Philadelphia University
Faculty of Science
Department of Basic Sciences and Mathematics

Course Syllabus

Course Title	Real Analysis I	**Course Code**	250311
Course Level	"3"	**Course Prerequisite**	"set theory" 250251
Lecture Time	8:10-9:10 S T Thur	**Credit Hours**	"3"

Course Description:

This course is intended to familiarize the students with the basic concepts, principles and methods of real analysis and its applications. The course covers many of important subjects. It starts with **Real numbers** and ends with **Continuity**. Between these two subjects, the student will deal with new subjects like **Sequences of Real numbers and Limits.** Also, the student will learn about **Infinite series.**

Course Objectives:

1. Define the limit and related concepts and illustrate them with typical examples.
2. Understand and prove the density theorem and the Archimedean property.
3. Understand the properties of sequences and the fundamental theorems.
4. Derive and apply the basic properties of real numbers.
5. Prove the fundamental theorems for continuity.
6. Apply the concept of continuity and prove the main properties for uniformly continuous functions

Course Components (Text Book):

Title : Introduction to Real Analysis

Author : Bartle and Sherbert.

Publisher : **John Wiley & Sons, Inc.**

Edition : 4th Edition

Year : 2011

ISBN : 978-0-471-43331-6

Teaching Methods:

1. Understand properties of real numbers.
2. Use the properties of real numbers to prove the fundamental theorems.
3. Use the properties of sequences to prove some important theorems.

Learning Outcomes:

- **Knowledge and understanding**

1. To give the student the necessary information to deals with mathematical problems.
2. To give the student the necessary mathematical tools for further study in pure mathematics
3. To demonstrate the ability of using Real analysis in solving mathematical problems.

- **Cognitive skills (thinking and analysis).**

To identify and solve problems. Work with given information and handle mathematical proofs based on mathematical theorems.

- **Communication skills (personal and academic).**

Encourage the students to be self-starters (creativity, decisiveness, initiative) and to finish the mathematical problems properly (flexibility, adaptability). Also to improve general performance of students through the interaction with each other in solving different mathematical problems.

- **Practical and subject specific skills (Transferable Skills).**

Gaining knowledge and experience of working with many pure mathematical problems

Assessment Instruments	**Mark**
First Examination	20
Second Examination	20
Homework's and Projects	20
Final Examination	40
Total	100

Attendance Policy:

Absence from lectures shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module Reference(s):

Title : Mathematical Analysis
Author : S.C. Malik
Publisher : John Wiley& Sons., Inc
Edition : 2ed edition
Year : 1994
ISBN : 81-224-0323-9

Course Academic Calendar

Week	Basic and Support Material to be Covered
(1)	**Preliminaries:** 1. Sets. 2. Functions. 3. Mathematical Induction.
(2)	**Real numbers:** 1. The Algebraic properties of R. 2. Applications. 3. The Order properties of R.
(3)	4. The completeness property of R. 5. The Archimedean principle in R
(4)	**Sequences:** 1. Limit of a sequence. 2. Applications. 3. Convergent sequence.
(5)	4. Monotone and bounded sequences. 5. Applications. 6. Subsequences and limit points.
(6) **First examination**	7. Cauchy sequences
(7)	8. Bolzano .Weierstrass Theorem. 9. Properties. 10. Monotone and bounded theorem.
(8)	**Limits** 1. Limits of real valued functions. 2. Applications. 3. Definition of limits by neighborhoods
(9)	4. Definition of limits by sequences. 5. Properties of Limits. 6. Applications. The sequential theorem.
(10)	**Continuity** 1. Continuous functions on ¡ . 2. Sequences definition and neighborhoods definition of continuity. 3. Limit and Continuity
(11) **Second examination**	4. Properties of continuous Functions
(12)	**Uniform Continuity:** 1. Open sets, closed sets bounded sets in ¡ . 2. Compact sets in ¡ . 3. Uniformly continuous functions.
(13)	4. Boundedness of continuous functions on compact intervals. 5. Applications. 6. The extreme value theorem.
(14)	7. The intermediate value theorem. 8. The sequential criterion for uniform continuity 9. Properties and Examples.
(15)	1. Review.
(16)	Final Examination