SCIENCES, TECHNOLOGIES AND HEALTH

Master in Mathematics and applications

Mathématiques et applications

Target level
Baccalaureate +5

ECTS
120 credits

Duration
2 years

Component
UFR IM2AG (informatique, mathématiques et mathématiques appliquées), UFR Sciences de l'Homme et de la Société (SHS), Grenoble INP - Ensimag (Informatique, mathématiques appliquées et télécommunications), UGA

Language(s) of instruction
English, French

Subprograms

- Preparation for agregation
- Fundamentals mathematics
- Operations Research, combinatorics and optimization (ORCO)
- Cybersecurity
- Statistics and data sciences (SSD)
- Science in industrial and applied mathematics (MSIAM)

Presentation

Below is a diagram (in French) of the structure of the master : on the left column, the first year masters (core curriculum), on the center and right columns the second year masters.

Co-accredited training between the Grenoble Alpes University, the Polytechnic Institute of Grenoble, and the University of Savoie Mont-Blanc.

This master courses offers several programs :

- Science industrial applied mathematics (MSIAM) : first year + second year
- Preparation for agregation : second year
- Cybersecurity (CybSec) : second year
- Fondamental mathematics : second year
- Statistics and data science (1) : first year + second year
- Operation recherch combinatorics and optimization (ORCO) : second year
- Mathematical modeling applied analysis (MMAA) (2) : first year + second year

(1) Co-delivered by the Humanities and social sciences teaching department of Grenoble Alpes University

(2) Delivered by the Université de Savoie Mont Blanc

The master proposes two core curricula :

- General mathematics core curriculum in French
- Applied mathematics core curriculum in French and English

Differentiation at first year level : The optional teaching units proposed in semester 7 and semester 8 aim at guiding the students towards the various courses of the second year of the master. The Statistics and data science program is independent of the core curricula. The Mathematical modelling applied analysis program is also independent of the core curricula, but one can enter it at the second year level.

Differentiation of the courses at the second year level (Statistics and data sciences and Mathematical modelling applied analysis excepted) :

- The Science in industrial and applied mathematics, based on the core curriculum Applied mathematics accessible via the core curriculum General mathematics
- Fundamental mathematics, based on the core curriculum General mathematics
- Preparation for agregation, based on the core curriculum General mathematics
- Cybersecurity, accessible via the core curricula Applied mathematics and General mathematics, as well as via the core curriculum Computer science of the Computer science master program
- ORCO, accessible via the core curricula Applied mathematics and General mathematics, as well as via the core curriculum Computer science of the master program Computer science

The objective of this master is to train highly skilled specialists in mathematics and computer science for engineering, teaching, and research in a wide range of fields (pure and applied maths) where the demand from the socio-economic world is strong : security and cryptology, scientific computing, operational research, big data analysis, image synthesis and processing, statistics...

Identifier ROME : IT studies and development

Skills

The basic courses (between 40 and 50 ECTS) are offered in French or English in the first year of the Master.
For research-oriented courses: body of general research-related competencies
- formulate a problem, establish a state of the art, estimate the feasibility, and the impact of a resolution of problem, establish, follow a strategy. Skills are acquired during TER, projects and internships research in M1 and M2 (> 30 ECTS).
Discovery of the socio-economic world offered to all students through introductory modules to the company, project and industrial internships (at least 36 ECTS for career paths), the business forum (presentation of ~ 40 companies, interviews, tables rounds ...) and thematic conferences given by industry.
All students also have access to language courses (English or French as a foreign language depending on their level, 6 ECTS)

International education : Double degrees, joint degrees, Erasmus Mundus, Education with formalized international partnerships, Internationally-oriented programmes

International dimension

- Course CM-BHC in Erasmus Mundus
- CS course, MSIAM are entirely in English, international recruitment
- MF course taught in English according to the public, international recruitment

Organisation

Abroad intership : In France or abroad

Admission

Access conditions

The first year master is open to students with a degree conferring the title of bachelor in a field compatible with the fields of the master, or with a validation of studies or of prior experience.

Admission to the second year's master is selective. It is open to candidates who completed a first year master in the field.

