

Master Ingénierie des systèmes complexes



Niveau de
diplôme
BAC +5



ECTS
120 crédits



Durée
2 années



Langues
d'enseignement
Anglais

Parcours proposés

› M1-M2 Advanced mechatronics

Présentation

The Master's programme in Complex Systems Engineering at Savoie Mont Blanc University (USMB) offers a programme entitled Advanced Mechatronics. It is an internationally oriented course, taught in English and research-oriented.

Mechatronics is at the meeting point of the physical world and the digital world. It is a process integrating in synergy several sciences and skills (mechanics, electronics, control science and computer science). It enables the conception and design of products and systems offering increased or improved functionality. This requires to place the design of the product or system within its overall life cycle and to adopt a cooperative interdisciplinary approach.

Organised over 4 semesters, the training is strongly based on a project-based pedagogy and on a competency approach based on the use of an e-portfolio. It is also supported by contact hours (lectures, seminars, practical works) as well as self-directed study based on digital contents.

Admission in 1st or 2nd year is possible, depending on the held degree.

Objectifs

During the training, students acquire the skills necessary to:

1. Define and solve research problems
2. Manage a (research) project
3. Contribute to design and achieve a mechatronic system.

Dimension internationale

Taught in English, the Advanced Mechatronics Master's programme welcomes students from abroad since its opening (Spain, Lebanon, Algeria, Egypt, Morocco, Tunisia, Mexico, India...).

The teaching team is at the origin of the creation of the International Network for Higher Education in Engineering (INHEE), which brings together, in addition to USMB, the following institutions:

- * [Hochschule Kaiserslautern – University of Applied Sciences \(Germany\)](#)
- * [Fachhochschule Technikum Wien \(Austria\)](#)
- * [Universidad de Jaén \(Spain\)](#)
- * [AGH University of Science & Technology \(Poland\)](#)
- * [University of Genoa \(Italy\)](#)

Students in the Advanced Mechatronics Master's programme may apply for mobility in one of the many international partners of Polytech Annecy-Chambéry Engineering School, within which the Master's programme is prepared.

They can also apply for a double master degree in Computer Engineering with the University of Genoa (Italy).



Co-funded by the
Erasmus+ Programme
of the European Union

The USMB's Master's programme in Complex Systems Engineering is involved in the [XP2P project](#) "Crossing Borders: Peer-to-Peer Education in Mechatronics" under Key Action 2 of the Erasmus+ programme, in the "Strategic Partnerships" section. The aim of the project is the implementation and evaluation of peer learning in a context of project-based learning and competency-based assessment from an e-portfolio.



The programme is also involved in the SysE2021 project, a Franco-Italian Interreg Alcotra project with the University of Genoa. Click on the following links for more information on the [project](#) and on the [Interreg Alcotra programme](#). The following is a brief description of the project in French.

[Projet Alcotra SysE2021](#) : Centre d'excellence transfrontalier pour une formation en ingénierie des systèmes.

La robotisation et la digitalisation croissantes de l'industrie transforment le monde du travail. Aujourd'hui, les entreprises de la région ALCOTRA sont confrontées à une pénurie d'ingénieurs sur le marché du travail, en particulier, dans le domaine des technologies de l'information et de la communication (TIC) ainsi que dans le domaine

de l'ingénierie des systèmes. Les centres de recherche peinent également à recruter de nouveaux chercheurs. Or la région ALCOTRA possède un très grand potentiel pour la formation dans les domaines de l'automatisation et de l'ingénierie des systèmes, à l'image des deux partenaires du projet SysE2021, l'université de Gênes (chef de file) et l'université Savoie Mont Blanc. L'objectif général du projet, démarré en janvier 2021 et réalisé avec le soutien et le financement de l'Union européenne dans la cadre du programme Interreg Alcotra, est de créer une collaboration transfrontalière commune dans la formation en ingénierie des systèmes au niveau master. Le projet doit permettre d'accroître l'attractivité des programmes de formation dans les deux universités partenaires en leur donnant une portée internationale, d'augmenter les effectifs étudiants en ingénierie des systèmes, d'améliorer la qualité de la formation et enfin, de combler le manque d'information entre les entreprises de la région Alcotra en recherche de compétences dans le domaine de l'ingénierie des systèmes et les étudiants ou futurs étudiants de niveau master.

