Welcome !

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Agenda

- Link between Bachelor and Master studies
- Optional courses at the end of the Microengineering Bachelor
- Common aspects between Microengineering and Robotics Master
    - Master program structure
    - Rules and procedures
    - Semester projects
    - Minors (not mandatory)
    - Industry internship
    - Master thesis
- Microengineering Master specifics
- Robotics master specifics
- Minors
    - Photonics
    - Biomedical technologies
    - Imaging
- Beyond your studies
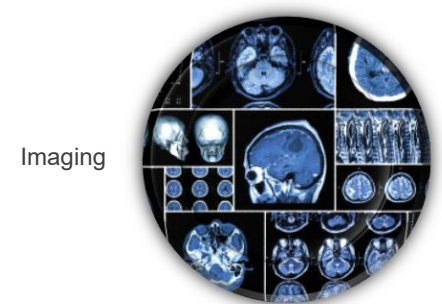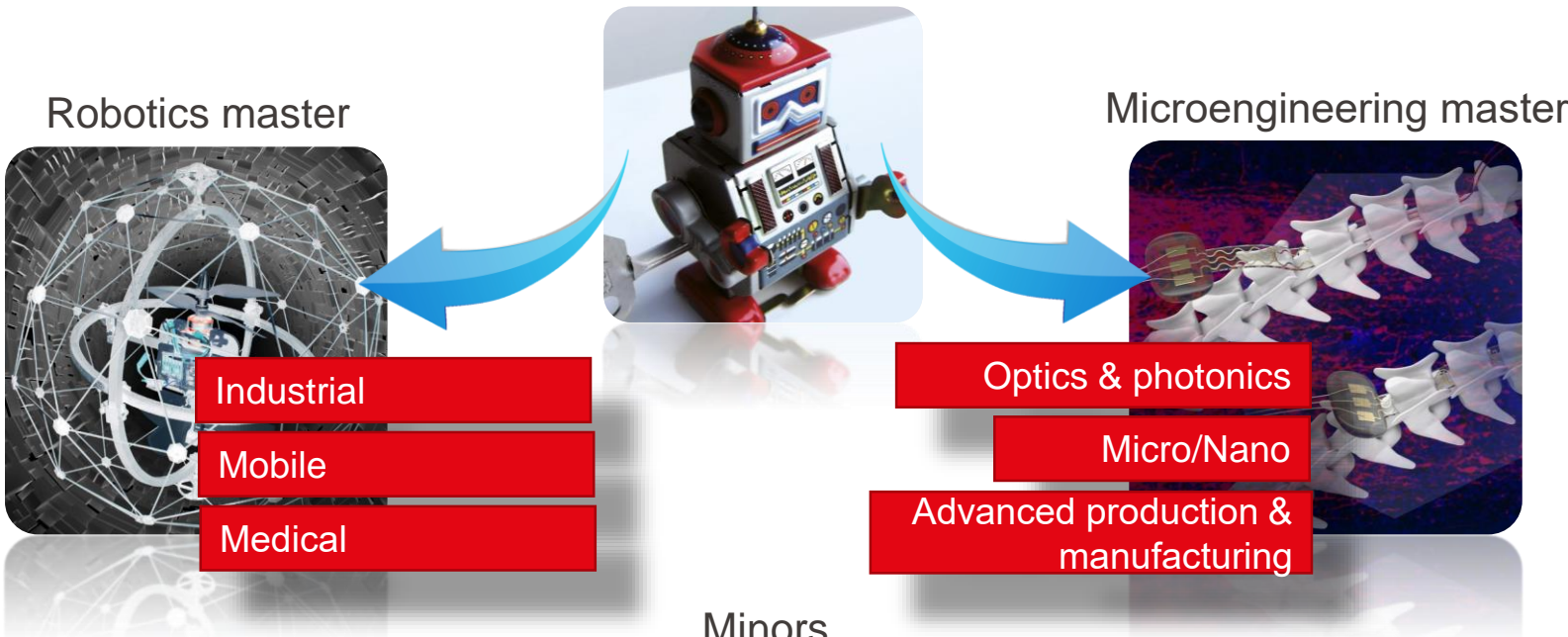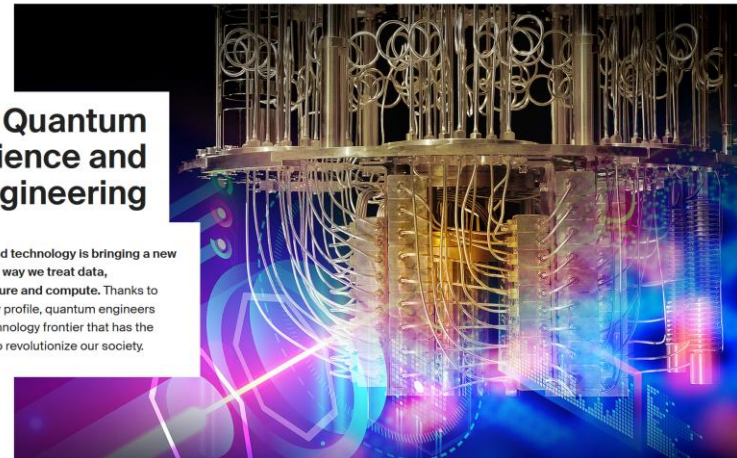
But not only…

Neuro-X

Science, technology and computation are the foundations onto which engineers in Neuro-X build their expertise. Their multidisciplinary profile complements the fundamental skills of engineers and medical-domain specialists by a strong technological component, making them not only highly demanded and valued professionals in neurotechnology, but also preparing them for research in neuroscience-related fields.
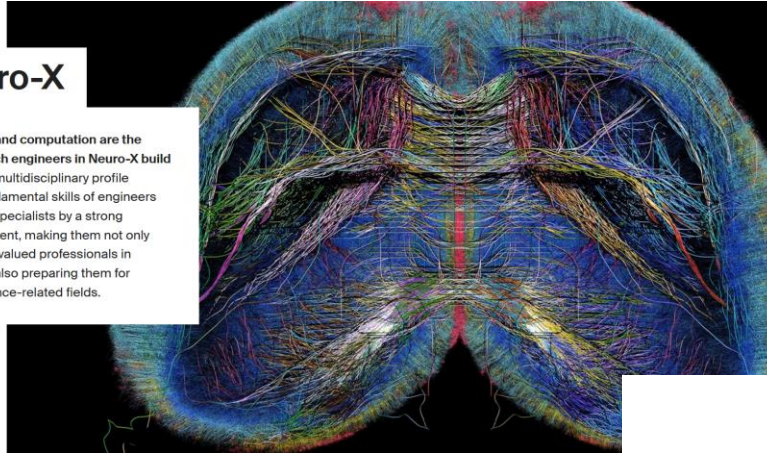

Quantum Science and Engineering

Quantum science and technology is bringing a new paradigm shift in the way we treat data, communicate, measure and compute. Thanks to their multidisciplinary profile, quantum engineers thrive in this new technology frontier that has the disruptive potential to revolutionize our society.

Optional Bachelor courses

Physique des Composants Semiconducteurs	La science quantique – une vision singulière	Analyse matricielle	Architecture software	Introduction to Bioengineering	Mécanismes pour environnements extrêmes	Wireless sensor practicals (40 places)	Advanced Microfabrication practicals (12-15 places)

Quantum science master
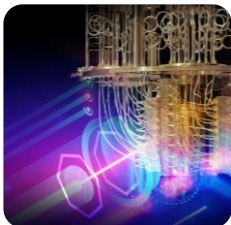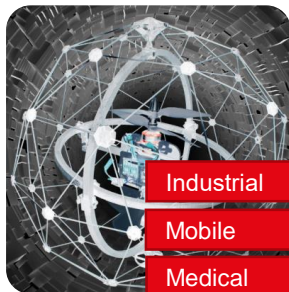
Robotics master

- Industrial
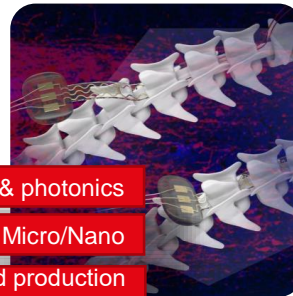- Mobile
- Medical

Microengineering master

- Optics & photonics
- Micro/Nano
- Advanced production & manufacturing

Neuro-X master

Optics & Photonics

Biomedical Technologies

Imaging

Optional Bachelor courses

Physique des Composants Semiconducteurs

La science quantique – une vision singulière

Analyse matricielle

Architecture software

Introduction to Bioengineering

Mécanismes pour environnements extrêmes

Wireless sensor practicals

(40 places)

Advanced Microfabrication practicals

(12-15 places)

Robotics master

Microengineering master
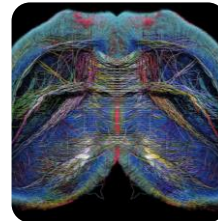
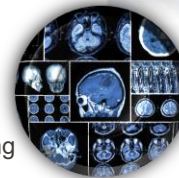Quantum science master

Neuro-X master

Industrial

Mobile

Medical

Optics & photonics

Micro/Nano

Advanced production & manufacturing

Optics & Photonics

Biomedical Technologies

Imaging

Optional Bachelor courses

Physique des Composants Semiconducteurs

La science quantique – une vision singulière

Analyse matricielle

Architecture software

Introduction to Bioengineering

Mécanismes pour environnements extrêmes

Wireless sensor practicals

(40 places)

Advanced Microfabrication practicals

(12-15 places)

