Study Plan

School: School of Sciences and Technology
Degree: Master
Course: Mathematics for Teaching (cód. 603)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11921M	Seminar of Mathematics for Teaching	Mathematics	6	Semester	156

Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT10199M	Complements of Discrete Mathematics	Mathematics	6	Semester	156
PED10202M	Didactics of mathematics and Knowledge	Education Sciences	6	Semester	156
MAT11920M	Principles of Geometry	Mathematics	6	Semester	156
MAT10201M	Principles of Probabilities and Statistics	Mathematics	6	Semester	156
MAT10200M	Real Analysis through an Historical Approach	Mathematics	6	Semester	156

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11923M	Training Complementary in Mathematics	Mathematics	6	Semester	156

Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT10203M	Statistical Models	Mathematics	6	Semester	156
PED10207M	Technology in Mathematics Education	Education Sciences	6	Semester	156
MAT10206M	Multivariate Data Statistics	Mathematics	6	Semester	156
MAT11922M	Chaos and Fractals in the Classroom	Mathematics	6	Semester	156
MAT10204M	Mathematical Modelling	Mathematics	6	Semester	156

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
Dissertation					

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
Dissertation					

Conditions for obtaining the Degree:

Program Contents

Back
Complements of Discrete Mathematics (MAT10199M)
Elementary number theory with applications in cryptography. Graph Theory

Back
Didactics of mathematics and Knowledge (PED10202M)
C1. Mathematics teaching as an area of scientific knowledge;
C2.The nature of mathematics knowledge;
C3. Problem solving and research activities in the mathematics teaching.
C4. The professional knowledge of mathematics teacher.

Back
Principles of Geometry (MAT11920M)
Moderns elementary geometry (ulterior developments of Euclidean Geometry)
Geometrical transformations, isometries and similarities.
Symmetry and its relation with art and architecture.
Projective geometry and evolution of perspective in painting.

Back
Principles of Probabilities and Statistics (MAT10201M)
That treats Statistics:
The Statistics as scientific research methodology. Observational and experimental. The collection, cleaning, summary and presentation of data. Populations and samples, sampling units and variables. The scale of Stevens. Elementary notions on sampling and planning experiences.
Data Analysis:
(a) Univariate data. Sample characteristics. Graphic representations.
(b) Bivariate data: descriptive approach to correlation and regression.
Conditional Probability and Probability:
(a) Notions of probability, Kolmogorov axiomatics and its consequences.
(b) conditional probability. Probability of a chain and the multiplication rule. Independence. The Theorem of Total Probability and Bayes Theorem.
Models:
(a) discrete models: binomial, hypergeometric and Poisson, and mutual relations.
(b) continuous models: uniform and Gaussian.

Real Analysis through an Historical Approach (MAT10200M)
1. Archimedes and the Parabola
2. The calculation of Fermat
3. The calculation of Newton
4. Euler: trigonometric series
5. The real numbers
6. Sequences and their limits
7. Infinite series
8. Series of functions
9. Continuity, differentiability and integrability.

Statistical Models (MAT10203M)
Exploratory Data Analysis. Principal distributions of Probability. Law of Large Numbers and Central Limit Theorem. Sampling and Surveys. Correlation and Linear Regression. Selection of models. Use of Statistical Software: SPSS and R.

Technology in Mathematics Education (PED10207M)
C1. Perspectives about the use of technologies on Mathematics Education: first years of use of computer and calculator; international evolution on recent years;
C2. Evolution of curricular orientations about the use of technologies on Mathematics Education; international tendencies; Portuguese situation.
C3. The calculator (simple and graphic): Strategies for use; potentialities; implications.
C4. Specific software for Mathematics: Strategies for use; potentialities; implications.
C5. The internet in Mathematics classroom: Strategies for use; potentialities; implications.
C6. Technologies and the curricular areas: Number; Algebra and Functions; Geometry; Statistics and Probability.
C7. Innovative situations of use of technologies in Mathematics Education: description an d analysis of particular cases.
C8. Investigations about the use technologies on Mathematics Education: Main results from research; actual tendencies; Portuguese research in the domain.

Multivariate Data Statistics (MAT10206M)
1- Early numerical notations
2-The ethnomathematical thesis
3-Oriental antiquity. India and Greece
4-The taming of the infinite through the indivisibles
5-The great syntheses ,analytic geometry ,and calculus
6-Euler,Gauss,complex numbers and number theory
7-Non euclidean geometry as a revolution in the axiomatic methodology
8-Logic and mathematics in the XXth century
9-The rising of applied mathematics
10-Philosophies of Mathematics

Chaos and Fractals in the Classroom (MAT11922M)
Iteration Theory
Intuitive notions of attractor
Fractals as fixed points of MRCM or IFS systems
Fractal dimension
Cellular automata Expansion and compression, sensibility to the initial conditions. Rate of mixing and
Lyapunov Exponents
Devaney's definition of chaos
Chaos in the quadratic family

Mathematical Modelling (MAT10204M)
Introduction: mathematical models in life;
Computing machines: History of computing machines. Working with a programmable
calculator. When the calculator mislead. Arithmetic operations on computing machines;
Numerical methods: Numerical resolution of nonlinear equations. Numerical solution of
differential equations. Numerical optimization problems.
Applications of numerical methods: Mathematical problems of classical physics (motion of an
oscillator, movement of objects in an electric field, gravity, etc.). Problems of mathematical
biology (population dynamics models, etc.); Optimization problems or minimum and maximum
in our life (old optimization problems, optimization of curves, satellite control, etc.). Problems of
Mathematical Physics (diffusion equation, wave equation). Mathematical models in economics
and ecology.

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