

## Master Mathématiques et applications

# Parcours Master of Science in Industrial and Applied Mathematics (MSIAM)

### Présentation

Currently, applied mathematics is an area that provides many job opportunities, in industry and in the academic world. There is a great demand for mathematical engineers on topics such as scientific computation, big data analysis, imaging and computer graphics, with applications in many fields such as physics, medicine, biology, engineering, finance, environmental sciences.

The Master of Science in Industrial and Applied Mathematics (MSIAM) offers a large spectrum of courses, covering areas where the research in applied math in Grenoble is at the best level. Our graduates are trained to become experts and leaders in scientific and technological projects where mathematical modeling and computing issues are central, in industry or research. A large and distinguished graduate Faculty participate in the program, bringing their expertise in a wide range of areas of mathematics including applied analysis, numerical analysis and scientific computing, probability theory and statistics, computational graphics, image analysis and processing, and applied geometry.

The academic program is a two-year master program (120 ECTS), fully taught in English. It combines three semesters of courses and laboratory work (90 ECTS) with a six-month individual research project (30 ECTS).

The first year is composed of a common core which provides theoretical and practical grounds in probability and statistics, PDE and modelling, images and geometry as well as computer sciences, optimisation and cryptology.

In the second year, the first semester is divided in 2 tracks :

- Modeling, Scientific Computing and Image analysis (MSCI)
- Data Science (DS)

The second semester is devoted to the master thesis project.

[Site web du M2 MSIAM](#)

### Admission

To be admitted to the program, candidates must have previously completed their undergraduate studies and been awarded a bachelor degree in Mathematics or Applied mathematics, or equivalent. MSIAM is a two-years master degree. Students can apply to 1st year or directly to second year.

- Admission in MSIAM 1st year : anyone holding a 3rd year or bachelor degree in mathematics or applied mathematics or an equivalent degree, interested in pursuing a high level mathematical education and motivated by the applications of mathematics. The minimum requirement is to have earned at least the equivalent of 180 ECTS credits
- Admission in MSIAM 2nd year : anyone holding a first year of master (60 ECTS credits) in mathematics or applied mathematics or an equivalent degree, interested in pursuing a high level mathematical education and motivated by the applications of mathematics. The minimum requirement is to have earned at least the equivalent of 240 ECTS credits.

Important notes :

- Students from related backgrounds (physics, computer science, engineering,...) may also apply provided they possess outstanding mathematical qualifications and are highly motivated by applications
- Eligibility : only individuals who have an excellent academic record will be considered. Applications from students from traditionally underrepresented groups are particularly encouraged
- Academic standing : Fellows must maintain full-time status in the master's program, and must be engaged in full-time coursework or research during the academic year (september 1st – july 31st)

#### Language requirements :

- Students from countries where English language is not the primary language are required to provide evidence of Competence in English. The requirement is waived for applicants from English speaking countries as well as applicants whose previous degree is from a program taught in English. English scores required: TOEFL IBT 100 min / TOEIC 750 min / IELTS 6.5 min. This is equivalent to the CEFR level B2, although we will consider applicants with a B1 level and who have an excellent academic record
- An A2 level in French is recommended

#### Public continuing education : You are in charge of continuing education :

- if you resume your studies after 2 years of interruption of studies
- or if you followed a formation under the regime formation continues one of the 2 preceding years
- or if you are an employee, job seeker, self-employed

If you do not have the diploma required to integrate the training, you can undertake a [validation of personal and professional achievements \(VAPP\)](#)

Vous souhaitez candidater et vous inscrire ? Sachez que la procédure diffère selon le diplôme envisagé, le diplôme obtenu, ou le lieu de résidence pour les étudiants étrangers.

- **Vous êtes un candidat non ressortissant de l'Union Européenne, résidant en** Algérie, Argentine, Bénin, Brésil, Burkina Faso, Cameroun, Chili, Chine, Colombie, Comores, Congo, Corée du Sud, Côte d'Ivoire, Egypte, Etats-Unis, Gabon, Guinée, Inde, Indonésie, Iran, Japon, Liban, Madagascar, Mali, Maroc, Maurice, Mauritanie, Mexique, Pérou, Russie, Sénégal, Syrie, Taïwan, Togo, Tunisie, Turquie, Vietnam.

