

CSE 260

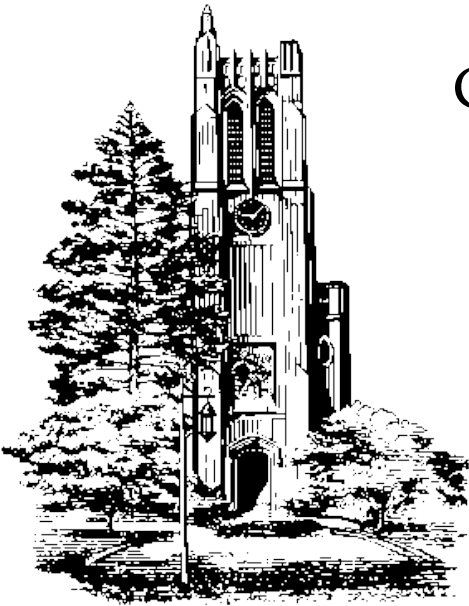
Discrete Structures in Computer Science

Dr. Sandeep S. Kulkarni

Computer Science and Engineering Department

3115 Engineering Building

Syllabus and Course Policies



CSE 260

- Introduction to the course
- Course policies and procedure

Catalog Description

- **CSE 260: Discrete Structures in Computer Science**
- **Prerequisite:** {MTH 126 (Survey of Calculus II) or MTH 133 (Calculus II) or MTH 153H (Honors Calculus II) or LBS 119 (Calculus II) }
- **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. Boolean algebra. Truth tables and minimization of Boolean expressions. Applications to computer science and engineering.

Continuous vs Discrete Mathematics

■ CM

- Math based on the real numbers
- Use topology to study the idea of shape, closeness, etc
- Use differential equations to study how things change

■ DM

- Distinct values
- Use graph theory to study relations between objects
- Use recurrence relations to study how things change

Course Motivation & Objectives

- Motivation:
 - The role of discrete mathematics in the study of computer science is analogous to the role that calculus plays in physics or in the engineering disciplines
 - It allows us to define, describe, and reason about complex systems.
- Objectives:
 - Expose you to the mathematical concepts that form the basis for **much of Computer Science**.
 - Train you to analyze problems; think in a logical fashion; and ***communicate your reasoning in a clear and unambiguous manner.***

Motivation

if $x < 5$ $y = 2$

elseif $x > 7$ $y = 3$

elseif $x > 2$ $y = 4$

elseif $y = 3$

Can y ever be set to 4?

- y is set to 4 iff
 - $x \geq 5$
 - $x \leq 7$, and
 - $x \leq 2$

Applications of discrete mathematics

- World of computers
 - Algorithm Design
 - Programming Languages Design
 - Compiler Design
 - Software Engineering & Formal Methods
 - Data Structures
 - Relational Database Theory
 - Complexity Theory
 - Security

Course Topics

- Propositional Logic
- Predicate Logic
- Proof Methods
- Set Theory
- Number Theory
- Recurrence Relations
- Combinatorics
- Relations and their Representations
- Languages and Grammars

Course Outcome (ABET)

- Students will be skilled in **propositional logic**, including modeling English descriptions with propositions and connectives and doing truth table analysis. Students will be conversant in predicate logic.
- Students will be able to use various **methods of proof**, such as direct, proof by contradiction, and mathematical induction.
- Students will be conversant in the concepts of **sets** and their refinements as relations and functions.
- Students will be able to solve basic **counting and combinatoric** problems.

Instructional Team

- Instructor: Dr. Sandeep S. Kulkarni
- Email: sandeep@cse.msu.edu
- Url: <http://www.cse.msu.edu/~sandeep/>
- Office: 1135 EB
- Tel: 355 2387 (Checked infrequently. So do not use)
- Office Hours: Will be posted on piazza.

Instructional Team

- Instructor: Dr. Eric Torng
- Email: torng@msu.edu
- Url: <http://www.cse.msu.edu/~torng/>
- Office: 3132 EB
- Tel: 353 3543 (Checked infrequently. So do not use)
- Office Hours: [Will be posted on piazza.](#)

Instructional Team...

- Course TAs:
 - TAs Office: Will be announced on piazza

Source of Information

- Piazza
 - Most announcements will be posted on Piazza
 - Piazza will have `pinned' links for links to slides, videos etc.
 - **You should have received a notification that you are added to the class. If you have not, please contact me after class.**
- Visit piazza, including pinned notes on Piazza regularly. **It is your responsibility to keep yourself updated.**

Source of Information

- D2L
 - This will contain videos, quizzes, exams etc.