Robotics master

Microengineering master

Quantum science master

Neuro-X master

Industrial

Mobile

Medical

Optics & photonics

Micro/Nano

Advanced production & manufacturing

Optics & Photonics

Biomedical Technologies

Imaging

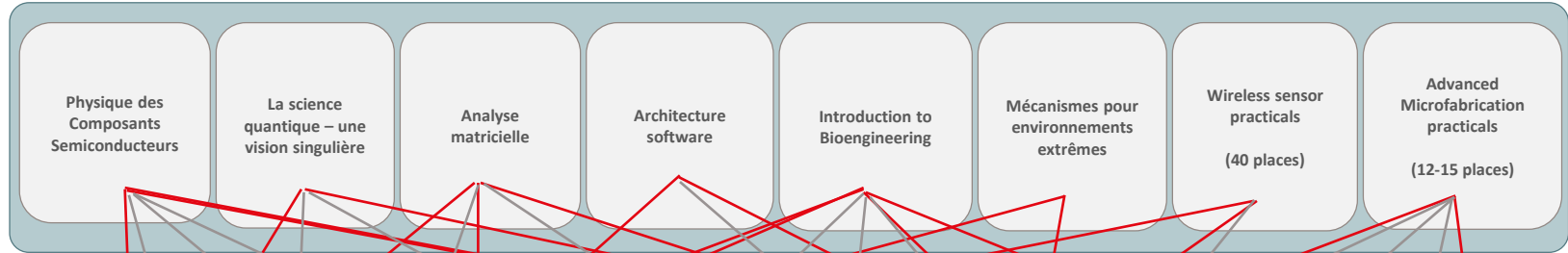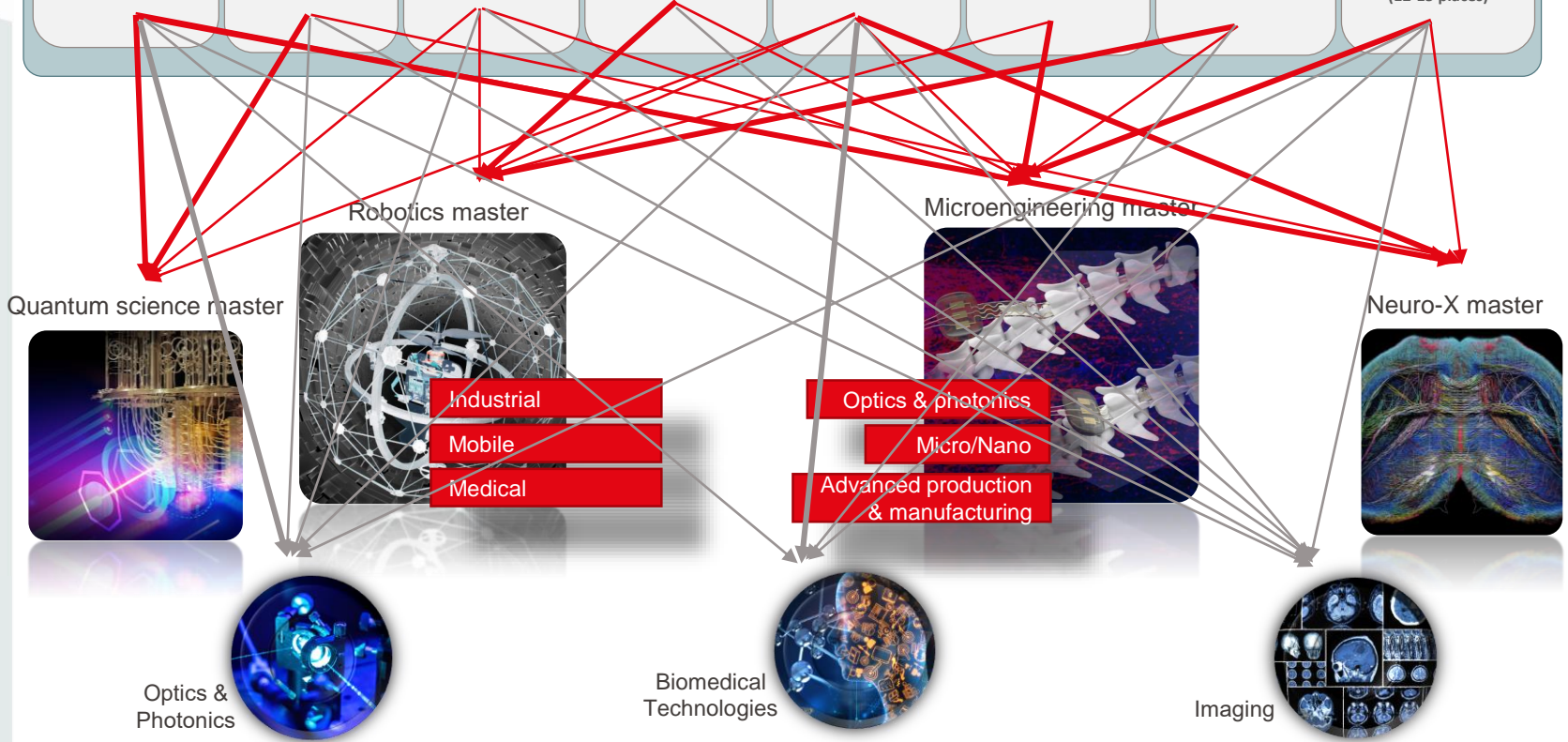# Master program structure

ELECTIVE COURSES
Orientations and specializations are possible | 90 ECTS

INTERNSHIP
In a company or a laboratory

MASTER 120 ECTS
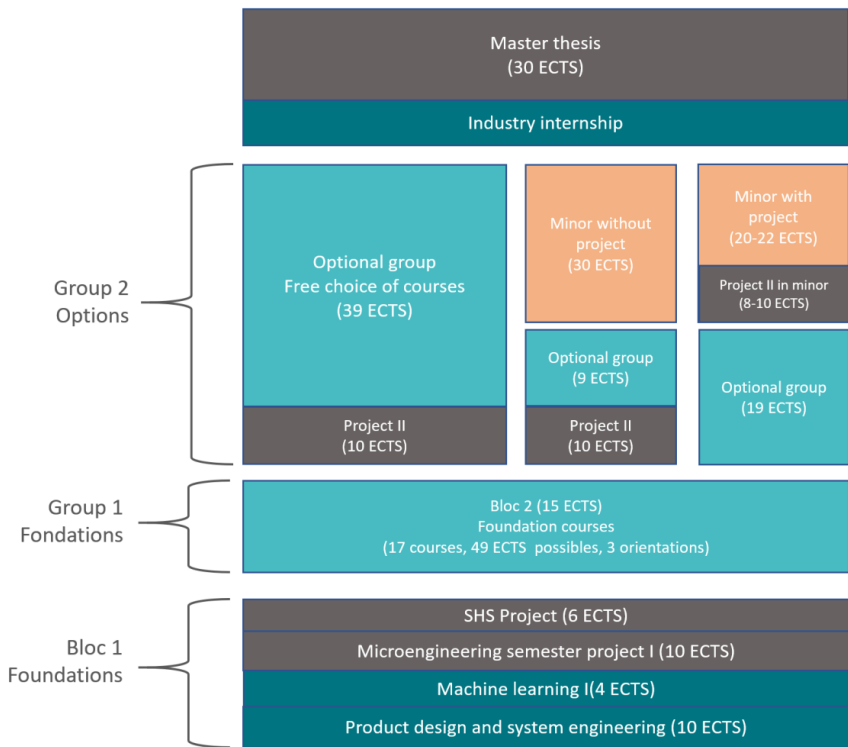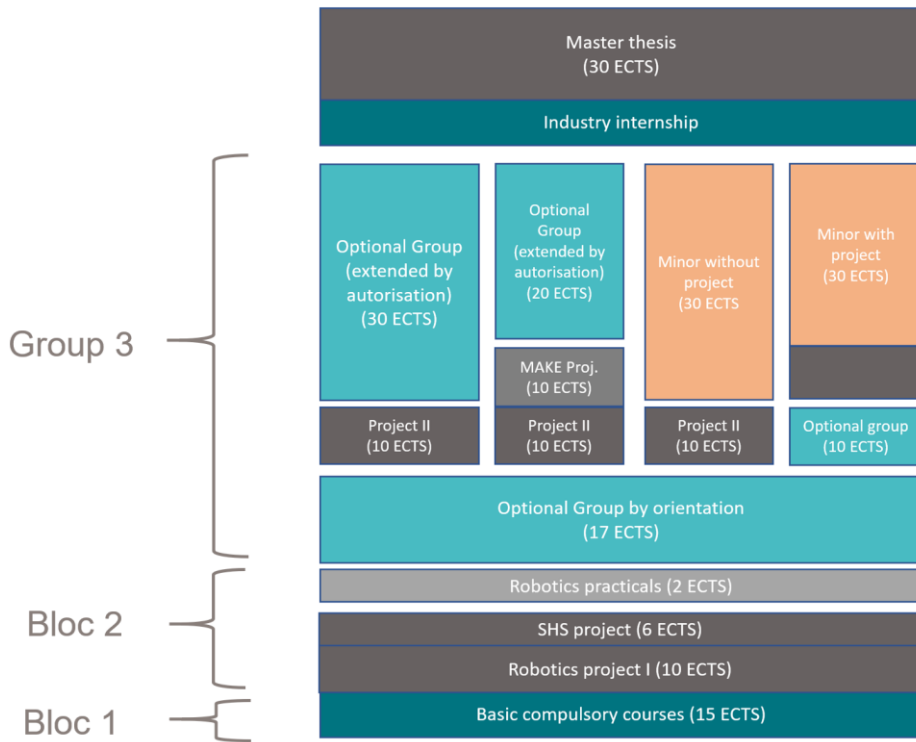
INCLUDING AN OPTIONAL MINOR
30 ECTS

MASTER'S THESIS
At EPFL, in a company or at another university | 30 ECTS

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

Master Program structures

Your study plans online

Master project (.)

COURSES	LANGUAGE	MASTER 1			MASTER 2			MP AUTUMN			MP SPRING			EXAM	CREDITS
		L	E	P	L	E	P	L	E	P	L	E	P		
Engineering internship credited with master project (master in Microengineering) *(Stage d'au minimum 8 semaines après le 2ème semestre de Master. Inscription par la bourse aux stages)* MICRO-597 / Section MT Profs divers	FR	-	-	320h	-	-	320h	-	-	320h	-	-	320h	**Winter/Summer session** Term paper	0
Master project in robotics MICRO-598 / Section MT Profs divers	FR/EN	-	-	-	-	-	-	-	-	900h	-	-	900h	**Winter/Summer session** Oral	30

Block 1

COURSES	LANGUAGE	MASTER 1			MASTER 2			SPECIALISATIONS/ORIENTATIONS	EXAM	CREDITS
		L	E	P	L	E	P			
Applied machine learning MICRO-455 / Section MT Billard	EN	4h	-	-	-	-	-		**Winter session** Written	4
Basics of mobile robotics MICRO-452 / Section MT Mondada	EN	2h	2h	-	-	-	-		**Winter session** Written	4
Basics of robotics for manipulation MICRO-450 / Section MT Bouri	EN	3h	-	-	-	-	-		**Winter session** Written	3
Model predictive control ME-425 / Section GM Jones	EN	2h	2h	-	-	-	-		**Winter session** Written	4

https://edu.epfl.ch/studyplan/en/master/microengineering/
https://edu.epfl.ch/studyplan/en/master/robotics/

Course and exam registrations

You must **register yourself** for all subjects taught in the Bachelor's and Master's programs, **including compulsory topics**. Registration is done through your secure access to the IS-Academia application:

- for subjects taught in the **autumn semester**: from August to the **Friday of the second week** of the autumn semester

- for subjects taught in the **spring semester**: from January to the **Friday of the second week** of the spring semester

https://www.epfl.ch/education/studies/en/rules-and-procedures/faq/registering-courses-exams-register/

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.

