

#### SCIENCES, TECHNOLOGIES AND HEALTH

# Master in Computer science

Informatique

+5

Target level

**Baccalaureate** 

0

ECTS 120 credits O Duration 2 years



Component Grenoble INP, Institut d'ingénierie et de management - UGA, UFR IM2AG (informatique, mathématiques et mathématiques appliquées)



## Subprograms

- > Master in Computer science standard 1st year
- Master of Science in Informatics at Grenoble (MoSIG)
- > Computer engineering standard 2nd year
- > Computer engineering block-release 2nd year
- > Operations Research, Combinatorics and Optimisation (ORCO) 2nd year
- > Cybersecurity 2nd year
- > Supplementary computing skills (CCI) 2nd year
- > Cybersecurity and legal informatics 2nd year

# Presentation



Co-accredited training between Grenoble University Alpes and Grenoble Polytechnic Institute. It offers the following courses :

- Computer engineering : standard and block-release format
- Master of science in informatics at Grenoble (MoSIG) : in English, open to international students
- Operations research, combinatorics and optimization (ORCO) : core with Mathematics and applications program
- Cybersecurity (CS) : in English, open to international students, core with Mathematics and applications program
- Supplementary computing skills : intended for students having completed a first year master's from a scientific discipline other than computing, dual competences





 Corporate computer network : alternatively accessible (apprenticeship) or in-service training: this course is offered by Grenoble INP

This training is part of the regional dynamic of research through the ARCs (Academic research communities) in the Rhône-Alpes region : master's students obtain funding to pursue their thesis studies. Only the Computer engineering course is also offered in the block-release format. The MoSIG (first and second year), CS, and ORCO courses are coaccredited with Grenoble Institute of Technology. Students are enrolled in one or the other of the institutions according to their origin. These courses are also offered to students of the National Higher School for Computer Science and Applied Mathematics in the second or third year to validate their engineering school. The CS and ORCO courses are also offered in Mathematics and applications programs. Indeed, these courses are located at the interface Mathematics and informatics and the students can come from the first year master's of these two programs. The ORCO contains a course at the Industrial Engineering School of the Grenoble Institute of Technology. The first year master's Cryptography course is core to the Mathematics and applications and Computer science programs. A number of second-year teaching units are offered on half-days to facilitate pooling.

- Site of the master's degree: <sup>[]</sup> https://masterinformatique.univ-grenoble-alpes.fr
- Site of the Cybersecurity course: C http:// cybersecurity.imag.fr/

The goal of the program is to provide high-level training in computer science for the fields of software and hardware engineering and computer science research. The training covers a broad spectrum ranging from software and hardware engineering to theoretical computer science, encompassing several domains, to the interface of mathematics and computer science such as computer security or optimization.

The training relies on a rich fabric (industry/experts/ laboratories of the site and researchers) and responds to a strong and important demand of the socio-economic world. The main sectors of activity are computer service companies, software publishers, computer manufacturers, business R&D centres, corporate IT departments, and public or private research laboratories. Identifier ROME : IT studies and development

**International education :** Double degrees, joint degrees, Erasmus Mundus, Internationally-oriented programmes

## International dimension

In order to welcome international audiences, two courses are entirely taught in English (MoSIG and Cybersecurity). In addition, these courses welcome students to Erasmus Mundus master's courses (AREAS + and India 4 EU). The move to international recruitment at the 1st year's level is therefore aimed at students who have obtained their degree in a European university.

# Organisation

Abroad intership : In France or abroad

Internship period : Second semester

# Admission

## Access conditions

The first year master's is open to those who have obtained a national degree conferring the title of bachelor in a field compatible with that of the master's or a validation of studies or acquisition.

