UNIVERSITÉ SAVOIE MONT BLANC

SCIENCES, TECHNOLOGIES, SANTÉ

Master Ingénierie des systèmes complexes

Niveau de diplôme
BAC +5

ECTS
120 crédits

Durée
2 années

Langues d'enseignement
Anglais

Taux d'insertion professionnelle
https://vip.sphinxonline.net/ovetu/Fusion_IPIQ2/Report_MonMaster.htm?pwd=Mas&user=isc

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 was 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 was the implementation and evaluation of peer learning in a context of project-based learning and competency-based assessment from an e-portfolio.

The programme was 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, était de créer une collaboration transfrontalière commune dans la formation en ingénierie des systèmes au niveau master. Le projet devait 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, 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 : 10th September 2024

Date de fin de la formation : M1 : 30th June 2025 - M2 : internship end 30th September 2025 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

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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 Individual Project and Tools/Openness Courses for a Research Project	UE				11 crédits
Bibliographical tools & project management	EC		19,5h		2 crédits
S7 Individual project	EC				5 crédits
Communication for research	EC		28h		4 crédits
UE702 Collective Research Project and Mechatronics Framework	UE				9 crédits
S7 Collective research project	EC				6 crédits
Mechatronics common framework	EC	11h	10,5h		3 crédits
UE703 Collective International Challenge and Design Tools for Mechatronics	UE				10 crédits
S7 Collective project in the framework of an international challenge	EC				4 crédits
Architecture and robotics	EC	15h	12h	20h	3 crédits
Computer-aided design CAD	EC	1,5h		18h	2 crédits
Fundamentals of electronics and electricity	EC	1h		20h	2 crédits
Design of experiments	EC	1h	7,5h		1 crédits
French classes for non-French speaking people (FLE for A1 and A2 level only)	EC				1 crédits

Semestre 8

	Nature	CM	TD	TP	Crédits
UE801 Individual Project and Tools/Openness Courses for a Research Project	UE				12 crédits
S8 Individual project	EC				5 crédits
Basics of Mechanics and Materials for Mechatronic System	BLOC				
Materials for mechatronics	EC	4,5h	6h	8h	2 crédits
Multiphysics coupling in materials	EC		6h	9h	2 crédits
Finite element simulation	EC	6h	3h	12h	2 crédits
Heat transfer in mechatronic systems	EC		4,5h		1 crédits
French classes for non-French speaking people (FLE for A1 and A2 level only)	EC	1,5h			1 crédits
Monitoring and Control of Mechatronic Systems	BLOC				
Data science	EC	6h	6h	8h	2 crédits
Security Protect the system from intrusion	EC	4,5h	3h	8h	2 crédits
Embedded control and computer science	EC	16,5h	3h	16h	2 crédits

French classes for non-French speaking people (FLE for A1 and A2 level only)	EC	1,5h			1 crédits
Development and deployment frameworks	EC	1,5h		12h	1 crédits
UE802 Collective Research Project and Mechatronics Framework	UE				9 crédits
S8 Collective research project	EC				6 crédits
Modelling, simulation and numerical analysis	EC	3h	15h		2 crédits
Core skills, research organizations and standards	EC	13,5h	3h		1 crédits
UE803 Collective International Challenge and Design Tools for Mechatronics	UE				9 crédits
S8 Collective project in the framework of an international challenge	EC				4 crédits
Signals and systems, continuous control	EC	1,5h	1,5h	8h	2 crédits
Metrology for mechatronic systems	EC		4,5h	8h	3 crédits

M2 - Advanced mechatronics

Semestre 9

	Nature	CM	TD	TP	Crédits
UE901 Individual Project and Tools/Openness Courses for a Research Project	UE				10 crédits
Individual S9 project	EC				6 crédits
Intellectual property, contracts, law, research funding	EC	6h	6h		3 crédits
Ethics and scientific diffusion	EC	6h	6h		1 crédits
UE902 Collective Research Project and Mechatronics Framework	UE				12 crédits
Collective Research S9 project	EC				10 crédits
PhD communication	EC	4,5h	22h		2 crédits
UE903 Collective International Challenge and Design tools for mechatronics	UE				8 crédits
Collective S9 project in the framework of an international challenge	EC				5 crédits
Embedded systems introduction to supervision methods, models and tools	EC	10,5h		12h	3 crédits

Semestre 10

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