

MATH 201
INTRODUCTION TO ABSTRACT MATHEMATICS
COURSE SYLLABUS

General Information

Course Information

- a. Time: Fall Quarter MWF from 11:00 – 12:20
- b. Location: Room 120 in the Stevenson Building (formerly the Education Building)
- c. Credits: 5 credits
- d. Prerequisite: Math 112 or instructor consent

Instructor Information

- a. Instructor: Terry Souhrada
- b. Office: Stevenson Building Room 104 (formerly the Education Building)
- c. Office Hours: 8:30 am – 11:00 am M-F, 1:30 pm – 3:00 pm W, or by appointment
- d. Telephone: 406-275-4764

Required Materials

Text: Maddox. Mathematical Thinking and Writing: A Transition to Abstract Mathematics.
 Burlington, MA: Harcourt/Academic Press, 2002. IBN: 0-12-464976-9
 (text is available free to students for use during the course)

Description/Rationale

This course is designed to prepare students for upper-division proof-based mathematics courses. Students are introduced to various methods of proof and their structures. Topics include reasoning and communication in mathematics, logic, proof, functions, relations, sets, recursion, and an introduction to abstract algebra and number theory.

Objectives

1. *General Course Objectives*

Upon completion of this course students will:

- a. master the underlying philosophy and technique of mathematical proof.
- b. become proficient in the language and notation of introductory abstract mathematics.
- c. construct and evaluate logical arguments.
- d. understand the basic principles of real number analysis.
- e. understand the basic principles of abstract algebra.
- f. learn to convey mathematical meaning through writing.
- g. gain perspective by exploring historical contributions from prominent mathematicians.

2. *Critical Thinking*

Upon completion of this course students will:

- f. develop the ability to interpret, understand, and create abstract constructs.
- g. be able to evaluate the quality of an argument in terms of validity, accuracy, and reasonability.
- h. validate their work with clear organization and explanation.

3. *Cultural*

Upon completion of this course students will:

- i. accept and appreciate a variety of mathematics backgrounds and abilities.
- j. increase understanding of their own strengths and methods through interaction with a diverse group of learners.
- k. quantify and solve problems specifically related to issues on the reservation.

Other Course Information

Attendance Expectations

Although no attendance points will be given, you will be expected to be in class at all times. There will be activities and assignments that you will not be able to make up due to the nature of the assignment. In addition to the content in this course you are training to be a professional.

Professionals are expected to be on the job on time and at all times. By being consistent with attendance, you are beginning to act and think like a professional. This is professional responsibility. Poor attendance will result in missed information, missed assignments and tests, and possible failure of the course.

Students are expected to be on time for class and to stay until the designated time set for dismissal. If a student must leave early he/she must inform the instructor at the beginning of class. In addition, please keep cell phones in the off or silence position and put away during class. These are all considered professional courtesies.

Academic Honor Code

All course work shall follow the guidelines of the Academic Honor Code as set forth by the SKC Student Handbook. Do your own work; allow other students to do their own work. **Plagiarism** involves the taking of someone else's words, ideas, or writings and presenting them as your own. Avoid plagiarism, and always acknowledge the ideas of others and cite your sources of information. Violation of the Academic Honor Code may result in failure of the assignment, the course, or possible expulsion from school.

Course Responsibilities

Knowledge of the course content, class lectures, assignments, and syllabus content are the responsibility of the student regardless of absenteeism. Syllabus content and calendars are tentative; instructors will notify you of any changes in writing.

Any material missed due to absences is the student's responsibility to get from someone who was in attendance. Missed assignments due to absences may only be made up if the instructor was given notification prior to the missed class. The student must also obtain the instructor's approval before making up the missing work.

Reasonable Accommodations

Reasonable accommodations are provided for eligible students with identified disabilities. The College complies with the Rehabilitation Act of 1973 and the Americans with Disabilities Act. Students may contact the College's Disability Officer or consult the SKC web page for Students with Disabilities for more information.

SKC Retention

The SKC Retention Team consists of SKC staff and faculty who provide student-centered support services on a daily basis. The SKC Retention Team is here to help you to be successful in reaching your educational goals. You can contact the SKC Retention Team yourself, or your instructor may refer you (for example, if you "disappear" from class or they are concerned about your attendance and performance). *Debbie L. Bell, SKC Retention Coordinator* (Bookstore Annex, 275-4928, Email: retention@skc.edu)

Course Requirements

- a. 20 homework tasks or assignments (approximately two per week)
- b. 4 short exams
 - each covering a portion of the class topics
 - might be in class, take home, or be replaced with a mini-project

Grading

Your final grade will be determined according to a standard percentage scale (90-100=A, 80-89=B, 70-79=C, 60-69=D, 0-59=F) with points distributed as follows:

a. homework tasks or assignments,	40%	(1 – 2 per week)
b. short exams	60%	(approx. 4 per quarter)
Total Possible	100%	

Course Outline

Week 1 – Foundational Ideas and Assumptions, Intro to Logic
 Week 2 – Logical Arguments and Techniques of Proof
 Week 3 – Properties of Real Numbers
 Week 4 – Sets and Their Properties
 Week 5 – Functions
 Week 6 – Real Number Analysis
 Week 7 – Sequences
 Week 8 – Limits and Continuity
 Week 9 – Introduction to Groups
 Week 10 – Introduction to Rings

Credit Hours

Following the SKC Credit Hour policy, to meet the identified objectives of this course, this five-credit course, delivered over a 10-week term will approximate:

5 hours/week classroom instruction

In addition, out-of-class student work will approximate a minimum of 10 hours per week.