Admission to the second year master's is selective. It is open to candidates who completed a first year master's in the field. Summary of the proposed courses for the computer science program :

Computer Science	First year Master's
MoSIG	First year Master's + second year Master's
Computer Engineering	First year Master's + second year Master's
Cybersecurity	Second year Master's*
ORCO	Second year Master's*





\* These courses can be chosen as early as the first year master's, depending on the options of the students

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, **Z** you can undertake a validation of personal and professional achievements (VAPP)

# Candidature / Application

You wish to apply for master in Computer science

- Master MoSIG 1st year
- Master MoSIG 2nd year
- · Cybersecurity 2nd year
- Operations Research, Combinatorics and Optimisation (ORCO)

THE APPLICATION FORM WITH FSA

- Computer science standard 1st year
- · Computer engineering standard 2nd year
- Computer engineering block-release 2nd year
- THE APPLICATION FORM WITH E-CANDIDAT

## Fees

Tuition fees 2019-2020 : 243 €

# And after

## Additional information

The Computer science program is based on the laboratories in computer science and mathematics in Grenoble, as well as

on the INRIA Rhones-Alpes, the LabEx Persyval-lab, and the Carnot Institute for Software and Intelligent Systems.

There is a very strong interaction between the master's program and the research teams : platforms for research and teaching allow for teaching projects to be carried out on advanced forms of computer science. The researchers benefit from the materials available in the dedicated rooms of the Teaching and Research Units and the research teams occasionally provide material for certain courses. The Grenoble Computing Laboratory rapid prototyping workshop (FabMSTIC) is also available to students and teachers for projects.

# Useful info

## Contacts

#### Program director

Laurence Pierre laurence.pierre@univ-grenoble-alpes.fr

#### Program administration

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

## Course location(s) - City

#### Grenoble

## Campus

Grenoble - University campus

## Know more

## Website of Grenoble computer master

L https://master-informatique.univ-grenoble-alpes.fr/en/





# Program

## Master in Computer science standard 1st year

## Master Computeur science standard 1st year

#### Semestre 7

	Nature	СМ	TD	TP	Crédits
UE Sémantique des langages de programmation et compilation	UE	30h	30h		6 credits
UE Génie logiciel	UE	15h	15h		3 credits
UE Conception et programmation par objets	UE	15h	15h		3 credits
UE Conception des systèmes d'exploitation et programmation concurrente	UE	30h	15h	15h	6 credits
UE Base de données	MATIERE	15h	15h		3 credits
UE Introduction aux réseaux	UE	15h		15h	3 credits
UE Technique des logiciels interactifs	UE	15h		15h	3 credits
UE Algorithmes et traitement de données	UE	15h	6h	9h	3 credits

#### Semestre 8

	Nature	CM	TD	ΤP	Crédits
UE Projet	UE				3 credits
UE Complexité algorithmique de problèmes	UE	15h	15h		3 credits
UE Introduction à la recherche et Travail d'Etude et de Recherche	UE	15h			3 credits
UE Introduction à la recherche et stage en entreprise	UE	15h			3 credits
UE Anglais scientifique écrit si pas B2	UE				3 credits
UE Introduction to distributed systems	UE	15h		18h	3 credits
UE Planification automatique et techniques d'intelligence artificielle	UE				3 credits
UE Introduction to Modeling and Verification of Digital Systems	UE	15h		15h	3 credits
UE Synthèses d'images	UE	15h		15h	3 credits
UE Parallel Algorithms and Programming	UE	15h	6h	12h	3 credits
UE Fundamental Computer Science	UE	15h	15h		3 credits
UE Ergonomie des interfaces homme-machine	UE	15h	15h		3 credits





UE Operations Research	UE	15h	18h	3h	3 credits
UE DevOps : méthodes et outils	UE	12h		18h	3 credits
UE Géométrie numérique	UE	15h		15h	3 credits
UE Introduction à l'administration des réseaux	UE	9h		21h	3 credits
UE Introduction au pervasive computing	UE	15h	15h		3 credits
UE Introduction to cryptology	UE	16,5h	9h	10,5h	3 credits
UE Introduction à la cybersécurité	UE	15h		15h	3 credits
UE Robotics and IoT	UE	6h		21h	3 credits
UE Histoire de l'informatique	UE	16,5h	2,25h		3 credits
UE Sciences Informatiques et Médiation	UE	15h	15h		3 credits

