CSC 226: Discrete Mathematics for Computer Scientists

Section 051, Summer 2020
3 Credit Hours

Course Meetings:	T/W/Th 5:30 – 6:45pm, Synchronous Online Delivery
Instructor:	Gina Bai - rbai2@ncsu.edu
Office Hours:	M/F 1:00 – 2:00 pm (via Google Calendar Appointments)
	https://go.ncsu.edu/csc226_gina_officehour
Head TA:	Xiaohan Liu - xliu74@ncsu.edu
Office Hours:	T/Th 2:00 – 3:30 pm (via Google Calendar Appointments)
	https://go.ncsu.edu/csc226_xiaohan_officehour
Grader:	Anisha Gupta - agupta44@ncsu.edu

Prerequisites:
MA 101 or equivalent completed in high school; CSC, CSU Majors and minors; CPE, CPU Majors

Course Materials (Required):

- **Textbook**
  CSC 226: Discrete Mathematics for Computer Scientists - **zyBook Cost: $58**
  Web Link: https://go.ncsu.edu/csc226-051-zybook (code: NCSUCSC226BaiSummer2020)
- **Homework**
  WebAssign for HW submission - **Cost: $23**
  Web Link: https://go.ncsu.edu/csc226-webassign
- **Discussion**
  Piazza for class discussions, questions, and announcements
  Web Link: https://piazza.com/ncsu/summer2020/csc226051

Course Overview:
Propositional logic and the predicate calculus. Logic gates and circuits. Methods of proof. Mathematical induction. Recursive definitions and algorithms. Solving recurrences. The analysis of algorithms and asymptotic growth of functions. Elementary combinatorics. Introduction to graph theory. Ordered sets, including posets and equivalence relations.

Transportation:
This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities is NOT required for this class.

Safety & Risk Assumptions: None.

Learning Outcomes: By the end of the course students should be able to:

1. Represent logical statements in propositional and predicate calculus, and use truth tables and formal proofs to determine their truth values.
2. Create a truth table for a logical expression. Derive a logical expression from a given truth table. Design a circuit to perform a simple task.
3. Construct a circuit from a logical expression using AND, OR, and NOT gates. Simplify logical expressions. Derive a logical expression from a given circuit.
4. Describe set notations using predicate calculus. Determine the power of a set. Use predicate calculus to prove set theoretic propositions.

5. Describe and use proof by induction. Derive closed form representations for recursively defined sequences; prove their correctness by induction. Derive recursive sequences from closed form functions and prove their equivalence by induction.

6. Describe asymptotic growth of functions, compare functions using big-oh notation. Compare asymptotic growth and prove inequalities by induction. Determine and solve recurrences arising from algorithms.

7. Define binary relations and their properties using predicate calculus. Represent binary relations as ordered pairs, matrices or graphs. Combine binary relations by union, intersection, and composition using matrix operations.

8. Describe and calculate permutations and combinations with and without replacement and with and without distinguishable objects. Describe and apply the pigeonhole principle. Calculate probabilities using basic principles.

9. Describe and determine the existence of Euler circuits and paths and Hamilton circuits and paths in graphs. Determine the minimum spanning tree of a graph. Construct and analyze Hasse diagrams for partially ordered sets.

Grading Scale: This course uses the following letter grading standards that rely on a 100 point scale

A+: [97, 100]	B+: [87, 90)	C+: [77, 80)	D+: [67, 70)	F: [0, 60)
A: [90, 97)	B: [80, 87)	C: [70, 77)	D: [60, 67)	

Grade Breakdown and Assessments:

- **Homeworks (30%)**
  Ten homeworks to be completed via WebAssign. Homework extensions may be requested through WebAssign following course policies.

- **Labs (5%)**
  Two Labs are all linked through WebAssign. Each lab should be completed by the assigned deadline. All problems assigned should be worked until all problems are correct. There is no penalty for reworking any portion of any lab/tutorial.

- **Tests and Exam (60%)**
  Three tests will be administered during class time (18% each), on paper. **Scan** the answer sheets prior to submitting the exams via Moodle or Gradescope. Each test has approximately 8-10 questions, with about 110 points available, but the score is counted out of 100, meaning there are typically 10 flexible extra credit points. Notes are not allowed on any of the tests.