Source of information (Continued)

- Google drive
 - Link is on piazza
 - This drive will contain information such as homework.
 - Spend some time to familiarize yourself with data in here.

Important announcement about Class Structure

- We will do the class using a flipped class structure
 - You will watch videos posted on D2L
 - You will take a review quiz for those videos before they are discussed in class
 - Review quiz should be straightforward if you watched the video
 - You will have 3 attempts for the review quiz
 - You need to get at least 50% in one of the attempts to get full credit for that review quiz
 - Review quiz must be completed **at least 24 hours before** we discuss that module in class
 - You will be provided a way to send us questions (if any) about the module
 - At the beginning of each class, if needed, we will spend a few minutes discussing some of the critical questions the class has submitted about the current day's module.
 - After some initial discussion to answer questions, remaining class time will be used to solve a **problem set** as a group
 - Groups will be formed using zoom breakout rooms
 - Instructors and TAs will circulate among the breakout rooms to answer questions you may have while solving the homework
 - We expect that you will solve most of the questions during class.
 - **You will each submit completed problem set (as homework) citing all sources of help.**
 - **Each homework is due one week after the module was discussed in class**

Grading Structure

- Review quizzes (10%)
 - One review quiz per module
 - Must be completed 24 hours before it will be discussed in class
 - You must watch the relevant videos before you do the review quiz
- If you have completed 90% of the review quizzes successfully, you will receive full credit
- D2L provides us information about who has watched the videos. Students taking the quiz without watching the videos will be penalized with negative points (up to minus 30%)
- Our hope is that everyone takes this seriously and everyone will get full credit for review quizzes

Grading Structure (Continued)

- Homework (10%)
 - Homework will be done via students solving the problem set during class time (and after as needed)
 - **Each homework will be due one week after the module is discussed in class**
 - Homework will be *lightly graded*.
 - Do not assume that your solutions are correct just because you received full credit
 - Please check with the solutions provided.
- **When you submit the homework, you are certifying that you have understood how each problem is solved even if someone else has solved it.**

Grading Structure (Continued)

- Homework (continued)
 - You are required to collaborate with your group to complete the homework
 - You are **allowed almost any type of help in doing the homework**
 - Allowed: Book, internet, other members of the group, etc.
 - **Not allowed:** solutions from students who have previously taken CSE 260
 - **You must cite any help you received**
 - Do not distribute homework solutions to your friends who may be taking the class in future semester
 - You will be hurting them if you do

Course work and grading

- Post-Quizzes (2% each); Lowest score dropped; **No makeup;**
 - By post-quiz, I mean that the quizzes would be conducted after material has been covered in class.
 - Post-Quizzes will be based on material in recent homework
 - Therefore, you should be aware of the work done in the homework even if it was done by others in the group.
 - **Post-Quizzes will be announced one class before**

Course work and grading (Continued)

- Exam 1 (20%)
- Exam 2 (20%)
- Final (Rest)
 - It is anticipated that we have 11 post-quizzes with one dropped, thereby making post-quizzes 20%. Homework is 10%. That will make final exam to be 20%
 - However, it may change if we have more or less post-quizzes depending upon logistics.
 - It may also change if we assign additional homework. This will be done if we feel that it is needed based on class discussion.

Course work and grading (Continued)

- Bonus points and Penalty points
 - A pre-quiz would be on a module that is not yet covered in class.
 - A pre-quiz would include material that will be taught in the near future. For example, if we have gone over module 5, then pre-quiz would be on module 6 or 7.
 - Pre-quizzes will be **unannounced**.
 - Each pre-quiz will be worth 1% BONUS point. (I.e., it will let you have more than 100% total)
 - There will be **no makeup** for pre-quizzes.

Course work and grading (Continued)

- Bonus points and Penalty points
 - Classroom attendance
 - You are required **to attend at least 75% of the classes**
 - Points will be deducted for those who fall below this.
 - This number is chosen so that you should be able to attend at least this many classes even in the presence of conflicts (being on a sports team, going to conference, going to interviews...)
 - If you believe that an exception applies to you for this, you should let me know.
 - Negative points will be assigned to students if they fail to meet the 75% attendance requirement.
 - Hopefully, we will not need to apply this to anyone

Course grade scale

93 – 100%	4.0
85 – 93%	3.5
80 – 84%	3.0
75 – 79%	2.5
70 – 74%	2.0
65 – 69%	1.5
60 – 64%	1.0