## Master of Science in Informatics at Grenoble (MoSIG)

## Master MoSIG 1st year

	Nature	CM	TD	TP	Crédits
UE Programming language and compiler design	Teaching Unit (UE)	33h	33h		6 credits
UE Software engineering	Teaching Unit (UE)				3 credits
UE Principles of operating systems	Teaching Unit (UE)	33h	33h		6 credits
UE Algorithms and program design	Teaching Unit (UE)				3 credits
UE Mathematics for computer science	Teaching Unit (UE)				3 credits
UE Introduction to visual computing	Teaching Unit (UE)	15h	18h		3 credits
UE Technical writing and speaking	Teaching Unit (UE)		27h		3 credits
UE Programming project (OS)	Teaching Unit (UE)				3 credits



UE Programming project (Compiler design)	Teaching	3 credits
	Unit (UE)	

	Nature	CM	TD	TP	Crédits
UE Research project (TER)	Teaching Unit (UE)				3 credits
UE Research methodology	Teaching Unit (UE)	3h	4,5h		3 credits
UE Introduction to modeling and verification of digital systems	Teaching Unit (UE)	15h		15h	3 credits
UE Operations research	Teaching Unit (UE)	15h	18h	3h	3 credits
UE Data base foundations	Teaching Unit (UE)	19,5h	12h	4,5h	3 credits
UE Introduction to distributed systems	Teaching Unit (UE)	15h		18h	3 credits
UE Human computer interaction	Teaching Unit (UE)	18h	18h		3 credits
UE Intelligent systems: reasoning and recognition	Teaching Unit (UE)	36h			3 credits
UE Computer networks principles	Teaching Unit (UE)	24h		12h	3 credits
UE 3D graphics	Teaching Unit (UE)		18h		3 credits
UE Robotics and IoT	Teaching Unit (UE)	6h		21h	3 credits
UE Introduction to cryptology	Teaching Unit (UE)	16,5h	9h	10,5h	3 credits
UE Parallel algorithms and programming	Teaching Unit (UE)	15h	6h	12h	3 credits
UE Fundamental computer science	UE	15h	15h		3 credits

# Master MoSIG-AISSE 2nd year

Nature	CM	TD	TP	Crédits
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UE Architecture : components and services	Teaching Unit (UE)	13,5h 4,5h	3 credits
UE Model driven engineering	Teaching Unit (UE)	18h	3 credits
UE Process engineering	Teaching Unit (UE)	18h	3 credits
UE Verification and test theories	Teaching Unit (UE)	18h	3 credits
UE Data management in large-scale distributed systems	Teaching Unit (UE)	18h	3 credits
UE Temporal and spatial informations	Teaching Unit (UE)	18h	3 credits
UE Software mining and re-engineering	Teaching Unit (UE)	18h	3 credits
UE Information access and retrieval	Teaching Unit (UE)	18h	3 credits
UE Engineering human-computer interaction	Teaching Unit (UE)	36h	6 credits
UE Scientific methodology and performance evaluation	Teaching Unit (UE)	18h	3 credits

	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

# Master MoSIG-AIW 2nd year

	Nature	СМ	TD	TP	Crédits
UE Knowledge representation and reasoning	Teaching Unit (UE)	36h			6 credits
UE Semantic Web : from XML to OWL	Teaching Unit (UE)	36h			6 credits
UE Machine learning fundamentals	Teaching Unit (UE)	18h			3 credits





UE Advanced algorithms for machine learning and data mining	Teaching Unit (UE)	18h	3 credits
UE Information access and retrieval	Teaching Unit (UE)	18h	3 credits
UE Natural language and speech processing	Teaching Unit (UE)	18h	3 credits
UE Multi-agent systems	Teaching Unit (UE)	18h	3 credits
UE Information visualization	Teaching Unit (UE)	18h	3 credits

	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

## Master MoSIG-GVR 2nd year

	Nature	СМ	TD	TP	Crédits
UE Computer graphics II	Teaching Unit (UE)	36h			6 credits
UE Autonomous robotics	Teaching Unit (UE)	36h			6 credits
UE Computer vision	Teaching Unit (UE)	36h			6 credits
UE Medical imaging, simulation and robotics	Teaching Unit (UE)	12h	6h		3 credits
UE Computational geometry	Teaching Unit (UE)	18h			3 credits
UE Human-centered interaction	Teaching Unit (UE)	36h			6 credits
UE Scientific methodology and performance evaluation	Teaching Unit (UE)	18h			3 credits
UE Machine learning fundamentals	Teaching Unit (UE)	18h			3 credits





