3) Mathematical Induction: Weak Induction</li> <li>• Chapter 5: Section - 5.4 Strong Mathematical Induction</li> <li>• Chapter 5: (Section - 5.6, 5.7, and 5.9) Recursive Definitions</li> </ul> <p style="text-align: right;"><b>CLO #4 &amp; CLO #5</b></p>
#5	<ul style="list-style-type: none"> <li>• Chapter 9: Section-(9.2 and 9.3) Basic Counting Rules: Multiplication and Addition Rule</li> <li>• Chapter 9: Section-9.4 The Pigeonhole Principle</li> </ul> <p style="text-align: center;"><b>Midterm Exam (Week 1 - Week 4)</b></p> <p style="text-align: right;"><b>CLO #6</b></p>

#6	<ul style="list-style-type: none"> <li>• Chapter 9: Section- (9.2 and 9.5) Permutations and Combinations</li> <li>• Chapter 9: Section - 9.6 Combinations with Repetition Allowed</li> </ul> <p style="text-align: right;"><b>CLO #6</b></p>
#7	<ul style="list-style-type: none"> <li>• Chapter 10: Section-10.1 Basic Graph Definitions and Properties</li> <li>• Chapter 10: Section-10.2 Connectedness: Trails, Paths and Circuits</li> <li>• Chapter 10: Section -10.7 Shortest Path Problem</li> </ul> <p style="text-align: right;"><b>CLO #7</b></p>
#8  <b># Final Week</b>	<b>Final Exam: (Week 1 - Week 7)</b>

**Learning resources:**

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Text books:

- Discrete Mathematics with Applications (4th Edition), Susanna S. Epp, ISBN/SKU 978-0495391326 (Required)
- Discrete Mathematics and Its Applications (7th Edition), Kenneth Rosen, ISBN: 0073383090 (Optional)

## **Evaluation of student performance:**

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Scores for quizzes, assignments, and exams will be posted on Canvas. The final grade will be computed using a weighted average according the weighting below -

- Homework assignments 20%
- Quizzes 30%
- Midterm 20%
- Final 30%

### Homework Assignments (20%)

There are homework assignments each week to be completed over the course of this class.

- Assignments include writing written answers to questions. There will be homework assignments due by the end of each week. Include a comment at the top of all of your assignments that contains your name, the homework number and the list of questions.
- Assignments should be submitted in .pdf format. You can submit scanned handwritten answers saved in .pdf format.
- Assignments are to be turned in **before 23:59** on the date they are due. The late assignment must be submitted no more than 48 hours after the original deadline. This means that if an assignment is due on Oct 1 at 23:59, you may turn it in as late as Oct 3 at 23:59 (with 15% penalty for each 24 hours).
- You will turn in your assignments through the Canvas website.
- If you have a problem with an assignment grade, you must contact the teaching assistant, who graded your assignment, through EMAIL within **ONE WEEK** of receiving your grade.

### Quizzes (30%)

There will be (1 syllabus + 5 weekly) quizzes to be completed over the course of this class. The best 4 quizzes out of 5 weekly quizzes will be counted.

- The quizzes are timed, closed-book, computer-based exams. Multiple attempts of the quizzes are not allowed. Also, quizzes will not be proctored.
- The quizzes will be conducted via Canvas . Each quiz will be 90 - 130 minutes long.
- **No late submission will be graded. Please plan to take and submit the quiz before the deadline. And most importantly please don't make any request for quiz deadline extension.**
- When taking the quiz, you must use a text editor to write down questions involving symbols, equations and tables. Then upload it as a separate file in the Canvas. In each quiz, the last question will be just to upload your file (Please remember, answers got lost in the past terms due to Canvas technical difficulties, so due to your own safety don't forget to use the text editor and upload the file as a separate answer). Also, **no hand written or scanned submissions will be allowed in the quizzes.** You must get used to with text editors before you start taking the quizzes. You can use tablets for taking the quizzes.