Grâce au projet, on mentionnera en particulier l'organisation de deux écoles d'été destinées aux étudiants de niveau Bac +2/+3 ont été organisées en septembre 2021 et 2022 à Imperia (Italie). Des étudiants en 2ème année du master mention Ingénierie des Systèmes complexes – parcours Advanced Mechatronics de Polytech Annecy-Chambéry (USMB) y ont participé pour présenter leur projet collectif mené dans le cadre du master en vue d'une participation au challenge international Robocup. Ils ont aussi joué le rôle de tuteurs au cours du hackathon organisé pendant l'école. On retiendra aussi l'organisation de deux écoles d'hiver destinées aux étudiants de 2ème année de master et aux doctorants à Annecy en décembre 2021 et 2022 ([vidéo de l'école d'hiver 2022](#)). Enfin, c'est dans le cadre de ce projet qu'a été conclu l'accord de double diplôme avec l'Université de Gênes (Laurea Magistrale in Computer Engineering).

Montant prévisionnel du projet : 503 000€
Subvention maximum : 427 550€

Les atouts de la formation

The programme, taught in English, in an international context, is based on a student-centred pedagogy that encourages the development of autonomy and collaborative work for a better preparation for professional life: project-based learning, peer learning, e-portfolio and competency-based approach.

During each semester, students carry out projects, being immersed in a research laboratory which is a partner of the master's programme, in contact with researchers on various subjects, some of which may be in collaboration with companies.

During the first 3 semesters of the programme, students develop their capacity to take up collective challenges by preparing their participation in the international Robocup challenge.

Finally, an optional internship is possible at the end of the 1st year (6 weeks minimum) and a final year internship (16 weeks minimum) during the second semester of the 2nd year is compulsory. The local industrial base is conducive to the realisation of internships in line with the training programme. There is a strong link between training and research. An example of this link is the USMB's [Disrupt'Campus Piton](#), which offers opportunities for final year internships.

Organisation

Effectifs attendus

Capacité d'accueil de la 1ère année (*1st year capacity*) : 20 places

Capacité d'accueil de la 2ème année (*2nd year capacity*) : 20 places

Aménagements d'études

<https://www.univ-smb.fr/en/formation/amenagements-specifiques/>

Date de début de la formation : 12th September 2023

Date de fin de la formation : M1 : 30th June 2024 - M2 : internship end 30th September 2024 at the latest

Admission

A qui s'adresse la formation ?

To apply for entering the 1st year of the programme, candidates must hold a Bachelor's degree or equivalent and demonstrate a good command of English (B2 level minimum recommended). An interest in research and development and a willingness to involve themselves in a training with a strong emphasis on project-based learning is recommended.

The recommended Bachelor's degrees are in the fields of:

- * Engineering sciences
- * Science and technology
- * Mechanics
- * Electronics, electrical energy, control science

Depending on the courses taken, Bachelor's degrees in Computer science or Physics may be eligible.

For candidates holding a foreign degree, the degree must be equivalent to a French Bachelor's degree ("Licence") to enter the 1st year (180 ECTS) and at least equivalent to a first year Master's degree to enter the second year (240 ECTS). The degree must be in the field of mechatronics (engineering sciences, mechanics, electronics, electrical energy, control science) or in a related scientific field (computer science, physics) with courses oriented towards engineering sciences.

Applications are examined by an admission board and admissions are pronounced by the President of USMB based on the admission board proposals.

Attendus de la formation

In order to succeed in the SCI-Advanced Mechatronics Master's degree, it is necessary, at the end of the Bachelor's programme, to possess

- * scientific expertise: This master's programme implies the ability to analyse, pose a problem and carry out a reasoning, a capacity for abstraction, logic and modelling and the command of a core of disciplinary knowledge in engineering sciences acquired in the first study cycle and associated experimental methods.
- * communication skills: This Master's programme requires the ability to communicate in writing and orally in a rigorous and adapted manner, an ability to document oneself, all in English, language which must be mastered at least at a B2 level.
- * methodological and behavioural skills: This master's programmes requires intellectual curiosity, the ability to organise and conduct learning independently, the ability to plan personal work and to stick to it over time, and the ability to adopt new digital tools. Finally, it requires an appetite for collaborative work in an international context.

