



JOHN CABOT UNIVERSITY

COURSE CODE: "MA 497"
COURSE NAME: "Real Analysis"
SEMESTER & YEAR: Spring 2020

SYLLABUS

INSTRUCTOR: Stefano Arnone

EMAIL: sarnone@johncabot.edu

HOURS: TTH 3:00-4:15 PM

TOTAL NO. OF CONTACT HOURS: 45

CREDITS: 3

PREREQUISITES: Prerequisite: MA 198 Calculus I. Recommended: MA 299 Calculus II

OFFICE HOURS:

COURSE DESCRIPTION:

This course covers the fundamentals of mathematical analysis: convergence of sequences and series, continuity, differentiability, and the Riemann integral. In this course the concepts learnt in calculus classes will be looked at more deeply and in greater detail, especially those relating to the calculus of a single real variable. While in prior courses students had experience computing limits, derivatives, and integrals to solve specific problems, in this class the focus will be on what makes the computations work, as well as on the precise definitions of the notions used. The goal is to develop a deeper understanding of the various concepts defined, and to train the critical thinking and rigorous reasoning skills of the students.

A major component of this course will be exposing students to proofs, with the aim of having them learn how to read, write, and understand a proof.

SUMMARY OF COURSE CONTENT:

Topics include: properties of the real number system, with an emphasis on the topology of the real line; continuity, differentiability, and the Riemann integral; sequences of functions.

LEARNING OUTCOMES:

Upon successful completion of this course, the student will be able to:

- describe the real line as a complete, ordered field;
- use the definitions of convergence as they apply to sequences, series, and functions;
- determine the continuity, differentiability, and integrability of functions defined on subsets of the real line;
- write solutions to problems and proofs of theorems that meet rigorous standards based on content, organization and coherence, argument, and style.

TEXTBOOK:

| Book Title | Author | Publisher | ISBN number | Library Call Number | Comments |
|--|-------------------|--|----------------|---------------------|--|
| Basic Analysis: Introduction to Real Analysis (volume I) | Jiří Lebl | N/A | 978-1718862401 | | It is free online at http://www.jirka.org/ra/ |
| Introduction to real analysis | William F. Trench | N/A | 0-13-045786-8 | | It is freely downloadable at http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF |
| Principles of mathematical analysis, 3rd ed. | Walter Rudin | McGraw-Hill Book Co., New York, 1976. International Series in Pure | 0-07-054235-X | | This is suggested material only |

REQUIRED RESERVED READING:

NONE

RECOMMENDED RESERVED READING:

NONE

GRADING POLICY

-ASSESSMENT METHODS:

| Assignment | Guidelines | Weight |
|------------------------------------|--|--------|
| Homework | Homework assignments will be graded: the average grade weighs 20 percent of the final grade. At the professor's discretion, late assignments might not be accepted. | 20/100 |
| Attendance and class participation | Full credit for attendance will be given to students with three or fewer unexcused absences. Four or more absences will result in a proportional reduction of the grade. | 10/100 |
| Mid-term exam | | 30/100 |
| Final exam (comprehensive) | | 40/100 |

-ASSESSMENT CRITERIA:

A Work of this quality directly addresses the question or problem raised and provides a coherent argument displaying an extensive knowledge of relevant information or content. The student demonstrates complete, accurate, and critical knowledge of all the topics, and is able to solve problems autonomously.

B This is highly competent level of performance and directly addresses the question or problem raised. There is a demonstration of some ability to critically evaluate theory and concepts and relate them to practice. The work does not suffer from any major errors or omissions and provides evidence that the student uses clear logic in his/her arguments.

C This is an acceptable level of performance and provides answers that are clear but limited, reflecting the information offered in the lectures. Mathematical statements are properly written most of the time.

D This level of performances demonstrates that the student lacks a coherent grasp of the material. Important information is omitted and irrelevant points included. Many mistakes are made in solving the problem raised. In effect, the student has barely done enough to persuade the instructor that s/he should not fail.

F This work fails to show any knowledge or understanding of the subject-matter. Most of the material in the answer is irrelevant.

-ATTENDANCE REQUIREMENTS:

ATTENDANCE REQUIREMENTS AND EXAMINATION POLICY

Full credit for attendance will be given to students with three or fewer unexcused absences. Four or more absences will result in a proportional reduction of the grade.

Students cannot make-up a major exam (midterm or final) without the permission of the Dean's Office. The Dean's Office will grant such permission only when the absence was caused by a serious impediment, such as a documented illness, hospitalization or death in the immediate family (in which you must attend the funeral) or other situations of similar gravity. **Absences due to other meaningful conflicts, such as job interviews, family celebrations, travel difficulties, student misunderstandings or personal convenience, will not be excused.** Students who will be absent from a major exam must notify the Dean's Office prior to that exam. Absences from class due to the observance of a religious holiday will normally be excused. Individual students who will have to miss class to observe a religious holiday should notify the instructor by the end of the Add/Drop period to make prior arrangements for making up any work that will be missed.

ACADEMIC HONESTY

As stated in the university catalog, any student who commits an act of academic dishonesty will receive a failing grade on the work in which the dishonesty occurred. In addition, acts of academic dishonesty, irrespective of the weight of the assignment, may result in the student receiving a failing grade in the course. Instances of academic dishonesty will be reported to the Dean of Academic Affairs. A student who is reported twice for academic dishonesty is subject to summary dismissal from the University. In such a case, the Academic Council will then make a recommendation to the President, who will make the final decision.

STUDENTS WITH LEARNING OR OTHER DISABILITIES

John Cabot University does not discriminate on the basis of disability or handicap. Students with approved accommodations must inform their professors at the beginning of the term. Please see the website for the complete policy.

SCHEDULE

Topics that will be covered (a more detailed schedule to be posted later on)

The set of real numbers: ordered sets; fields; Euclidean spaces.

Basic topology and metric spaces: countable and uncountable sets; metric spaces; open and closed sets; compactness and Weierstrass theorem; connectedness.

Convergence: Cauchy sequences; subsequences; upper and lower limits; completeness of real numbers; convergence and absolute convergence of series.

Continuity: limits; continuous functions on metric spaces; continuity and compactness/connectedness; intermediate value theorem; discontinuities; monotonic functions.

Differentiation: definition of the derivative; mean value theorem; differentiability; applications.

The Riemann integral: existence of Riemann integrals; the fundamental theorem of calculus.

Sequences and Series of functions: uniform convergence of functions.

