

1er mars 2023

Programme Master Microtechnique

 Faculté des Sciences et Techniques de l'Ingénieur (STI)



What is Microengineering?



Microengineering is a branch of engineering that deals with the design and fabrication of very small structures and devices, typically on the scale of micrometers or smaller. It involves the use of microfabrication techniques to create complex systems and machines with dimensions that are often measured in microns.

Microengineering encompasses a wide range of applications, including micro-electronics, micro-electromechanical systems (MEMS), microfluidics, nanotechnology, and bioengineering. Some examples of microengineering products include microsensors, micro-actuators, micro-optics, microfluidic chips, and microelectronic devices.

Microengineering plays an increasingly important role in many fields, including medicine, electronics, materials science, and environmental monitoring. By creating devices that are small, efficient, and precise, microengineering is enabling new applications and advancing scientific understanding in a variety of areas.



What is Microengineering?

Microengineering

Making small smaller.

Microengineering is the art and science of creating, designing, integrating and manufacturing miniature components, instruments and products.





Why go Small ???

Size and Mass





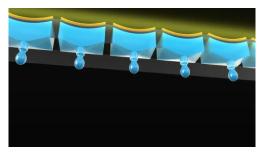
IMU on Saturn V (1960)







40'000 droplets per second



Energy consumption





Welcome to Microengineering!



Prof. Christophe Moser Section Director



Dr. Sebastian Gautsch Adjunct



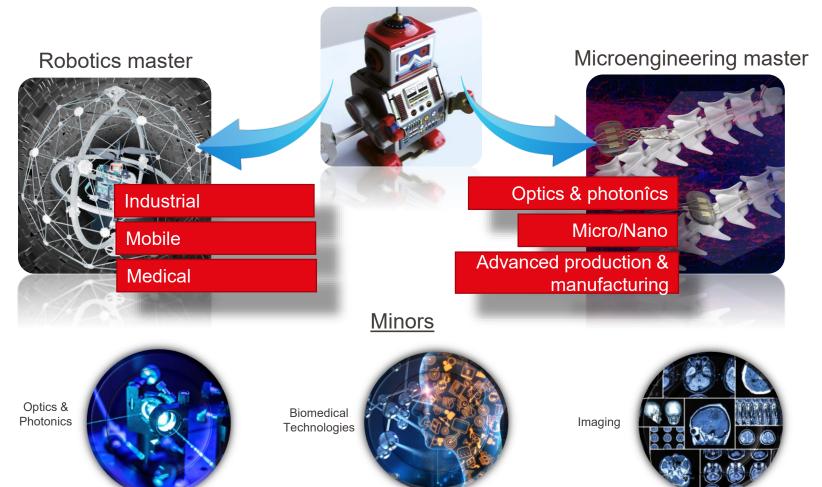
Presentation Outline

- Microengineering section and program offer
- Microengineering and Robotics Historical and technological background
- Robotics Master detailed program structure
- Minors of the section
 - Photonics
 - Biomedical technologies
 - Imaging
- Semester projects, industry internships, master thesis
- Beyond your studies
- Testimonies and teaser movies
- General student info and contacts



Bachelor Microtechnique

7





Other EPFL BaS programs

4.50 average No mandatory prerequisit rules Recommended background:

- Electronics
- Programming
- Mechanical design
- Microfab

Microengineering master



Micro/Nano

Advanced production & manufacturing

<u>Minors</u>

Optics & Photonics



Industrial

Mobile

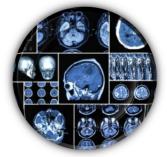
Medical

Robotics master

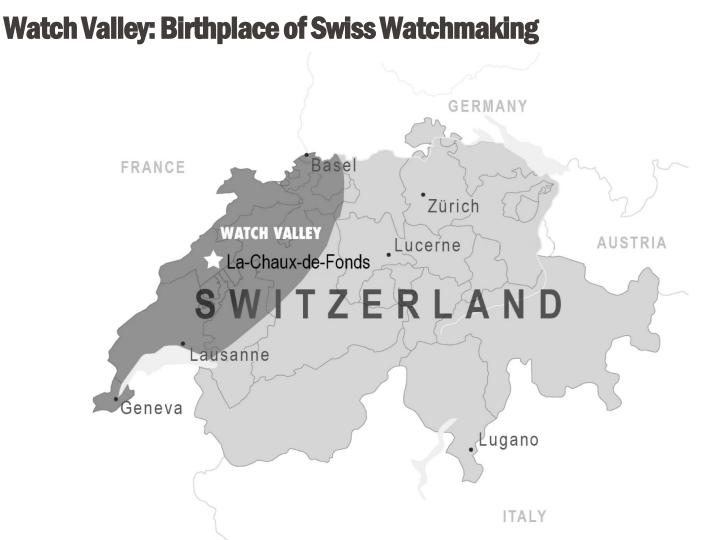
Biomedical Technologies



Imaging





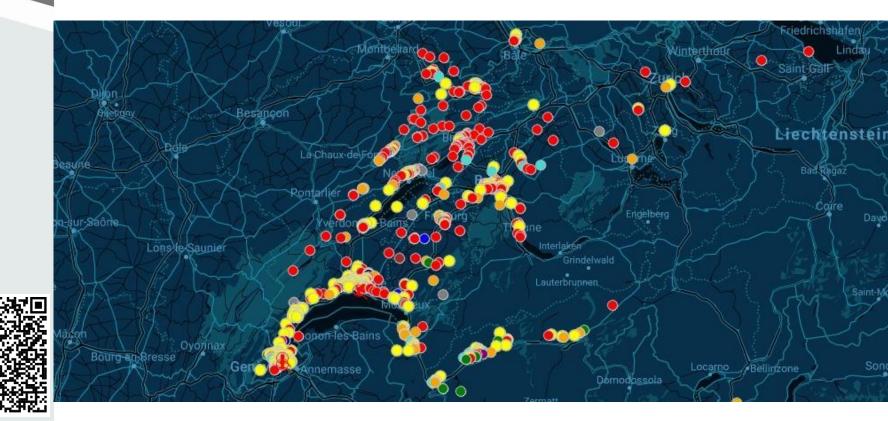






Building on History - The Health Valley

"Western Switzerland's Health Valley is home to 39 research and academic institutions, 1'020 companies, 62 private and public innovation support programs and over 5'000 life sciences students"





History of Microengineering

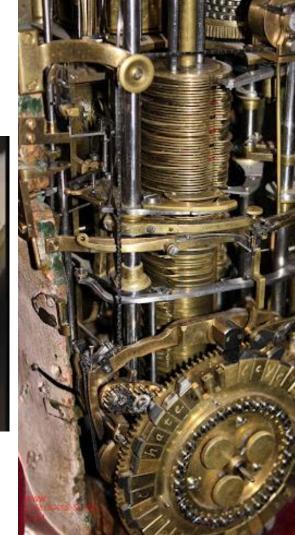
The Jaquet-Droz Automata (*La Chaux-de-Fonds* - 1768 and 1774)



«The earliest ancestors of Modern Robotics»



Le dessinateur (2000 pieces)





History of Microengineering

2009 – Spiral made of Silicon Institut de Microtechnique, Patek-Philippe, *Neuchâtel*



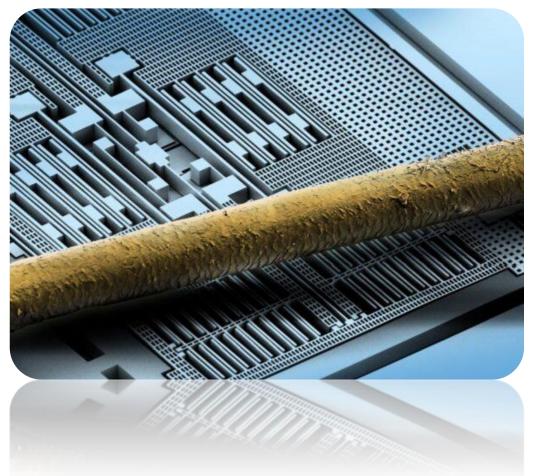
Adapt advanced Microfabrication techniques to build Watchpieces made of Silicon





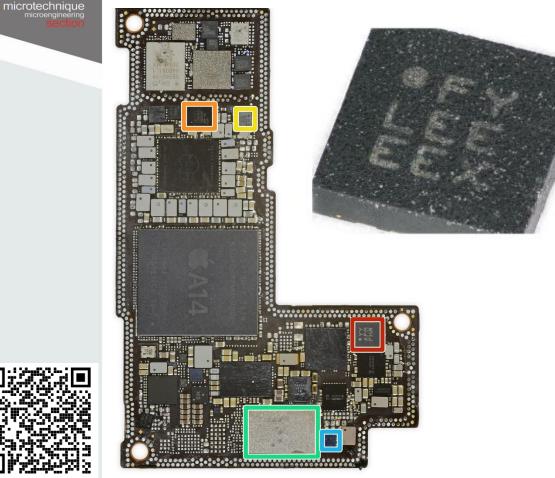


EPFL Microsystems







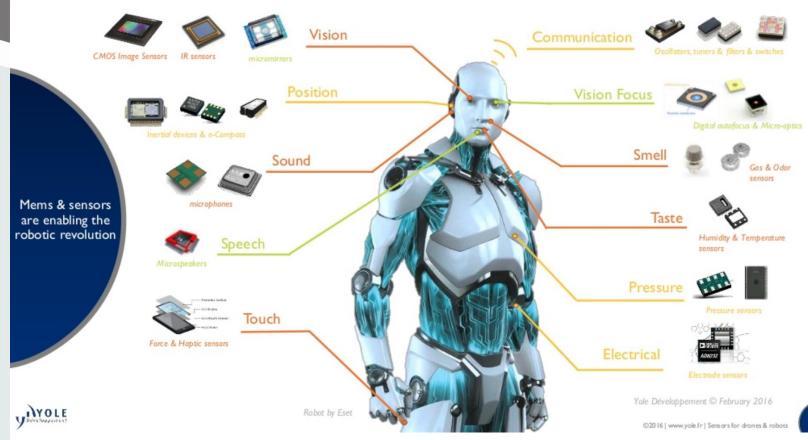


- Accelerometers: X, Y, Z
- Gyroscope: Role, Pitch, Yaw
- Magnetometer: X, Y, Z
- GPS





Robotics and Sensing





Stabilized drones, stablilized cameras





Machine Learning, Artificial Intelligence

Mind controlled Robots

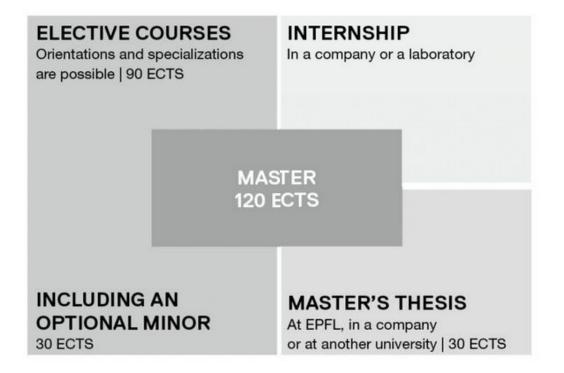




Microengineering Master - detailed program structure



Master program structure



https://www.epfl.ch/education/master/study-programs-structure/



Your EPFL e-mail !!!