UE Machine Learning for Computer Vision and Audio Processing	Teaching Unit (UE)	18h	3 credits
UE Numerical optimal transport and geometry	UE	18h	3 credits

	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

## Master MoSIG-DI 2nd year

#### Semester 9

	Nature	СМ	TD	TP	Crédits
UE Advanced aspects of operating systems	Teaching Unit (UE)	36h			3 credits
UE Advanced data networks	UE	36h			6 credits
UE Software infrastructure of data centers and Cloud computing	UE	18h			3 credits
UE Scientific methodology and performance evaluation	Teaching Unit (UE)	18h			3 credits
UE Wireless networks	Teaching Unit (UE)	18h			3 credits
UE Distributed system	Teaching Unit (UE)	18h			3 credits
UE Security architecture : network, system, key management, cybersecurity of industrial IT	Teaching Unit (UE)	42h	15h	21h	6 credits

#### Semester 10

	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

## Master MoSIG-HECS 2nd year

Nature	СМ	TD	TP	Crédits





UE Verification and test theories	Teaching Unit (UE)	18h			3 credits
UE Models and languages for model checking	UE	18h			3 credits
UE SAT / SMT solving	UE	6h	6h	6h	3 credits
UE Analysis and verification of sequential programs	Teaching Unit (UE)	12h	12h	12h	6 credits
UE Requirements engineering	Teaching Unit (UE)	18h			3 credits
UE Industrial processes for high-confidence design	Teaching Unit (UE)	18h		18h	6 credits
UE Advanced algorithms for machine learning and data mining	Teaching Unit (UE)	18h			3 credits
UE Probabilistics, timed and hybrid systems	UE	18h			3 credits

	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

## Master MoSIG-UIS 2nd year

	Nature	СМ	TD	TP	Crédits
UE Human-centered interaction	Teaching Unit (UE)	36h			6 credits
UE Engineering human-computer interaction	Teaching Unit (UE)	36h			6 credits
UE Information visualization	Teaching Unit (UE)	18h			3 credits
UE Computer vision	Teaching Unit (UE)	36h			6 credits
UE Machine learning fundamentals	Teaching Unit (UE)	18h			3 credits
UE Scientific methodology and performance evaluation	Teaching Unit (UE)	18h			3 credits





	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching				30 credits
	Unit (UE)				

## Master MoSIG-Data Sciences 2nd year

	Nature	СМ	TD	TP	Crédits
UE Data management in large-scale distributed systems	Teaching Unit (UE)	18h			3 credits
UE Convex and distributed optimization	Teaching Unit (UE)	18h			3 credits
UE High performance computing for mathematical models	Teaching Unit (UE)	9h			3 credits
UE Fundamentals of probabilistic data mining	Teaching Unit (UE)	18h			3 credits
UE Machine learning fundamentals	Teaching Unit (UE)	18h			3 credits
UE Advanced algorithms for machine learning and data mining	Teaching Unit (UE)	18h			3 credits
UE Distributed system	Teaching Unit (UE)	18h			3 credits
UE Information visualization	Teaching Unit (UE)	18h			3 credits
UE Information access and retrieval	Teaching Unit (UE)	18h			3 credits
UE Machine Learning for Computer Vision and Audio Processing	Teaching Unit (UE)	18h			3 credits
UE Data challenges	Teaching Unit (UE)		18h		3 credits
UE Model selection for large-scale learning	UE	15h		3h	3 credits
UE Computational biology	Teaching Unit (UE)	18h			3 credits
UE Data science seminar	UE	18h			3 credits
UE Numercial optimal transport and geometry	UE	18h			3 credits





