SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**311**	**Real Analysis**	**4**	**3**	**0**	**2**	**6**	**MAT 203**	**5**[1]	**English**

A. Course Description

This course gives students the theoretical foundations underlying the topics taught in typical Calculus courses. It will cover the fundamentals of mathematical analysis, algebraic and order properties of the real numbers, the least upper bound axiom, sequences, limits, continuity, uniform continuity, differentiation, the Riemann integral, and series of functions. An understanding and construction of proofs will be stressed throughout the course.

B. Course Outcomes

At the end of this course the student will be able to:

- Understand fundamental properties of the real numbers which are necessary to the formal development of real analysis.
- Be familiar with rigorous arguments that lead to understand theoretical aspects of real analysis.
- Construct rigorous mathematical proofs.
- Understand deeply the notion of limit and know about its various uses which are innermost and fundamental process of converging values in real analysis such as sequences, series, continuity, differentiation and integration.

C. References

Required Textbook

Introduction to Real Analysis, R. Bartle, D. Sherbert, 4th Edition, Wiley, 2011.

Other references

- *Introduction to Real Analysis*, William F. Trench, Pearson Education.
- *Real and Complex Analysis*, W. Rudin, 3rd edition, McGraw-Hills, 1987.

Course Website: Google Classroom Webpage: http://www.imamm.org/

[1] *B.Sc. in Applied Mathematics.*

D. Topics Outline

1. **Fundamentals:** The Field of Real Numbers, The Least Upper Bound Property, Completeness Property, Archimedean Property, Density of Rationals in the Set of Real Numbers, Nested Intervals Property.
2. **Real Sequences:** Formal Definition of the Limit of a Sequence, Limit Theorems, Monotonicity, Boundedness, Subsequences and Bolzano-Weirstrass Theorem, Cauchy Criterion.
3. **Limits and Continuity:** Formal Definition of the Limit, Right and Left Limits, Continuity, Continuous Functions on Intervals, Uniform Continuity.
4. **Differentiation:** Derivative of a Function, the Mean Value Theorem, Main Applications to Calculus.
5. **Riemann's Integral:** Riemann Sums, Riemann Integral, Properties of Riemann Integral, Case of Monotonic Functions, Case of Continuous Functions, The Fundamental Theorem of Calculus.
6. **Sequences of Functions:** Pointwise Convergence, Uniform Convergence, Applications on Uniform Convergence.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	**Midterm 2:** 20 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

The grading distribution:

A$^+$	A	B$^+$	B	C$^+$	C	D$^+$	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams
goo.gl/ykm7t3