1stname.lastname@epfl.ch

- Should now become your reference account
- Important info regarding your studies will be sent to this address

«Ignorantia juris non excusat»

In case of doubt, please consult official regulations for your studies



Microengineering/Robotics Passerelle program

Puis-je commencer le cycle Master sans avoir terminé la passerelle HES ?

Oui, mais seulement si :

- vous avez obtenu au moins 30 crédits ECTS de passerelle HES et
- vous n'êtes pas en échec définitif à la passerelle HES.

La période durant laquelle vous avez commencé votre cycle Master mais pas encore terminé la passerelle HES compte à la fois dans la durée maximale de la passerelle HES et dans celle du cycle Master.



Microengineering/Robotics Passerelle program

validé par la vice-présidence pour les affaires académiques le 25 mai 2022

Code	Matières	Enseignants	Sections	Semestres						Crédits	Période	Type
		sous réserve			AUT		PRI				des	exam.
		de modification		c	e	p	С	e	P		épreuves	
	Bloc 1 "Branches de base"									30		
MATH-203(a)	Analyse III	Michelat	MA	2	2				-	4	Н	écrit
MATH-207(a)	Analysis IV (for SV, MT)	Licht	MA				2	2		4	Е	écrit
ME-326	Automatique et commande numérique	Karimi + Salzmann	GM	4	1	1				6	Н	écrit
MICRO-321	Ingénierie optique	Achouri K./Martin O.	MT	2	1	3				6	H	écrit
PHYS-201(c)	Physique générale : électromagnétisme	Boero	MT	4	2					6	H	écrit
MICRO-310(a)	Signaux et systèmes I (pour MT)	Unser	MT	2	2					4	H	écrit
	Bloc 2 "Branches d'approfondissement"									27		
MICRO-313/314	Actionneurs et systèmes électromagnétiques I, II	Köchli/Perriard + Hodder/Köchli/Perriard	MT	2			2	1	2	7	E	écrit
MICRO-330	Capteurs	Boero/Shea	MT				5			5	E	écrit
MICRO-312	Physique des composants semiconducteurs	Besse	MT	4						4	H	écrit
MICRO-311(a)	Signaux et systèmes II (pour MT)	Unser	EL				2	2		4	E	écrit
MICRO-315	Systèmes embarqués et robotique + travail supplémentaire de 1 crédit	Mondada	MT				2		4	7	sem P	sans retrai
	Totaux :			20	8	4	13	5	6			
	Totaux par semaine :				32			24		57		

Pour **réussir la passerelle HES**, un étudiant doit :

- avoir acquis au moins 30 crédits à la fin du deuxième semestre de la passerelle HES et
- avoir acquis tous les crédits requis à la fin du quatrième semestre de la passerelle HES.

https://www.epfl.ch/education/studies/reglement-et-procedure/conditions_reussite/reussite-passerelle/



Reading a study plan

2022-2023 MICROTECHNIQUE

Cycle Master

validé par la vice-présidence pour les affaires académiques le 25 mai 2022

Code	Matières	Enseignants	Sections	Semestres MA1 / MA3 MA2						Crédits	Nbre places	Période des	Type examen *
		sous réserve							2				
		de modification		c	e	p) C	e	р			épreuves *	
	Bloc 1									26			
MICRO-406	Products design & systems engineering	Bellouard/Charbon	MT	5		5	;			10		sem A	sans retrait
MICRO-498	Projet microtechnique I	Divers enseignants	Divers	<			- 10		>	10		sem A ou P	sans retrait
HUM-nnn	SHS : introduction au projet	Divers enseignants	CDH	2		1	L			3		sem A	
HUM-nnn	SHS : projet	Divers enseignants	CDH					1	2	3		sem P	sans retrait
	Bloc 2									15			
MICRO-534	Advanced MEMS & microsystems	Briand	MT				3			3		Е	oral
MICRO-451	Applied and industrial robotics	Bouri	MT				2			2		Е	écrit
MICRO-455	Applied machine learning	Billard	MT	4						4		H	écrit
EE-311	Apprentissage et intelligence artificielle	Liebling	EL				2		2	4		Е	écrit
MICRO-421	Imaging optics	Psaltis	MT	2	1					3		sem A	sans retrait
ME-413	Introduction to additive manufacturing	Boillat + Boillat/Brugger/Moser	GM/MT	2		1	!			3		H	écrit
MICRO-426	Laser fundamentals and applications for engineers	Moser	MT				2	1		3		E	oral
MICRO-448	Manufacturing systems and supply chain dynamics	Filliger/Gallay	MT				2	1		3		E	oral
MICRO-431	Materials and technology of microfabrication	Gijs/Lehnert	MT	2	1					3		H	oral
MICRO-457	Materials processing with intelligent systems	Hoffmann/Wasmer	MT	2	1					3		H	oral
MICRO-428	Metrology	Bruschini/Charbon/Fantner	MT/SV				3			3		Е	oral
MICRO-530	Nanotechnology	Boero/Brugger	MT				3			3		E	oral
MICRO-523	Optical detectors	Besse	MT	3						3		H	oral
MICRO-470	Scaling laws & simulations in micro & nanosystems	Renaud/Shea	MT	3	1					4		H	oral
MICRO-420	Selected topics in advanced optics	Martin O.	MT	3						3		H	oral
EE-594	Smart sensors for IoT	Enz/Ionescu	MT/EL	2	1					3		H	écrit
	Groupe 3 "Options"									49			
	Voir liste d'options ci-après									49			
				-									
	Total des crédits du cycle master									90			

https://www.epfl.ch/education/studies/en/rules-and-procedures/pass-conditions/requirements-passing-master-degree/



Requirements for obtaining the master's degree

Block

A **block is passed** (and thus all the credits associated with the block are acquired) when all the subjects it contains have been examined at least once and the **weighted average of the block is 4,00 or above**.

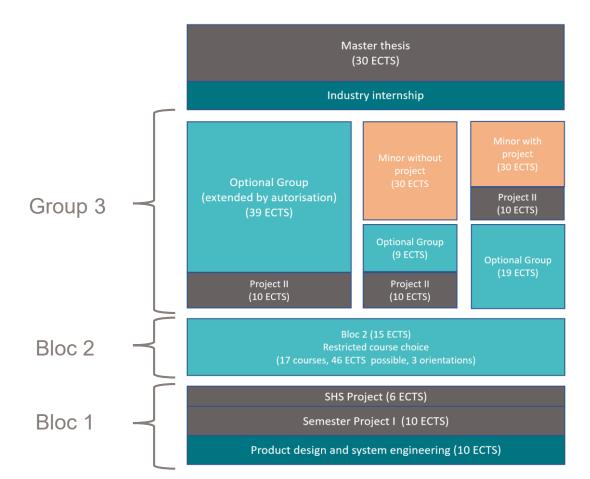
Group

A group is passed when enough subjects in the group are passed (final grade 4,00 or above) to reach the number of credits associated with the group. Although an average is calculated, it has no bearing on the passing of the group.





Master Program structure

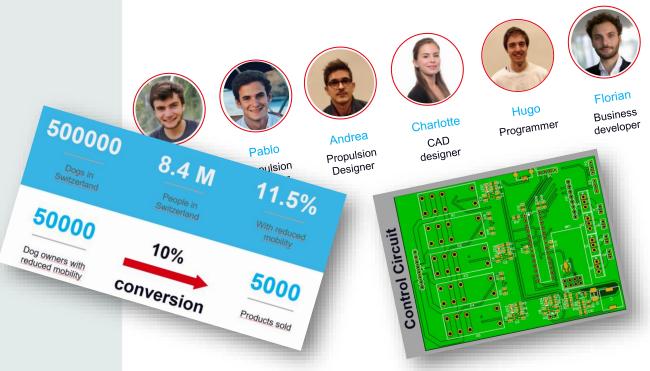


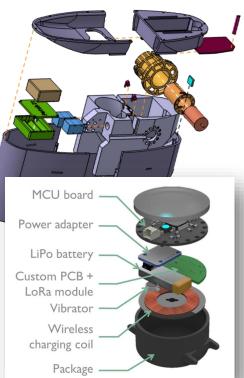


Products Design and Systems Engineering

Foundational course in the first semester letting groups of students create their own product from concept tu prototype, including a first marketing plan.

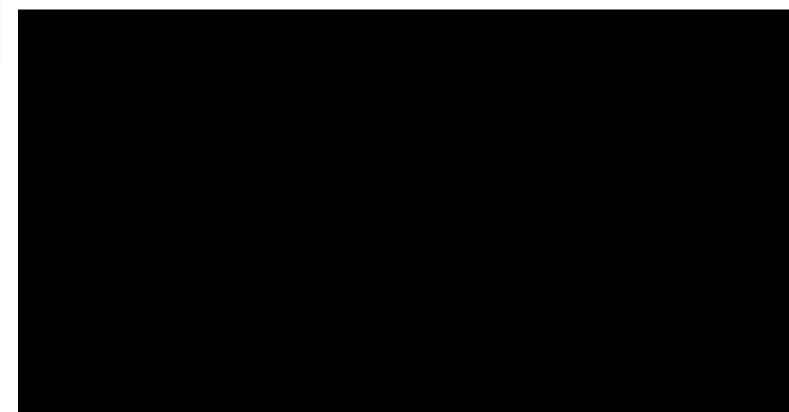
With invited speakers from Academia and Industry.