	Nature	СМ	TD	TP	Crédits
UE Research project	Teaching Unit (UE)				30 credits

## Computer engineering standard 2nd year

## Master 2nd year

	Nature	CM	TD	TP	Crédits
UE ECOM integration project	Teaching Unit (UE)	18h	18h	27h	6 credits
UE Principles of agile methods	Teaching Unit (UE)	12h	20h		3 credits
UE Communication skills in English	Teaching Unit (UE)		30h		3 credits
UE Security of information systems	Teaching Unit (UE)	15h	15h		3 credits
UE Man-machine interaction : multimodality and mobility	Teaching Unit (UE)	18h		12h	3 credits
UE Multimedia documents : automatic description and search	Teaching Unit (UE)	15h	15h		3 credits
UE Distributed systems and applications	Teaching Unit (UE)	18h		12h	3 credits
UE Communicating embedded systems for the internet of things	Teaching Unit (UE)	21h		9h	3 credits
UE e-services for M2M and the internet of things	Teaching Unit (UE)	15h	15h		3 credits
UE Wide scale data	Teaching Unit (UE)	15h	15h	10h	3 credits
UE Data analysis, data web and semantic web	Teaching Unit (UE)	15h	15h		3 credits
UE Advanced validation techniques/tests	Teaching Unit (UE)	15h	15h		3 credits







UE Principles	and technique	es of model·	-driven engineer	ing	Te Ui	eaching hit (UE)	15h	15h	3 credits
UE Mobile dev	velopment pro	oject			Te Ui	eaching hit (UE)	30h		3 credits

	Nature	CM	TD	TP	Crédits
UE Conduct of software projects in companies	Teaching Unit (UE)				24 credits
UE Software engineering : life cycle and quality	Teaching Unit (UE)	45h	15h		6 credits

## Computer engineering block-release 2nd year

## Master 2nd year

	Nature	СМ	TD	TP	Crédits
UE ECOM integration project	Teaching Unit (UE)	18h	18h	27h	6 credits
UE Principles of agile methods	Teaching Unit (UE)	12h	20h		3 credits
UE Software engineering : life cycle and quality	Teaching Unit (UE)	45h	15h		6 credits
UE Communication skills in English	Teaching Unit (UE)		30h		3 credits
UE Security of information systems	Teaching Unit (UE)	15h	15h		3 credits
UE Man-machine interaction : multimodality and mobility	Teaching Unit (UE)	18h		12h	3 credits
UE Multimedia documents : automatic description and search	Teaching Unit (UE)	15h	15h		3 credits
UE Distributed systems and applications	Teaching Unit (UE)	18h		12h	3 credits
UE Communicating embedded systems for the internet of things	Teaching Unit (UE)	21h		9h	3 credits





UE e-services for M2M and the internet of things	Teaching Unit (UE)	15h	15h		3 credits
UE Wide scale data	Teaching Unit (UE)	15h	15h	10h	3 credits
UE Data analysis, data web and semantic web	Teaching Unit (UE)	15h	15h		3 credits
UE Advanced validation techniques/tests	Teaching Unit (UE)	15h	15h		3 credits
UE Principles and techniques of model-driven engineering	Teaching Unit (UE)	15h	15h		3 credits
UE Mobile development project	Teaching Unit (UE)	30h			3 credits

	Nature	СМ	TD	ΤP	Crédits
UE In-business learning	Teaching Unit (UE)				24 credits
UE Financial and marketing aspects	Teaching Unit (UE)	35h			3 credits
UE Workflow and groupware	Teaching Unit (UE)	21h	9h		3 credits

## Operations Research, Combinatorics and Optimisation (ORCO) 2nd year

## Master 2nd year

	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 Logistic and transport	Teaching Unit (UE)	18h			3 credits





UE Scheduling	Teaching Unit (UE)	18h	3 credits
UE Graph 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 Efficient methods in optimization	Teaching Unit (UE)	18h	3 credits
UE Parallel systems	Teaching Unit (UE)	36h	6 credits
UE Academic and industrial challenges	Teaching Unit (UE)	18h	3 credits

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

# Cybersecurity 2nd year

## Master 2nd year

	Nature	СМ	TD	TP	Crédits
UE Software security, secure programming and computer forensics	Teaching Unit (UE)	19,5h		19,5h	3 credits
UE Security architecture : network, system, key management, cybersecurity of industrial IT	Teaching Unit (UE)	42h	15h	21h	6 credits
UE Cryptographic engineering, protocols and security models, data privacy, coding and applications	Teaching Unit (UE)	36h	21h	21h	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)	48h	15h	15h	6 credits





## Supplementary computing skills (CCI) 2nd year

## Cybersecurity and legal informatics 2nd year

