National University of Science and Technology

POLITEHNICA Bucharest

Faculty of Applied Sciences

Master's Program in Applied Mathematics and Computational Sciences

Description

Advances in artificial intelligence, scientific computing, and digital technologies increasingly rely on sophisticated mathematical models and computational methods. From engineering design and data-driven decision making to machine learning and scientific simulation, modern challenges require specialists who combine strong mathematical foundations with advanced programming and analytical skills.

The **Master's Program in Applied Mathematics and Computational Sciences** provides an interdisciplinary education that integrates applied mathematics, numerical analysis, computational science, machine learning, and data analytics. Delivered entirely in **English**, the program prepares students to model, analyze, and solve complex real-world problems using state-of-the-art computational techniques.

The curriculum combines rigorous theoretical foundations with extensive practical training in scientific programming, numerical algorithms, statistical modeling, and artificial intelligence. Students develop the ability to design computational solutions for engineering, industry, scientific research, and emerging data-intensive applications while gaining experience with professional software environments widely used in academia and industry.

Relevance to the Job Market

The rapid digitalization of science, engineering, and industry has created a growing demand for specialists capable of developing computational models, analyzing complex datasets, and implementing intelligent algorithms. Organizations increasingly seek professionals with expertise in mathematical modeling, scientific computing, machine learning, and data analysis to support innovation and technology development.

Graduates are well prepared for careers in software development, scientific computing, artificial intelligence, data science, engineering simulation, quantitative analysis, and research. Typical career paths include **Computational Scientist**, **Machine Learning Engineer**, **Data Scientist**, **Numerical Software Engineer**, **Research Engineer**, **Scientific Programmer**, **AI Specialist**, and **Data Analyst**. The program also provides excellent preparation for doctoral studies in applied mathematics, computer science, computational engineering, or artificial intelligence.

Competencies Acquired

Upon completion of the program, graduates will be able to:

- Develop mathematical models for complex engineering and scientific applications.
- Design, implement, and optimize numerical algorithms for computational problems.
- Apply machine learning and statistical methods to prediction, classification, and decision support.
- Process, analyze, and visualize large and complex datasets using modern computational tools.
- Develop software solutions using Python and MATLAB for scientific computing and artificial intelligence.
- Apply numerical methods to simulation, optimization, and data-driven modeling.
- Process natural language data and implement AI-based analytical techniques.
- Validate, evaluate, and optimize computational models and numerical algorithms.
- Conduct independent research and contribute to interdisciplinary projects involving mathematics, computation, and artificial intelligence.
- Conduct independent research and develop innovative solutions for modern information and communication technologies.

Selected Courses

The curriculum includes advanced topics such as:

- Numerical Analysis
- Mathematical Modeling
- Data Analysis and Management
- Scientific Programming with Python and MATLAB
- Machine Learning
- Natural Language Processing
- Statistical Modeling
- Scientific Computing
- Numerical Optimization
- Research Methodology

Computational Tools

Students gain practical experience using industry-standard software and programming environments, including:

- **Python** (NumPy, pandas, scikit-learn, TensorFlow, PyTorch, Matplotlib)
- **MATLAB** (Control System Toolbox, Image Processing Toolbox, Robust Control Toolbox, LMI Control Toolbox, Simulink)
- **PHP** and **MySQL** for database-driven applications

Research Topics

Students have the opportunity to participate in research projects in areas including:

- Scientific and High-Performance Computing
- Numerical Methods for Engineering Applications
- Mathematical Modeling and Simulation
- Machine Learning and Artificial Intelligence
- Data Science and Statistical Learning
- Optimization Algorithms
- Natural Language Processing
- Computational Mathematics
- Numerical Solutions of Differential Equations
- Intelligent Data Analysis and Visualization

Program Highlights

- **Entirely taught in English**, making it accessible to international students.
- Strong emphasis on the integration of mathematics, computation, and artificial intelligence.
- Hands-on experience with widely used scientific computing and machine learning software.
- Interdisciplinary curriculum combining theory, programming, and practical applications.
- Excellent preparation for careers in industry, research, and doctoral studies.

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Additional Information

- **Language of instruction:** Romanian
- **Duration:** 2 years
- **Degree awarded:** Master of Science (M.Sc.) in Applied Engineering Sciences
- **Contact person:** Cof.dr. Anddreea BEJENARU, andreea.bejenaru@upb.ro