Continuing education : You are in this situation if :

- you resume your studies after 2 years or more of interruption of studies
- or you followed a formation under the regime *Formation continue* during one of the 2 preceding years
- or you are an employee, job seeker, self-employed

If you do not have the diploma required to integrate the training program, you can undertake a validation of personal and professional achievements (VAPP). (in French)

Candidature / Application

Would you like to apply and register ? Then please be aware that the procedure differs depending on your diploma, on your degree, or on your place of residence for foreign students. For more details, please follow this link (in French)

And after

Sector(s)

Activity areas : R & D, mathematical engineering in industry, public research, and education

Targeted trades

The main opportunities for each standard programme are:
-Preparation for agregation : algebra, analysis, modelling, teacher and agregation
- Science in industrial and applied mathematics: researcher and teacher, researcher in applied mathematics, R&D engineer in mathematics and industrial computing, technical and commercial engineer
- Statistics and data sciences : statistical engineer, data-analyst, biostatistician, statistical programmer in industry and administration, technical commercial and statistical engineer
- ORCO : operational research engineer, logistics engineer, optimization development engineer, R&D engineer in operations research, teacher-researcher in operations research and combinatorics
- Cybersecurity : engineer in cybersecurity, security of information systems, specialized in auditing security of information systems, technical engineer in computer security, R&D engineer specialized in cybersecurity
- Fundamental mathematics : researcher and teacher-researcher in mathematics, higher education

Additional information

Several courses (MSIAM, CySec, ORCO) provide highly sought-after math/computing skills.

Useful info

Contacts

Program director

Didier Piau
didier.piau@univ-grenoble-alpes.fr

Program director

Christophe Picard
christophe.picard@imag.fr

Program administration

Service de formation UFR IM2AG
im2ag-service-formation@univ-grenoble-alpes.fr

Course location(s) - City

Grenoble

Campus

Grenoble - University campus

Program

Preparation for agregation

Fundamentals mathematics

Master in general mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Algebra	Teaching Unit (UE)	33h	48h		9 credits
UE Holomorphic functions	Teaching Unit (UE)	21h	33h		6 credits
UE Probabilities	Teaching Unit (UE)	33h	48h		9 credits
UE Analysis	Teaching Unit (UE)	33h	48h		9 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Study and research work	Teaching Unit (UE)				6 credits
UE Effective algebra and cryptographie	Teaching Unit (UE)	21h	33h		6 credits
UE Compléments sur les EDP	Teaching Unit (UE)	21h	33h		6 credits
UE Differential geometry	Teaching Unit (UE)	19,5h	29h		6 credits
UE Markov process	Teaching Unit (UE)	21h	33h		6 credits
UE Galois theory	Teaching Unit (UE)	21h	33h		6 credits

UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE English S8	Teaching Unit (UE)		24h		3 credits
UE Opening UE (only if C1 level in English reached)	Teaching Unit (UE)				3 credits

Master 2nd year

Semester 9

	Nature	CM	TD	TP	Crédits
UE Morse theory in geometry and topology	Teaching Unit (UE)	36h	18h		12 credits
UE Random models on lattices	Teaching Unit (UE)	36h	18h		12 credits
UE Analysis and probability on manifolds	Teaching Unit (UE)	36h	18h		12 credits
UE Topology of random hypersurfaces	Teaching Unit (UE)	24h			6 credits
UE Probabilistic and geometric techniques in high dimension	Teaching Unit (UE)	24h			6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research internship	Teaching Unit (UE)				27 credits
UE English	Teaching Unit (UE)				

Operations Research, combinatorics and optimization (ORCO)

Master applied mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)			18h	3 credits
UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits
UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE English	Teaching Unit (UE)		24h		3 credits
UE Applied probability and statistics	Teaching Unit (UE)	22,5h	18h	9h	6 credits
UE Systèmes dynamiques	Teaching Unit (UE)	12h	9h	3h	3 credits
UE Instability and Turbulences	Teaching Unit (UE)				3 credits
UE Turbulence	Teaching Unit (UE)	12h		18h	3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	
Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits

UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits
3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		
Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	

Master applied mathematics 1 st year Graduate School program

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)			18h	3 credits
UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits

UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE Applied probability and statistics	Teaching Unit (UE)	22,5h	18h	9h	6 credits
UE English	Teaching Unit (UE)		24h		3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	
Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE GS_MSTIC_Scientific approach	Teaching Unit (UE)				6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits
3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		

Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits

Master in general mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Algebra	Teaching Unit (UE)	33h	48h		9 credits
UE Holomorphic functions	Teaching Unit (UE)	21h	33h		6 credits
UE Probabilities	Teaching Unit (UE)	33h	48h		9 credits
UE Analysis	Teaching Unit (UE)	33h	48h		9 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Study and research work	Teaching Unit (UE)				6 credits
UE Effective algebra and cryptographie	Teaching Unit (UE)	21h	33h		6 credits
UE Compléments sur les EDP	Teaching Unit (UE)	21h	33h		6 credits
UE Differential geometry	Teaching Unit (UE)	19,5h	29h		6 credits
UE Markov process	Teaching Unit (UE)	21h	33h		6 credits
UE Galois theory	Teaching Unit (UE)	21h	33h		6 credits

UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE English S8	Teaching Unit (UE)		24h		3 credits
UE Opening UE (only if C1 level in English reached)	Teaching Unit (UE)				3 credits

Master 2nd year

Semester 9

	Nature	CM	TD	TP	Crédits
UE Advanced models and methods in operations research	Teaching Unit (UE)	36h			6 credits
UE Combinatorial optimization and graph theory	Teaching Unit (UE)	36h			6 credits
UE Optimization under uncertainty	Teaching Unit (UE)	36h			6 credits
UE Constraint Programming, applications in scheduling	Teaching Unit (UE)				3 credits
UE Graphs and discrete structures	Teaching Unit (UE)	18h			3 credits
UE Advanced heuristic and approximation algorithms	Teaching Unit (UE)	18h			3 credits
UE Advanced mathematical programming methods	Teaching Unit (UE)	18h			3 credits
UE Academic and industrial challenges	Teaching Unit (UE)	18h			3 credits
UE Transport Logistics and Operations Research	Teaching Unit (UE)				6 credits
UE Advanced parallel system	Teaching Unit (UE)	36h			6 credits
UE Multi-agent systems	Teaching Unit (UE)	18h			3 credits

UE Fundamentals of Data Processing and Distributed Knowledge	Teaching Unit (UE)	36h			6 credits
UE Scientific Methodology, Regulatory and ethical data usage	Teaching Unit (UE)	36h			6 credits
UE Large scale Data Management and Distributed Systems	Teaching Unit (UE)	30h		6h	6 credits
UE Cryptographic engineering, protocols and security models, data privacy, coding and applications	Teaching Unit (UE)	36h	18h	24h	6 credits
UE From Basic Machine Learning models to Advanced Kernel Learning	Teaching Unit (UE)	36h			6 credits
UE Mathematical Foundations of Machine Learning	Teaching Unit (UE)	36h			3 credits
UE Learning, Probabilities and Causality	Teaching Unit (UE)	36h		18h	6 credits
UE Statistical learning: from parametric to nonparametric models	Teaching Unit (UE)	36h			6 credits
UE Mathematical optimization	Teaching Unit (UE)	36h			6 credits
UE Safety Critical Systems: from design to verification	Teaching Unit (UE)	36h			6 credits
UE Natural Language Processing & Information Retrieval	Teaching Unit (UE)	36h			6 credits
UE Information Security	Teaching Unit (UE)	36h			6 credits
UE Human Computer Interaction	Teaching Unit (UE)	36h			6 credits
UE Next Generation Software Development	Teaching Unit (UE)	36h			6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Practicum	Teaching Unit (UE)				30 credits

Master 2nd Graduate School program

Semester 9

	Nature	CM	TD	TP	Crédits
UE Advanced models and methods in operations research	Teaching Unit (UE)	36h			6 credits
UE Combinatorial optimization and graph theory	Teaching Unit (UE)	36h			6 credits
UE Optimization under uncertainty	Teaching Unit (UE)	36h			6 credits
UE GS_MSTIC_Research ethics	Teaching Unit (UE)				6 credits
UE Constraint Programming, applications in scheduling	Teaching Unit (UE)				3 credits
UE Graphs and discrete structures	Teaching Unit (UE)	18h			3 credits
UE Advanced heuristic and approximation algorithms	Teaching Unit (UE)	18h			3 credits
UE Advanced mathematical programming methods	Teaching Unit (UE)	18h			3 credits
UE Academic and industrial challenges	Teaching Unit (UE)	18h			3 credits
UE Transport Logistics and Operations Research	Teaching Unit (UE)				6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Practicum	Teaching Unit (UE)				30 credits

