CSC 226 Course Syllabus

CSC 226 – Discrete Mathematics for Computer Scientists

Section 051

SUMMER 2017

3 Credit Hours

Course Description

CSC 226 **Discrete Mathematics for Computer Scientists** ***UNITS:*** *3 - Offered in Fall, Spring, and Summer*

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

Propositional logic and the predicate calculus. Logic gates and circuits. Methods of proof. Elementary set theory. 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 po-sets and equivalence relations. Introduction to formal languages and automata.

Learning Outcomes

At the conclusion of this 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 the first, second, and general principles of 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. Determine big-oh running times for algorithms.
7. Define binary relations and their properties using predicate calculus. Represent binary relations as ordered pairs, matrices, predicates, or graphs. Combine binary relations by union, intersection, and composition using matrix operations. Find the reflexive, symmetric, and transitive closures of a binary relation.
8. Describe and calculate permutations and combinations with and without replacement and with and without distinguishable objects. Describe and apply the pigeonhole principle.
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.

Course Structure

The course will meet each week in person on T/W/Th.

Course Policies

- It is important that you participate actively in this class. This means: posting to piazza, asking questions, being conscientious about important course dates, and contacting your instructor if you have special needs or concerns. We are all working together to learn.

- This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.
  Find our class page at: https://piazza.com/ncsu/summer2017/csc226/home

- Homework due dates may be extended automatically upon request for 3 days. Each homework allows 3 extensions.

- You will be allowed one chance to take a replacement test for ONE of the three tests at the end of the semester. If your grade is higher, it will replace your original test grade. If not, the new score will be disregarded.

- You will receive a guaranteed C in this course if you:
  - Submit all homeworks until you have received credit for at least 70% of the problems,
  - Take all tests and rework each problem until they are correct,
  - Work every special test problem until they are correct before the last day of class, AND
  - Take all labs
  - Participate by reading and posting on Piazza, and reading and completing 80% of in-chapter activities in zybooks.

  Most students who perform each of these items will receive a B or better in the course.

Instructor & Office Hours

Justin Smith (jssmit11) - *Instructor*
Email: jssmit11@ncsu.edu
Web Page: http://www4.ncsu.edu/~jssmit11
Office Location: EB II 2267
Office Hours: Wed 4 – 5 pm and by appointment

Course Meetings

051 Lecture by Smith

Days: T W Tr
Time: 5:30 – 6:45 pm
Campus: Centennial
Location: 2240 EB III
This meeting is required.

Course Materials

Textbooks

zyBooks.com - $48
code: NCSUCSC226Summer2017
This textbook is required.

Expenses

None.

Materials

WebAssign for HW submission - $22.95
This material is required.
Piazza for Class Discussion: https://piazza.com/ncsu/summer2017/csc226/home

This material is required.

Requisites and Restrictions

Prerequisites

MA 101 or equivalent completed in high school

Co-requisites

None.

Restrictions

CSC, CSU Majors and minors; CPE, CPU Majors

General Education Program (GEP) Information

GEP Category

Mathematical Sciences

GEP Category Outcomes

At the conclusion of this 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 the first, second, and general principles of 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. Determine big-oh running times for algorithms.
7. Define binary relations and their properties using predicate calculus. Represent binary relations as ordered pairs, matrices, predicates, or graphs. Combine binary relations by union, intersection, and composition using matrix operations. Find the reflexive, symmetric, and transitive closures of a binary relation.
8. Describe and calculate permutations and combinations with and without replacement and with and without distinguishable objects. Describe and apply the pigeonhole principle.
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.

How This Course Will Fulfill GEP Category Outcomes

Each outcome will be met through completing course homeworks, labs, and tests.

GEP Co-requisites

This course does not fulfill a General Education Program co-requisite.

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.

Grading

Grade Components

Component	Weight	Details
Homeworks	30	10 homeworks are given in the class. The homeworks are linked in WebAssign as "Practice Homework" documents that should be printed and worked by hand. To have these graded, the student should open webassign and use their previously worked homework as a source to enter answers into the corresponding questions. Homework extensions may be requested through Webassign. They are automatically granted.
Labs and Participation	10	Labs (5%) 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. Participation (5%) consists of completing 80% of the in-chapter activities in zybooks for all assigned readings. In zyBooks, we will download activity reports at the due date/time. Please do not ask for zyBooks extensions. If you do not complete the assigned readings and exercises on time, you can complete them any time and you will receive credit minus a 10% penalty. Participation in discussion on Piazza through reading and making posts is expected (no points, but you are responsible for knowing what is posted on Piazza).
Tests (3 & Final Exam)	60	Three tests will be administered during class time, on paper. 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. The COMPREHENSIVE final exam will be held on: • 051: Mon, July 31, 6-9pm

Letter Grades

This Course uses Letter Grading:

97≤**A+**≤100
90≤**A** <97
87≤**B+**<90
80≤**B** <87
77≤**C+**<80
70≤**C** <77
67≤**D+**<70
60≤**D** <67
0 ≤**F** <60

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 instructor or department, 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) 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-02-50-3.

