MATH 034: Foundations of Higher Mathematics

General Information:

<table>
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<th>Term: 2019 Summer Session</th>
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<tr>
<td>Instructor: Staff</td>
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<td>Language of Instruction:</td>
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<tr>
<td>English</td>
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<tr>
<td>Classroom: TBA</td>
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<tr>
<td>Office Hours: TBA</td>
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<tr>
<td>Class Sessions Per Week: 5</td>
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<td>Total Weeks: 5</td>
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<tr>
<td>Total Class Sessions: 25</td>
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<tr>
<td>Class Session Length (minutes): 120</td>
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<td>Credit Hours: 4</td>
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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 Format and Requirements:

This course has 25 class sessions in total. Each class session is 120 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.

**Course Materials:**
*A Transition to Advanced Mathematics*, 8th Edition

Author(s): Douglas Smith, Maurice Eggen, Richard St. Andre
Publisher: Brooks Cole (August 6, 2014)
Language: English
ISBN-10: 1285463269

**Course Assignments:**

**Homework:**
You are encouraged to work together on problem sets, but each of you must hand in your own work.

**Quizzes:**
There will be six 10-20 minute quizzes in total. The quizzes will cover material from in-class handouts and homework.

**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 cumulated final exam.

**Course Assessment:**

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<tbody>
<tr>
<td>Homework and Quizzes</td>
<td>20%</td>
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<tr>
<td>Midterm Exams 1</td>
<td>20%</td>
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<tr>
<td>Midterm Exams 2</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
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<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Grading Scale (percentage):

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 Schedule:

Week 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
Week 2:

**Proof techniques and induction**

Direct proof, proof by contraposition, proof by contradiction, proof by exhaustion, proof by 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

**Midterm 1**

Week 3:

**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

**Equivalence relations and partitions**

Equivalence relations and equivalence classes

Week 4:

Partitions

Relationships between equivalence relations and partitions

**Midterm 2**

**Functions**

Functions, images and pre-images

Inverse of a function, restriction of a function, injections, surjections, and bijections,

induced set functions

Algebra of functions
Week 5:

Cardinality, countable and infinite sets
Canals
Countable Sets and Counting Techniques
Uncountable sets
Infinite Sets
Ordered Sets and Well-Ordered Sets
Course summary
Review for final exam

Final Exam (Cumulative): TBA

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 Huazhong University of Science & Technology’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.