CSE 20110 - Discrete Mathematics

Fall 2020

Instructor: Dr. Corey Pennycuff  
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Office Hours: See Course Website Calendar  
382 Fitzpatrick, or by appointment  
Class Meeting: Tu, & Th, 9:35AM-10:50AM  
Stepan Center 101  
TA Office Hours: TBA  
Websites: https://sakai.nd.edu  
https://www3.nd.edu/~cpennycu/2020-2021/Fall/CSE20110/  
http://cscrunch.com:8890/

Course Description

Introduction to mathematical techniques fundamental to computer engineering and computer science. Topics: mathematical logic, induction, set theory, relations, functions, recursion, recurrence relations, introduction to asymptotic analysis, algebraic structures, and graphs.

Organization

This course is taught through lectures as well as through online supplementary materials that may be provided from time to time. This class will also utilize online forums when necessary, to provide for inter-student communication, peer help, and other announcements.

Course Objectives

In particular, at the end of the course, students will be able to meet the following measurable objectives:

1. Translate statements in propositional and predicate logic to English and vice versa; and determine logical equivalences using truth tables and standard equivalences.

2. Verify whether an argument or proof is correct, as well as create proofs (or find counterexamples) for theorems on integers and divisibility using common forms such as direct, indirect, contradiction, and existence.

3. Use set operations to prove set identities (tentative), as well as identify different types of functions: injective, surjective, and bijective. Find sums of arithmetic and geometric progressions and determine if a set is countable or otherwise.

4. Determine if a function has the same order as another, as in $O$, $Ω$, and $Θ$; and determine the time complexity of simple algorithms.

5. Use Euclid’s algorithm to determine the greatest common divisor of two integers, and the Chinese Remainder Theorem to solve a system of linear congruences (the latter is tentative).

7. Use the pigeonhole principle, count number of permutations and combinations satisfying given criteria, model counting problems with recurrence relations, and use inclusion-exclusion for counting.

8. Determine the probability of simple events, verify if two events are independent, and use Bayes’ Theorem to determine the probability of conditional events (the latter is tentative).

9. Determine if a relation is reflexive, symmetric, or transitive, and its closure with respect to some property, as well as identify equivalence classes, partially ordered sets, and various kinds of elements in a lattice.

10. Use the handshaking theorem for graphs, understand what it means for two graphs to be isomorphic, and relate the number of leaves in a tree to its height (the latter is tentative).

Text and Required Supplies/Resources


- Online resources such as https://www.mhhe.com/rosen should be referenced as needed.

- Resources will be updated at https://nd.edu/~cpennycu and https://sakai.nd.edu.

Grading Plan

- Grade composition: Homework — 60%
  Exam 1 — 20%
  Exam 2 — 20%

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<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
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<th>C+</th>
<th>C</th>
<th>C-</th>
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<td>74+</td>
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<td>&lt; 60</td>
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- Extra Credit may be assigned from time to time at the discretion of the Instructor.

Classroom Rules of Conduct

1. If the lecture is online, all students must attend and have their camera on, to facilitate the online learning experience for everyone.

2. Use of electronics are permitted during lectures, providing that their use is related to the lecture subject and that it is not distracting to other students.

3. Homework is due at the beginning of class on the stated due date, unless otherwise indicated.

4. No late homework will be accepted. No excuses are accepted.

5. All work that a student submits must be his or her own, original solution to the problem or assignment. Any exceptions to this rule will be explicitly stated.

6. All work must conform to the CSE specific application of the Honor Code (https://cse.nd.edu/undergraduates/honor-code).

7. Any and all plagiarism, cheating, unauthorized answer-sharing, or any other form of academic dishonesty will be strictly dealt with in accordance with the Notre Dame Academic Code of Honor (http://honorcode.nd.edu/).
Health & Safety Protocols

In this class, as elsewhere on campus, students must comply with all University health and safety protocols, including:

- Face masks that completely cover the nose and mouth will be worn by all students and instructors;
- Physical distancing will be maintained in all instructional spaces;
- Students will sit in assigned seats throughout the semester, which will be documented for purposes of any needed contact tracing; and
- Protocols for staged entry to and exit from classrooms and instructional spaces will be followed.

We are part of a community of learning in which compassionate care for one another is part of our spiritual and social charter. Consequently, compliance with these protocols is an expectation for everyone enrolled in this course. If a student refuses to comply with the University’s health and safety protocols, the student must leave the classroom and will earn an unexcused absence for the class period and any associated assignments/assessments for the day. Persistent deviation from expected health and safety guidelines may be considered a violation of the University’s “Standards of Conduct,” as articulated in du Lac: A Guide for Student Life, and will be referred accordingly.

Classroom Recording Notification

This course lectures may be recorded. This system allows us to automatically record and distribute lectures to you in a secure environment. You can watch these recordings on your computer, tablet, or smartphone. In the Sakai course page, look for the “Panopto” tool on the left hand side of the page.

Because we will be recording in the classroom, your questions and comments may be recorded. Recordings typically only capture the front of the classroom, but if you have any concerns about your voice or image being recorded please speak to me to discuss your concerns. Except for faculty and staff who require access, no content will be shared with individuals outside of your course without your permission.

These recordings are jointly copyrighted by the University of Notre Dame and your instructor. Posting them to other websites (including YouTube, Facebook, SnapChat, etc.) or elsewhere without express, written permission may result in disciplinary action and possible civil prosecution.