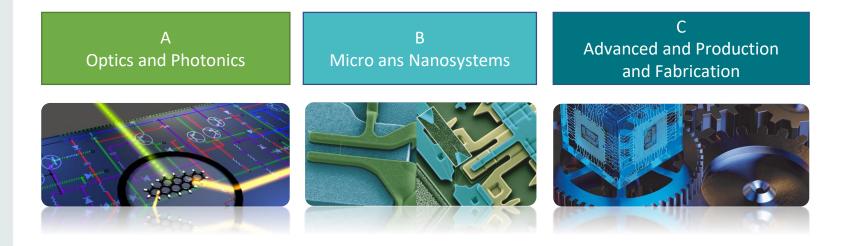
Product design example – Pill'it



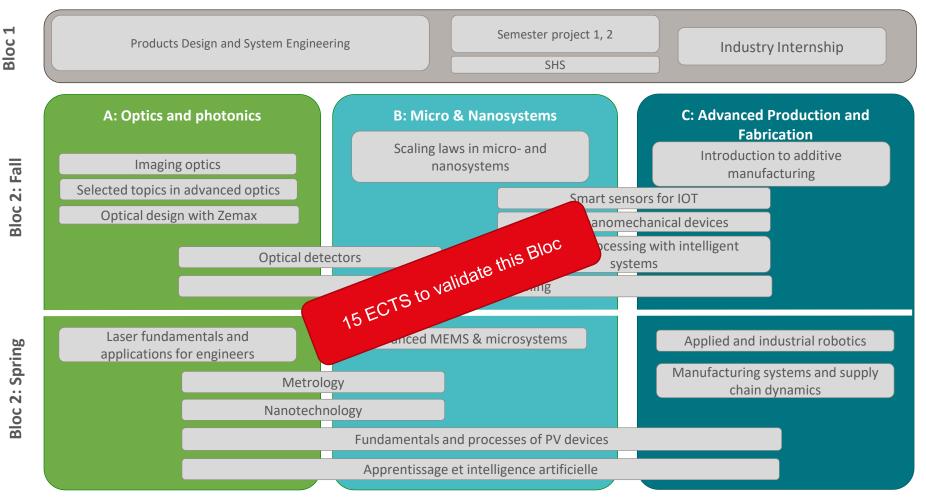


Orientations – Microengineering Master

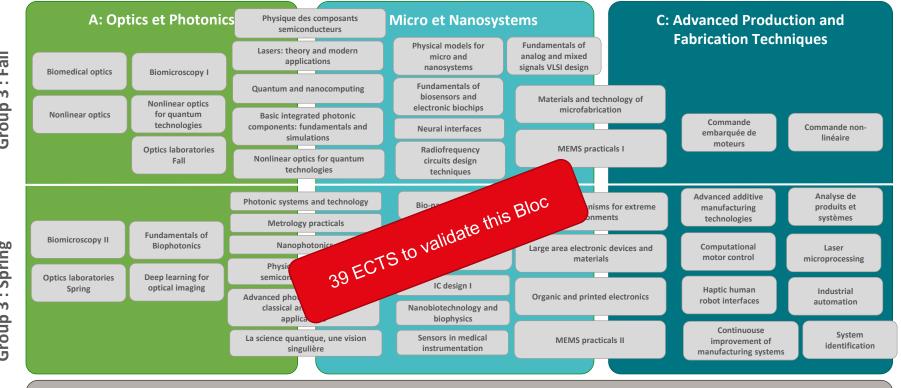
Orientations are meant as **guidelines** to help students in their course choices.



Orientations - Master Microengineering



Orientations - Master Microengineering



AI / ML Software architecture Advanced machine learning Machine learning programming: Distributed intelligent systems Model predictive control Advanced control systems

Signals & Bio Image processing I Image processing II Bio-image informatic. Audio Neural signal and signal processing Translational neuroengineering Applied biomedical signal processing Introduction to Bioengineering

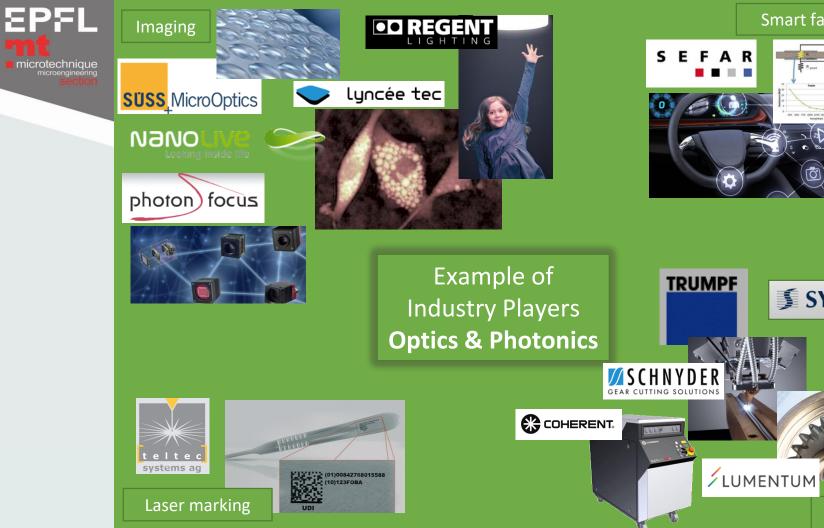
Systems Embedded systems Systems engineering Lab on app development for tablets and smartphones Management de projet et analyse du risque Space mission design and operations

Robotics Basics of mobile robotics Aerial robotics **Evolutionary robotics**

Intercultural presentation skills

more

And



Smart fabric printing

SYNOVA

Laser cutting







Advanced manufacturing

BÜHLER



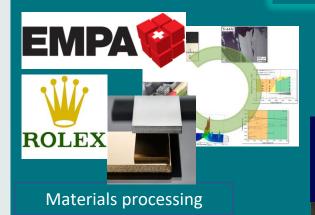


Supply chain

Example of Industry players **Advanced Manufacturing** & Production



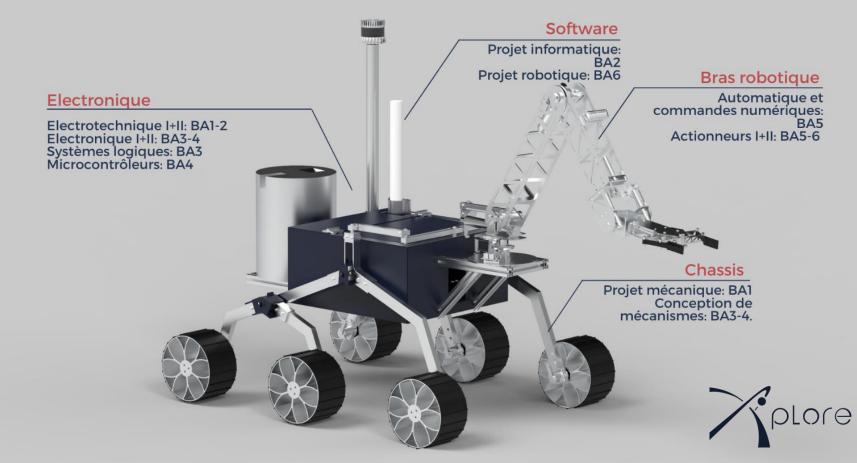








Quoi de microtechnique à bord d'un Rover?





Entrepreneurship!

Student Startup Launchpad

We foster student entrepreneurship as a driver for leadership, impact and innovation. We are building the next generation of students founders with a drive for excellence, an instinct for leadership and an aspiration for societal impact.

> applications are open blaze startup accelerator The 3-month program for EPFL promising student startups Application deadline Feb. 19 rogram starts in March

go.epfl.ch/blas

Master project in your Startup (PDM)

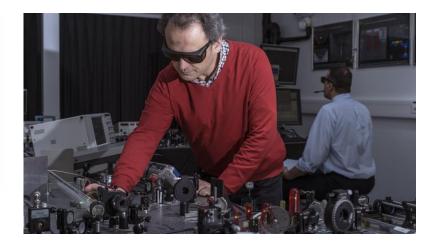


Research - IEM to host your projects

EPFL ICM institute of electrical and micro engineering

IEM covers the following major technical fields:

- Electronic Circuits and Devices
- Micro-manufacturing and Micro- and Nano-technologies
- Robotics
- IoT, Computer & Communication Engineering
- · Optics, Photonics and wave engineering
- Machine learning, Information Science and Systems
- Power and Energy



Research in IEM :

- 37 Full Professors / Associate Professors / Tenure-Track Assistant Professors
- I SNSF-funded Professor
- 13 Adjunct Professors
- 11 Senior Scientists
- 1 Member of the US National Academy of Engineering
- 1 Member of the American Academy of Arts & Sciences
- 1 Member of the Academia Europaea
- 2 Members of Swiss Academy of Engineering Sciences
- 25 ERC grants : 12 Advanced, 6 Consolidator and 7 Starting grants since 2008



One Institute on 3 campuses



Geneva - Campus Biotech

- · Bio- and neuroengineering (Wyss center)
- Human Brain Project
- Center for neuroprosthetics

Neuchâtel - Microcity

Microengineering and nanotechnologies





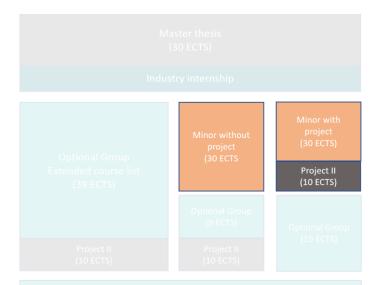


Minors of the section

- Photonics
- Biomedical technologies
- Imaging



Minors...



Bloc 2 (15 ECTS) Restricted course choice 7 courses, 46 ECTS possible, 3 orientations)

HS Project (6 ECTS

Semester Project I (10 ECTS

Product design and system engineering (10 ECTS)



Minors

A minor is a group of compulsory and optional courses from one or more Master's programs.