Requirements for passing the internship and the Master's project
Please check the webpages dedicated to the internships and to the Master's projects.
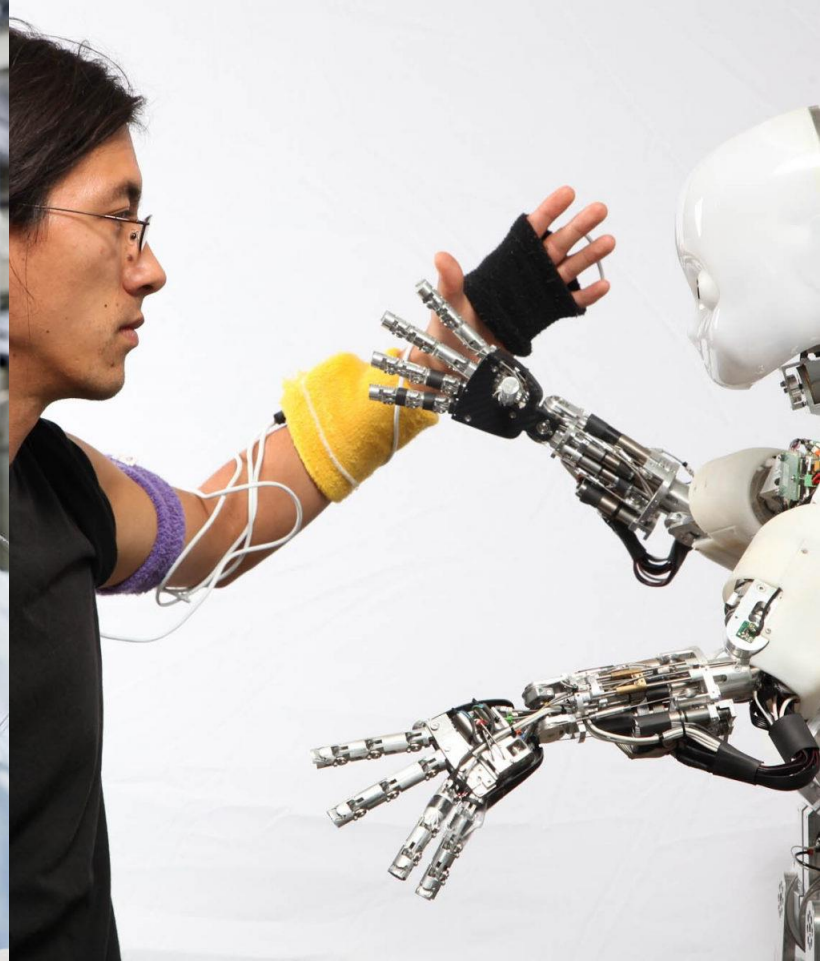
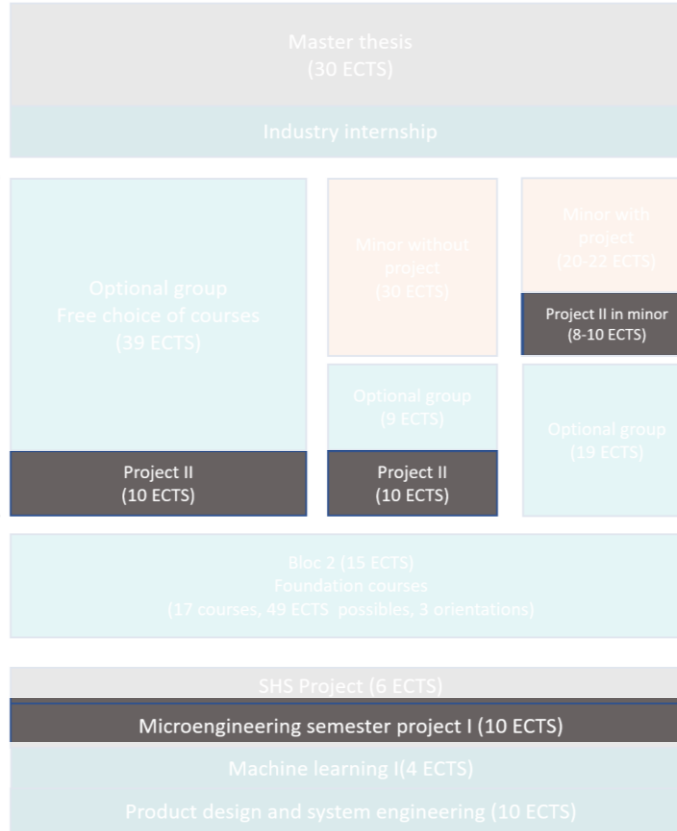# Other important questions - FAQs

Microenginering

Robotics
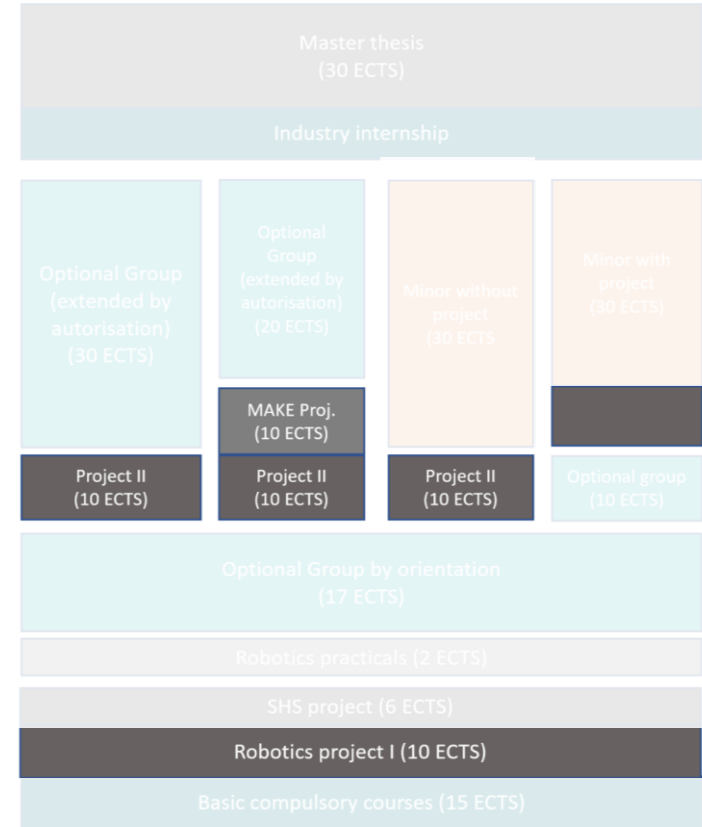
2 mandatory semester projects

Semester projects ...

Microenginering

Master thesis (30 ECTS)

Industry internship

Optional group Free choice of courses (39 ECTS)	Minor without project (30 ECTS)	Minor with project (20-22 ECTS)
		Project II in minor (8-10 ECTS)
	Optional group (9 ECTS)	Optional group (19 ECTS)
Project II (10 ECTS)	Project II (10 ECTS)	

Bloc 2 (15 ECTS) Foundation courses (17 courses, 49 ECTS possibles, 3 orientations)

SHS Project (6 ECTS)

Microengineering semester project I (10 ECTS)

Machine learning I(4 ECTS)

Product design and system engineering (10 ECTS)

Robotics

Master thesis (30 ECTS)

Industry internship

Optional Group (extended by autorisation) (30 ECTS)	Optional Group (extended by autorisation) (20 ECTS)	Minor without project (30 ECTS)	Minor with project (50 ECTS)
	MAKE Proj. (10 ECTS)		
Project II (10 ECTS)	Project II (10 ECTS)	Project II (10 ECTS)	Optional group (10 ECTS)

Optional Group by orientation (17 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 ECTS)

Semester projects guidelines

Home   About   BSc in Microengineering   MSc in Microengineering   MSc in Robotics   PhD Studies   Contact

Semester projects guidelines

Find a project

We recommend to look for your project at the end of the previous semester. Browse through the following pages

- Lab webpages dedicated to projects
- Extraction list from the IS-A project portal

These project lists are non-exhaustive and other projects can be found by contacting directly the labs of interest.

Reserve your project as early as possible. Meet with the Professor in charge and define the objectives and work to be accomplished.

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

It is not allowed to take two projects during the same semester, neither to carry out two projects in the same laboratory.

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 deadlines).

Attention, the semester project is non-withdrawable. Once enrolled, it is no longer possible to change.

https://sti.epfl.ch/smt/smt-semester-project-guidelines/

Finding a project

Lab websites with semester and master projects proposals

		LABORATOIRES
Institut	LAB	Laboratoire
STI-IEM	AQUA	Advanced Quantum Architecture Laboratory
STI-IBI	Biorob	Biorobotics Laboratory
STI-IEM	BNMS	Biomedical and neuromorphic microelectronic systems
STI-IGM	CREATE-Lab	Computational Robot Design & Fabrication Lab
STI-IGM	DDMaC	Data-Driven Modelling and Control Group
ENAC-IIE	DISAL	Distributed Intelligent Systems and Algorithms Laboratory

Students projects SMT

Search

Sort by project name | Sort by project ID | Sort by professor | Sort by type

Morphing Capabilities to Land on Challenging Terrain
ID: 13713 | Projet de Master (PDM) EL | EL | Validé | Dario Floreano

Morphing Strategy for Approaching People and Infrastructure Safely
ID: 13716 | Projet de semestre MA EL | EL | Validé | Dario Floreano

Optimization Engine for Hybrid Drones' Propellers
ID: 13717 | Projet de Master (PDM) EL | EL | Validé | Dario Floreano

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- If the Professor proposing the project is not affiliated with Microengineering section, the project has to submitted for validation to sebastian.gautsch@epfl.ch
- It is not allowed to take two projects during the same semester, neither to carry out two projects in the same laboratory

https://sti.epfl.ch/smt/smt-lab-websites-with-semester-and-master-projects-proposals/
https://inside.epfl.ch/projets-etudiants-sti/microengineering/students-projects-smt/
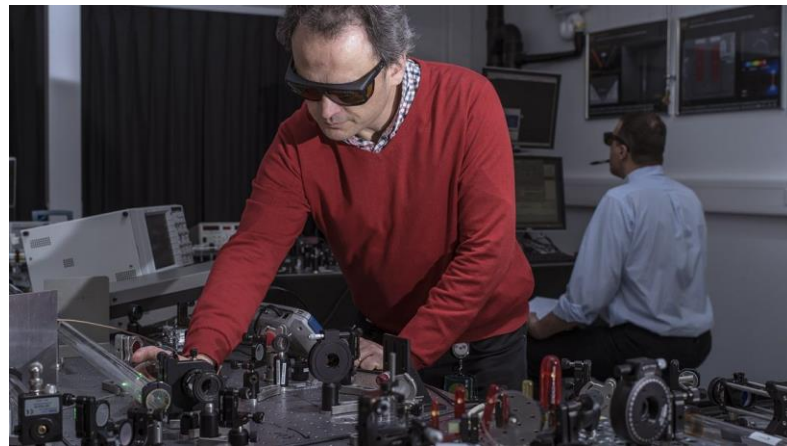
IEM covers the following major technical fields:

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

Research in IEM :

- **39** Full Professors / Associate Professors / Tenure-Track Assistant Professors
- **1** SNSF-funded Professor
- **12** 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

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.

