INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES RENNES

Department MA
Applied Mathematics

The aim of the Applied Mathematics (MA) major is to prepare mathematical engineers able to formulate problems from various areas such as industry and services. It provides the future engineering mathematician with necessary backgrounds for using and developing mathematical tools and models, incorporating computer and numerical aspects. In addition to the technical issues in mathematical engineering, the program strengthens teamwork skills through supervised projects and internships.

Opportunities

Graduates can work in a broad range of industries (aeronautics, automotive sector, electronics, energy, imaging, pharmaceuticals, transports) and services (banking, insurance, logistics, risk management, IT services company, ...). Opportunities are also possible in research departments of major companies.

A three-year program

The program is cross-training: the students will learn how to handle modeling problems arising in random or deterministic situations and to develop software solutions.

It offers a broad scientific culture allowing to grasp various problems encountered in mathematical engineering.
It fully integrates the numerical and computational aspects of the studied modeling techniques.
It provides answers to needs expressed in different industry and services sectors.

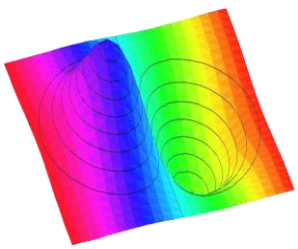
The MA graduates have

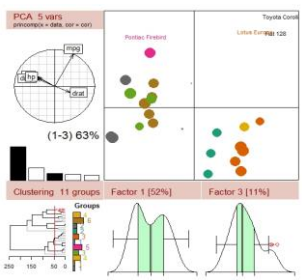
on the one hand, a dual mathematical background:

- statistics, data processing, random modeling, design of experiments,
- optimization, high dimensional optimization, operational research, modeling,

on the other hand

- strong computer science skills for numerical simulations and data management.



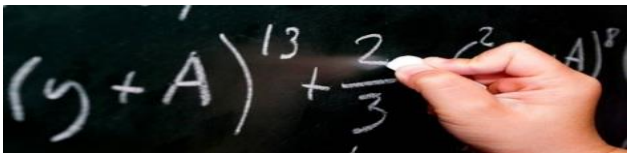


The program

The program is built around four main objectives: providing the MA graduates with

- core courses in mathematics and computer science;
- data processing (descriptive tools, data management) and random modeling (forecasting, decision making support) tools;
- optimization, operational research, and deterministic modeling tools;
- methodologies integrating different skills (taking into account uncertainties in solving industrial or numerical engineering problems).

It also incorporates disciplines which are devoted to the operational and economic aspects of engineering as well as foreign language courses (international mobility is required). The program gives a significant place to professional situations (individual projects, design offices, internships, etc).



Study pursuing

Students who wish to complement and/or pursue their studies may enroll in

- a international double degree (Canada, Italy, Maroc)
- a double degree in actuarial science with EURIA
- a double degree with National School for Statistics and Information Analysis (ENSAI),
- a Management training in one of the INSA partner schools (Audencia, RSB, IGR),
- a Master's degree: Advanced Studies and research in Finance, Mathematics and Applications, Modelling in Clinical pharmacology, Biostatistics and Epidemiology
- an academic Ph.D. thesis or an industrial Doctorate program.

Admission requirements

Applicant must have completed, at least, a two-year undergraduate program (with a substantial background in mathematics) or its equivalent.

Contact
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www.insa-rennes.fr/applied-mathematics.html

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3rd Year

Semester 1

- Basic mathematical tools
- Probability
- Remediation
- Multivariate data analysis
- Modeling with ordinary differential equations
- Numerical methods for linear systems
- Introduction to mathematical software
- C Programming language
- Python and scientific computing

Semester 2

- Continuous optimization
- Inferential statistics
- Functional Transforms and applications
- Linear regression models
- Markov models
- Discrete optimization
- Databases
- Numerical methods: non-linear cases

4th Year

Semester 1

- Stochastic models for dynamical systems*
- Hilbertian tools and applications*
- Risk analysis and scoring*
- Time series*
- Operational research methods*
- Object-oriented programming (C++)
- Interdisciplinary project or research initiation project

Semester 2

- Statistical learning*
- Design of experiments*
- Modelling with PDE and numerical resolution*
- Large scale optimization
- High performance computing
- Nondifferentiable optimization and Applications
- Engineering and design office or research initiation project
- Internship

5th Year

Semester 1

- Optimal control
- Optimization under uncertainty
- Machine Learning and Deep Learning
- Uncertainty and Sensitivity analysis in engineering
- Reliability and survival analysis
- Rare events simulation and estimation

Semester 2

- Final project

Companies seminars

Humanities[1]

[1] (25% of the program) : Foreign languages, Human sciences project, Creativ, Risk management, Introduction to sustainable digitalisation, Individual professional project, Economic, legal and social issues, Innovation and entrepreneurship, Engineer & Society, Sport,…

* Handout in English