

CSE 260 Discrete Structures in Computer Science

Credits: 4

Course web: <https://piazza.com/msu/fall2019/cse260002>

Description: Propositional and first order logic. Equivalence, inference and method of proof. Mathematical induction, diagonalization principle. Basic counting. Set operations, relations, functions. Grammars and finite state automata. Applications to computer science and engineering.

Time and location: Tuesdays, Thursdays, and Fridays 3:00 PM - 4:20 PM in EB1345

Instructor: Yiyong Tong, email: ytong@msu.edu

Office: 1140 Engineering Building

Office Hours: By appointment

TAs:

Ze Zhang, email: zhangze6@msu.edu

Hayam Abdelrahman, email: abdelr14@msu.edu

Lifan Frank Zeng, email: zenglifa@msu.edu

Helproom 3203EB (Bones Lab) for Ze and Hayam

Hours: Tuesday 12:30pm-2:30pm, Wednesday 12:30pm-2:30pm

1140EB for Yiyong

Hours: Thursday 1:00pm-3:00pm

Prerequisite: One of MTH 133, MTH 126, MTH 153H, or LB 119

Required Text: Discrete Mathematics and its Applications, 8th ed., Kenneth H. Rosen. Earlier versions (6/7) allowed.

Class notes: The class notes will be posted on D2L.

Course Objectives The role of discrete mathematics in computer science is analogous to the role of calculus in physics and engineering: it provides the mechanisms that allow computer scientists to define and reason about complex systems. Complex systems of interest include software, algorithms, data structures, and hardware. The objectives of this course are to introduce the mathematical concepts that provide the basis for much of computer science and to develop the ability to describe and analyze problems in a logical and systematic fashion. This course focuses on:

- Logic and mathematical reasoning
- Set theory and functions
- Induction and recursion
- Mathematical relations
- Grammars and finite state machines

To achieve these objectives, we study broad, general concepts in these areas and discuss applications of these concepts in computer science and computer engineering. Current ABET/CAC accreditation requirements (<http://www.abet.org/>) for CS programs specify a half-year of mathematics courses, including Discrete Structures.

Piazza: This section will use Piazza for discussion. You can use the Piazza link on D2L to sign up. The instructor and TAs monitor Piazza and respond to questions posted to it; other students may also. If you have a question, you will often find that it has already been asked and answered on Piazza - so check. Important class notifications will be sent via Piazza, so be sure that you join.

Graded work: Grades will be available on Crowdmark after you are notified that the assessments have been evaluated. Graded assignments will be divided into the following categories.

- Weekly Homework (10%)
- Four Quizzes (20%)
- Two In-class Exams (40%, 20% each)
- Final Exam (25%)
- Class Participation (5%)

Grading: The final grades will be assigned based on the following scale. The instructor reserves the right to make changes to the grading scale. Specifically, the score required to obtain each mark may be slightly lowered.

4.0	90%
3.5	85%
3.0	80%
2.5	75 %
2.0	70 %

Homework: You will have homework each week due on Wednesdays at 11:59pm. Homework will be submitted **electronically** via Crowdmark. Late work may be submitted up to one day late for 50% credit. Crowdmark is the final arbiter of upload times; be sure to leave sufficient time to upload your files before the deadline. **You are responsible for ensuring that your homework is uploaded properly.**

You may either handwrite your homework and scan it or prepare it electronically with tools such as L^AT_EX. Scanners are available in several computer labs on campus including 1328 EB. Please ensure that your answers are clear and legible. **Points may be deducted if your answers are not clear.** Each problem should be submitted on its own page. **Problems with no submission will receive 0 points even if the solution is included with another problem.** You are responsible for ensuring that you upload the correct solution to each problem. However, we allow you to submit the entire homework to the first problem, just in case you accidentally omit one of the problems. We reserve the right to take points off if you are careless frequently.

Quizzes: Short quizzes covering the previous weeks' material will be given on Thursdays. Each quiz will be weighted equally. No notes or electronic devices are allowed during quizzes.

Examinations: Two midterm exams and one final exam will be given. The exams will contain questions covering material in the text, required reading, homework, in-class discussions, and lectures. Exams will be closed book. You may bring one sheet of notes on $8\frac{1}{2} \times 11$ (letter-size) page of notes with you to exams, which you will hand in with the exam. You may use both sides of the sheet. You are **not** allowed any notes for quizzes. Bring picture ID with you to all exams and quizzes to verify your identity when you submit your exam or quiz. **A penalty will be assigned if you do not bring identification.**

No digital devices (e.g. calculators, music players, phones, translators, hand brains) are allowed during quizzes or exams. You may bring a paper dictionary. Once you begin a quiz or exam, you must turn in your exam before leaving.