Guidelines

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
Recommandations for intermediate and final presentations
Template for intermediate presentation
Template for final presentation

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.
Procedure for entering grades in IS-Academia

The section also recommends to complete the following form (which is a supplement to the evaluation) and to send the PDF to the Section for the student's file.
Project evaluation sheet (template)

https://sti.epfl.ch/smt/smt-semester-project-guidelines/

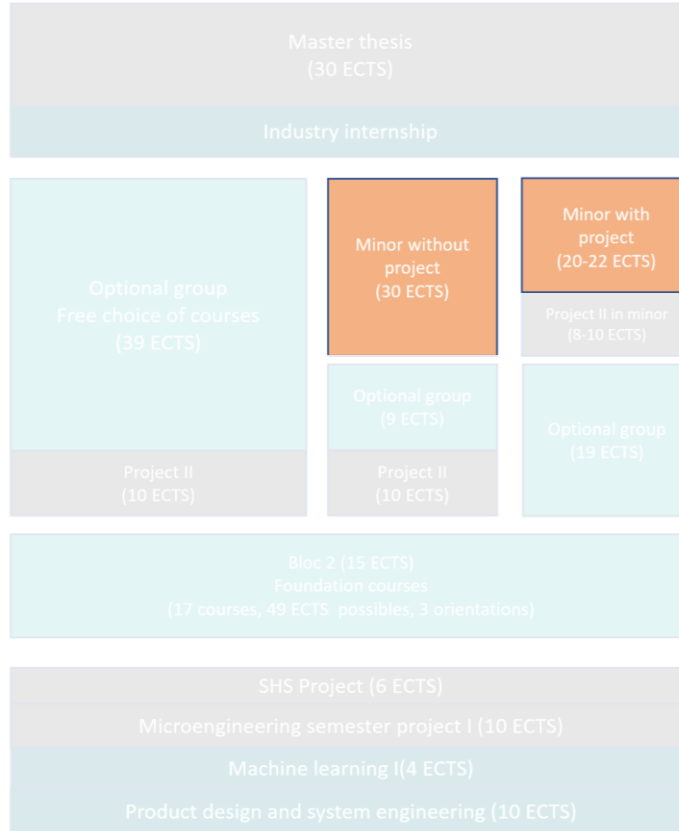# Guidelines for validating an "out of the lab" semester project related to a MAKE projects
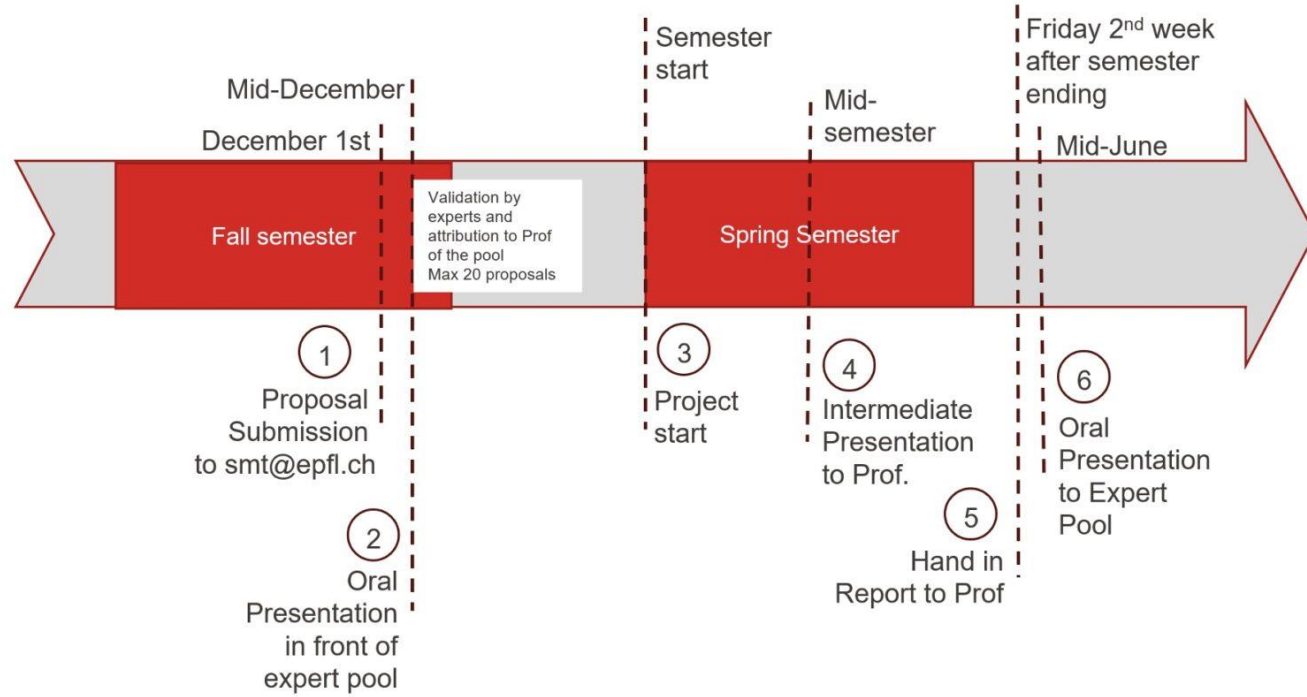
Study room in BM 0246
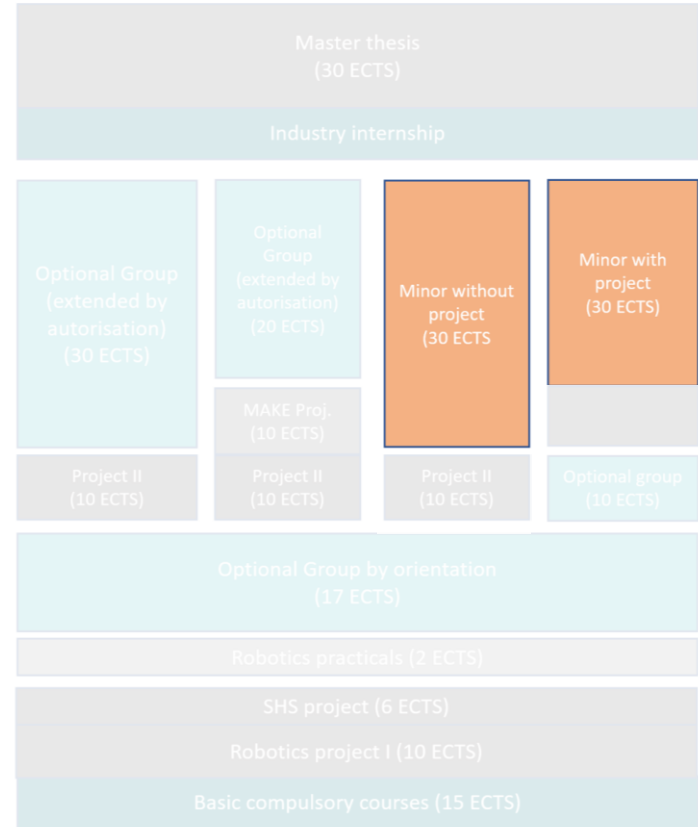# Exclusively for SMT Master students !
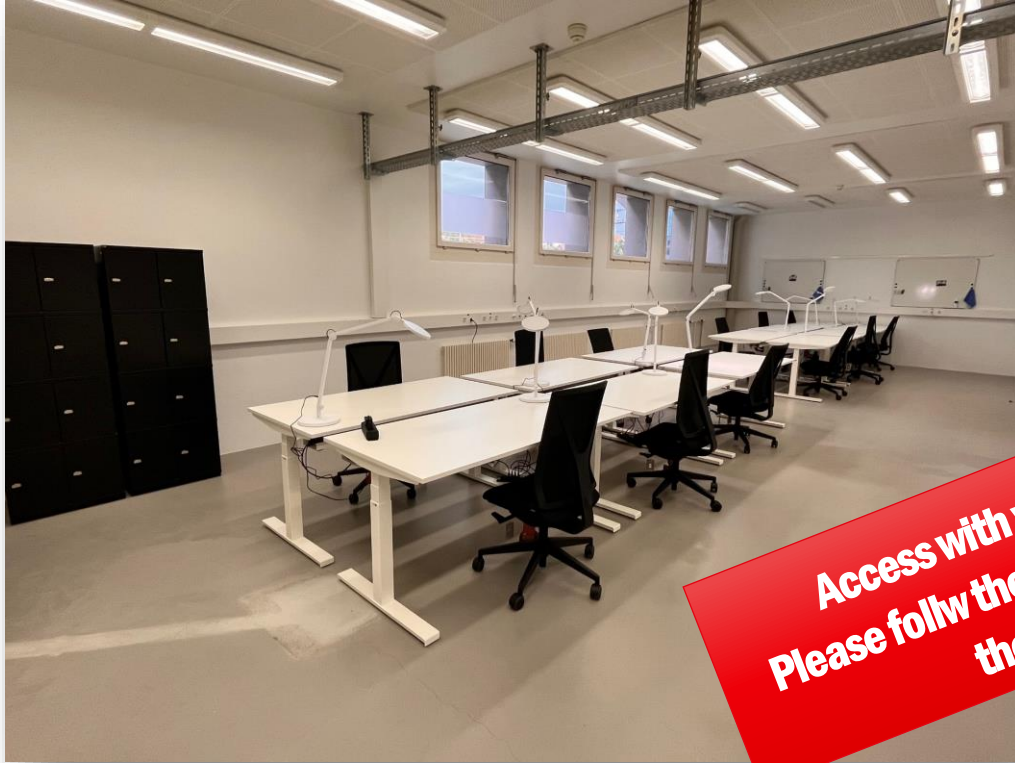
Access with your Camipro card
Please follw the rules and guidelines of the study room !

Minors

Microenginering

| Master thesis (30 ECTS) |
| Industry internship |

- Optional group Free choice of courses (39 ECTS)
  - Project II (10 ECTS)
- Minor without project (30 ECTS)
  - Optional group (9 ECTS)
  - Project II (10 ECTS)
- Minor with project (20-22 ECTS)
  - Project II in minor (8-10 ECTS)
  - Optional group (19 ECTS)

Bloc 2 (15 ECTS)
Foundation courses
(17 courses, 49 ECTS possibles, 3 orientations)

SHS Project (6 ECTS)

Microengineering semester project I (10 ECTS)

Machine learning I(4 ECTS)

Product design and system engineering (10 ECTS)

Robotics

| Master thesis (30 ECTS) |
| Industry internship |

- Optional Group (extended by autorisation) (30 ECTS)
  - Project II (10 ECTS)
- Optional Group (extended by autorisation) (20 ECTS)
  - MAKE Proj. (10 ECTS)
  - Project II (10 ECTS)
- Minor without project (30 ECTS)
  - Project II (10 ECTS)
- Minor with project (30 ECTS)
  - Optional group (10 ECTS)

Optional Group by orientation (17 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 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)

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

Minors (optional)

The student **informs the section of his choice of minor** and **selects it in the course-registration screen on IS-Academia**, **no later than the beginning of the 2nd semester** of his Master's studies.