EPFL offers a wide choice of **disciplinary** and **interdisciplinary** minors.

Interdisciplinary minors

Interdisciplinary minors often group together courses from several Master's programs. Some consist of a multidisciplinary topic (I.E. photonics minor), others offer complementary education to the classical engineering curriculum (Management, Technology and Entrepreneurship)

https://www.epfl.ch/education/studies/en/rules-and-procedures/minors/



Recommended and possible Minors

		5070 (0.04)	400	400
Master ECTS (PdM ir Aineurs / Minors			120	120
			Ŧ	
Imaging	Interdisc		r	
Technologies biomédicales / Biomedical technologies	Interdisc		r	r
Photonique / Photonics	Interdisc		r	r
Energie / Energy	Interdisc		r	r
Ingénierie pour la durabilité / Engineering for sustainability	Interdisc		r	r
Neuro-X	Discipl.	NX	r	r
Physique des systèmes vivants / Physics of living systems	Interdisc		r	r
Science et ingénierie quantiques / Quantum science and engineering	Discipl.	SIQ	r	r
Technologies spatiales / Spacial technologies	Interdisc		r	r
Data and internet of things	Interdisc		r	с
Management, technologie et entrepreneuriat / Technology management and entrepren	e Interdisc	ipl MTE	r	с
Science et ingénierie computationnelles / Computational science and engineering	Discipl.	MA	r	с
Architecture	Discipl.	AR	С	С
Computational Biology	Interdisc	ipl IN	С	с
Biotechnologie / Biotechnology	Interdisc	ipl CGC	с	с
Chimie et génie chimique / Chemistry and chemical engineering	Discipl.	CGC	с	с
Cyber security	Discipl.	IN	с	с
Data science	Discipl.	SC	с	с
Design intégré, architecture et durabilité / Integrated Design, Architecture and Sustair	Interdisc	ipl AR	с	с
Génie civil / Civil engineering	Discipl.	GC	с	с
Génie électrique et électronique / Electrical and electronic engineering	Discipl.	EL	с	с
Génie mécanique / Mechanical engineering	Discipl.	GM	с	с
Ingénierie des systèmes / Systems Engineering	Interdisc	ipl MTE	с	с
Informatique / Computer science	Discipl.	IN	с	с
Ingénierie des sciences du vivant / Life sciences engineering	Discipl.	SV	с	с
Ingénierie financière / Financial engineering	Discipl.	IF	с	с
Mathématiques / Mathematics	Discipl.	MA	С	С
Physique / Physics	Discipl.	PH	с	С
Science et génie des matériaux / Materials science and engineering	Discipl.	MX	с	с
Sciences et ingénierie de l'environnement / Environmental sciences and engineering	Discipl.	SIE	с	С
Statistique / Statistics	Discipl.	MA	с	с
Systèmes de communication / Communication systems	Discipl.	SC	С	с

recommanded in the study plans

MT MT-Ro

ΜТ

c choice of the courses with the advice of the initiating section and the person in charge of the minor



7 mars 2022

VELOCOLOURIES

Faculté des Sciences et Techniques de l'Ingénieur (STI)

Mineur en Photonique

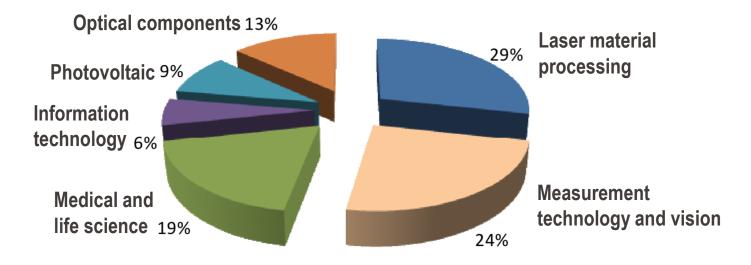
TILITIC CONTRACTOR



Photonics and industry

- One of the five key enabling technologies identified by the European Commission
- € 447 billion world market, growing at a rate of 6.2%
- CHF >4 billions Swiss photonics industry, ~ 100 companies,

>10'000 highly skilled collaborators:



SWISS*PHOTONICS



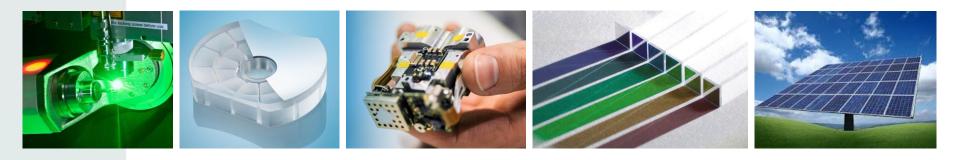
Photonics in Switzerland – e.g. Optical components*

CHF 400 Mio turnover

• Some large companies and many Small & Medium Enterprises:

ABB, Alpes Laser, ams-OSRAM, Axetris, Balzers Optics, Lumentum Ultrafast Lasers, Escatec, Exalos, Feinwerkoptik Zünd, Fiberoptic, FISBA, Fischer Connectors, Heptagon/AMS, id Quantique, IMT Masken und Teilungen, Industrial Laser Electronics and Engineering, Insolight, Leica, Leister, LESS, Logitech, Mikrop, Omnisens, Onefive, OVD-Kinegram, Silitec Fibers, Sinar, Rainbow Photonics, Schott Suisse, Spectros, Suss Microoptics, SwissOptic, Thin Film Physics, Time-Bandwidth Products, Victor Kyburz, Volpi, Vectronix WZW Optic, Xenlux, Zünd Precision Optics... ... and many, many more !

ISS*PHOTONICS





Context for the Minor in Photonics

- Photonics is widespread at EPFL: Physics, Chemistry, Microengineering, Electrical Engineering, Bioengineering, Architecture...
- Very successful Doctoral Program in Photonics
- Large photonics faculty body in the Microengineering Section, where photonics is one of the focuses
- The minor in photonics bundles these competencies to propose a high level photonics degree

Objectives

- Educate students in the science of optics and photonics
- Prepare the students for their future in industry or academia
- Propose a balanced study plan between theory and practical work



What, How and with Whom?

- Choose 20 ECTS (6-7 courses) from 98 ECTS (30 courses) and a lot of freedom
 + Project in photonics (10 ECTS)
- Three tracks: Foundations of photonics, Applied photonics, Biomedical photonics
- Key laboratories for each track:

Foundations of photonics K-Lab – Kippenberg LAPD - Moser LASPE – Grandjean/Butté/... LBP - Roke LIB – Unser LWE – Fleury NAM – Martin PHOSL – Brès PVLAB – Ballif/Haug Applied photonics EDMX – Hoffmann LAPD – Moser LO - Psaltis LMTS – Briand LNET – Tagliabue LT – Thévenaz LWE – Fleury NAM - Martin PHOSL - Brès PVLAB – Ballif/Haug

....

Biomedical photonics BIOS - Altug EDCH - Wagnieres LAPD - Moser LBEN - Radenovic LIB - Unser LO - Psaltis MIPLAB – Van De Ville PTBIOP - Seitz LBP – Roke

. . .



Proposed lectures in 2022/2023

Foundations of photonics

Laser fundam. and applications for engineers Lasers: theory and modern applications Nonlinear optics **Optical communications** Optics laboratories I and II Optique III Photonic systems and technology Physics of photonic semiconductor devices Quantum physics III and IV Quantum electrodynamics and quantum optics Quantum optics and quantum information Selected topics in advanced optics Semiconductor physics and fundamentals of electronic devices

Applied photonics

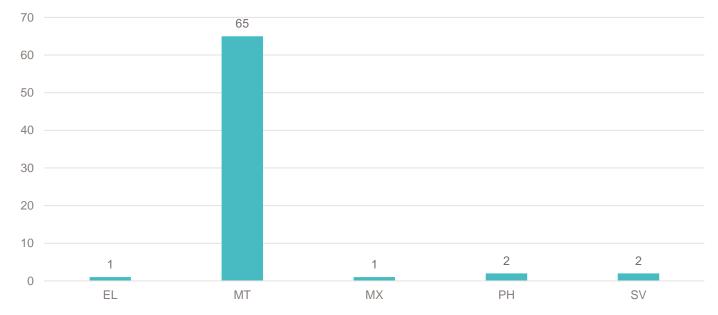
Advanced materials for photovoltaics and lighting Fundamentals & processes for photovoltaïc devices

Fundamentals of biophotonics Imaging optics and design Image processing I and II Laser microprocessing Laser fundam. and applications for engineers **Optical detectors Optical communications** Optics laboratories I and II Organic and printed electronics Photonic micro- and nanosystems Photonic systems and technology Selected topics in advanced optics Technologie des microstructures I **Biomedical photonics** Biomedical optics Biomicroscopy I and II Fundamentals of biophotonics Image processing I and II Imaging optics and design Laser fundam. and applications for engineers Optics laboratories I and II Photomedicine



Statistiques

Total cumulé d'étudiants par section pour le mineur en photonique 2019-2020





Further information

please do not hesitate to contact me olivier.martin@epfl.ch





Mineur en Technologies Biomédicales

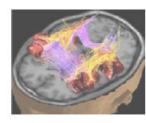
7 mars 2022

 Faculté des Sciences et Techniques de l'Ingénieur (STI)



- Mineur de complément proposé en STI, SV et SB
 - Acquérir les bases physiologie + bio (-logie, -physique, -chimie)
 - Applications biomédicale
 - Technologies spécifiques



















MEDTECH EN SUISSE

L'ESSENTIEL EN BREF

La Suisse est l'un des principaux sites pour l'industrie mondiale des technologies médicales (ou medtech). En effet, les techniques médicales y tiennent une place inégalée, tant dans le PIB qu'en proportion des actifs. La Suisse est dotée de sites de recherche de grande qualité et d'un système de santé très développé, qui attend des produits à la hauteur de ses exigences et stimule l'innovation. Elle est ainsi un pays extrêmement attractif pour la recherche, le développement et la production dans le secteur des technologies médicales.

