Description of the course (syllabus): As Professor Ritter puts it

“The central goal of Introduction to Advanced Mathematics is to move the student’s perspective, knowledge, and skills from a merely algorithmic and computational position to one focused actively on using the language, logic, fundamental structures, and proof techniques of modern mathematics.”

The source that will help us achieve the central goal described above is the book “Foundation of Higher Mathematics”. In more detail, here is what and when will be covered in the course.

**Basic Logic:** Lectures 1-5, Sections 1.1-1.6.

**Basic Set Theory:** Lectures 6 and 7, Sections 2.1 and 2.2.

**Mathematical Induction:** Lectures 8 and 9, Sections 3.1 and 3.2.

These are the most important topics in the course. Here, we will learn the formalism for correctly doing and writing proofs in mathematics. The very basic definitions, principles, and techniques will be introduced and explained in numerous examples. A lot of examples will be borrowed from the lower level mathematics courses, such as Calculus and Geometry. To better monitor the students’ proficiency, there will be two “turn-in” Homework Assignments and two Quizzes on this part of the course performed by the end of Lecture 9.

Lecture 10 is devoted to a Review of Chapters 1, 2, and 3.
Lecture 11: Midterm 1 on the material taught so far.

Lectures 12 and 13 cover Sections 3.4 and 3.5. In these sections, the learned so far theory is applied to the basics of Number Theory. We will have more encounters with NT later in the course.

**Relations and Orders:** Lectures 14-16, Sections 4.1-4.4.

In these lectures we will learn about some more involved and useful constructions from Set Theory. We will apply these to NT in Lecture 17, Section 4.5.

**Functions in general:** Lectures 18 and 19, Sections 5.1 and 5.2.

**Real Valued Functions:** Lecture 20, Section 5.5.

Lecture 20 completes the second part of the course. To keep monitoring the success of the students, there will be meanwhile two more “turn-in” Homework Assignments and two more Quizzes.

Lecture 21 is devoted to a Review of Chapters 3-5.
Lecture 22: Midterm 2 on Chapters 3, 4, and 5.

**Introduction to Advanced Calculus:** Lectures 23-26, Sections 9.1-9.4.

This is a topic that will help the students in their transition to the advanced courses on Calculus and Differential Equations taught at the Department of Mathematics at FIU. Here, we will see that the hard parts of Calculus course (definitions, theorems, etc.) have a natural and elegant expression in terms of what we have learned so far in the course. There will be one Quiz and one “turn-in” Homework
Assignment covering this last part of the course.

Lectures 27 and 28 are devoted to some more special topics (Sect. 2.3, 2.4, 5.6, and 5.7) which will be covered as the time permits.

Lecture 29: Review and preparation for the Final Exam.

A word of warning: The course in general and the book we will be using in particular are not easy to understand without active learning. The more so if you encounter the notions we will cover here for the first time. This is indeed a different from the lower level math courses perspective. The students need to read carefully the text, do regularly the exercises given for work at home, ask for help if they need it.

Homework Assignments: After every Section covered in class, there will be given Exercises for work at home. Specified number of them will be given as “turn-in” homework. These latter will be graded and taken in consideration when forming the overall grade in the end of the course.

Quizzes: There will be five Quizzes performed in class (for about 15 minutes each)

Midterm tests: There will be two Midterm Tests performed as scheduled above.

Grading policy: The lowest graded Quiz will be dropped when forming the overall grade of each student.

The overall grade of the students will be formed by taking
10% of the HW grades
20% of the Quizzes’ grades
30% of the Midterms’ grades
40% of the Final Exam grade.

Example: Suppose a student has A points total on the HW, B points total on the Quizzes, C points total on the Midterm Exams, and D points on the Final Exam. Suppose further that the maximal possible points one can get on these are A’, B’, C’, and D’ respectively. Then, one can compute a number S by the formula
\[ S = \frac{10*A + 20*B + 30*C + 40*D}{10*A' + 20*B' + 30*C' + 40*D'} \]

The overall grade of the student above is determined now by the scale:
- 0.92 < S : A
- 0.89 < S < 0.92 : A-
- 0.86 < S < 0.89 : B+
- 0.78 < S < 0.86 : B
- 0.75 < S < 0.78 : B-
- 0.71 < S < 0.75 : C+
- 0.62 < S < 0.71 : C
- 0.58 < S < 0.62 : C-
- 0.55 < S < 0.58 : D+
- 0.49 < S < 0.55 : D
- 0.46 < S < 0.49 : D-
- S < 0.46 : F

Make-up exams: No make-up exams will be given.

Remark: The Instructor reserves the right to make any changes he considers academically advisable. Any such changes will be announced in advance in class, posted to the web page of the course and to the e-mail accounts of the students. The students are responsible to be aware of the changes announced these ways.