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.**

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

Recommended and possible Minors

Mineurs / Minors	Type	Section	Contact	MT 120	RO 120
Energy	Interdiscipl.	GM	Maréchal F.	r	r
N! Imaging	Interdiscipl.	MT	Sage Daniel	r	r
Engineering for sustainability	Interdiscipl.	SIE	Gilliéron P.Y. , Leterrier	r	r
Neuro-X	Discipl.	NX	Hummel F, Micera S.	r	r
Photonics	Interdiscipl.	MT	Martin O.	r	r
Physics of living systems	Interdiscipl.	SV	Persat A.	r	r
Quantum science and engineering	Discipl.	SIQ	Macris N. et Klinke H.	r	r
Biomedical technologies	Interdiscipl.	MT	Guiducci C.	r	r
Spacial technologies	Interdiscipl.	EL	Kneib J.-P.	r	r
Computational science and engineering	Discipl.	MA	Pouchon O.	r	c
Data and internet of things	Interdiscipl.	EL	Atienza D.	r	c
Technology management and entrepreneurship	Interdiscipl.	MTE	de Rassenfosse G.	r	c
Computer science	Discipl.	IN	Hazboun E.	c	r
Architecture	Discipl.	AR	Kochnitzky Palluel L.	c	c
N! Computational Biology	Interdiscipl.	IN	Salathé M.	c	c
Biotechnology	Interdiscipl.	CGC	Pick H.	c	c
Chemistry and chemical engineering	Discipl.	CGC	Marendaz J.-L.	c	c
Cyber security	Discipl.	IN	Hazboun E.	c	c
Data science	Discipl.	SC	Hazboun E.	c	c
Integrated Design, Architecture and Sustainability (IDEAS)	Interdiscipl.	AR	Andersen M., Rey E.	c	c
N! Territories in transformation and climate	Interdiscipl.	AR	Joost St.	c	c
Civil engineering	Discipl.	GC	Turberg P.	c	c
Electrical and electronic engineering	Discipl.	EL	Gay-Balmaz Ph.	c	c
Mechanical engineering	Discipl.	GM	Prenleloup A.	c	c
Systems Engineering	Interdiscipl.	MTE	Weber Th.	c	c
Life sciences engineering	Discipl.	SV	Grisoni B.	c	c
Financial engineering	Discipl.	IF	Fahlenbrach R.	c	c
Mathematics	Discipl.	MA	Pouchon O.	c	c
Physics	Discipl.	PH	Mari D.	c	c
Materials science and engineering	Discipl.	MX	Marselli B.	c	c
Environmental sciences and engineering	Discipl.	SIE	Gilliéron P.-Y	c	c
Statistics	Discipl.	MA	Mhalla L.	c	c
Communication systems	Discipl.	SC	Hazboun E.	c	c

Master ECTS (PdM inclus/Master project included)
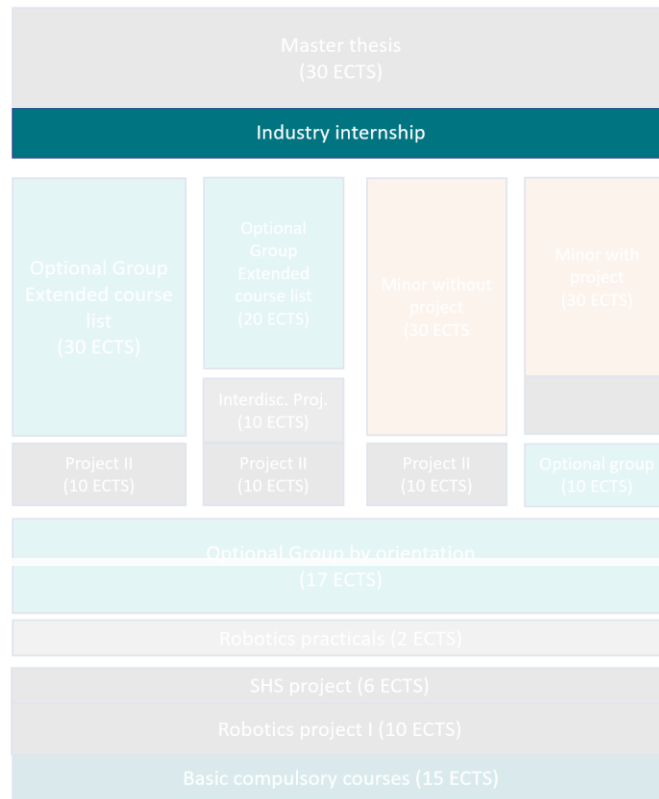
r Recommanded in the study plans

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

Industry Internship

Microenginering

| Master thesis (30 ECTS) |
| Industry internship |

Optional Group Extended course list (39 ECTS)

Minor without project (30 ECTS)

Minor with project (30 ECTS)

Project II (10 ECTS)

Optional Group (9 ECTS)

Optional Group (19 ECTS)

Project II (10 ECTS)

Project II (10 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)

Robotics

| Master thesis (30 ECTS) |
| Industry internship |

Optional Group Extended course list (30 ECTS)

Optional Group Extended course list (20 ECTS)

Minor without project (30 ECTS)

Minor with project (30 ECTS)

Interdisc. Proj. (10 ECTS)

Project II (10 ECTS)

Project II (10 ECTS)

Project II (10 ECTS)

Optional group (10 ECTS)

Optional Group by orientation (17 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 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)

An excellent opportunity

❑ Students
  - **A Great incentive to ask oneself the right questions !**
  - Familiarize with working life
  - Immerse into Industry practice
  - Future Hiring opportunity

❑ Companies
  - Benefit from highly qualified students
  - A new insight on current issues, innovate !
  - Evaluate futur employees

❑ EPFL
  - A direct link to industry
  - A platform to start collaborations on the research level
  - Feedback from industry to improve the education of our students

Speaker

Master internship evaluations

Company evaluation of over 400 students

■ Excellent ■ Good ■ Sufficient ■ Insufficient

Category	Metric	Excellent	Good	Sufficient	Insufficient
	Overall Evaluation	310	79	10	3
Independence	Capacity to self-evaluate and to respond constructively to feedback	280	102	13	2
	access sources of information and to evaluate them	287	96	12	
	Ability to present and defend her/his own ideas	261	113	23	4
Communication	Interpersonal skills and engagement, including in a multicultural context	318	71	12	
	munication (clarity, reasoning, self-confidence)	231	136	30	5
	Written communication (structure, clarity, coherence of reasoning)	224	155	14	4
Integration in the professional world	Quality of the work delivered	287	99	10	5
	Capacity to work in teams	297	77	11	2
	Res... for the organizations procedures/ rules and for their professional ethical codes	334	50	8	2
Planning and management of work tasks	Work planning, monitoring of activities, and management of emergent issues	239	135	20	4
	Evaluation of resources required	216	135	13	1
	Definition of work objectives and management of priorities	221	146	28	4
Application of scientific and technical knowledge	Mastery of domain-specific methodologies	238	142	16	2
	Ability to resolve complex problems	269	111	15	6
	Technical skills and knowle...	279	111	7	4

Break between bachelor and Master studies

❑ If you have finished your bachelor
and would like to take an interim year to do your mandatory
industry internship for your master, the following academic rules and
FRAC status' apply:
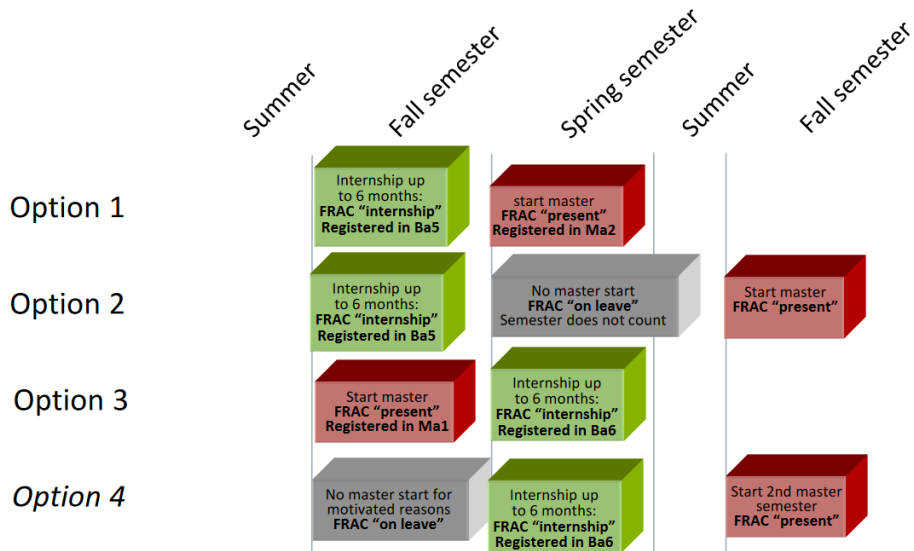
In option 4 the fall semester will be accounted to your master studies, except if you are doing your army or civil service

https://www.epfl.ch/education/studies/en/special-study-arrangements/interruption-studies/interruption-studies-bachelor-master/

