MATH A287: INTRODUCTION TO ABSTRACT MATHEMATICS

Item	Value
Curriculum Committee Approval Date	12/06/2023
Top Code	170100 - Mathematics, General
Units	4 Total Units
Hours	72 Total Hours (Lecture Hours 72)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 2A Math Concepts (2A)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 2A Math Concepts (2A)

Course Description

This course is an introduction to proof writing and mathematical reasoning. Topics include logic, set theory, functions, induction, equivalence relations, cardinality, and proof writing techniques. PREREQUISITE: MATH A185 or MATH A185H or MATH A182H. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Students will be able to write elementary proofs including direct proof, proof by contradiction, proof by contrapositive, and proof by induction.
2. Students will be able to perform operations on sets using appropriate notation.
3. Students will be able to draw conclusions about the veracity of a statement with appropriate mathematical justification.

Course Objectives

- 1. Distinguish between definition, conjecture, theorem, and proof.
- 2. Write proofs using a variety of proof techniques.
- 3. Perform mathematical operations on sets.
- 4. Utilize quantifiers in mathematical arguments.
- 5. Identify cardinality of sets.
- 6. Calculate greatest common divisors using the Euclidean Algorithm.
- 7. Prove equivalence relations
- 8. Prove a definition is well-defined.

Lecture Content

Mathematical Structure Proof Definition Theorem and Conjecture Planning and Writing a Proof Logic Propositions Functions and Quantifiers Proof Direct Contradiction Contrapositive Sets and Functions Set Notation Subsets Unions, Intersections, and Compliments Functions Cartesian Products Power Sets Indexed Collections of Sets Divisibility and the Euclidean Algorithm Remainders and Congruence Greatest Common Divisors and the Euclidean Algorithm Mathematical Induction and Well-Ordering Recursive Processes Proof by Induction Well-Ordering and the Principle of Mathematical Induction Strong Induction Relations and Partitions Relations Equivalence Relations Partitions Functions Well-Definition Congruence Cardinalities of Infinite Sets Cardinality Countable Sets Uncountable Sets

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

Lecture, Discussion, Collaborative Learning

Reading Assignments

Students will spend approximately 1 hour per week reading from the assigned text.

Writing Assignments

Students will spend approximately 1 hour per week on written assignments.

Out-of-class Assignments

Students will spend approximately 6 hours per week on homework assignments as given by the instructor.

Demonstration of Critical Thinking

Problem solving is foundational to a course in abstract mathematics which requires deep critical thinking. Critical thinking is an integral part of an abstract mathematics course.

Required Writing, Problem Solving, Skills Demonstration

Problem sovling exercises commonly appear on exams or quizzes. These require written responses of the students. Grades are determined by performance on quizzes and exams. Some instructors may also include grades on homework, cooperative assignments, or participation in cooperative learnign sessioons. A comprehensive final exam is par tof this course.

Eligible Disciplines

Mathematics: Master's degree in mathematics or applied mathematics OR bachelor's degree in either of the above AND master's degree in statistics, physics, or mathematics education OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Sundstrom, T. Mathematical Reasoning: Writing and Proof, 2nd ed. Pearson, 2020

Other Resources

1. Other appropriate textbook as chosen by full-time faculty.