

## FUNDAMENTOS DE MATEMÁTICA

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Code: 322049

Main Scientific Area: Mathematics and Statistics

Lecturer: Liliana Angélica Costa Matos Pereira

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 105h

ECTS: 6,0

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### **Objectives**

The teaching of Geometry is of the utmost importance and must develop in the student a geometric intuition and a spatial reasoning as well as capacities to explore, to conjecture, to reason logically, to use and to apply Mathematics, to formulate and to solve abstract problems or in a perspective of mathematical modelling. He must also develop in the student oral and written communication and organization skills.

The knowledge about functions, indispensable to the understanding of the world in which we live, will be enlarged based on numerical and graphical study, privileging intuitive work with functions such as trigonometric functions.

This theme has a marked emphasis on the connection between formulas and geometric representations. This connection is very important for everyone who uses math. The capacity to relate them is a fundamental capacity for the world of today and the future, and so this theme should provide a life-long training as basic as the table.

### **Learning Outcomes**

At the end of the course, students should:

Understand the definition of real function of a real variable and how to interpret and apply concepts associated with it: function domain calculation, function limit calculation, function continuity, derivation rules, continuity theorems and differential calculus theorems.

Establish metric relationships between figures.

Solve problems analytically and / or geometrically.

Calculate angles and solve problems involving trigonometry.

### **Course Contents**

1. Analytical Geometry in Plane and Space

1.1. Elementary Concepts

1.2. Represent sections

1.3. Establish metric relations between figures:

1.3.1. linear measurements;

1.3.2. areas;

1.3.3. volumes.

1.4. Use the Cartesian method to solve problems in plane and space

1.5. Identify sets of points of the plane and space from conditions and reciprocally

1.6. Solve geometric and / or analytical problems, involving:

1.6.1. line segment midpoint;

1.6.2. vectors;

1.6.3. straight;

1.6.4. places.

2. General functions

2.1. Definition and Properties

2.2. Graphic study

2.2.1. Domain, contradiction, monotony, intersection with coordinate axes

2.2.2. Limits:

2.2.2.1. Intuitive notion of limit (geometric interpretation);

2.2.2.2. Points of accumulation, isolated;

2.2.2.3. Definition and operations with limits;

2.2.2.4. Indeterminations.

2.3. Continuity

2.3.1. Intuitive notion

2.3.2. Definition: continuity at one point and at intervals (limited and unlimited

2.3.3. Function Graph Assoc

2.4. Differentiability

2.4.1. Definition of derivative at a point and interval

2.4.1.1. Side Derivatives

2.4.1.2. Differentiability and continuity

2.4.2. Geometric interpretation and its applications

2.4.3. Derogation rules

2.4.4. Derivatives of functions and their applications

2.4.4.1. Study of extremes and monotony

2.4.4.2. Concavity and inflection points

3. Trigonometric Functions

3.1. Sine, cosine, and tangent function

3.1.1. Definition and Properties

3.1.1.1. Domain, Countermand, zeros, periods, parity, asymptotes and monotony

3.1.1.2. Relations between trigonometric functions

3.1.1.3. Trigonometric equations

3.1.1.4. Troubleshooting trigonometric functions

### **Recommended Bibliography**

Spivak, M: Cálculos, New York, W. A. Benjamim

### **Learning and Teaching Methods**

The understanding, manipulation and application of the concepts continuity of differentiability of real functions of a real variable provide a base set of mathematical knowledge required for the proper functioning of other units of the course curriculum. They also allow to develop the scientific reasoning and the mathematical ability to the application of the mathematical concepts.

### **Assessment Methods**

Continuous evaluation:

$$\text{Final score} = 0.15 * \text{QA} + 0.85 * (\text{T1} + \text{T2}) / 2$$

QA is an individual class question, to be held in class;

T1 and T2 tests to be performed on a date to be combined, and in the 2nd test a minimum grade of 7 values is required.

Exam Rating:

Final grade = exam grade