When to place your internship
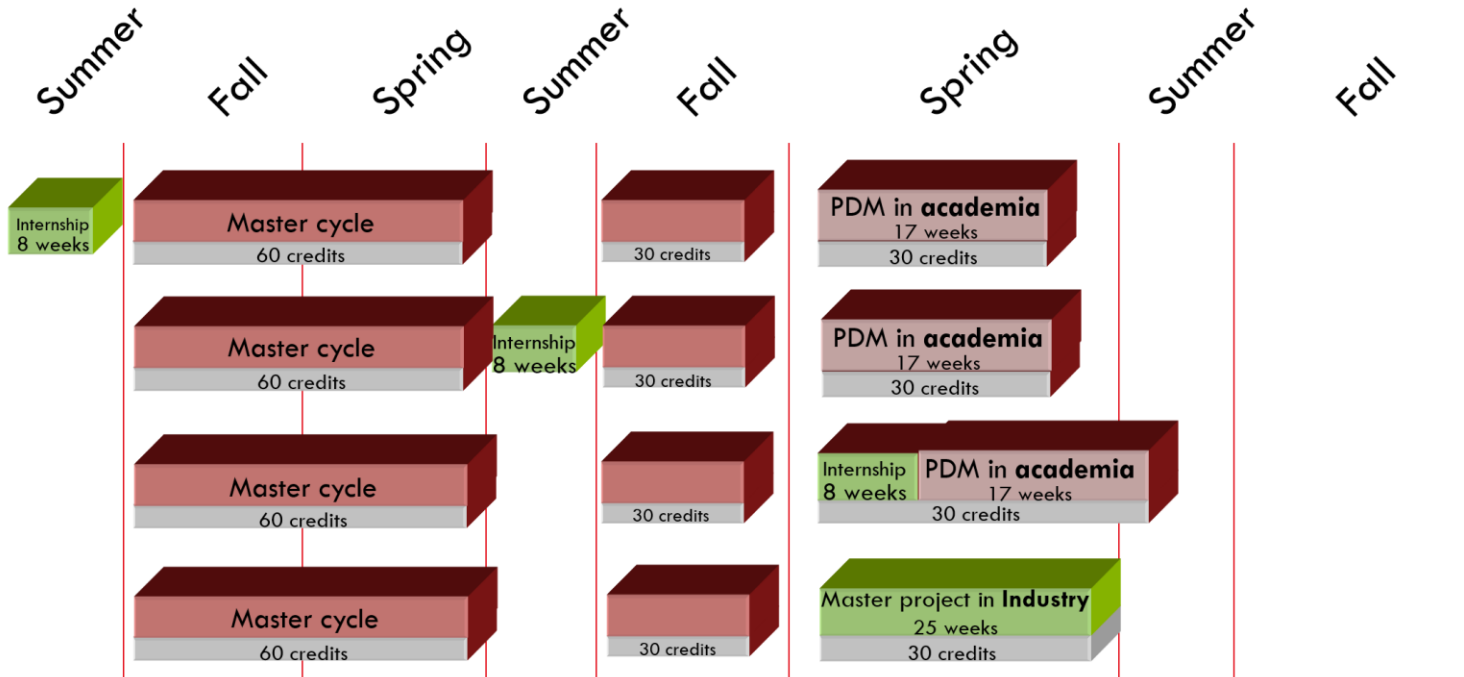
Master thesis (PDM) in academia in foreign Universities: 25 weeks
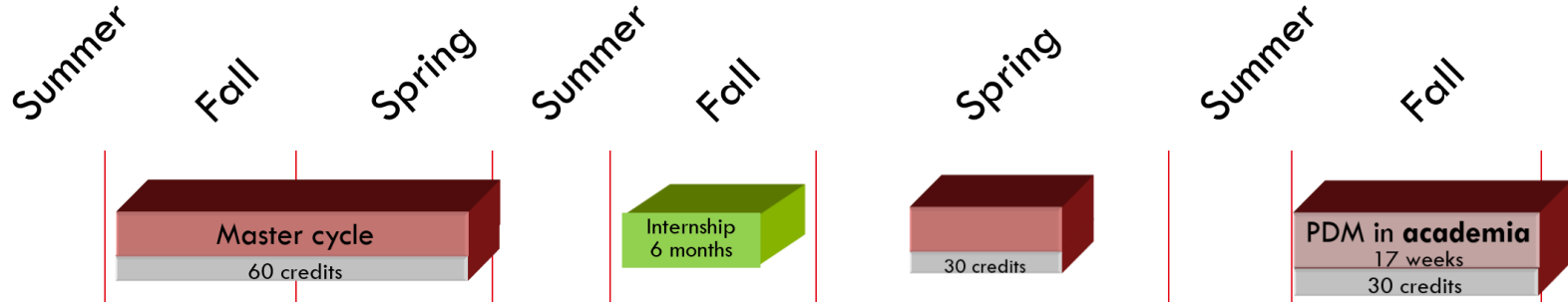
When to place your internship

When to place your internship
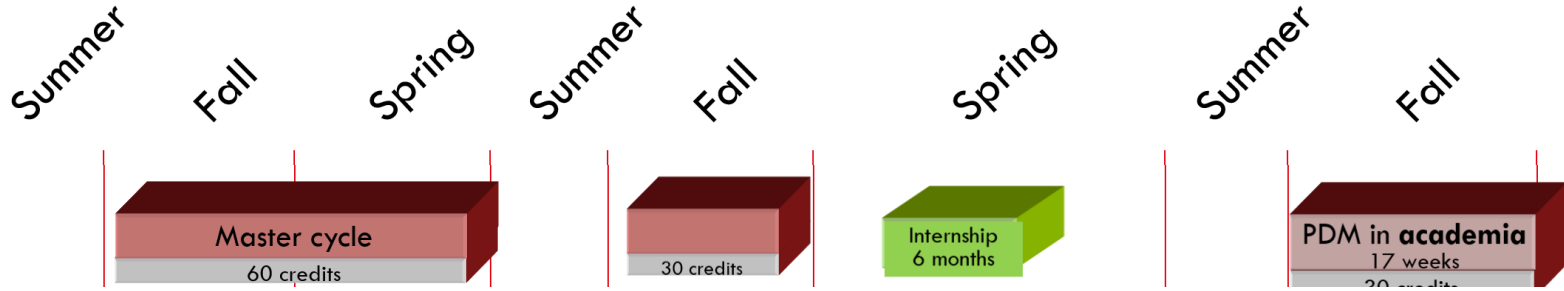
Summer | Fall | Spring | Summer | Fall | Spring | Summer | Fall

Master cycle
60 credits

30 credits

Internship
6 months

PDM in **academia**
17 weeks
30 credits

When to place your internship

Summer | Fall | Spring | Summer | Fall | Spring | Summer | Fall

Master cycle
60 credits

30 credits

Internship
6 months

Master project in **Industry**
25 weeks
30 credits
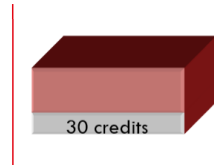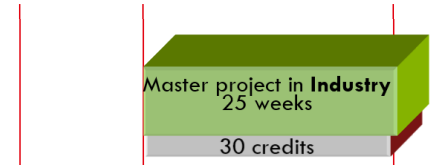
Industry internship

Detailed info session:
Early November 2024

STI Industry internship coordinator
Hind.Klinke@epfl.ch

Already interested ? More INFO here
https://sti.epfl.ch/wp-content/uploads/2023/11/SMT-Internships-student-2023.pdf

Master thesis

Microenginering

Master thesis (30 ECTS)		
Industry internship		

Optional Group Extended course list (39 ECTS)	Minor without project (30 ECTS)	Minor with project (30 ECTS)
		Project II (10 ECTS)
Project II (10 ECTS)	Optional Group (9 ECTS)	Optional Group (19 ECTS)
	Project II (10 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)

Robotics

Master thesis (30 ECTS)			
Industry internship			

Optional Group Extended course list (30 ECTS)	Optional Group Extended course list (20 ECTS)	Minor without project (30 ECTS)	Minor with project (30 ECTS)
Project II (10 ECTS)	Interdisc. Proj. (10 ECTS)		
	Project II (10 ECTS)	Project II (10 ECTS)	Optional group (10 ECTS)

Optional Group by orientation
(17 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 ECTS)

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
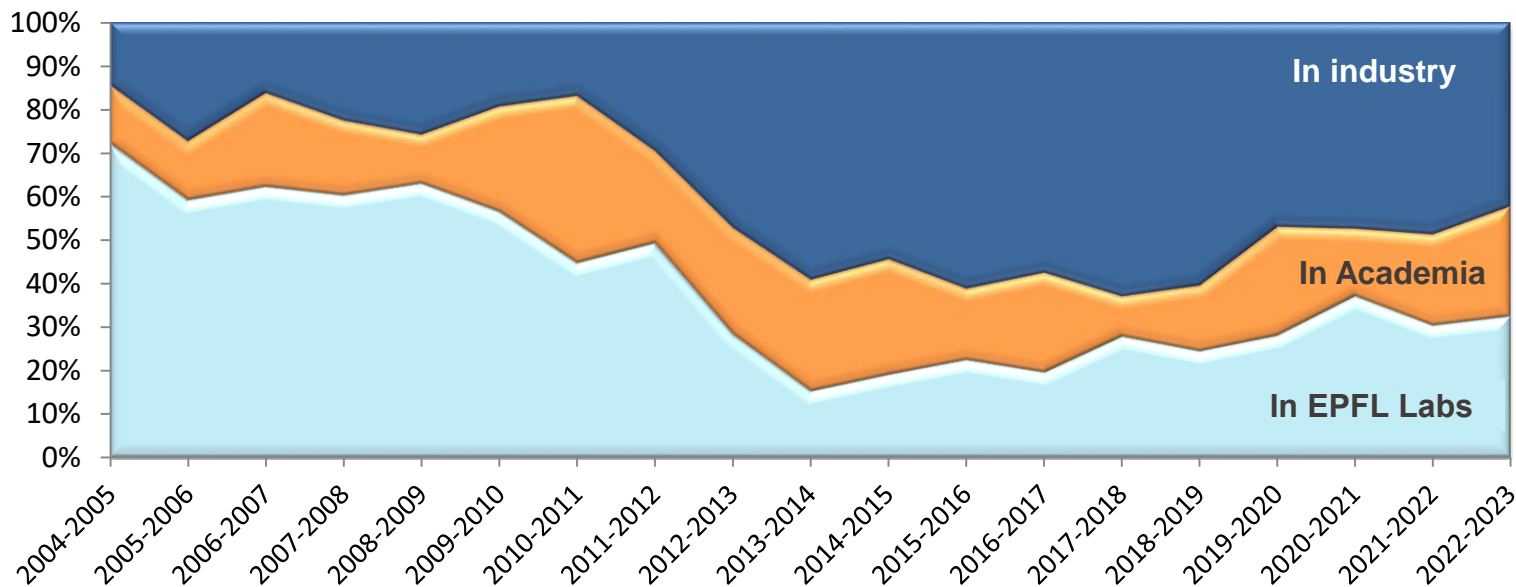
Postulations Prix PDM 2023

Prix **Section étudiant**

Prix Bluebotics
MT
MT
MT
MT
ME
MT

Prix Faulhaber
MT
MT
MT
MT

Prix OMEGA
MT
MT
EL
MT
MT

Prix Swissphotonics
MT
MT
EL
MT
MX
MX

Omega award

Hilti award

Swissphotonics award

Faulhaber award

Bluebotics award

Master projects guidelines

- **Calendar**
- **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/smt/master-projects-guidelines/