Cybersecurity

Master applied mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)			18h	3 credits

UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits
UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE English	Teaching Unit (UE)		24h		3 credits
UE Applied probability and statistics	Teaching Unit (UE)	22,5h	18h	9h	6 credits
UE Systèmes dynamiques	Teaching Unit (UE)	12h	9h	3h	3 credits
UE Instability and Turbulences	Teaching Unit (UE)				3 credits
UE Turbulence	Teaching Unit (UE)	12h		18h	3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	
Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits

UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits
3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		
Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	

Master applied mathematics 1 st year Graduate School program

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)			18h	3 credits
UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits
UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE Applied probability and statistics	Teaching Unit (UE)	22,5h	18h	9h	6 credits

UE English	Teaching Unit (UE)		24h		3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	
Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE GS_MSTIC_Scientific approach	Teaching Unit (UE)				6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits
3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		
Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits

Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits

Master general mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Algebra	Teaching Unit (UE)	33h	48h		9 credits
UE Holomorphic functions	Teaching Unit (UE)	21h	33h		6 credits
UE Probabilities	Teaching Unit (UE)	33h	48h		9 credits
UE Analysis	Teaching Unit (UE)	33h	48h		9 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Study and research work	Teaching Unit (UE)				6 credits
UE Effective algebra and cryptographie	Teaching Unit (UE)	21h	33h		6 credits
UE Compléments sur les EDP	Teaching Unit (UE)	21h	33h		6 credits
UE Differential geometry	Teaching Unit (UE)	19,5h	29h		6 credits
UE Markov process	Teaching Unit (UE)	21h	33h		6 credits
UE Galois theory	Teaching Unit (UE)	21h	33h		6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits

Operations Research Complementary	OTHER	16,5h	16,5h		
UE English S8	Teaching Unit (UE)		24h		3 credits
UE Opening UE (only if C1 level in English reached)	Teaching Unit (UE)				3 credits

Master 2nd year

Semester 9

	Nature	CM	TD	TP	Crédits
UE Software security, secure programming and computer forensics	Teaching Unit (UE)	19,5h		19,5h	3 credits
UE Security architecture	Teaching Unit (UE)	48h		30h	6 credits
UE Cryptographic engineering, protocols and security models, data privacy, coding and applications	Teaching Unit (UE)	36h	18h	24h	6 credits
UE Threat and risk analysis, IT security audit and norms	Teaching Unit (UE)	19,5h		19,5h	3 credits
UE Physical Security : Embedded, Smart Card, Quantum & Biometrics	Teaching Unit (UE)	39h	18h	21h	6 credits
UE Advanced cryptology	Teaching Unit (UE)	24h	12h	12h	6 credits
UE Advanced security	Teaching Unit (UE)	24h	24h		6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research practicum (in company or laboratory)	Teaching Unit (UE)				30 credits

Master 2nd Graduate School program

Semester 9

	Nature	CM	TD	TP	Crédits
UE Software security, secure programming and computer forensics	Teaching Unit (UE)	19,5h		19,5h	3 credits

UE Cryptographic engineering, protocols and security models, data privacy, coding and applications	Teaching Unit (UE)	36h	18h	24h	6 credits
UE Threat and risk analysis, IT security audit and norms	Teaching Unit (UE)	19,5h		19,5h	3 credits
UE Physical Security : Embedded, Smart Card, Quantum & Biometrics	Teaching Unit (UE)	39h	18h	21h	6 credits
UE GS_MSTIC_Research ethics	Teaching Unit (UE)				6 credits
UE Advanced cryptology	Teaching Unit (UE)	24h	12h	12h	6 credits
UE Advanced security	Teaching Unit (UE)	24h	24h		6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research practicum (in company or laboratory)	Teaching Unit (UE)				30 credits

Statistics and data sciences (SSD)

Science in industrial and applied mathematics (MSIAM)

Master applied mathematics 1st year

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)				3 credits
UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits

UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE English	Teaching Unit (UE)		24h		3 credits
UE Applied probability and statistics	Teaching Unit (UE)				6 credits
UE Systèmes dynamiques	Teaching Unit (UE)	12h	9h	3h	3 credits
UE Instability and Turbulences	Teaching Unit (UE)				3 credits
UE Turbulence	Teaching Unit (UE)	12h		18h	3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	
Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits

3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		
Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	

Master applied mathematics 1 st year Graduate School program

Semester 7

	Nature	CM	TD	TP	Crédits
UE Object-oriented and software design	Teaching Unit (UE)			18h	3 credits
UE Partial differential equations and numerical methods	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Partial differential equations and numerical methods	OTHER	16,5h	16,5h		
Partial differential equations and numerical methods complementary	OTHER			16,5h	
UE Signal and image processing	Teaching Unit (UE)			16,5h	6 credits
UE Geometric modelling	Teaching Unit (UE)			16,5h	6 credits
UE Applied probability and statistics	Teaching Unit (UE)	22,5h	18h	9h	6 credits
UE English	Teaching Unit (UE)		24h		3 credits

Semester 8

	Nature	CM	TD	TP	Crédits
UE Computing science for big data and HPC	Teaching Unit (UE)			15,5h	6 credits
HPC	OTHER			9h	

Introduction to database	OTHER			7,5h	3 credits
UE Project	Teaching Unit (UE)				3 credits
UE Internship	Teaching Unit (UE)				3 credits
UE Numerical optimisation	Teaching Unit (UE)			16,5h	6 credits
UE GS_MSTIC_Scientific approach	Teaching Unit (UE)				6 credits
UE Operations Research (AM)	Teaching Unit (UE)				6 credits
UE Operations Research	Teaching Unit (UE)	16,5h	16,5h		3 credits
Operations Research Complementary	OTHER	16,5h	16,5h		
UE Introduction to cryptology (AM)	Teaching Unit (UE)				6 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	13,5h	3h	3 credits
Introduction to cryptology complementary	OTHER		16,5h		
UE 3D Graphics (AM)	Teaching Unit (UE)				6 credits
UE 3D graphics	Teaching Unit (UE)	16,5h	16,5h		3 credits
3D Graphics Complementary	OTHER			16,5h	
UE Turbulences	Teaching Unit (UE)				6 credits
Plasmas Astrophysiques et de Fusion	Teaching Unit (UE)	24h	3h		
Experimental techniques in fluid mechanics	Teaching Unit (UE)	6h		24h	
UE Variational methods applied to modelling	Teaching Unit (UE)	16,5h	16,5h	16,5h	6 credits
Variational methods applied to modelling	OTHER	16,5h	16,5h		
Variational methods applied to modelling Complementary	OTHER			16,5h	
UE Statistical analysis and document mining	Teaching Unit (UE)				6 credits
Statistical analysis and document mining	OTHER	16,5h		25,5h	
Statistical analysis and document mining Complementary	EPREUVE		7,5h	9h	3 credits

Master MSIAM modeling, scientific computing and image analysis (MSCI) 2nd year

Semester 9

	Nature	CM	TD	TP	Crédits
UE Differential Calculus, Wavelets and Applications	Teaching Unit (UE)	36h			6 credits
UE An Introduction to Shape and Topology Optimization	Teaching Unit (UE)	18h			3 credits
UE Efficient methods in optimization	Teaching Unit (UE)	36h			3 credits
UE Computational biology	Teaching Unit (UE)	36h			3 credits
UE Fluid Mechanics and Granular Materials	Teaching Unit (UE)				6 credits
UE GPU Computing	Teaching Unit (UE)	18h		18h	6 credits
UE Software development tools and methods	Teaching Unit (UE)	9h		30h	3 credits
UE Geophysical imaging	Teaching Unit (UE)	18h			3 credits
UE Handling uncertainties in (large-scale) numerical models	Teaching Unit (UE)	36h			6 credits
UE Modeling seminar and projects	Teaching Unit (UE)		36h	24h	6 credits
UE Quantum Information & Dynamics	Teaching Unit (UE)	36h			6 credits
UE Optimal transport: theory, applications and related numerical methods	Teaching Unit (UE)	36h			6 credits
UE Statistical learning: from parametric to nonparametric models	Teaching Unit (UE)	36h			6 credits
UE Temporal, spatial and extreme event analysis	Teaching Unit (UE)	36h			6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research projects	Teaching Unit (UE)				30 credits