  The final exam will consist of two parts: a test on the material covered after test 3 (6%), and the opportunity to retake a version of **ONE** prior test.

- **zyBook Readings (5%)**
  Assigned readings and in-chapter activities (challenges, exercises) in zyBooks must be completed by the respective due dates/times for full credit. Readings and in-chapter activities completed after their respective due dates/times will earn up to 80% of credit. We will download activity reports at the due date/time. Please do not ask for zyBooks extensions. zyBook activity completed after July 27th will receive no credit.

Tentative Course Schedule:

Week 1 (May 13 - 14):
- Introduction & Sets
- Counting

Week 2 (May 19 - 21):
- Counting
- Counting
- Propositions

Week 3 (May 26 - 28):
- Propositional Logic & Boolean Algebra
- Boolean Circuits
- Test 1 Review

Week 4 (June 2 - 4):
- **Test 1** ..... **Online, Class Time** on **June 2**
- Logic Proofs
- Predicates & Quantifiers

Week 5 (June 9 - 11):
- Predicates & Quantifiers
- Predicates & Quantifiers
- Arithmetic Proofs

Week 6 (June 16 - 18):
- Arithmetic Proofs
- Induction
- Induction

Week 7 (June 23 - 25):
- Test 2 Review
- Reading + Q&A
- **Test 2** ..... **Online, Class Time** on **June 25**

Week 8 (June 30 - July 2):
- Recursion
- Recursion
- Big-O

Week 9 (July 7 - 9):
- Binary Relations
- Binary Relations
- Test 3 Review

Week 10 (July 14 - 16):
- **Test 3** ..... **Online, Class Time** on **July 14**
- Graph Theory
- Graph Theory

Week 11 (July 21 - 23):
- Reading + Q&A
- Reading + Q&A
- Reading + Q&A

Final Exam ..... **Online, 6:00 – 9:00pm** on **Mon., July 27**

Course Policy:

- **Attendance**: Regular attendance is essential and expected, and it is strategic for success in this class. In particular, it is during class sessions when we will address the most challenging components of the course content. In case of Internet connection issues, every lecture via Zoom will be recorded and

posted. For complete attendance and excused absence policies, please see https://policies.ncsu.edu/regulation/reg-02-20-03-attendance-regulations/.

- **Late Assignment**: To alleviate pressure and possible conflicts with other commitments, students may request penalty-free extensions (of a few days) on WebAssign homeworks and labs/tutorials, which will be granted automatically for up to 3 requests, as long as the extension does not go beyond the test for which the homework applies. There will be no extensions on Gradescope submissions.
- **Make-up Tests**: Requests to make up missed tests will be evaluated on a case-by-case basis, and will only be granted with supporting documentation. These documented requests should be submitted as early as possible, preferably before the test, but no later than 2 days after the missed test. Leaving a phone message or sending an e-mail without confirmation is not acceptable.

Requirements for Credit-Only (S/U) Grading: In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to http://policies.ncsu.edu/regulation/reg-02-20-15.

Requirements for Auditors (AU): Information about and requirements for auditing a course can be found at http://policies.ncsu.edu/regulation/reg-02-20-04.
Policies on Incomplete Grades: If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at http://policies.ncsu.edu/regulation/reg-02-50-03. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/.

Academic Integrity: Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01. Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Accommodations for Disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resources Office (DRO) at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at https://policies.ncsu.edu/regulation/reg-02-20-01/.

Non-Discrimination Policy: NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed

at http://policies.ncsu.edu/policy/pol-04-25-05 or https://oied.ncsu.edu/divweb/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

Trans-Inclusive Statement: In an effort to affirm and respect the identities of transgender students in the classroom and beyond, please contact me if you wish to be referred to using a name and/or pronouns other than what is listed in the student directory.

Supporting Fellow Students in Distress: As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you. When this is the case, you are encouraged to report this behavior to the NC State Students of Concern website. Although you can report anonymously, it is preferred that you share your contact information so they can follow-up with you personally.

Basic Needs Security: Any student who faces challenges securing their food or housing or has other severe adverse experiences and believes this may affect their performance in the course is encouraged to notify the professor if you are comfortable in doing so. Alternatively, you can contact the Division of Academic and Student Affairs to learn more about the Pack Essentials program https://dasa.ncsu.edu/pack-essentials/