Specifics about the 2 Masters

Robotics master

Industrial
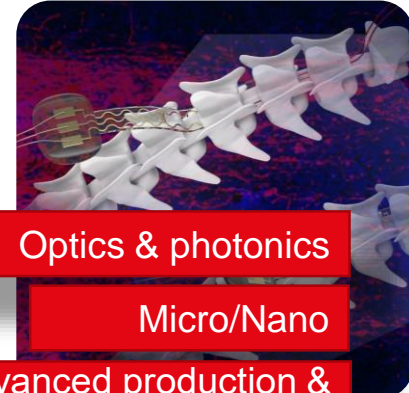
Mobile

Medical

Microengineering master

Optics & photonics

Micro/Nano

Advanced production & manufacturing
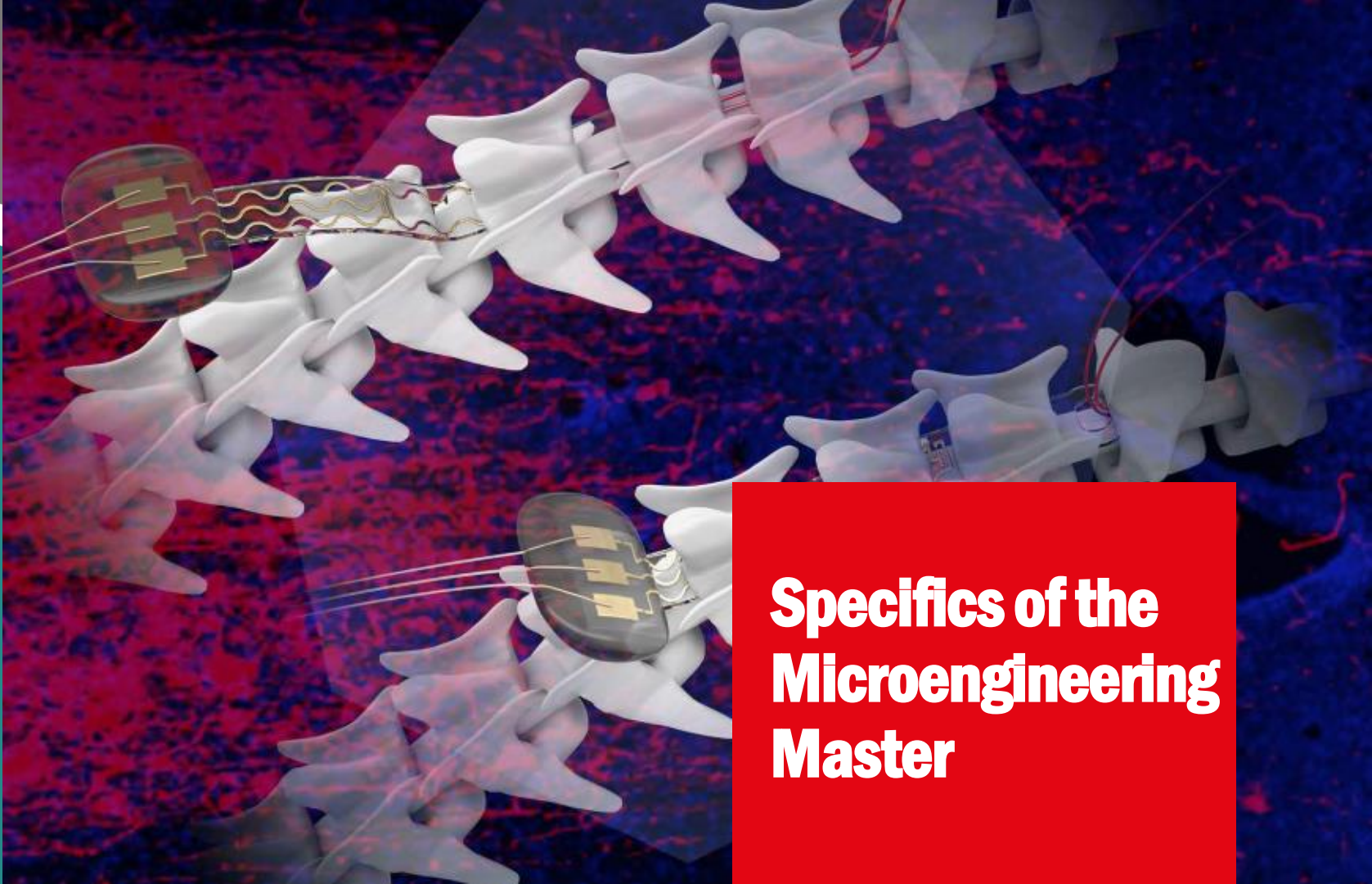
What is Microengineering ?

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.

Watch Valley: Birthplace of Swiss Watchmaking

Building on history, The Swiss Health Valley
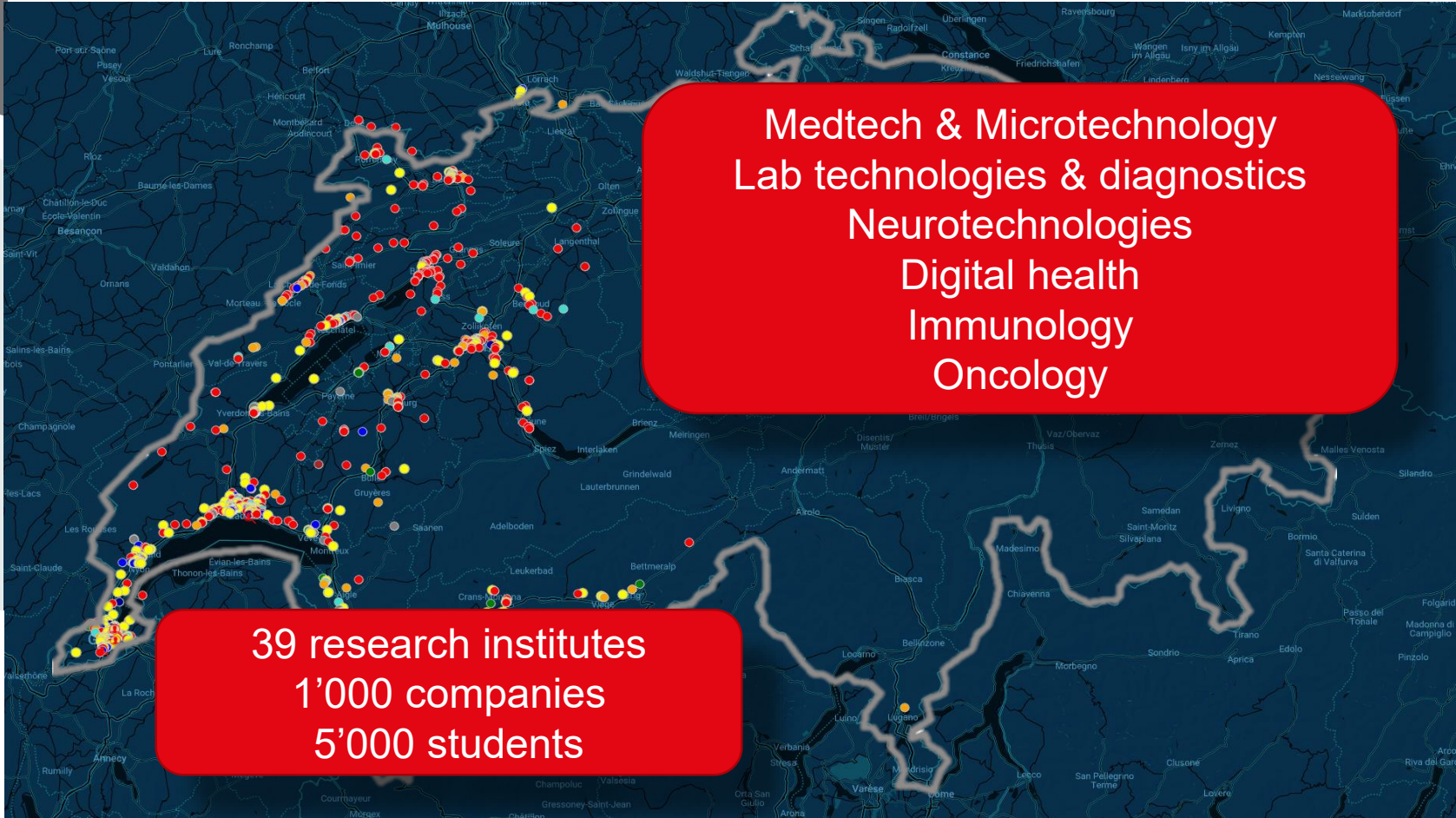
Medtech & Microtechnology
Lab technologies & diagnostics
Neurotechnologies
Digital health
Immunology
Oncology

39 research institutes
1'000 companies
5'000 students

Admissions Internationales Master Microtechnique

Chine
- Beihang University, Beijing
- Sun Yat-Sen University, Guangzhou
- Xi'an Jiaotong University
- Zhejiang University, Hangzhou

Suisse
- Ecole polytechnique fédérale de Lausanne EPFL
- Haute Ecole d'ingénierie et de gestion du Canton de Vaud HEIG-VD

Etats-Unis
- Harvey Mudd College, Claremont
- University of Michigan, Ann Arbor

Taïwan
- National Taipei University of Technology, Taipei

Allemagne
- Technische Universität München

Turquie
- Istanbul Technical University

Italie
- Politecnico di Milano

Canada
- McGill University, Montreal

1 passerelle HES
2 bachelor SV
1 bachelor GM

Master Program structure
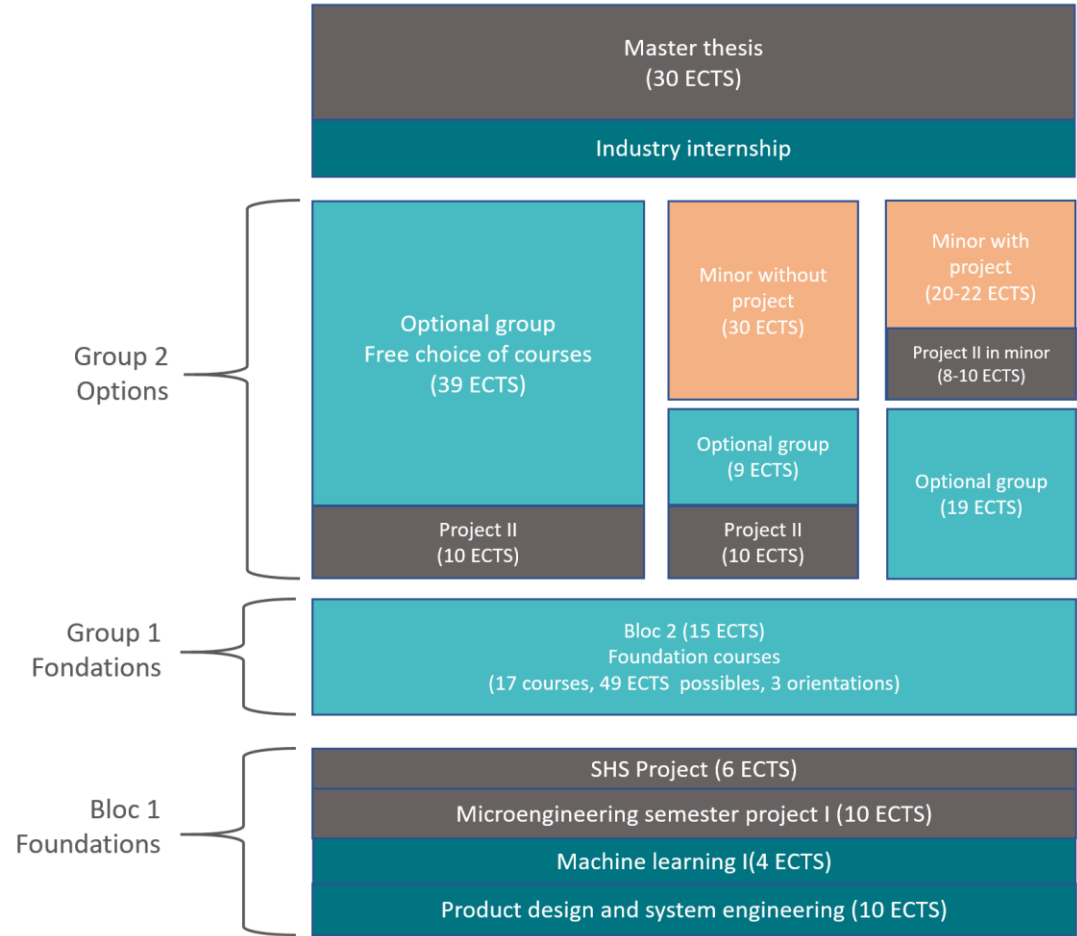
Products Design and Systems Engineering

Foundational course in the first semester letting groups of students create their own product from concept to prototype, including a first marketing plan.
With invite speakers from Academia and Industry.