Available Help

- (1) If you are struggling or need help with this course, you should first contact the instructor to get support and advice about how you can improve your learning.
- (2) The SEM tutoring lab in room 109 is open every day and staffed with tutors to help you succeed in this course. Please take advantage of this service.
- (3) Reasonable accommodations are provided for eligible students with identified disabilities. The College complies with the Rehabilitation Act of 1973 and the Americans with Disabilities Act. Students may contact the College's Disability Officer, Stanley Fleming (stanley_fleming@skc.edu, 406.275.4968) or consult the SKC web page for Students with Disabilities for more information.

* The faculty reserves the right to change the course syllabus or course content. Students will be provided advanced written notice of any changes.

Standards Addressed

The content and assessment within this course, as with all the courses included as part of the Bachelor of Science in Secondary Education – Mathematics (BSSEM) degree program, is guided by various sets of standards. These standards serve as the goals and learning outcomes established for this course.

Below are the standards to be addressed within this course. You may receive a complete copy of these standards upon your request.

InTASC Standards

Standard #4: Content Knowledge

The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.

Standard #5: Application of Content

The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

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Preservice teacher candidates

- 1a)** Demonstrate and apply knowledge of major mathematics concepts, algorithms, procedures, applications in varied contexts, and connections within and among mathematical domains.

Specifically from the Mathematics Content for Secondary Addendum:

- A.1.1 Structure, properties, relationships, operations, and representations including standard and non-standard algorithms, of numbers and number systems including integer, rational, irrational, real, and complex numbers
 - A.1.2 Fundamental ideas of number theory (divisors, factors and factorization, primes, composite numbers, greatest common factor, least common multiple, and modular arithmetic)
 - A.1.5 Historical development and perspectives of number, number systems, and quantity including contributions of significant figures and diverse cultures
 - A.2.2 Function classes including polynomial, exponential and logarithmic, absolute value, rational, and trigonometric, including those with discrete domains (e.g., sequences), and how the choices of parameters determine particular cases and model specific situations
 - A.2.7 Historical development and perspectives of algebra including contributions of significant figures and diverse cultures
 - A.6.3 Propositional and predicate logic
- 2a)** use problem solving to develop conceptual understanding, make sense of a wide variety of problems and persevere in solving them, apply and adapt a variety of strategies in solving problems confronted within the field of mathematics and other contexts, and formulate and test conjectures in order to frame generalizations.

- 2b) reason abstractly, reflectively, and quantitatively with attention to units, constructing viable arguments and proofs, and critiquing the reasoning of others; represent and model generalizations using mathematics; recognize structure and express regularity in patterns of mathematical reasoning; use multiple representations to model and describe mathematics; and utilize appropriate mathematical vocabulary and symbols to communicate mathematical ideas to others.
- 2d) organize mathematical thinking and use the language of mathematics to express ideas precisely, both orally and in writing to multiple audiences.
- 2e) demonstrate the interconnectedness of mathematical ideas and how they build on one another and recognize and apply mathematical connections among mathematical ideas and across various content areas and real-world contexts.

PEPP Standards

10.58.501 General Requirements

- (1) All programs require that successful candidates:
 - (b) demonstrate understanding of the central concepts, tools of inquiry, and structure of the discipline(s) he or she teaches and creates learning experiences that make subject matter meaningful for students;
 - (k) demonstrate continued growth in knowledge related to a particular subject area and the teaching of it; and

10.58.518 Mathematics

- (1) The program requires that successful candidates:
 - (a) demonstrate knowledge and understanding of and apply the process of mathematical problem solving;
 - (b) reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry;
 - (c) communicate mathematical thinking orally and in writing to peers, faculty, and others;
 - (d) recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding;
 - (e) use varied representations of mathematical ideas to support and deepen mathematical understanding; and
 - (g) support a positive disposition toward mathematical processes and mathematical learning.
- (2) The program requires that successful candidates demonstrate content knowledge in:
 - (a) numbers and operations by demonstrating computational proficiency, including a conceptual understanding of numbers, ways of representing number relations among number and number systems, and meanings of operations;
 - (b) different perspectives on algebra including ways of representing mathematical relationships and algebraic structures