Curve

- This is our process to curve each exam
 - Suppose the exam is worth 100 points and the scores are in decreasing order
 - 95, 93, 91, 90, 90, ...
 - I will mark the exam to be out of 90 (fifth highest number of points received by some student)
 - Quizzes are not curved

Class Etiquette

- When attending the class, we ask you to observe a few simple rules which are meant to create a better learning environment.
 - Come to class **at least 5-10 minutes early**.
 - Once class begins, we expect students to pay attention and not read emails, texts, or talk, etc. **Set your cell phones on vibrate**.
 - Use your laptops only for zoom. Do not *multi-task*

Class Etiquette

- At the end of every class, we will have a brief chat with one of the groups about difficulties for modules to be discussed in next class.

Textbook

- Textbook: Discrete Mathematics and it's Applications by Kenneth H. Rosen, McGraw Hill.
- You should get this book only via connect. Online access is required. Physical copy is optional.

Few important notes

- Education is a joint activity. It needs work from us (Instructors, TAs) AND from **you**.
- You need to
 - Review the videos
 - Read the textbook
 - **Use the smartbook feature. Many past students have found it to be very useful**
 - Ask questions when something is not clear
- This needs to be done on a regular basis and not just before the exam

Few important notes (continued)

- Some students do find this class challenging
 - Some students think that because it does not involve programming, it is easy. This is not the case
 - If you think this class will be easy, remember this is a math class:
 - Please revisit the title of the class.
- A key requirement for this is PRACTICE
 - Solve many many many problems
 - At least all the relevant problems from the textbook where the solution exists
- Solve practice exams to know what to expect
 - In some cases, solutions are provided.
 - However, in some cases, we want you to come up with the solution and check with the TA
 - Note that we are human beings and can make mistakes. If you feel a solution is incorrect, please check with the TA

Few important things

- Some of the TA hours will be designated as `problem-solving' sessions
 - This means these are sessions where students can listen to questions from other students.
- Some TA hours will be designated for 1-1 discussion only. Use these to deal with questions associated with grading etc.

Few important things

- You (alone) are responsible for keeping track of announcements, deadlines and the module number being covered in class
 - Create a system that works for you to keep track of it
 - Make sure to include any relevant information gathered through any source (e.g., email, piazza, in-class, etc)

Cheating Issues

- Do not cheat
- If you observe cheating, you are encouraged to report it to one of the instructors

- If we suspect someone of cheating
 - We will file an ADR
 - The ADR will stay on your record unless we are convinced of your explanation
 - If you have cheated and you take responsibility within a week of notification
 - Your grade will be reduced by 0.5
 - If you do not take responsibility and we are convinced that that your explanation is invalid,
 - Your grade will be 0.0

- You can avail yourself of the formal grievance procedure if you disagree with our decision.

Textbook Sections to be covered

- Chapter 1, Logic and proofs
 - Sections 1.1 – 1.8
- Chapter 2, Set, Functions, sequences, ...
 - Sections 2.1 – 2.5
- Chapter 3, Algorithm,
 - Sections 3.1 – 3.3
- Chapter 4, Number theory
 - Sections 4.1 – 4.6
- Chapter 5, Induction, Recursion
 - Sections 5.1 – 5.4, 8.1 – 8.2

Course Outline, Book Sections...

- Chapter 6, Counting
 - Sections 6.1 – 6.4
- Chapter 9, Relations
 - Sections 9.1 – 9.5
- Chapter 13, Languages and Grammars (maybe)
 - Sections 13.1 – 13.3

Academic Honesty

- Article 2.3.3 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the College of Engineering adheres to the policies on academic honesty as specified in General Student Regulations 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: www.msu.edu.) Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, quizzes and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another courses to satisfy the requirements for this course. Also, you are not authorized to use sites such as the <http://www.allmsu.com> to complete any course work in CSE 260. 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 your instructor if you are unsure about the appropriateness of your course work.

Academic Integrity

- Academic Integrity is very important in this class and in this university. It is important that students do their work on their own without help from anyone except the instructor or the teaching assistant. Students are permitted to discuss the homework problems with each other. However, the work they turn in must be completely their own. Obviously, no cooperation is permitted during examinations. Students violating this will be dealt with according to the university policy.

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 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.”**
- **honorcode.msu.edu**

To succeed in this course

- Read the material and/or watch videos before class
- Answer the questions posted about the given video
- Read textbook ahead of the class
- Do the homework
- Ask questions in class, piazza, ..
- Answer questions