Tentative Exam Dates:

- Exam 1: Tuesday, Oct 1
- Exam 2: Tuesday, Nov 5
- Exam 3: Wednesday, Dec 11, 10:00am-12:00pm

Make-up Exams: No make-up exams will be given except for documented illness or personal emergency. To be eligible for a make-up, you must notify the instructor or the department office prior to the time of the exam and provide documentation for the situation when arranging the makeup. A student not taking an exam will receive a grade of 0.

Mastery Requirement: A minimum average of 40% is required across all the three exams. Failure to meet this requirement will result in a failing grade even if the overall percentage is high enough for a better grade.

Class Participation: You are expected to attend class and to participate in the in-class discussion.

Spartan Code of Honor Academic Pledge: As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing

that honor in ownership is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.

Academic Integrity: Article 2.3.3 of the Academic Freedom Report states: The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards. In addition, CSE adheres to the policies on academic honesty specified in General Student Regulation 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide and/or the MSU Web site.)

You are expected to develop original work for this course. Therefore you may not submit course work you completed for another course to satisfy requirements for this course. While you may discuss problems with your classmates, **you may not share answers**, nor may you copy answers from online or other sources. You are not to distribute course materials or problem solutions without prior approval from the instructor. Students who violate MSU rules may receive a penalty grade, including but not limited to a failing grade on the assignment or in the course. Contact the instructor if you are unsure about the appropriateness of your course work. (See also <https://ombud.msu.edu/academic-integrity/student-faq.html>)

Students with Disabilities: Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at <http://rcpd.msu.edu>. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation (“VISA”) form. Please present this form to the instructor at the start of the term and/or two weeks prior to the accommodation date (exam, quiz, etc.).

Distribution and Commercialization: MSU prohibits students from commercializing their notes of lectures and class materials without written consent of the instructor. You are also prohibited from distributing course materials.

Changes: This syllabus is subject to change. The changes will be announced in class and then reflected in this document.

Acknowledgments: Parts of this syllabus, the lectures, and assignments are based on works from the MSU CSE faculty.

Tentative Schedule

Day	Date	Topic	Chapter
Th	Aug 29	Intro and Propositional Logic	1.1
T	Sept 3	Propositional Equivalences	1.3
Th	Sept 5	Predicates and Quantifiers	1.4
T	Sept 10	Rules of Inference	1.5, 1.6
Th	Sept 12	Proof Methods and Strategy	1.7, 1.8
T	Sept 17	Sets	2.1, 2.2
Th	Sept 19	Functions	2.2, 2.3
T	Sept 24	Sequences and Summations	2.4
Th	Sept 26	Cardinality of Sets	2.5
T	Oct 1	EXAM 1	
Th	Oct 3	Matrices	2.6
T	Oct 8	Big-Oh notation	3.2, 3.3
Th	Oct 10	Divisibility and Modular Arithmetic	4.1
T	Oct 15	*Integer Representation, Primes and GCD	4.2, 4.3
Th	Oct 17	* Solving Congruences	4.4
T	Oct 22	Induction	5.1
Th	Oct 24	Strong Induction, Recursion	5.2, 5.3
T	Oct 29	Structural Induction, Recursive Algorithms, Counting	5.3, 5.4, 6.1
Th	Oct 31	Linear Recurrence Relations	8.2
T	Nov 5	EXAM 2	
Th	Nov 7	Pigeonhole Principle, Permutations and Combinations	6.1, 6.2, 6.3
T	Nov 12	Binomials, Generalized Permutations and Combinations	6.3, 6.4, 6.5
Th	Nov 14	Discrete Probability	6.5, 7.1
T	Nov 19	Probability Theory	7.2
Th	Nov 21	Binary Relations and their properties	9.1
T	Nov 26	Representing relations; closures; equivalence relations	9.3, .4, 9.5
Th	Nov 28	No Class (Thanksgiving Holiday)	
T	Dec 3	Modeling Computation	13.1
Th	Dec 5	Finite Automata and Turing Machines	13.3, 13.5
W	Dec 11	FINAL EXAM (10 am)	