Top 10 des entreprises en technologies médicales

par nombre d'employés en 2017

J&J Medical	Zimmer Biomet	
Roche Diagnostics	Straumann	
Biotronik	B. Braun	
Sonova	Ypsomed	
Medtronic	Dentsply Sirona	

CHIFFRES-CLÉS



Source : SMTI, 2018

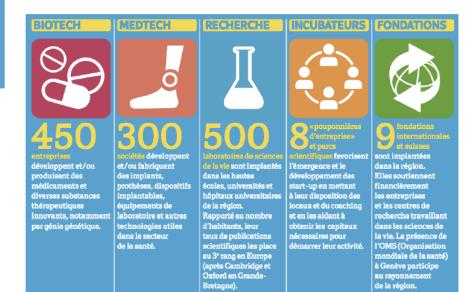


UNE INDUSTRIE ROMANDE 5000 +10%paran 80à

sont actifs dans le secteur

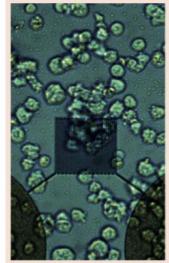
tel est le taux de croissance des secteurs de la biotech et de la medtech | exportées

des technologies médicales produites en Suisse sont





MINOR IN BIOMEDICAL TECHNOLOGY



The Minor in Biomedical Engineering complements the engineering programmes offered at EPFL, providing additional skills in the field of biomedical sciences and technologies.

The programme includes courses giving a general basis in biomedical sciences as well as a broad choice of engineering-related courses with special emphasis on applications in biomedical engineering.

Students have the opportunity to carry out a research project (semester project, 8 ECTS) in one of the laboratories participating in the programme. This Minor can be taken in addition to one of the following programmes:

- Mechanical Engineering
- Microengineering
- Materials Science and Engineering
- Electrical and Electronics Engineering
- Chemistry and Chemical Engineering
- Physics
- Life Sciences
- Civil Engineering

The 30 ECTS credits of the minor are added to the 90 ECTS of the Master (including the 30 ECTS of the Master's thesis) and duly mentioned in the Diploma Supplement.



Le mineur donne l'occasion d'acquérir des notions de bases essentielles en biophysique, biologie cellulaire et physiologie

The program includes **courses** (22 ECTS minimum, <u>all optional</u>) of basis in biomedical sciences as well as a broad choice of engineering-related courses with emphasis on applications in biomedical engineering.

A semester project (8 ECTS, mandatory) related to biomedical technology in included in the Minor.

For non-SV students (STI, SB...)

A core group of courses of biomedical basis is <u>strongly recommended:</u> BIO-105 Cellular biology and biochemistry for engineers PHYS-301 Biophysics I MICRO-560 Séminaire en physiologie et instrumentation

For SV students

Considering their pre-existing background in biology, SV students can select some other courses from MT, EL, ME, MX programs (up to 10 ECTS, with agreement of the responsible of the Minor program)



DOMAINES D'ACTIVITE DES INGENIEURS « MEDTECH »

Réhabilitation Neuroingénierie Bioingénierie cardiovasculaire Capteurs et instrumentation Traitement des biosignaux Imagerie Bioinformatique Protéomique Télémédecine Biomécanique Robotique chirurgicale BioMEMS Biomatériaux Biotechnologies Génétique Génie tissulaire



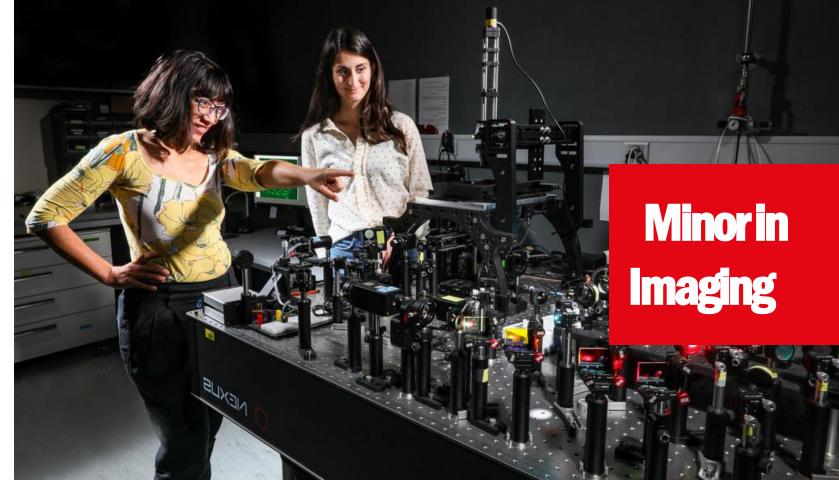
250

Statistiques

Total cumulé d'étudiants pour le mineur et technologie biomédicale 2015-2021



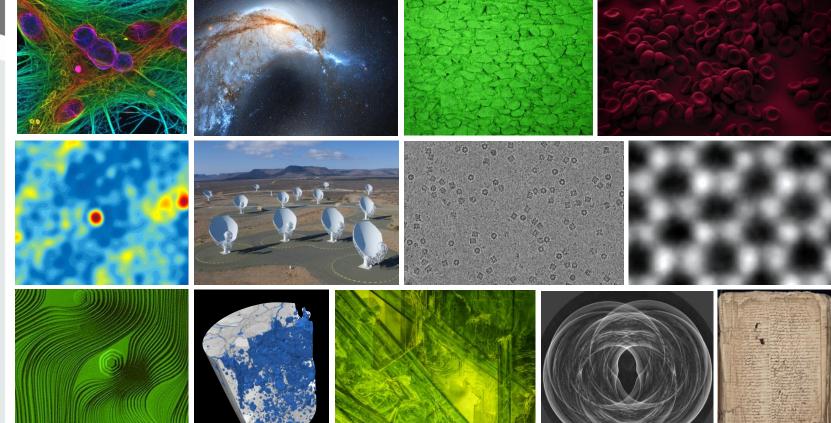




 École polytechnique fédérale de Lausanne

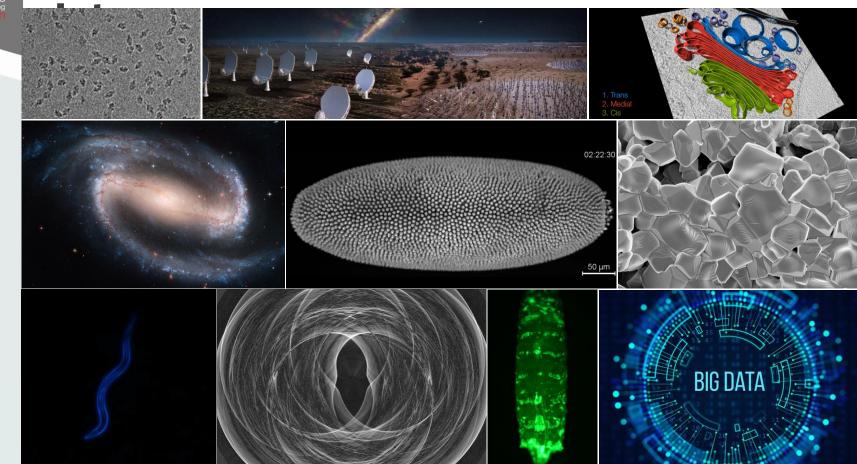


Imaging: from nano to macro



maging@EPFL Initiative





6



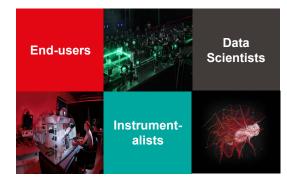
Context



Rich but scattered imaging curriculum



Skills in high demand by industry and academia



Interdisciplinary field par excellence



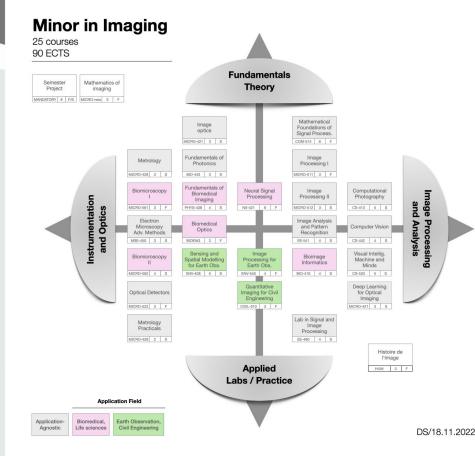
EPFL: unique concentration of academic strengths



Strategical context



Structure of the Minor



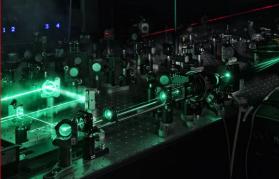
- 25 courses (90 ECTS) from 12 Master programs
- Open to all EPFL MSc students
- Students select courses for a minimum of 22 ECTS
- Mandatory (interdisciplinary) student project of 8 ECTS
- From Fall (September) 2023



Imaging: a transversal field

Most of the future progress will likely result from **cross-fertilisation between various disciplines.**

End-users



Data Scientists



Instrumentalists





The deep learning revolution, a double-edge sword

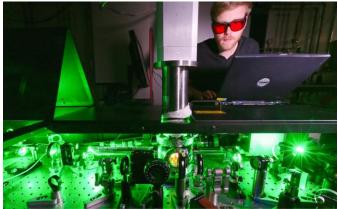
- Sophisticated frameworks, often too technical for non-experts
- Computationally demanding: relies on massive GPU resources
- Necessitates a huge amount of data for training
- The number of new algorithms grows by the day
- Need for clear good practice

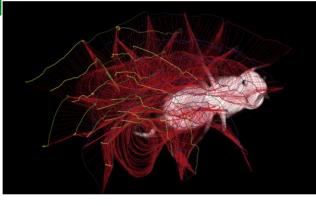




Pedagogical Concept

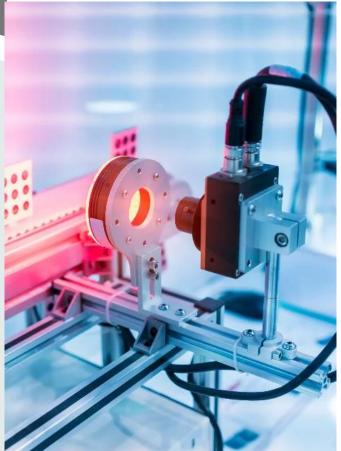
- Train students with a wide, transversal set of imaging skills.
- Bring greater visibility/coherency to the large offer of imaging-related classes at EPFL.
- Holistic program: From acquisition (optics, physics, sensors, etc.) to computation (image analysis, ML, computer vision, etc)
- Purely theoretical courses to fully applied ones.
- Mostly **application-agnostic**.







