UNIVERSITY of NICOSIA

Course Code	Course Title	Credits (ECTS)
MATH-390	Real Analysis	8
Department	**Semester**	**Prerequisites**
Mathematics	Fall, Spring	MATH-190
Type of Course	**Field**	**Language of Instruction**
Required	Mathematics	English
Level of Course	**Year of Study**	**Lecturer**
1st Cycle	2nd	Dr George Chailos
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

1. Enable the student to develop a basic understanding of certain new (to the student) mathematical concepts, enhance the understanding of concepts previously encountered and to put them in the right perspective.
2. Develop further the student's idea of what constitutes a proof, and to enhance the understanding for the need for precise/formal language.
3. Provide proofs of main theorems of a first Real Analysis course, teach fundamental proving techniques and develop the critical and creative thinking.
4. Establish the student capable to develop further the ability to read mathematics individually.
5. Enable the student to comprehend how mathematicians think and develop their ideas.

Learning Outcomes:

After completion of the course students are expected to:

1. Discuss the mathematical concepts and notions developed throughout the course.
2. Implement the proofs and proving techniques of the main results of the course.
3. Acquire the fundamental knowledge of the theory of the structure of point sets, which is essential to the study of limits, continuity and differentiability of real valued functions.
4. Handle the basic theory of limits, continuity and differentiability of real valued functions, in a rigorous manner and in the formal and precise Mathematical language.

5. Acquire thorough knowledge of the fundamental theory (and properties) of the Riemann Integral using lower and upper sums, and a rigorous proof of the Fundamental theorem of Calculus.

Course Contents:

1. The Real Number System
    - Sets and Functions
    - Mathematical Induction
    - The Least Upper Bound Property
    - Countable and Uncountable sets
2. Sequences of Real numbers
    - Monotone and Convergent Sequences, Limit Theorems
    - Subsequences and the Bolzano-Weiestrass Theorem
    - Cauchy Sequences
    - Series of Real numbers
3. Structure of Point Sets
    - Open, Closed and Compact Sets
    - The Cantor set *(If time permits.)*
4. Limits and Continuity
    - Limit of a Function
    - Continuous Functions and Uniform Continuity
    - Monotone Functions and Discontinuities
5. Differentiation
    - The Derivative
    - The Mean Value Theorem
    - L' Hospital's Rule
6. The Riemann Integral
    - The Riemann Integral and classes of Riemann Integrable Functions.
    - Properties of the Riemann Integral
    - The Fundamental Theorem of Calculus

Teaching Methods:

Lectures, Handouts and Assignments

Assessment Methods:

2 Mid-Term Exams; Final Exam; Class Participation.

Required Textbook:

Authors	Title	Publisher	Year	ISBN
Manfred Stoll	Introduction to Real Analysis	Addison-Wesley	2001	0-321-04625-0

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Rudin Walter	Principles of Mathematical Analysis	McGraw-Hill	1976	007054235X
Patrick M. Fitzpatrick	Advanced Calculus	American Mathematical Society; 2nd Revised edition	2009	0821847910
Withold Kosmala	A friendly introduction to Analysis	Pearson Prentice Hall	2004	0131273167