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Course Unit	Fundamentals of Mathematics		Field of study	Mathematics
Bachelor in	Multimedia		School	School of Public Management, Communication and Tourism

Academic Year	2022/2023	Year of study	1	Level	1-1	ECTS credits	6.0
Type	Semestral	Semester	1	Code	9213-656-1102-00-22		

Workload (hours)	162	Contact hours	T	-	TP	60	PL	-	TC	-	S	-	E	-	OT	-	O	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s)	Ines Monteiro Barbedo de Magalhaes

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Read, write and use the language of mathematics fluently to describe problems;
2. Apply the discrete mathematics concepts to the development of algorithms and programming;
3. Use the vector calculus to represent and manipulate geometric fiigures in the plane and in the space;
4. Use matrix calculations and transformations to work with vectors and geometric figures in the plane and in the space.

Prerequisites

Before the course unit the learner is expected to be able to:
Understand the use of Mathematics - medium level

Course contents

Topics of Discrete Mathematics: propositional calculus; set theory; sequences and proportions. Topics of Geometry: matrix calculation; trigonometry; vector calculus in plane and space; geometric transformations.

Course contents (extended version)

1. Topics in Discrete Mathematics
   - Logical operations on proposals: negation, conjunction, disjunction, implication and equivalence;
   - Truth tables and properties of the propositional calculus;
   - Logical operations on conditions and expressions with variables and quantifiers;
   - Equality of sets: extension axiom and set cardinality; inclusion;
   - Union, intersection, complementary sets, cartesian product and powerset of a sets;
   - Properties of set operation and Venn's diagrams;
   - Defining sequences by general formula and recursively;
   - Fibonacci sequence;
   - Proportions and golden ratio.
2. Topics in Geometry
   - Matrices. Definitions. Operations with matrices and properties.
   - The inverse matrix. Transpose of a matrix.
   - Determinant of a matrix of 1st, 2nd and 3rd order.
   - Trigonometry. Pythagorean trigonometry identity and formulas.
   - Trigonometric relations; remarkable values. Solving triangles.
   - Vectorial calculus. Representing points and vectores in aorthonormal reference; a standard vector.
   - Vector operations: adiction, scalar product, normalization and polar form.
   - Lines and planes, circles and spheres. Related position. Dot product and cross product.
   - Polygon and polyhedra. Some properties.
   - Geometric transformations. Rotation, translation, reflection, scale and projection.

Recommended reading

1. Epp, S. (2011). Discrete Mathematics and Applications, 4th edition, Brooks/Cole CENGAGE Learning [ISBN-10: 0-495-82616-2 | ISBN-13: 978-0-495-82616-3]
2. Corbalán, F. (2016) A PROPORÇÃO ÁUREA A linguagem matemática da beleza. National Geographic, Portugal
3. Kalajdzieyski, S. (2008) MATH and ART an introduction to visual mathematics. CRC Press [ISBN: 978-1-58488-913-7]
4. Anton, H. & Rorres, C. (2010). Elementary Linear Algebra with Applications. (10th ed.) Wiley. [ISBN: 0470432055]

Teaching and learning methods

Presentation of theoretical aspects of subjects in lectures using simple examples. Realization, on the part of the students, of practical exercises of application of the theoretical concepts in practical sessions tutorials. Individual work to be done outside of class and group work inside and outside the class, promoting the debate of ideas and joint resolution of proposed problems.

Assessment methods

- Distributed Evaluation (incoming students) - (Regular, Student Worker) (Final, Supplementary, Special)
   - Practical Work - 50% (3 out of 4 possible)
   - Final Written Exam - 50% (All syllabus (minimum mark 7 points in 20))

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Ines Monteiro Barbedo de Magalhaes	Ana Lucia Jesus Pinto	Elisabete da Anunciacao Paulo Morais	Luisa Margarida Barata Lopes
05-10-2022	07-10-2022	07-10-2022	14-10-2022