POSTGRADUATE PROGRAM IN MATHEMATICS (PROFMAT)
(NATIONAL PROFESSIONAL MASTER'S PROGRAM)

SUBJECT: ARITHMETIC
COURSE MENU: Whole Numbers. Induction Applications. Division in Whole Numbers. Representation of Whole Numbers. Euclid's Algorithm. Applications of the Maximum Common Divisor. Prime numbers. Special Numbers. Congruences. The Theorems of Euler and Wilson. Linear Congruences and Residual Classes. Quadratic Congruences. Notions of Encryption.

SUBJECT: EDUCATIONAL EVALUATION
COURSE MENU: National Exams of Educational Evaluation. The National System of Evaluation of Higher Education. What is the Item Response Theory? Estimation of Parameters and Proficiencies in IRT. The Engineering of Item Construction. Evaluation as a Means to Regulate Learning.

SUBJECT: NUMERICAL CALCULATION
COURSE MENU: Introduction to Mathematical Modeling. Model Construction. Examples of Models with Finite Differences and Growth Model. Roots of Equations. Bisection Methods. Fixed Point and Newton. Curve adjustment. Linear and Quadratic Approximations. Polynomial Interpolation. Least-Squares Fitting. Numerical Derivation and Integration.

SUBJECT: CALCULATION FOUNDATIONS
COURSE MENU: Sequences of Real Numbers. Limit of Functions. Continuous Functions. Derivation. Integration.

SUBJECT: GEOMETRY
COURSE MENU: Basic Geometric Concepts. Congruence of Triangles. Geometric places. Proportionality and Similarity. Areas of Flat Figures. Trigonometry and Geometry. Basic Concepts in Space Geometry. Some Simple Solids. Convex Polyhedra. Volume of Solids.

SUBJECT: ANALYTICAL GEOMETRY
COURSE MENU: Plane Coordinates. Plane Vectors. Equations of the Straight Line in the Plane. Relative Position between Straight Lines, Circles, and Distances. Ellipse. Hyperbole. Parable. General Second-Degree Plane Equation. Parametrized Plane Curves. Coordinates and Vectors in Space. Internal Product and Vector Product in Space. Mixed Product, Volume, and Determinant. The Straight Line in Space. The Plane in Space. Linear Equation Systems with Three Variables. Distance and Angles in Space.

SUBJECT: SPATIAL GEOMETRY
COURSE MENU: Incidence. Angles and Relative Positions between Straight Lines and Planes in Space. Angles in Space. Dihedral, Trihedral, and Polyhedral Angles. Prisms, Cylinders, Pyramids, Cones, and Spheres. Polyhedrons. Plato's polyhedrons. Euler's formula. Volumes.

SUBJECT: INTRODUCTION TO LINEAR ALGEBRA
COURSE MENU: Linear Systems and Matrices. Matrix Transformation and System Resolution. Vector Spaces. R3 Space. Linear Transformations. Linear transformations and Matrices. Spaces with Internal Product. Determinants. Diagonalization of Operators.

SUBJECT: DISCRETE MATHEMATICS
COURSE MENU: Natural numbers. Mathematical Induction. Progressions. Recurrences. Financial Mathematics. Combinatorial Analysis. Probability. Averages and Drawer Principle.

SUBJECT: MATHEMATICS AND ACTUALITY
COURSE MENU: Presenting an overview of the presence and usefulness of Mathematics in everyday life. Some suggestions for topics to be studied: Mathematics and Music. Sounds and Sound File Compression. Passwords used in Banks and the Internet. Codes. The Geometry of the Earth Globe. GPS operation. The Mathematics of Bar Codes. Applications of Conics. Other topics related to technological innovations.

SUBJECT: MATHEMATIC MODELING
COURSE MENU: Conceptual Aspects of Modeling. Optimization in Mathematical Modeling. Differential Equations and Differences in Mathematical Modeling. Probability and Statistics in Mathematical Modeling. Theory of Graphs in Mathematical Modeling. Mathematical Modeling in Teaching.

SUBJECT: REAL NUMBERS AND FUNCTIONS
COURSE MENU: Numerical Sets. Natural Numbers. Cardinal Numbers. Real Numbers. Related Functions. Quadratic Functions. Polynomial Functions. Exponential and Logarithmic Functions. Trigonometric Functions.

SUBJECT: POLYNOMIALS AND ALGEBRAIC EQUATIONS
COURSE MENU: Complex Numbers. The Geometry of the Complex Plane. Basic Properties of Polynomials. Factoring of Polynomials. Algebraic Equations. Constructions with Ruler and Compass. Hypercomplex Numbers.

SUBJECT: PROBABILITY AND STATISTICS
COURSE MENU: The Nature of Statistics. Treatment of Information. Frequency Distributions and Charts. Measures. Basic Concepts in Probability. Conditional Probability and Independence. Discrete and Continuous Random Variables. Accumulated Distribution Function. Hope and Variance of Random Variables. Bernoulli, Binomial, and Geometric Model. Uniform Model and Normal Model. Asymptotic Distribution of the Sample Mean. Introduction to Statistical Inference.

SUBJECT: COMPUTATIONAL RESOURCES IN MATHEMATICS TEACHING
COURSE MENU: The use of Calculator in Mathematics Teaching. Electronic Spreadsheets. Graphic environments. Dynamic Geometry Environments. Algebraic Computing Systems. Distance Learning. Electronic Research, Word Processors, and Hypertext. Criteria for Selection of Computational Resources in Mathematics Teaching.

SUBJECT: PROBLEM SOLVING
COURSE MENU: Strategies for solving problems related to real numbers and functions, discrete mathematics, geometry, and arithmetic. Analysis of exams, competitions and tests: Qualification of the National Professional Master's Program in Mathematics - PROFMAT, Program for International Student Assessment (PISA), National High School Examination (ENEM), Brazilian Mathematical Olympiad (OBM), Public School Mathematical Olympiad (OBMEP), International Mathematical Olympiad (IMO), Southern Cone Olympiad, Ibero-American Mathematical Olympiad (IOM), Mathematical Kangaroo Contest (Science Without Borders). Other exams, competitions, and tests related to Basic Education.

SUBJECT: TOPICS IN DIFFERENTIAL AND INTEGRAL CALCULATION
COURSE MENU: Series of Real Numbers. Taylor's Polynomials. Functions of n Variables. Partial Derivatives and Gradient. Critical Points of a Function of n Variables. Multiple Integral.

SUBJECT: TOPICS IN HISTORY OF MATHEMATICS
COURSE MENU: Mathematics in Babylon and Ancient Egypt. Greek Mathematics until Euclid. Greek Mathematics after Euclid. Al-Khwarizmi, Cardano, Viète, and Neper. The new Mathematics of the Seventeenth Century. Functions, Real and Complex Numbers.

SUBJECT: TOPICS IN MATHEMATICS
COURSE MENU: Subject without fixed course menu, in which the program must be proposed by each Associated Institution.

SUBJECT: TOPICS IN THEORY OF NUMBERS
COURSE MENU: Fundamentals. Powers and Congruences. Multiplicative Functions and Möbius Inversion Formulas. Continuous Fractions. Nonlinear Diophantine Equations.

SUBJECT: COURSE CONCLUSION WORK
COURSE MENU: Subject dedicated to supporting the elaboration of work on a specific subject pertinent to the curriculum of Basic Education Mathematics and that impacts the didactic practice in the classroom. Each work is presented in the form of an expository lecture on the theme of the project, in addition to a written work, with the option of presenting technical production related to the theme.