[Candidater sur études en France](#) **et** [sur FSA](#)

#### **Pour les autres candidats**

[Candidater](#)

## Infos pratiques :

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- > **Composante** : Grenoble INP, Institut d'ingénierie et de management, UFR IM2AG (informatique, mathématiques et mathématiques appliquées)
- > **Durée** : 2 ans
- > **Type de formation** : Formation initiale / continue
- > **Lieu** : Grenoble - Domaine universitaire
- > **Contacts** :

#### **Responsable(s) pédagogique(s)**

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### Secrétariat de scolarité

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## Programme

### Master Industrial and applied math 1re année

#### Semestre 7

<b>UE Object-oriented and software design</b>	3 ECTS	18h
<b>UE Applied probability and statistics</b>	6 ECTS	48h
<b>UE Partial differential equations and numerical methods</b>	6 ECTS	54h
<b>UE Signal and image processing</b>	6 ECTS	54h
<b>UE Geometric Modelling</b>	6 ECTS	54h

1 élément(s) au choix parmi 2

**UE Français langue étrangère**

**UE English**

#### Semestre 8

<b>UE Computing science for big data and HPC</b>	6 ECTS	54h
<b>UE Project</b>	3 ECTS	40h
<b>UE Internship</b>	3 ECTS	
<b>UE Numerical optimisation</b>	6 ECTS	54h

2 élément(s) au choix parmi 6

<b>UE Computer Algebra and Cryptology</b>	6 ECTS	51h
<b>UE Variational methods applied to modelling</b>	6 ECTS	54h
<b>UE 3D Graphics</b>	6 ECTS	54h
<b>UE Operations Research</b>	3 ECTS	36h
<b>UE Operations Research Complementary</b>	3 ECTS	
<b>UE Statistical analysis and document mining</b>	6 ECTS	49,5h

### Master MSIAM-Modeling, Scientific Computing and Image analysis (MSCI) 2e année

#### Semestre 9

10 élément(s) au choix parmi 12

<b>UE Advanced imaging</b>	3 ECTS	18h
<b>UE An introduction to shape and topology optimization</b>	3 ECTS	18h
<b>UE Congestion Phenomena and Compressibility for Granular Media</b>	3 ECTS	18h
<b>UE Efficient methods in optimization</b>	3 ECTS	18h
<b>UE Geophysical imaging</b>	3 ECTS	18h
<b>UE GPU Computing</b>	3 ECTS	18h
<b>UE Level set methods and optimization algorithms with applications in imaging</b>	3 ECTS	18h
<b>UE Model exploration for approximation of complex, high-dimensional problems</b>	3 ECTS	18h
<b>UE Modeling seminar and projects</b>	6 ECTS	60h
<b>UE Numerical optimal transport and geometry</b>	3 ECTS	18h
<b>UE Software development tools and methods</b>	3 ECTS	39h
<b>UE Wavelets and applications</b>	3 ECTS	18h

#### Semestre 10

**UE MA research project** 30 ECTS

### Master MSIAM-Data science 2e année

#### Semestre 9

10 élément(s) au choix parmi 21

<b>UE Advanced algorithms for machine learning and data mining</b>	3 ECTS	18h
<b>UE An introduction to shape and topology optimization</b>	3 ECTS	18h
<b>UE Computational biology</b>	3 ECTS	18h
<b>UE Data science seminar</b>	3 ECTS	18h
<b>UE Efficient methods in optimization</b>	3 ECTS	18h
<b>UE Fundamentals of probabilistic data mining</b>	3 ECTS	18h
<b>UE Geophysical imaging</b>	3 ECTS	18h
<b>UE GPU Computing</b>	3 ECTS	18h
<b>UE Information access and retrieval</b>	3 ECTS	18h
<b>UE Introduction to extreme-value analysis</b>	3 ECTS	18h
<b>UE Kernel methods for machine learning</b>	3 ECTS	18h
<b>UE Machine Learning for Computer Vision and Audio Processing</b>	3 ECTS	18h
<b>UE Machine learning fundamentals</b>	3 ECTS	30h
<b>UE Model exploration for approximation of complex, high-dimensional problems</b>	3 ECTS	18h
<b>UE Model selection for large-scale learning</b>	3 ECTS	18h
<b>UE Modeling seminar and projects</b>	6 ECTS	60h
<b>UE Numerical optimal transport and geometry</b>	3 ECTS	18h
<b>UE Software development tools and methods</b>	3 ECTS	39h
<b>UE Statistical methods for forecasting</b>	3 ECTS	18h
<b>UE Stochastic calculus and applications to finance</b>	3 ECTS	18h
<b>UE Wavelets and applications</b>	3 ECTS	18h

## Semestre 10

<b>UE MA research project</b>	30 ECTS
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