**Instructor:** Víctor Bermúdez, email address: vebermud@ucsc.edu.

**Office Hours:** MF 11:30 - 1:00, McHenry 1292.

**TA:** Wen Zheng, email address: wxheng14@ucsc.edu.

**Discussion Sections:** TuThF 1-2:30, .

**TA Office Hours:** TuTh 3:30 - 5:00, McHenry 1261.


**Course Description**

This class provides the necessary foundation for any other proof-based mathematics class. It focuses on developing the basic mathematical language along with the axiomatic logic needed in writing sound proofs, as well as setting up an abstract context in which a given problem may be solved. Problems in mathematics are mostly concerned with counting and classifying. Students will learn how to derive truth from a given set of principles and use mathematical language and logic to prove that their claims are valid. The objects studied, sets, and the functions between them, are the cornerstone of modern mathematics.

**Learning Outcomes**

- Determine the elements in a described set.
- Manipulate the basic operations between sets: union, intersection and complement.
- Derive new statements from old ones using logic.
- Compute with the basic operations between statements: and, or, then, negation.
- Verify the correspondence between set operations and logic rules.
- Solve counting problems using lists
- Apply the principles of multiplication, subtraction, inclusion exclusion, division and pigeon-hole in counting problems.
- Utilize factorials to count permutations and combinations.
- Validate counting formulas from combinatorial proofs.
- Inspect the validity of a proof based on definitions and theorems.
- Differentiate between types of proof and the underlying logic in each case.
• Prove statements about natural numbers using proof by induction.
• Detect false statement by finding counterexamples.
• Classify mathematical entities with equivalence relations and partitions.
• State the concept of function and the difference between injective and surjective functions.
• Associate the concepts of injectivity and surjectivity with the domain and image of a function.
• Translate statements about cardinals into statements about functions.

Tentative Course Outline:

• Lecture 1: Sets. 1.1 - 1.10
• Lecture 2: Logic. 2.1 - 2.8
• Lecture 3: Logic, Counting. 2.9 - 3.3
• Lecture 4: Counting. 3.3 - 3.10
• Lecture 5: Exam 1 (Chapters 1, 2, 3). Direct Proof. 4.1 - 4.5
• Lecture 6: Contrapositive proof, Proof by contradiction. 5.1 - 6.4
• Lecture 7: Proving non-conditional statements, proofs involving sets. 7.1 - 8.4
• Lecture 8: Disproof, Mathematical induction. 9.1 - 10.5.
• Lecture 9. Relations. 11.1 - 11.6
• Lecture 10: Exam 2 (Chapters 4 - 11)
• Lecture 11: Functions 12.1 - 12.6
• Lecture 12: Proofs in Calculus (if on schedule) 13.1 - 13.? 
• Lecture 13: Cardinality of sets 14.1 - 14.4
• Lecture 14: Review
• Lecture 15: Final Exam.

Grading: Exam 1 20%, Exam 2 20%, Quizzes 10%, Homework 20%, Final Exam 30%.

Extra Help: Do not hesitate to come to my or our TA’s office hours or make an appointment to discuss a homework problem or any aspect of the course. All UCSC students are eligible for up to 2 hours of tutoring per week and may sign-up for tutoring at https://eop.sa.ucsc.edu/OTSS/tutorsignup/. General information about LSS at http://www2.ucsc.edu/lss/.

2019 Deadlines Add: Thursday, June 27
Drop: Monday, August 6

Change grade option: Friday, July 5

Withdraw: Friday, July 12

Neither Summer Session nor instructors drop students for non-attendance or non-payment. Students must drop themselves. Dropping results in full tuition reversal/refund. Withdraw posts a W for the grade and full tuition is charged (no refund).

For all dates and deadlines, including change of grade option (P/NP) and grades due, here is the summer academic calendar - https://summer.ucsc.edu/fundamentals/academic-calendar.html

DRC Accommodations: The Disability Resources Center reduces barriers to inclusion and full participation for students with disabilities by providing support to individually determine reasonable academic accommodations. If you have questions or concerns about exam accommodations, or any other disability-related matter, please contact the DRC office, located in Hahn 125 or at 831-459-2089 or drc@ucsc.edu.

Academic Dishonesty: Academic integrity is the cornerstone of a university education. Academic dishonesty diminishes the university as an institution and all members of the university community. It tarnishes the value of a UCSC degree. All members of the UCSC community have an explicit responsibility to foster an environment of trust, honesty, fairness, respect, and responsibility. All members of the university community are expected to present as their original work only that which is truly their own. All members of the community are expected to report observed instances of cheating, plagiarism, and other forms of academic dishonesty in order to ensure that the integrity of scholarship is valued and preserved at UCSC. In the event a student is found in violation of the UCSC Academic Integrity policy, he or she may face both academic sanctions imposed by the instructor of record and disciplinary sanctions imposed either by the provost of his or her college or the Academic Tribunal convened to hear the case. Violations of the Academic Integrity policy can result in dismissal from the university and a permanent notation on a students transcript. For the full policy and disciplinary procedures on academic dishonesty, students and instructors should refer to the Academic Integrity page at the Division of Undergraduate Education.

Title IX: The university cherishes the free and open exchange of ideas and enlargement of knowledge. To maintain this freedom and openness requires objectivity, mutual trust, and confidence; it requires the absence of coercion, intimidation, or exploitation. The principal responsibility for maintaining these conditions must rest upon those members of the university community who exercise most authority and leadership: faculty, managers, and supervisors.

The university has therefore instituted a number of measures designed to protect its community from sex discrimination, sexual harassment, sexual violence, and other related prohibited conduct. Information about the Title IX Office, the online reporting link, applicable campus resources, reporting responsibilities, the UC Policy on Sexual Violence and Sexual Harassment and the UC Santa Cruz Procedures for Reporting and Responding to Reports of Sexual Violence and Sexual Harassment can be found at titleix.ucsc.edu.

The Title IX/Sexual Harassment Office is located at 105 Kerr Hall. In addition to the online reporting option, you can contact the Title IX Office by calling 831-459-2462.