### Exams (50% Total)

- There are 2 total exams for this course. The exams are computer-based proctored exams.
- The midterm is given in **Week 5** and the Final in **Week 8**. Please check the actual dates provided in the weekly schedule document. You will be given a 4/5 days long time window to take each exam. No extension will be allowed outside those assigned windows.
- The midterm is designed to take 110 minutes maximum.
- The final is designed to take 110 minutes maximum.
- Exam answers **can** be written using any text editor and uploaded (as .pdf format) to Canvas. This is to secure your submission. If the exam answers did not get saved on or uploaded to Canvas, the instructor can do nothing. Moreover, no hand written or scanned submission will be allowed in the exams. Most importantly, tablets, scanners and calculators are not allowed in the exams.

**\*\*REMINDER:** This course requires that you take the 2 exams under the supervision of an approved proctor. ProctorU is an allowed option for this course. It is entirely the student's responsibility to secure and schedule a proctor before the exam due date and is very important to submit your proctoring request as early as possible to avoid delays. Please remember that late exams will not be allowed due to not having scheduled a proctor early enough. Registration for proctored exams is available online and there is generally a small fee associated with exam proctoring. For more information please visit: <http://ecampus.oregonstate.edu/services/proctoring/> . If you need assistance please contact [ecampustesting@oregonstate.edu](mailto:ecampustesting@oregonstate.edu) or 541-737-9281.

## Grading Policies:

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We will use the following grading structure to calculate the final 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 > D- >= 59.5
59 >=F

\* REMINDER: 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.

\* 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/>

## Course Policies:

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**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.

### 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.

**\*\* Urgent: 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 two policies apply:

OSU policy: <https://studentlife.oregonstate.edu/sites/studentlife.oregonstate.edu/files/code-of-student-conduct-102218.pdf>

College of Engineering policy:

<http://engineering.oregonstate.edu/undergraduate-policy-manual#honesty>

- You **MAY** discuss the meaning of assignments, general approaches, and strategies with ~~students~~ **peers** 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 ~~source~~ **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 documentation of any kind with any other student in the course.
- 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 for your assignments.

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:**

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### **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

o writing online: <http://goto.intwg.com/>

o netiquette: <http://www.albion.com/netiquette/corerules.html>.

Please check the Announcements area, Piazza 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)

## **Student Assistance:**

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

- Piazza is your space to interact with your colleagues related to current topics or responses to your peers' 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 sexist, racist, homophobic, or victim-blaming comments at all.
- Be open to be challenged or confronted on your ideas or prejudices.

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

### Contacting the instructor and TAs —

- Piazza is the best way to reach the instructor and TAs for any course related query. We can refer back to our previous discussions here and also as it will be visible to the entire class. So, the other students will be able to get benefit from it. Not all posts require a reply from the instructor/TA and often it is better for students to hash out an answer to a question. But inform the instructor if you do not get a reply within 24 hours.
- Sending email ([ehsans@onid.oregonstate.edu](mailto:ehsans@onid.oregonstate.edu)) is the preferred way to only for matters of a personal nature related to the course (please include the prefix CS-225\_40X\_Term Name in the subject). If needed, Slack for discussion can be used. Please resend the email if the instructor does not respond within 24 hours.
- We will have constant TA support, so it should be possible to get office hour help throughout the term. Please create a private post on Piazza in advance to ensure that you get help when you ask for it. You will find the contact information of the TAs on Canvas.
- We will maintain virtual office hours using Slack. At the beginning and end of each office hour session, the TA would put up a message on the Slack channel(#Office\_Hours) informing so.
- The TAs and myself try the best we can to monitor Canvas email. But there are less options to sort and filter mail via that system so there is a much higher likely-hood that we will miss things that get sent via Canvas mail. So, I strongly recommend that you do not use it.

**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](mailto:osuhelpdesk@oregonstate.edu) or visit the OSU Computer Helpdesk online.

### Tutoring —

Here is the tutoring service information to provide additional support-

1. CS peer tutoring : [https://d1b10bmlvqabco.cloudfront.net/attach/j78ui8q3hnl3xj/j82bkzi8fsT/j84upog2jmd1/Tutoring\\_announcement.pdf](https://d1b10bmlvqabco.cloudfront.net/attach/j78ui8q3hnl3xj/j82bkzi8fsT/j84upog2jmd1/Tutoring_announcement.pdf)
2. Online tutoring : <http://ecampus.oregonstate.edu/services/student-services/online-tutoring/>

## Course Evaluation:

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I hope to have a location on Piazza 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.

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