

**Birzeit University**  
**Mathematics Department**  
**SYLLABUS**  
**Second Semester 2019/2020**  
**Instructor: Dr. Ala Talahmeh, [atalahmeh@birzeit.edu](mailto:atalahmeh@birzeit.edu)**  
**Course Code: MATH3331**  
**Title: Mathematical Analysis I**  
**Room: S.Abdulhadi276**  
**Office Hours: M: 9:20-11:20, T: 10-11:20, W: 12:20-13:40, R: 10-11:20**

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**Course Description:** The real number system. Sequences of real numbers. Real functions of one real variable: limits, continuity, uniform continuity and differentiability of functions. Definition, existence and properties of the Riemann integral. The fundamental theorem of calculus.

**Course Objectives:** This course is designed to provide a rigorous mathematical basis for the analysis of functions of one variable. Theorems usually stated without proof in elementary calculus courses will be completely proved in this course.

**Student Learning Outcomes:** After completion of the course, the students should be able to:

- ▶ Analyze a mathematical statement.
- ▶ Identify hypothesis and conclusion (s) from the statement of a mathematical result.
- ▶ Identify the set of mathematical results that lead to the proof of a statement.
- ▶ Compose the arguments leading to the proof of a mathematical statement.
- ▶ Acquire, whenever appropriate, a geometrical feeling of a statement.
- ▶ Apply the results to solve exercises, mostly theoretical in nature.
- ▶ Prepare the students for higher-level analysis courses.

**Textbook:** **Introduction to Analysis**, by William R. Wade, Fourth edition.

**Resource:** YouTube Playlist by Prof. S.H. Kulkarni, Department of Mathematics, IIT Madras. (<https://goo.gl/HyuhNc>).

**Topics to be Covered:**

Chapter 1: The Real Number System.

- 1.2: Ordered Field Axioms
- 1.3: Completeness Axiom.
- 1.6: Countable and Uncountable Sets.

## Chapter 2: Sequences in $\mathbb{R}$ .

- 2.1: Limits of Sequences.
- 2.2: Limit Theorems.
- 2.3: Bolzano-Weierstrass Theorem.
- 2.4: Cauchy Sequences.

## Chapter 3: Functions on $\mathbb{R}$ .

- 3.1: Two-Sided Limits.
- 3.2: One-Sided Limits and Limits at Infinity.
- 3.3: Continuity.
- 3.4: Uniform Continuity.

## Chapter 4: Differentiability on $\mathbb{R}$ .

- 4.1: The Derivative.
- 4.2: Differentiability Theorems.
- 4.3: The Mean Value Theorem.

## Chapter 5: Integrability on $\mathbb{R}$ .

- 5.1: The Riemann Integral.
- 5.2: Riemann Sums.
- 5.3: The Fundamental Theorem of Calculus.

### Grading Policy:

- **50%** Two In-class Exams. **Max. 30% Min. 20%**
- **10%** Quizzes & Homeworks.
- **40%** Final (Comprehensive).

**Good Luck**