<u>Calculus</u>

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Universidad Complutense de Madrid

Language of Instruction: English

Syllabus:

The aim of this course is to serve as introduction to Mathematical Analysis and Calculus. In the course, we will study functions of one and several variables. The course will place a strong emphasis on the nature of concepts and applications.

The course begins by a review of basic high school mathematics: numbers and sequences, and the notion of function. Then we will pay attention to functions of single variable and their analytical properties: continuity, differentiability and integrability. The course finishes by extending these notions to functions of several variables.

- 1. Pre-calculus
 - a. Real numbers: fractions, absolute value
 - b. Basic functions: sines, cosines, exponential and absolute value
 - c. Sequences of real numbers
- 2. Functions, graphs and limits
 - a. Functions and Graphs
 - b. Limits
 - c. Continuity
- 3. Differentiation
 - a. Interpretation: tangent line, rate of change
 - b. Explicit differentiation: product, quotient and chain rules
 - c. Implicit differentiation
 - d. Applications: monotonicity, concavity/convexity and extrema
 - e. Taylor expansion
- 4. Integration
 - a. Interpretation: area under a curve
 - b. Riemann's integral
 - c. Fundamental Theorem of Calculus
- 5. Calculus of several variables
 - a. Euclidean space and linear algebra
 - b. Functions of several variables
 - c. Continuity, Differentiation and Integration

References

- Lecture notes provided by lecturer
- Notes provided in class

Evaluation: I consider three options to be discussed in order to meet the University criteria and the goals of the students

- (A) Final Exam (50%) and short questions in class (50%)
- (B) Final Exam (50%) and term paper and presentation in class (50%)
- (C) Final Exam (100%)

Additional reading materials:

- Stewart, Calculus. Brooks/Cole Publishing. 8th Edition 2015
- Goldstein, Lay et al. Calculus & its Applications. Pearson 2014.
- Larson. Applied Calculus for the Life and Social Sciences