MATH 034: Foundations of Higher Mathematics

Term: 2020 Winter Session Instructor: Staff Language of Instruction: English Classroom: TBA Office Hours: TBA
Class Sessions Per Week: 6 Total Weeks: 4 Total Class Sessions: 25 Class Session Length (minutes): 145 Credit Hours: 4

Course Description:

This course is designed for students to prepare for the study of advanced mathematics. After practices of problem solving and calculations through previous Math courses, students will learn the language and philosophy of higher mathematics in this course. Topics include fundamentals of logic and mathematical statements; proof strategies; sets theories and functions; equivalence relations and partitions; functions and their properties; cardinality, countable sets & infinite sets, and counting techniques; ordered and well-ordered sets.

Course Materials:

Required Textbook：

A Transition to Advanced Mathematics, 8th Edition, Author(s): Douglas Smith, Maurice Eggen, Richard St. Andre, 2014

Course Format and Requirements:

This course has 25 class sessions in total. Each class session is 145 minutes in length. Pre-reading the relevant chapter and attempting the assigned homework problems prior to each class is strongly recommended. Familiarizing with the course material before class, you will gain a better understanding of the information presented during the class. Students are strongly

encouraged to ask questions on things they do not understand. Main learning points will be highlighted from the relevant textbook chapters.

Attendance

Students are expected to attend and participate in class. Strong attendance and participation are good indicators of success. Each student is responsible for all course material, announcements, quizzes and exams made in class, whether or not the student attended that day's class.

Grading Scale:

A+: 98%-100%
A: 93%-97%
A-: 90%-92%
B+: 88%-89%
B: 83%-87%
B-: 80%-82%
C+: 78%-79%
C: 73%-77%
C-: 70%-72%
D+: 68%-69%
D: 63%-67%
D-: 60%-62%
F: Below 60%

Course Assignments:

Homework

Homework will be related to class lecture and in-class discussion. Students shall hand in their finished homework at the beginning of next class. Homework is assigned to help review and enhance understanding on class content.

Quizzes

There will be 6 quizzes during this semester. Each quiz will be on the material covered that week. There will be NO make-ups for quizzes for any reason. All of the quizzes will be closed book.

Exams:

The exams will be closed book and closed notes. Formula sheets will be provided by the

Instructor. No make-up exams will be given. Upon prior notification of the Instructor, allowances will be made under extreme circumstances.
There will be two midterms and one cumulative final exam.

Course Assessment:

Homework	10%
6 Quizzes	10%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	40%
Total	**100%**

Course Schedule:

Week	Topics	Activities
1.	Go through syllabus + Course overview **Mathematical statements and logic** Language of mathematics-defined and undefined terms Statements Definitions, axioms and theorems Negation and conjugation Equivalent statements, truth tables Disjunctions Conditionals and Bi-conditionals **Proof techniques and induction** Direct proof, proof by contraposition, proof by contradiction, proof by exhaustion, proof by induction	• Homework • Quiz 1 • Quiz 2

2.	**Proof techniques and induction** Prove that two or more statements are equivalent Write logically coherent proofs Construct counter-examples Produce truth tables for statements in the propositional calculus **Set theory** Elementary set theory Set notation, set operations, inclusion, subsets, power sets Indexed families of sets and their union and intersection Cartesian product Relations and algebra of relations	• Homework • Review • Midterm 1 • Quiz 3
3.	**Equivalence relations and partitions** Equivalence relations and equivalence classes Partitions Relationships between equivalence relations and partitions **Functions** Functions, images and pre-images Inverse of a function, restriction of a function, injections, surjections, and bijections, induced set functions	• Homework • Quiz 4 • Review • Midterm 2 • Quiz 5
4.	**Functions** Algebra of functions **Cardinality, countable and infinite sets** Canals Countable Sets and Counting Techniques	• Homework • Quiz 6 • Review • Final Exam

	Uncountable sets Infinite Sets Ordered Sets and Well-Ordered Sets Course summary Review for final exam	

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Shanghai Normal University's *Academic Conduct Code.* Any work suspected of violating the standards of the *Academic Conduct Code* will be reported to the Dean's Office. Penalties for violating the *Academic Conduct Code* may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the *Academic Conduct Code*.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.