

## Master Mathématiques et applications

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

### Présentation

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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 essentially divided in 3 tracks :

- Modeling, Scientific Computing and Image analysis (MSCI)
- Data Science (DS), with the following two orientations :
  - . Fundamentals of Data Science (FDS)
  - . Large-Scale Data Science (LSDS)

The second semester is devoted to the master thesis project.

<http://msiam.imag.fr>

### Admission

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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 M1 (1st year) or directly to M2 (second year).

Admission in M1 (MSIAM 1st year):

- Anyone holding a L3 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 M2 (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 \(VAPP\)](#).

How to apply:

- [Admission information](#)
- [Application form](#). The on-line application for admission will be open from early January 2016 till June 30, 2016 for the September 2016 academic year

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, 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)

Edouard Oudet  
edouard.oudet@univ-grenoble-alpes.fr

Jean-Baptiste Durand  
jean-baptiste.durand@imag.fr

### Secrétariat de scolarité

Bérengère Duc  
04.76.63.57.89  
berengere.duc@univ-grenoble-alpes.fr

Carine Beaujolais  
04.76.63.57.22  
carine.beaujolais@univ-grenoble-alpes.fr

## Programme

### Master Industrial and Applied Math 1re année

#### Semestre 7

UE Algorithms and software tools	3 ECTS	36h
UE Partial differential equations and numerical methods	6 ECTS	54h
UE Signal and image processing	6 ECTS	54h
UE Geometric Modelling	6 ECTS	54h
UE Applied probability and statistics	6 ECTS	48h

1 élément(s) au choix parmi 2

UE Français langue étrangère

UE English (SET)

#### Semestre 8

UE Computing science for big data and HPC	6 ECTS	54h
UE Numerical optimisation	6 ECTS	54h
UE Project	3 ECTS	
UE Internship	3 ECTS	

2 élément(s) au choix parmi 4

UE Variational methods applied to modelling	6 ECTS	54h
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UE 3D Graphics	6 ECTS	54h
UE Data analysis, linear models and ANOVA	6 ECTS	54h
UE Computer Algebra and Cryptology	6 ECTS	51h

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

#### Semestre 9

10 élément(s) au choix parmi 13

UE Optimal transport, levelset : applications to image	3 ECTS	18h
UE Advanced imaging	3 ECTS	18h
UE Inverse methods and data assimilation	3 ECTS	30h
UE Medical imaging: tomography and 3D reconstruction from 2D projections	3 ECTS	30h
UE Modeling Seminar and Projects	3 ECTS	48h
UE Convex and distributed optimization	3 ECTS	36h
UE Efficient methods in optimization	3 ECTS	18h
UE Software development tools and methods	3 ECTS	39h

<b>UE High performance computing for mathematical models</b>	3 ECTS	18h
<b>UE Model exploration for approximation of complex, high-dimensional problems</b>	3 ECTS	18h
<b>UE Numerical optimal transport and geometry</b>	3 ECTS	18h
<b>UE GPU Computing</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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### Master MSIAM-Fundamental of Data Science (FDS) 2e année

#### Semestre 9

10 élément(s) au choix parmi 16

<b>UE Inverse methods and data assimilation</b>	3 ECTS	30h
<b>UE Modeling Seminar and Projects</b>	6 ECTS	60h
<b>UE Advanced learning models</b>	3 ECTS	18h
<b>UE Computational biology</b>	3 ECTS	18h
<b>UE Machine learning fundamentals</b>	3 ECTS	30h
<b>UE Fundamentals of probabilistic data mining</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
<b>UE Efficient methods in optimization</b>	3 ECTS	18h
<b>UE Software development tools and methods</b>	3 ECTS	39h
<b>UE High performance computing for mathematical models</b>	3 ECTS	18h
<b>UE Bayesian statistics</b>	3 ECTS	18h
<b>UE Model exploration for approximation of complex, high-dimensional problems</b>	3 ECTS	18h
<b>UE Numerical optimal transport and geometry</b>	3 ECTS	18h
<b>UE Advanced algorithms for machine learning and data mining</b>	3 ECTS	18h

<b>UE Model selection for large-scale learning</b>	3 ECTS	18h
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### Semestre 10

<b>UE MA research project</b>	30 ECTS
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### Master MSIAM-Large-Scale Data Science (LSDS) 2e année

#### Semestre 9

<b>UE Convex and distributed optimization</b>	3 ECTS	36h
<b>UE Data management in large-scale distributed systems</b>	3 ECTS	18h
<b>UE Distributed system</b>	3 ECTS	18h
<b>UE Fundamentals of probabilistic data mining</b>	3 ECTS	18h
<b>UE High performance computing for mathematical models</b>	3 ECTS	18h
<b>UE Model selection for large-scale learning</b>	3 ECTS	18h
<b>UE GPU Computing</b>	3 ECTS	18h
<b>UE Data science seminar</b>	3 ECTS	14h
<b>UE Data Challenges</b>	3 ECTS	60h
<b>UE Advanced learning models</b>	3 ECTS	18h
<b>UE Advanced algorithms for machine learning and data mining</b>	3 ECTS	18h
<b>UE Computational biology</b>	3 ECTS	18h
<b>UE Machine learning fundamentals</b>	3 ECTS	30h
<b>UE Software development tools and methods</b>	3 ECTS	39h
<b>UE Category learning and object recognition</b>	3 ECTS	18h
<b>UE Information access and retrieval</b>	3 ECTS	18h
<b>UE Information visualisation</b>	3 ECTS	18h
<b>UE Numerical optimal transport and geometry</b>	3 ECTS	18h

### Semestre 10

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