Interest from (Swiss) Industry

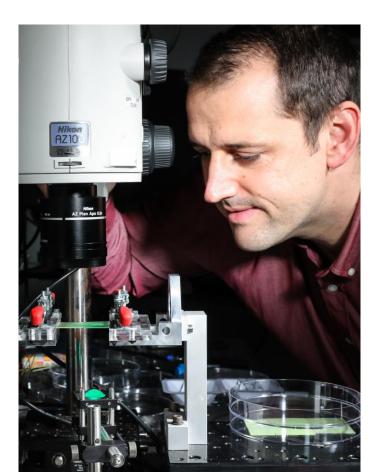


- Interdisciplinary imaging skills are in increasing demand from the Swiss industry and the academic world.
- Unanimously-positive feedback from contacted Swiss-based companies.
 - Nestlé CRN, Mikron, Rolex, Siemens Healthinners, NanoLive, etc.
- Wealth of job offers in imaging from major companies with offices in CH.
 - Apple CH, Novartis, Roche, Swatch, Google CH, Sony, etc.



Interest from Academia and Students

- Multiple positive indicators:
 - Size of the EPFL imaging community (a quarter of the labs).
 - Exploding production of imaging data (in space and time) in research.
 - Very-high demand for continuous training in imaging at the PhD level, across almost all PhD programs.
- Imaging courses are numerous and typically well attended at EPFL.
- Important number of student projects in imaging is proposed every year by labs.





Nurturing advanced imaging at EPFL, across scales and domains



Core Pillars

- 1. Promotion of **interdisciplinary collaborations** in imaging
- 2. Support in image analysis
- **3. Common solutions** for image handling and processing
- 4. Training of students and users
- Created in April 2021
- ~10 employees, 2 scientific hubs



Semester projects, industry internships, master thesis



2 Semester projects





Semester projects ...

Project II (10 ECTS) Project II Project II (10 ECTS) (10 ECTS)

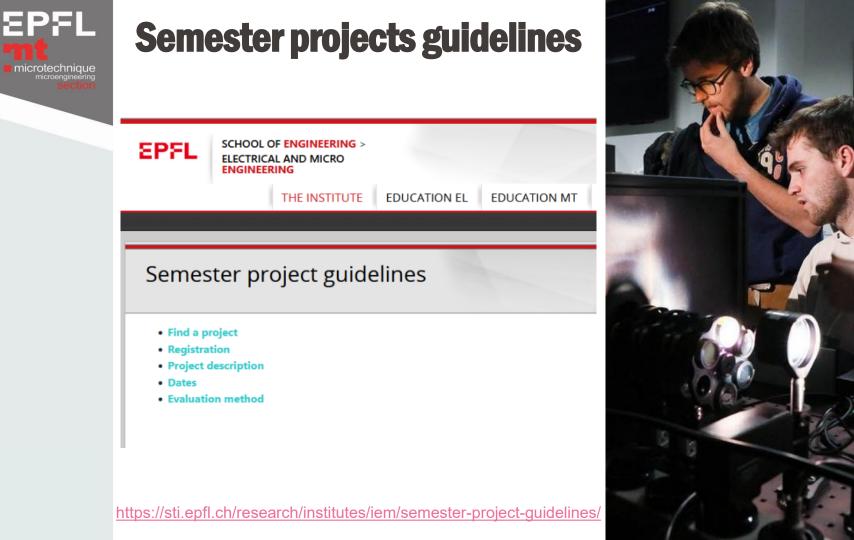
Microenginering

SHS Project (6 ECTS

Semester Project I (10 ECTS)

Product design and system engineering (10 ECTS







Finding a project

Lab websites with semester and master projects proposals &

RESPONSABLES		
Nom	Concerné(s)	
Martinoli	MT&RO	
ljspeert	MT&RO	
Radenovic	MT	
Aminian	MT&RO	
Ghezzi	MT&RO	
Van De Ville	MT&RO	
Micera	MT&RO	
Fantner	MT&RO	
Rachidi	MT&RO	
Shoaran	MT&RO	
Cevher	MT&RO	
Burg	MT	
Carrara	MT&RO	
	Martinoli Ijspeert Radenovic Aminian Ghezzi Van De Ville Micera Fantner Rachidi Shoaran Cevher Burg	

IMPORTANT : If the Professor proposing the project is not affiliated with Microengineering section, the project has to submitted for validation to <u>sebastian.gautsch@epfl.ch</u>

https://sti.epfl.ch/research/institutes/iem/project-proposals-eng/



Project registration

Register on IS-A as soon as the portal is opened by the Academic Service.

• This registration is official and mandatory, please respect the deadline: **2 weeks after semester start**





Important dates

Project starting date:

• Beginning of the semester

Report hand in

- Spring semester : at the latest on Friday of the **first** week after the end of the semester
- Fall semester : at the latest on Friday of the **second** week after the end of the semester

Your mark will be transferred to SAC 15 days after the report has been handed in.

IMPORTANT: The supervising Professor should confirm the exact dates to hand in the report and the oral presentation at the beginning of the project.



Project evaluation

An oral presentations of the work progress at mid-semester is **strongly recommended**. A final presentation at the end of the project **is mandatory**. The dates have to be defined with the Professor

- <u>Recommandations for intermediate and final presentations</u>
- Template for intermediate presentation
- <u>Template for final presentation</u>

A written report is mandatory at the end of the project

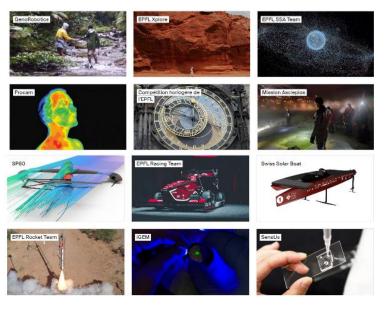
- Extensive Semester/Master thesis report template
- Example of a typical semester project report

The written report will be followed by an oral defense, organized by the Professor. The section also recommends to complete the following form (which is a supplement to the evaluation) and to send the PDF <u>to the Section</u> for the student's file.

Project evaluation sheet (template)



MAKE projects



A dedicated procedure for MAKE projects as semester projects is being set-up. For now, please follow the same instructions as for regular semester projects.

IMPORTANT : If the Professor proposing the project is not affiliated with Microengineering section, the project has to submitted for validation to <u>sebastian.gautsch@epfl.ch</u>



Registering a Minor

The student **informs the section of his choice of minor** and **selects it in the courseregistration screen on IS-Academia**, **no later than the end of the first semester** of his Master's studies.

The selection of courses making up a minor is done with the approval of the student's program and the person in charge of the minor. The student registers for these courses on IS-Academia, following the normal procedure.

A minor is successfully completed when **30 credits at minimum have been gained** among the approved subjects. Each subject must be successfully completed on it own merits: there is no possible compensation between the subjects. These 30 credits **add to the total for a 90-credit Master's program.**

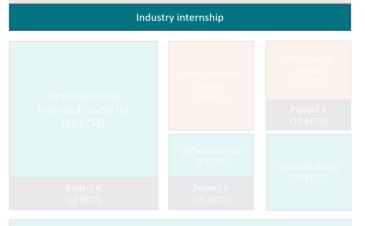




Microenginering

Master thesis

(30 ECTS)

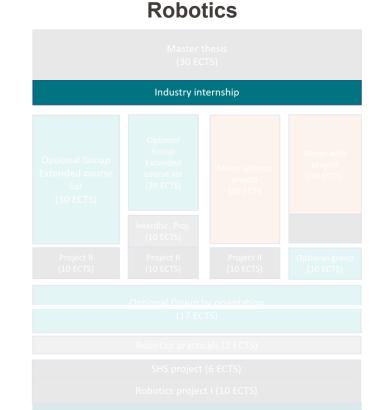


Bloc 2 (15 ECTS) Restricted course choice (17 courses, 46 ECTS possible, 3 orientations

SHS Project (6 ECTS

Semester Project I (10 ECTS

Product design and system engineering (10 ECTS





Mandatory Industry immersion: 2 options

Internship

- Minimum duration of 2 month, up to 6 months
- Immersion into industry
- Familiarize with company processes
- Aquire specific competences
- Apply transversal skills
- Evaluation report by student and industry supervisor

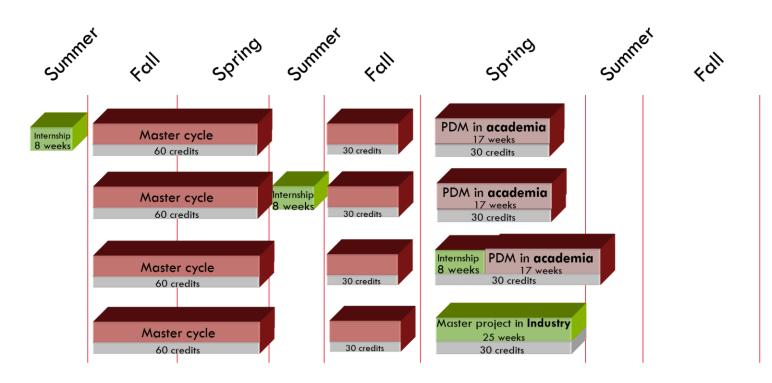


Master project in industry

- A research project in the company
- Student applies the competences aquired during his master
- Supervised by a Professor from his section
- Written report and oral defense
- Monthly feedback to Professor
- 25 week duration (+1 week vacation)