Late Assignments

Students may request extensions (of a few days) on webassign homeworks and labs/tutorials, which will be granted automatically for up to 3 requests. No penalties will be assessed for the first three extensions. If further extensions are granted, they may be subject to a 10% penalty.

Assignments completed over 7 days after the deadline without an extension request will not be graded, unless the student schedules an appointment with the instructor and the two jointly agree to a makeup policy, that will then be recorded via email from the instructor to the student.

Attendance Policy

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

Attendance Policy

We do not take attendance. However, you are expected to attend class, participate in class activities (problem solving, discussion, interactive demonstrations), and are responsible for all material covered in class. Research shows that active learning (the inclusion of hands-on, participatory activities in class, in place of uninterrupted lecture) is much more effective than lectures alone. Therefore, you are expected to participate fully.

Makeup Work Policy

Despite absences, all assignments shall be completed by the deadlines unless extensions are requested and granted; assignments completed more than 7 days after the original deadline will not be graded without an explicit written agreement (which will be on webassign and/or piazza) by the course TAs. Extenuating circumstances will be considered and all reasonable requests will be granted. If an absence occurs for a test/exam, advance notice must be given if it is possible. If it is not, an excuse should be provided and the exam should be made up as soon as possible.

Additional Excuses Policy

None.

Academic Integrity

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

Students are expected to behave professionally and respectfully at all times, in class, on campus, online, and in course feedback surveys and student evaluations. That means there is to be no offensive language, no threats, and absolutely no discussion/hints/threats of violence. Disrespectful language will not be tolerated and will be reported to Campus Police if the instructor deems that such language may be harmful to the psychological well-being of others or represents a need for assistance by the offending student.

Academic Honesty

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

If you complete work with others, it is your responsibility to report the names of your collaborators and the nature of your collaboration, on every assignment. Although you are encouraged to work in groups to solve homeworks, it is still expected that you will report the names of your collaborators and the nature of your collaboration on each homework.

Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Electronically-Hosted Course Components

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course. Students are expected to respect the integrity of others at all times, online and in person.

Electronically-hosted Components:

piazza.com
webassign.ncsu.edu
moodle.wolfware.ncsu.edu
zyBooks.com

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso), 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 http://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 http://www.ncsu.edu/equal_op/. 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.

Course Schedule

NOTE: The course schedule is subject to change. ALL official due dates for homework are on webassign.

- Test 1 6/7
- Test 2 6/27
- Test 3 7/19
- Final 7/31 6-9PM

Logic & Proofs, Circuits — 05/17 - 05/30

Propositional Logic
Truth Tables
Circuits
Proofs
Multiplexers
Predicate Calculus
All reading & assignments information available on Webassign

Pre-Course Skills Test
Homework 1: Logic & Proofs
Homework 2: Circuits
Lab 1&2: Justified & Deep Thought

Predicate Calculus & Set Theory — 05/30 - 06/07

Predicate Calculus
Set Theory
Arithmetic Proofs
All reading & assignments information available on Webassign

Homework 3: Predicate Calculus
Lab 3: Portal Proofs
Test 1
Homework 4: Sets & Predicate Calculus

Induction & Recursion — 06/07 - 06/22

Arithmetic Proofs
Induction
Recursion
Big-O
All reading & assignments information available on Webassign

Homework 5: Sets, Arithmetic Proofs, Induction
Homework 6: Induction, Recursion
Test 2

Big-O & Binary Relations — 6/22 - 7/5

Big-O
Binary Relations
Counting
All reading & assignments information available on WebAssign

Homework 7: Big-O, Induction, Recursion
Homework 8: Binary Relations
Lab 4: Binary Relations

Counting — 7/5 - 7/19

Counting
Finite State Machines
Graph Theory
All reading & assignments information available on WebAssign

Homework 9: Counting
Lab 5: Counting
Test 3

Graph Theory — 7/19 - 7/31

Graph Theory
Diagrams
All reading & assignments information available on WebAssign

Homework 10: Graphs, Hasse Diagrams

Final Exam — 7/31

FINAL EXAM: Monday, July 31 6-9PM