

Foundations of Higher Mathematics

MAT 224.020 • Spring 2010 • Mr. Schaeffer

COURSE DESCRIPTION

This course is designed to prepare the student for the study of advanced mathematics. Topics include fundamentals of logic, proof strategies, the algebra of sets; relations, including equivalence relations; functions and their properties; countable sets and counting techniques; ordered and well-ordered sets. Prerequisites: Completion of MAT 171 (Calculus I) with a grade of "C" or higher.

COURSE OBJECTIVES

By the conclusion of this course, the student will:

- (a) Learn to use the proper mathematical techniques in analyzing information, extracting pertinent facts and drawing appropriate conclusions.
- (b) Examine the basic logic that underlies mathematical proofs.
- (c) Write mathematical proofs using the following methods: direct proof; proof by contrapositive; proof by contradiction; proof by exhaustion; proof by induction.
- (d) Interpret and prove or disprove quantified mathematical statements.
- (e) Apply the abstract concepts of relations and functions in mathematical applications.
- (f) Recognize the foundational nature of set theory in mathematics and its development.
- (g) Apply the concepts and operations of sets in mathematical disciplines.

TEXTBOOK

Introductory Concepts For Abstract Mathematics by Hummel, published by Chapman & Hall/CRC.

COVERAGE (For a complete list of topics, go to my Web site and view the complete course syllabus.)

Section I: Logic and Proof.

Section II: Sets.

Section III: Functions and Relations.

Section IV: Algebraic and Order Properties of Number System.

Section V: Transfinite Cardinal Numbers.

Section VI: Axiom of Choice and Ordinal Numbers.

ASSESSMENT

The course assessment will be a subset of tests, projects, papers, presentations, quizzes, homework, team assignments, and final exam, as detailed below:

TESTS: There will be three (3) tests (exact dates to be announced, but approximately February 11, March 18, & April 15).
Value: 200 points each.
Missed tests: must be made up in a manner and date to be determined by the instructor; a university-approved, written excuse is required.

QUIZZES: Usually unannounced.
Value: 15-25 points each (approximate). Number of quizzes: approximately 5–8.
Missed quizzes: in-class quizzes not made up, but not counted against you; take-home quizzes must be made up.

HOMEWORK: Specific homework problems (announced in advance) will be collected and graded.
Value: 15-25 points each (approximate).

GROUP WORK: Randomly-selected groups of students will be assigned specific problems to be completed and presented to the rest of the class.
Value: 25–50 points each. Number of group assignments: approximately 2–4.

FINAL EXAM: Cumulative. Date: Tuesday, May 4, at 11:00 am.
Value: 300 points.

GRADING SYSTEM

Based on points, each item weighted according to its significance. Precise cutoff scores for letter grades will be determined at the end of the semester, but will essentially follow the standard 60-70-80-90 model, according to the rubric below:

90-100% Exemplary Response

Gives a complete response with a clear, coherent, and unambiguous explanation; includes a clear and simplified diagram if appropriate; communicates effectively; shows understanding of the problem's mathematical ideas and processes; identifies all the important elements of the problem; may include examples and counterexamples; presents strong supporting arguments.

80-89% Competent Response

Gives a fairly complete response with reasonably clear explanations; may include a diagram if appropriate; communicates effectively; shows understanding of the problem's mathematical ideas and processes; identifies the most important elements of the problem; presents solid supporting arguments.

70-79% Minor Flaws But Satisfactory

Completes the solution satisfactorily, but the explanation may be muddled; argumentation may be incomplete; diagram may be inappropriate or unclear; understands the underlying mathematical ideas; uses mathematical ideas effectively.

60-69% Serious Flaws But Nearly Satisfactory

Begins the solution appropriately but may fail to complete or may omit significant parts of the solution; may fail to show full understanding of mathematical ideas and processes; may make major computational errors; may misuse or fail to use mathematical terms; response may reflect an inappropriate strategy for solving the problem.

50-59% Begins, But Fails to Complete Problem

Explanation is not understandable; diagram may be unclear; shows almost no understanding of the problem situation; may make major computational errors.

0-49% Unable to Begin Effectively

Work does not reflect the intent of the problem; drawing misrepresents the problem situation; copies parts of the problem but without attempting a solution; fails to indicate which information is appropriate to the problem; leaves the problem blank.

ATTENDANCE

As in all university classes, your attendance is expected. Activities have been planned for which your attendance is necessary (see Group Work above). In short: You miss, you lose! You will be permitted to make up missed work only for those absences for which you have University-approved written excuses.

CONTACT INFORMATION

Office: Lytle 262; Phone: 610-683-4419; e-mail: schaeffe@kutztown.edu

Web site: <http://faculty.kutztown.edu/schaeffe>

OFFICE HOURS

Tu 5:00–6:00; W 4:00–5:30; Th 3:00–5:30 (also other times by appointment)

ACADEMIC DISHONESTY

At a minimum, you will receive a “0” on the applicable graded activity. Additionally, the instructor reserves the right to invoke the sanctions set forth in the Academic Dishonesty Policy (as printed in *The Key*).

ACCOMMODATIONS

If you have a disability that requires accommodations, please let me know so that I can assist you.

E-MAILING GRADES

I will e-mail you your grades only if you have given me prior permission in writing (a KU e-mail will suffice) and only to a KU e-mail address.