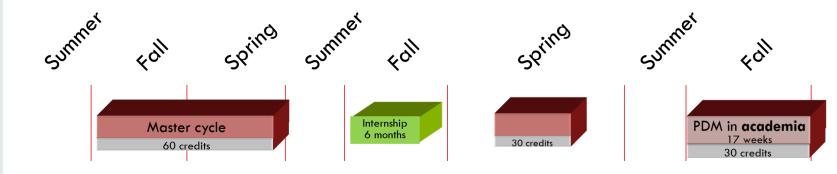




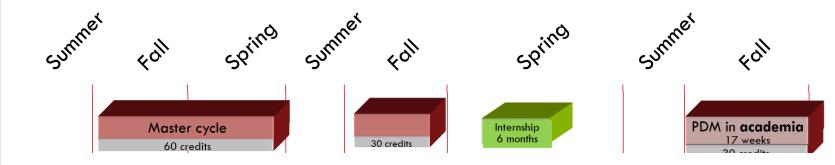


Master thesis (PDM) in academia in foreign Universities: 25 weeks

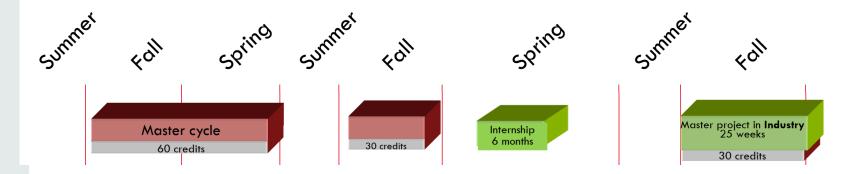














Industry internship

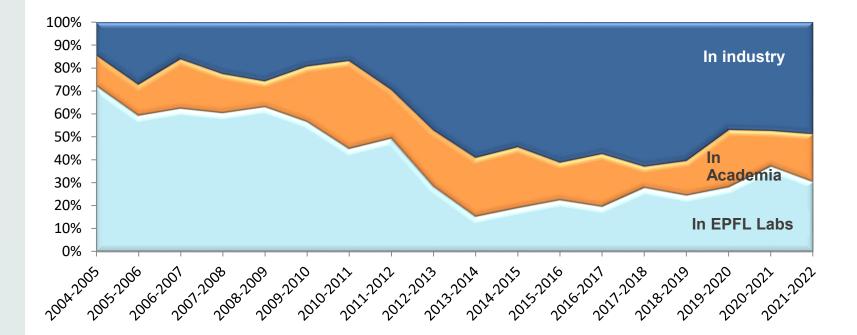




Master thesis location

Students have different option to complete the Master thesis:

- In a lab @ EPFL
- In a foreign University, co-supervised by a Prof from EPFL
- In Industry, co-supervised by a Prof from EPFL





Master thesis

Microengiliering							
Master thesis (30 ECTS)							
Industry internship							

Microenginering

Bloc 2 (15 ECTS) Restricted course choice (17 courses, 46 ECTS possible, 3 orientations

SHS Project (6 ECTS

Semester Project I (10 ECTS

Product design and system engineering (10 ECTS





Master projects 2021-2022

Academic outreach

Brigham and Women's Hospital (BWH), Harvard Medical School Brigham and Women's Hospital, Harvard Medical School California Institute of Technology Caltech - California Institute of Technology ETH (Robotics and Perception Group, with Prof. Scaramuzza) jointly wi ETH Zürich ETHZ Georgia Institute of Technology Harvard Harvard John A. Paulson School of Engineering and Applied Sciences Harvard SEAS - Biodesign lab Harvard University - School of Engineering and Applied Sciences Imperial College Imperial College London Korea Advanced Institute of Sciences and Technology Max Planck Institute fur Informatik National University Singapore Polytechnique Montreal Stanford Stanford University Technical University of Denmark Technical University of Denmark (DTU) UC Berkeley Université de Genève Universiteit van Amsterdam University of Basel University of British Columbia University of California, San Diego University of Geneva University of Illinois at Urbana-Champaign University of Oregon-Knight Campus

Industry outreach

Alpine Intuition Sarl Alpia SA Logitech Europe SA Artiria Medical SA Astek London Centre for Nanotechnology autonomyo Magma Learning Baracoda Mantis Technologies GmbH Bionomous Sàrl Manufacture des Montres Rolex SA Bulgari Horlogerie Medtronic Europe Sarl Carevature Medical Melexis Technologies SA Carl Zeiss AG Cartier Opérations - Branch of Richemont Internationa Merck Serono SA Metvos CleanGreens Solution SA CSEM - Centre suisse d'électronique et de microtech MotionTech CSEM - Centre suisse d'électronique et de microtechNeurorestore CSEM S.A Neurorestore (CHUV) Cyberbotics Ltd. Observatoire de Genève Demaurex SA Omnisens SA ecoRobotix Onward Medical SA Empa opticode.ch European Southern Observatory Philips High Tech Campus Eindhoven Expedia Lodging Partner Services Readily3D SA EyeOn Switzerland Rigi Technologies Fusion Lab Technologies SARL Rigitech GSK Hublot S A Rolex Hvdromea Schindler Aufzüge AG IBM Research GmbH Sensirion AG ID Quantique SA Technis SA IEP Innovation Park Foundation Tecma Industrias Illuin Technology TWICE SA Innovation Park Foundation (EIP) VLC Photonics Isochronic AG Volocopter Gmbh KEP Innovation Center



Master projects guidelines

SCHOOL OF ENGINEERING > ELECTRICAL AND MICRO ENGINEERING

THE INSTITUTE EDUCATION EL EDUCATION MT

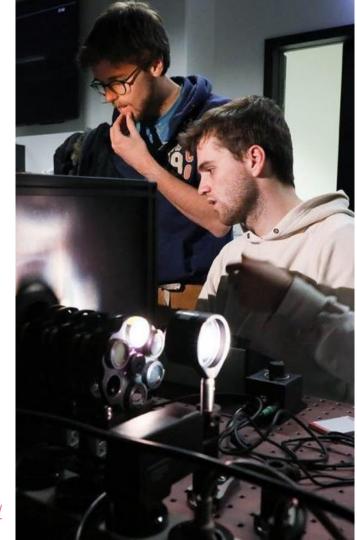
Master projects guidelines

Calendar

EPFL

- Choosing a master project in a laboratory
- Master project in another university
- Project's objectives
- Master projects in Industry (PDMe)
- Registration
- Hand-in procedure
- Evaluation method
- Student prizes

https://sti.epfl.ch/research/institutes/iem/master-project-guidelines/





Beyond your studies



Entrepreneurship!

Student Startup Launchpad

We foster student entrepreneurship as a driver for leadership, impact and innovation. We are building the next generation of students founders with a drive for excellence, an instinct for leadership and an aspiration for societal impact.

> applications are open blaze startup accelerator The 3-month program for EPFL promising student startups Application deadline Feb. 19 rogram starts in March

go.epfl.ch/blas

Master project in your Startup (PDM)

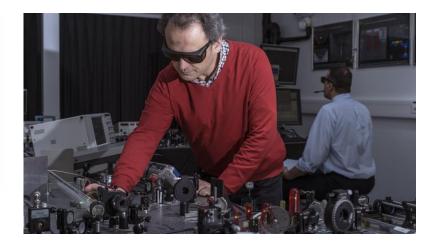


Research - IEM to host your projects

EPFL ICM institute of electrical and micro engineering

IEM covers the following major technical fields:

- Electronic Circuits and Devices
- Micro-manufacturing and Micro- and Nano-technologies
- Robotics
- IoT, Computer & Communication Engineering
- · Optics, Photonics and wave engineering
- Machine learning, Information Science and Systems
- Power and Energy



Research in IEM :

- 37 Full Professors / Associate Professors / Tenure-Track Assistant Professors
- I SNSF-funded Professor
- 13 Adjunct Professors
- 11 Senior Scientists
- 1 Member of the US National Academy of Engineering
- 1 Member of the American Academy of Arts & Sciences
- 1 Member of the Academia Europaea
- 2 Members of Swiss Academy of Engineering Sciences
- 25 ERC grants : 12 Advanced, 6 Consolidator and 7 Starting grants since 2008



One Institute on 3 campuses



Geneva - Campus Biotech

- · Bio- and neuroengineering (Wyss center)
- Human Brain Project
- Center for neuroprosthetics

Neuchâtel - Microcity

Microengineering and nanotechnologies







EPFL Xplore

Beyond your studies ...

EPFL Spacecraft Team

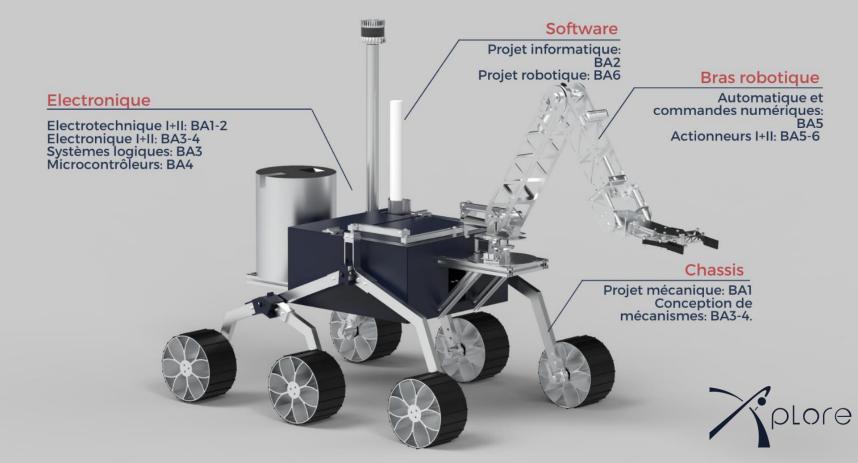
CARSO

EPFL Rocket Team





Quoi de microtechnique à bord d'un Rover?





