Course Description:
This capstone course examines the mathematical foundations of arithmetic, algebra, geometry, number theory, and other topics and the connections that unify those concepts. Emphasis is on thinking deeply about fundamental concepts while further developing mathematical reasoning, representation, and problem-solving abilities.

Course Overview and Expectations:
Research shows that teachers of mathematics are more effective when they have a **profound understanding** of the content that is being taught and the content to which students have previously been exposed. This course is concerned with helping you develop that kind of knowledge. Your overall responsibility will be to demonstrate that you have developed profound understanding of mathematical fundamentals as exhibited in the following ways:

- Profound understanding is much more than being able to produce the correct answers to mathematical questions. It is not enough to be able to perform certain procedures. You also must be able to demonstrate and explain why those procedures are used, when and under what conditions the procedures are valid, and what other alternatives are available.
- Profound understanding requires that you comprehend of all the underlying concepts and relationships.
- Profound understanding requires that you can express numerical and spatial concepts and relationships using the symbols of algebra and geometry and that you can translate symbolic representations into verbal expressions.
- Profound understanding requires that you communicate your knowledge to others in a meaningful way using multiple representations and perspectives.
- Profound understanding is connected knowledge; it requires that you that integrate concepts and principles across the spectrum of mathematics and link them to applications outside of mathematics itself.
- Profound understanding is productive (not reproductive) knowledge; it requires that you approach problems from different perspectives and figure out what to do when you don’t know what to do.
Text and Materials:


Materials:

- Compile a “mathematics tool kit” and bring it to class with you (as well as to wherever else you study). Include the following items:
  - Ruler
  - Scissors
  - Compass
  - Eraser
  - Protractor
  - Graph paper
  - Colored pencils
  - Unlined paper

- Be sure you have the following technology readily available:
  - Graphing calculator
  - Geometer’s Sketchpad installed on your laptop
  - Excel spreadsheet on your laptop

- Make sets of manipulatives for your own use now and for future classroom use when you teach. Many important manipulatives can be made using the cutting machine in the mathematics education classroom. Additional directions will be given in class. Examples of important manipulatives include pattern blocks, tangrams, pentominoes, models of regular polygons, and others of your choice (look over the available dies in the classroom).

Course Requirements:

- Attend all classes and participate actively in class discussions and activities. (Attendance is taken daily; absence, tardiness, or failure to participate actively, have a negative impact on the course grade.)

- Complete assignments on time. Come to class prepared to raise as well as answer questions and otherwise contribute to discussion of the material. You can expect to be called upon in class to report on, present, or explain ideas from your work. (Specific assignments are given in class.)

- Develop the habit of thinking deeply about mathematical concepts and relationships; discuss the insights you have developed; raise questions about what you don’t understand; and challenge each other to expand your individual and collective understanding, appreciation, and enjoyment of mathematics.

Grading:

- Points are assigned for class participation, projects, presentations, assignments, and tests. Your grade will be determined by the percentage of the total possible points that you earn, as follows:
  - A = 93-100%;  A– = 90-92%;  B+ = 87-89%;  B = 83-86%;  B– = 80-82%;  etc.

- Solutions to mathematics problems must be presented neatly and clearly and must be easy to follow in order to receive full credit. Problem solutions must include a clear statement of the problem, the known information, and the question to be answered. It must be clear from your solution what the problem is without having to read the problem statement from the text or other source. (When grading assignments, I will rely only on your written work. I will not go to the text to look up the problem.) It also must be clear not only what your answer is but, most important, the process by which you arrived at the solution. “Naked answers” receive no credit—period.

- As teachers, you will be expected to communicate with students, parents, administrators, and others in correct and proper English. Therefore, such things as grammar, spelling, punctuation, and syntax are considered in the evaluation of your written work.

- Late assignments have points deducted unless prior arrangements have been made for good and valid reasons.

- Class participation means attending class every day, always being prepared for class, actively contributing to class discussions, asking as well as answering questions, and engaging in discourse with other members of the class as well as with the professor. Active participation is a requirement for success in the course.

Tests and Exams:

There will be a midterm exam (date to be announced later) and a final. The final exam for this class is scheduled for Tuesday, December 10, 4:00 – 5:50 p.m. Additional tests, if warranted, will be announced in class.

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock (227-1700). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.