Master MSIAM data science (DS) 2nd year

Semester 9

	Nature	CM	TD	TP	Crédits
UE Advanced Machine Learning: Applications to Vision, Audio and Text	Teaching Unit (UE)	36h			6 credits
UE An Introduction to Shape and Topology Optimization	Teaching Unit (UE)	18h			3 credits
UE Computational biology	Teaching Unit (UE)	36h			3 credits
UE Data Science Seminars and Challenge	Teaching Unit (UE)		36h		6 credits
UE Differential Calculus, Wavelets and Applications	Teaching Unit (UE)	36h			6 credits
UE Efficient methods in optimization	Teaching Unit (UE)	36h			3 credits
UE From Basic Machine Learning models to Advanced Kernel Learning	Teaching Unit (UE)	36h			6 credits
UE Handling uncertainties in (large-scale) numerical models	Teaching Unit (UE)	36h			6 credits
UE GPU Computing	Teaching Unit (UE)	18h		18h	6 credits
UE Learning, Probabilities and Causality	Teaching Unit (UE)	36h		18h	6 credits
UE Mathematical Foundations of Machine Learning	Teaching Unit (UE)	36h			3 credits
UE Modeling seminar and projects	Teaching Unit (UE)		36h	24h	6 credits
UE Optimal transport: theory, applications and related numerical methods	Teaching Unit (UE)	36h			6 credits
UE Natural Language Processing & Information Retrieval	Teaching Unit (UE)	36h			6 credits
UE Statistical learning: from parametric to nonparametric models	Teaching Unit (UE)	36h			6 credits
UE Software development tools and methods	Teaching Unit (UE)	9h		30h	3 credits
UE Temporal, spatial and extreme event analysis	Teaching Unit (UE)	36h			6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research projects	Teaching Unit (UE)				30 credits

Master 2nd Graduate School program

Semester 9

	Nature	CM	TD	TP	Crédits
UE GS_MSTIC_Research ethics	Teaching Unit (UE)				6 credits
UE Software development tools and methods	Teaching Unit (UE)	9h		30h	3 credits
UE Modeling seminar and projects	Teaching Unit (UE)		36h	24h	6 credits
UE Geophysical imaging	Teaching Unit (UE)	18h			3 credits
UE An Introduction to Shape and Topology Optimization	Teaching Unit (UE)	18h			3 credits
UE Refresh courses	Teaching Unit (UE)	6h	6h	6h	0 credits
UE GPU Computing	Teaching Unit (UE)	18h		18h	6 credits
UE Differential Calculus, Wavelets and Applications	Teaching Unit (UE)	36h			6 credits
UE Optimal transport: theory, applications and related numerical methods	Teaching Unit (UE)	36h			6 credits
UE Fluid Mechanics and Granular Materials	Teaching Unit (UE)				6 credits
UE Handling uncertainties in (large-scale) numerical models	Teaching Unit (UE)	36h			6 credits
UE Temporal, spatial and extreme event analysis	Teaching Unit (UE)	36h			6 credits
UE Advanced Machine Learning: Applications to Vision, Audio and Text	Teaching Unit (UE)	36h			6 credits
UE Natural Language Processing & Information Retrieval	Teaching Unit (UE)	36h			6 credits

UE From Basic Machine Learning models to Advanced Kernel Learning	Teaching Unit (UE)	36h			6 credits
UE Mathematical Foundations of Machine Learning	Teaching Unit (UE)	36h			3 credits
UE Statistical learning: from parametric to nonparametric models	Teaching Unit (UE)	36h			6 credits
UE Learning, Probabilities and Causality	Teaching Unit (UE)	36h		18h	6 credits
UE Efficient methods in optimization	Teaching Unit (UE)	36h			3 credits
UE Data Science Seminars and Challenge	Teaching Unit (UE)		36h		6 credits
UE Computational biology	Teaching Unit (UE)	36h			3 credits
UE Quantum Information & Dynamics	Teaching Unit (UE)	36h			6 credits
UE Numerical Mechanics	Teaching Unit (UE)				6 credits

Semester 10

	Nature	CM	TD	TP	Crédits
UE Research projects	Teaching Unit (UE)				30 credits