MAKE Projects: Fantastic team effort



EPFL MAKE projects – In the Media

microtechnique





Testimonies and teaser movies



Short Movie to learn more

Section de Microtechnique EPFL



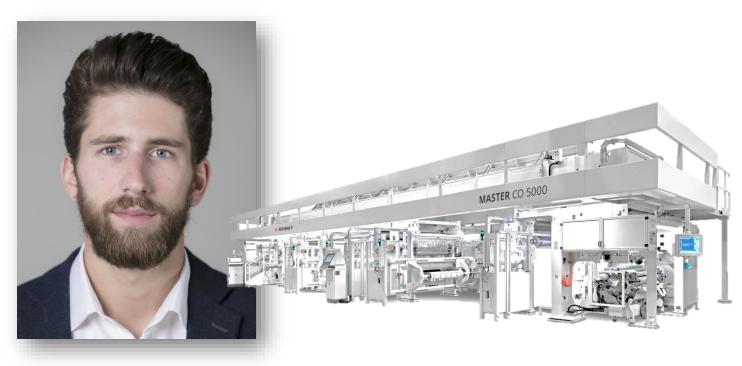
 Faculté des Sciences et Techniques de l'Ingénieur (STI)



6 🍌







Léonard Badet Head of Group Technology – Bobst Master Microtechnique terminé en 2017

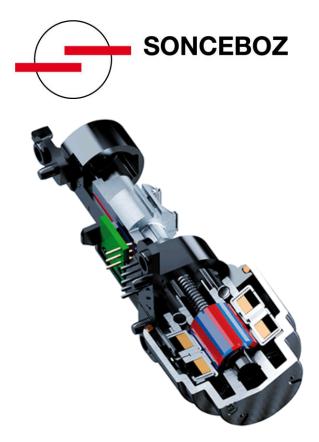




Alumni Testimonies



Damien Wittwer Business Unit Manager Associate Master Microtechnique terminé en 2010



https://tube.switch.ch/videos/J6tEwLlxYr



Alumni Testimonies





Adrien Briod Founder and CTO Master Microtechnique terminé en 2009 Thès doctorat EPFL 2013

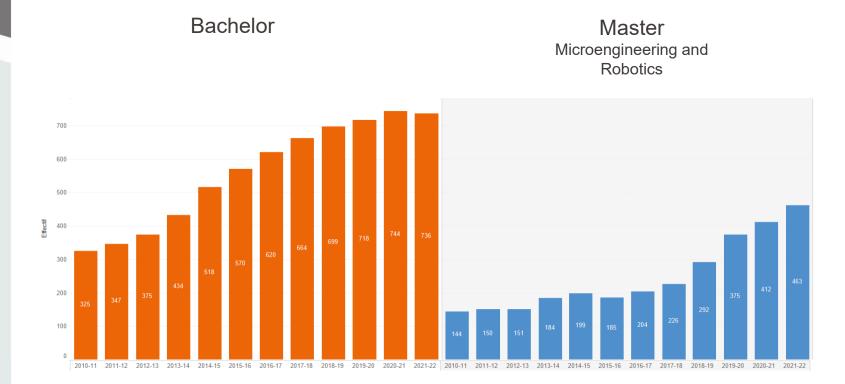




General student info and contacts



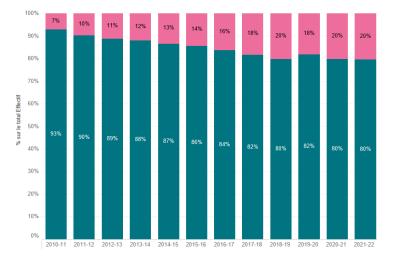
Successful curricula (>1100 students)





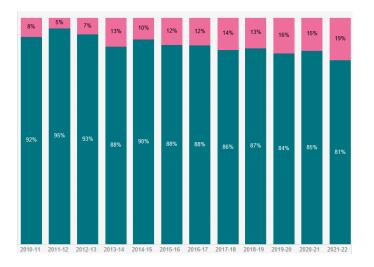
Gender balance

Bachelor



25% women this fall

Master (MT + RO)



23% women this fall

EPFL **Remembering phases during COVID-19**

the long term. "

microtechnique



"The rapid return to in-person teaching and learning and the stabilization of enrolment patterns suggest that the changes will not lead to a fundamental transformation

of higher education as a face-to-face experience.

Higher Education Institutions around the world are likely to take forward at least some digitalized practices in

14 C

Unesco, May 2022



Course attendance and online offer

- Take profit as much as possible from presential courses and interact with teachers and assitants
- Follow live recordings only if you have major impediments
- Take profit of the School's infrastructure to be on campus
- Make use of archived recordings to revise, catch-up and strenghten your knowledge
- All teachers look forward to welocme xou in class in order to have the best dynamic and pedagogical teaching style possible



Indicative course evaluations

- Each semester, all courses given at EPFL are evaluated by registered students
- Your productive feedback is essential to help teachers of the section to adapt and improve in a continuouse way their lectures and teaching style.
- Only a high enough participation rate gives representative and useful information
- Your evaluations (and constructive recommendations) have a real impact on teaching



IT security

- Protect your passwords
- Beware of Phishing e-mails
- Protect your hardware and login credentials
- Update your software
- Minimize risks when surfing the web
- → <u>https://go.epfl.ch/ITSecure</u>





Let's set the example of a culture of respect

- Harassment, violence and discrimination are not tolerated here
- Provide and seek support
- Talk about it, bring up the problems



> go.epfl.ch/tsn (Trust and Support Network)

> Take the online training on Moodle: « Promoting Respect »



EPFL student services

The EPFL "Student Services" desk is the main contact point for all academic queries

For EPFL students or doctoral students, whether recently arrives or recently graduated, whether you have a doubt, a question or a problem. The "Student Services" Hotline is the focal point to process all your requests.

A question ?

Please contact the Student Services Hotline preferably in the following order:

- Look up our information pages on the website <u>EPFL studies</u>.
- Send an <u>e-mail</u>
- Go to the Student Services desk during office hours (see below)
- Call 021 693 43 45 (you will get voice mail outside office hours or if the office is busy)





Individual support

Social and psychotherapeutic consultations are available to students and doctoral students.

- Do you feel demotivated, isolated, depressed, anxious?
- Do you have problems related to your studies or finances or other kinds of personal problems?
- Are you in need of <u>accommodations for your</u> <u>studies</u>?
- Are you facing difficulties and need someone neutral to talk to?
- If you do not know which consultation to contact, do not hesitate to ask for an initial interview with the Social consultation or to refer to the <u>list of difficulties, advice and</u> <u>contacts</u>.





Get in touch with your study advisors

- Microengineering Master: <u>Sebastian Gautsch</u>
 - Advanced Manufacturing : Prof. Yves Bellouard
 - Micro/nanosystems : Prof. Herbert Shea
 - Photonics : Prof. Olivier Martin
- Robotics Master: <u>Prof. Francesco Mondada</u>
- Minor in Biomedical Technologies: <u>Prof. Philippe Renaud</u>
- Minor in Photonics: <u>Prof. Olivier Martin</u>
- Passerelle HES : <u>Sebastian Gautsch</u>
- Industry internships: <u>Hind Klinke</u>

EPFL mt microtechnique microtechnique

Before contacting the Section ...

SCIENCES ET TECHNIQUES DE L'INGÉNIEUR >

GÉNIE ÉLECTRIQUE

EPFL



ET MICROTE	CHNIQUE				
	INSTITUT	ÉDUCATION EL	EDUCATION MT	RECHERCHE	INNOVATION
Aperçu	Bach	elor	Master		Programme doctorale
Bienvenue du directeur de la section de microtechnique		l – Bachelor MT or en Microtechnique	Master en Master en	Microtechnique Robotique	EDMI – Microsystèmes et microélectronique EDPO – Photonique
La direction (SMT)	Critêre	s d'admission et candidatu	ire Mineur en	technologies biomédie	
Heures de bureau Journée d'accueil SMT		de prérequis – Bachelor echnique		Photonique	intelligents EDAM – Manufacturing
Conseil consultatif	Règles	de prérequis	Plan d'étud Plan d'étud	le – Cycle master mie	
La section MT en chiffres	-	Bachelor (MT)		h	
Plans et règles d'étude Témoignages	Cycle	oropédeutique (MT)	, onfl	CII	
Canal Switchtube de la section		cM	t.epfl	aquirces	
Les prix en Microtechnique			Critères d'a	admission et candidatu	ıre
Associations d'étudiants Q&A des étudiants Covid-19					
Directives Covid-19 EPFL					
Stages d'ingénieur	Mobi	lité horizontale			
A propos	A prop	005			
Procédure pour les étudiants					
FAQ pour étudiants					
Documents					

Q EN / FR

search



Memo sticker

Bienvenue !

Le présent document utilise la forme masculine, étant précisé cependant qu'il vise aussi bien les fen Nos **nouveaux étudiants Master** trouveront quelques compléments d'information en bas de pag

Bienvenue en Microtechnique

Vous avez, en toute objectivité, choisi la meilleure section !

Nous avons regroupé ici quelques éléments partagés par vos prédécesse

- Guide de préparation pour les nouveaux étudiants Bachelor
- Règlements et procédures : bien entendu, tous ces éléments sont à
- IS-Academia: l'outil de gestion de vos études à l'EPFL! Notez qu'il cours, mais faites attention aux nombres de places disponibles: po
- Moodle : vous serez automatiquement inscrit à certains cours ! Pou moment venu.
- Courseware & SwitchTube
- BEAST: le point d'accès à toutes les ressources de la Bibliothèque (demandés par les enseignants, sans qu'il ne soit forcément nécessa
- Poséidon : le service de l'EPFL dédié au conseil d'achat et au suppo besoin d'être le plus performant du marché : la tâche la plus exigea
- Drive des Microtechniciens : vérifiez que vous êtes bien connecté à EPFL ». Les instructions sur l'utilisation du drive sont disponibles di
- Discord des Microtechniciens : pour communiquer et poser des que channel « Ressources » de ce serveur.
- A noter encore que les premières années ont un groupe Telegram (
- Et bien entendu, toujours à votre écoute pour vous soutenir et vou Johanne Pinel
- Pour terminer, nous vous rappelons qu'il est très important de vérif

Mais encore, pour nos étudiants Master :

- · Guide de préparation pour les nouveaux étudiants Master
- Lignes directrices des projets de semestre
- Lignes directrices des projets de master
- Stages en entreprise
- · Procédure pour les étudiants
- Lire la présentation des stages SMT (PDF)

section de microtechnique





MT Section office

The section office (BM1136) is open everyday for **administrative questions** from 8 AM to 2 PM

• <u>Isabelle Schafer (administrative assitant)</u>

For detailed questions regarding **your curriculum or study plan**, please **request an appointement:**

- <u>Sebastian Gautsch</u> (section adunct)
- Prof. Christophe Moser (section director)



We wish you a sussful continuation of your BaS studies and hope that you will make the right choice for your Master !