Et après

Poursuite d'études

Possibility to carry on doctoral studies in laboratories partners of the Master's programme, depending on thesis subjects, application quality and available funding.

Métiers visés et insertion professionnelle

Graduate destinations:

- * Engineering activities in public or private R&D centres
- * High level technical and scientific activities in specialised design offices.

Infos pratiques

Laboratoires partenaires

Systems and Materials for Mechatronics Laboratory (SYMME)

<https://www.polytech.univ-smb.fr/en/research/symme-laboratory.html>

Laboratory of Computer Science, Systems, Processing of Information and Knowledge (LISTIC)

<https://www.polytech.univ-smb.fr/en/research/laboratoire-listic.html>

Laboratory for Design Optimization and Environmental Engineering (LOCIE)

<https://www.polytech.univ-smb.fr/en/research/locie-laboratory.html>


Laboratory of Annecy for Particle Physics (LAPP)

<https://lapp.in2p3.fr/?lang=en>

Inter-university Laboratory of Human Movement Biology (LIBM)

<https://libm.univ-st-etienne.fr/fr/index.html>

Campus

 Annecy / campus d'Annecy-le-Vieux

En savoir plus

Master Advanced Mechatronics

<https://www.polytech.univ-smb.fr/en/programs/masters/advanced-mechatronics.html>

Programme

M1-M2 Advanced mechatronics

M1 - Advanced mechatronics

Semestre 7

	Nature	CM	TD	TP	Crédits
UE701 Mechatronics framework	UE				10
Mechatronics common framework	EC	7,5h	10,5h		3
Metrology for mechatronic systems	EC		4,5h	8h	3
S7 Collective project in the framework of an international challenge	EC				4
UE702 Tools for a research project	UE				12
Bibliographical tools & project management	EC	3h	12h		2
Communication for research	EC		28h		4
S7 Collective research project	EC				6
UE703 Individual project and openness courses	UE				8
S7 Individual project	EC				5
Materials for mechatronics	EC	4,5h	6h	8h	2
Heat transfer in mechatronic systems	EC		4,5h		1
Signals and systems, continuous control	EC		1,5h	8h	2
Development and deployment frameworks	EC			12h	1
French classes for non-French speaking people	EC				1

Semestre 8

	Nature	CM	TD	TP	Crédits
UE801 Toolbox for research in mechatronics	UE				9
Modelling, simulation and numerical analysis	EC		18h		2
Core skills, research organizations and standards	EC	13,5h	3h		1
S8 Collective research project	EC				6
UE802 International project and Design tools for mechatronics	UE				11
S8 Collective project in the framework of an international challenge	EC				4
Design of experiments	EC		7,5h		1
Computer-aided design CAD	EC			18h	3
Instrumentation electronics, MEMS and actuators	EC			20h	3
Architecture and robotics	EC	12h	13,5h	20h	4
Data science	EC	6h	6h	8h	2
UE803 Individual project and specialisation/openness courses	UE				10

S8 Individual project	EC				5
Finite element simulation	EC	3h	3h	12h	2
Multiphysics coupling in materials	EC		6h	9h	2
Physics for autonomous wireless systems	EC		4,5h		1
Embedded control and computer science	EC	15h	3h	16h	3
Security Protect the system from intrusion	EC	3h	3h	8h	2
French classes for non-French speaking people (FLE)	EC				1

M2 - Advanced mechatronics

Semestre 9

	Nature	CM	TD	TP	Crédits
UE901 Embedded systems and supervision	UE				13
Embedded systems introduction to supervision methods, models and tools	EC	3h	9h	12h	3
Collective Research S9 project	EC				10
UE902 Rights, ethics and scientific diffusion	UE				9
Intellectual property, contracts, law	EC	4,5h	6h		2
Ethics and scientific diffusion	EC	9h	7,5h		2
Individual S9 project	EC				5
UE903 Preparation for doctoral studies	UE				8
Research funding and PhD communication	EC	6h	18h		3
Collective S9 project in the framework of an international challenge	EC				5

Semestre 10

	Nature	CM	TD	TP	Crédits
UE001 Internship devoted to research topic	UE				30
Internship	EC				30