Fred
Electrical
Engineer

Pablo
Propulsion
Designer

Andrea
Propulsion
Designer

Charlotte
CAD
designer

Hugo
Programmer

Florian
Business
developer

500000 — Dogs in Switzerland

8.4 M — People in Switzerland

11.5% — With reduced mobility

50000 — Dog owners with reduced mobility

10% conversion

5000 — Products sold

Control Circuit

MCU board
Power adapter
LiPo battery
Custom PCB + LoRa module
Vibrator
Wireless charging coil
Package
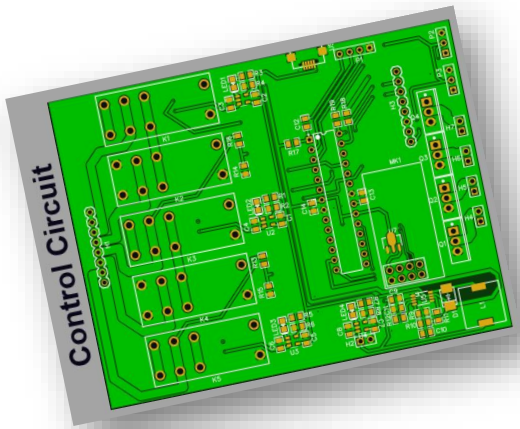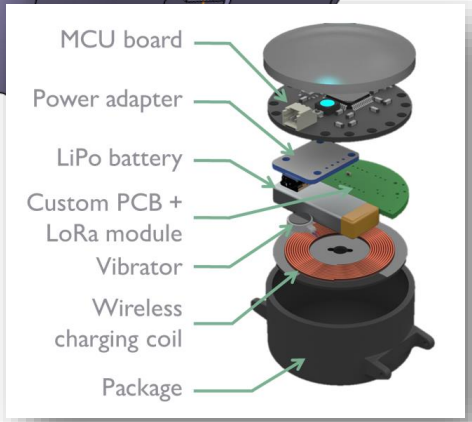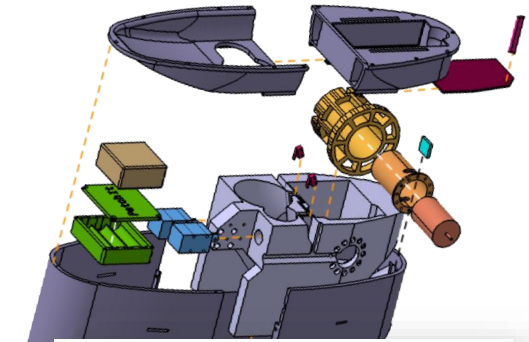
Product design example – Pill'it
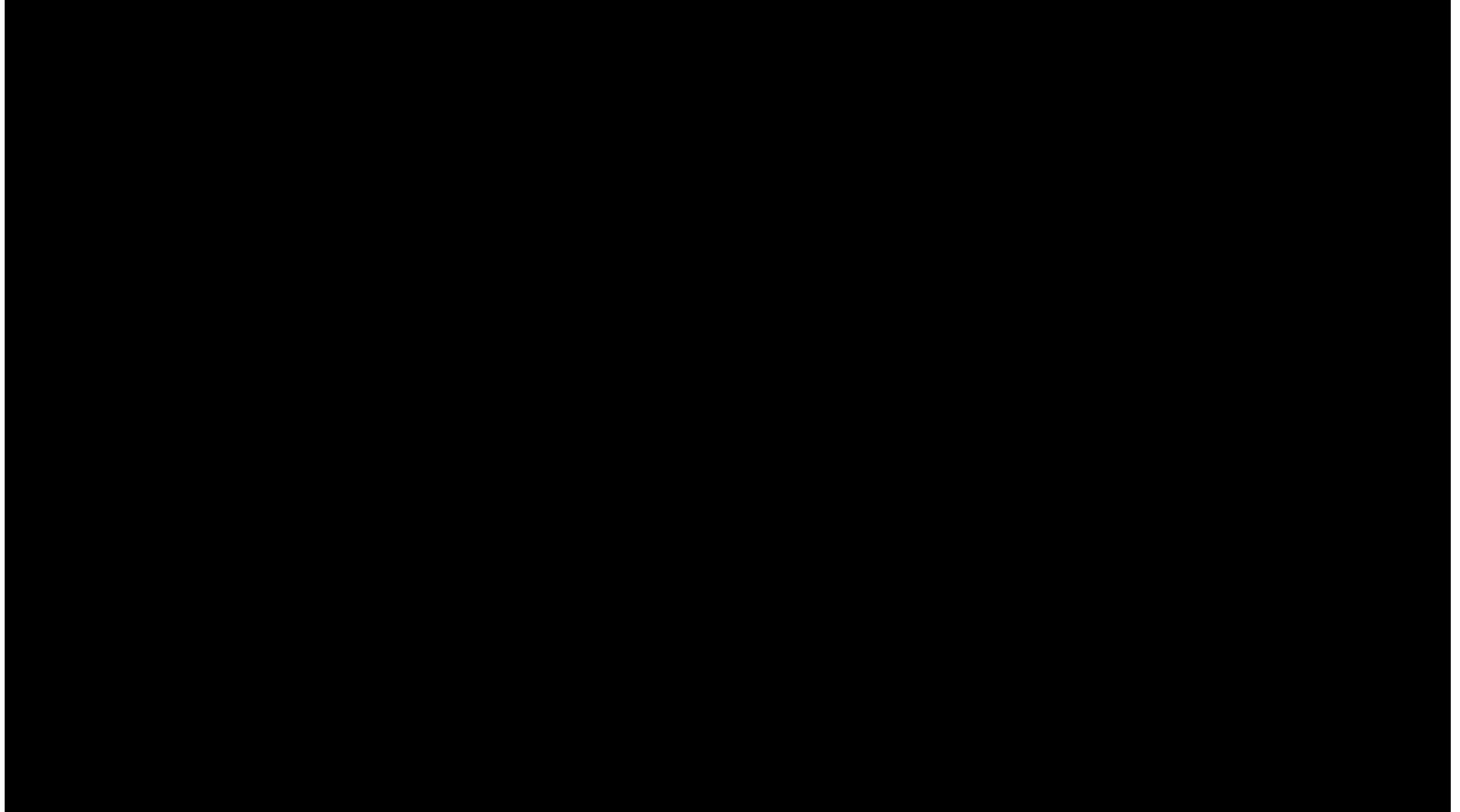
Orientations – Microengineering Master

Orientations are meant as **guidelines** to help students choose their courses
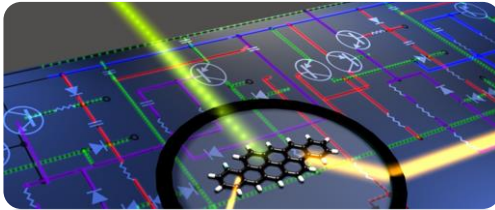
A Optics and Photonics	B Micro ans Nanosystems	C Advanced and Production and Fabrication
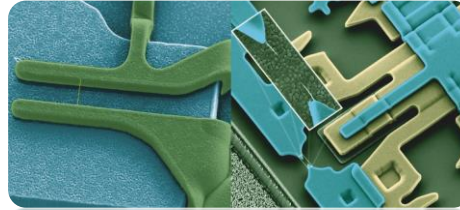
Bloc 1

- Products Design and System Engineering
- Machine learning I
- SHS
- Semester project 1

Group 1: Fall

A: Optics and photonics

- Computational optical imaging
- Selected topics in advanced optics
- Optical design with Zemax
- Optical detectors

B: Micro & Nanosystems

- Scaling laws in micro- and nanosystems
- Smart sensors for IOT
- nomechanical devices
- cessing with intelligent systems

C: Advanced Production and Fabrication

- Introduction to additive manufacturing

Group 1: Spring

- & microsystems
- Nanoscale heat transfer
- Metrology
- Nanotechnology
- Fundamentals and processes of PV devices
- Laser fundamentals and applications for engineers
- Applied and industrial robotics
- Manufacturing systems and supply chain dynamics

15 ECTS to validate this Group

Orientations - Master Microengineering

Group 2 : Fall

A: Optics et Photonics

- Biomedical optics
- Biomicroscopy I
- Nonlinear optics
- Nonlinear optics for quantum technologies
- Optics laboratories Fall

- Physique des composants semiconducteurs
- Lasers: theory and modern applications
- Quantum and nanocomputing
- Basic integrated photonic components: fundamentals and simulations
- Nonlinear optics for quantum technologies

Micro et Nanosystems

- Physical models for micro and nanosystems
- Fundamentals of biosensors and electronic biochips
- Neural interfaces
- Radiofrequency circuits design techniques

- Fundamentals of analog IC design
- MEMS practicals I

C: Advanced Production and Fabrication Techniques

- Commande embarquée de moteurs
- Commande non-linéaire

Group 2 : Spring

- Biomicroscopy II
- Fundamentals of Biophotonics
- Optics laboratories Spring
- Deep learning for optical imaging

- Photonic systems and technology
- Metrology practical
- Nanophoton...
- Physics of photon... semiconductor devic...
- Advanced photonic transducers: classical and quantum applications
- La science quantique, une vision singulière

- Mecanisms for extreme environments
- ...log-to-...nverters with projects
- IC design I
- Nanobiotechnology and biophysics
- Sensors in medical instrumentation

- Large area electronic devices and materials
- Organic and printed electronics
- MEMS practicals II

- Advanced additive manufacturing technologies
- Computational motor control
- Haptic human robot interfaces
- Continuous improvement of manufacturing systems

- Analyse de produits et systèmes
- Laser microprocessing
- Industrial automation
- System identification

35 ECTS + 1 semester project to validate this Group

And more ...

AI / ML
Software architecture
Machine learning II
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
Legged robots
Aerial robotics
Evolutionary robotics
Intercultural presentation skills
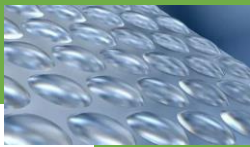
Imaging

Smart fabric printing
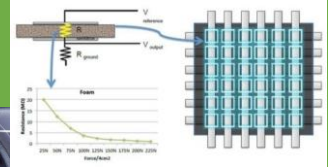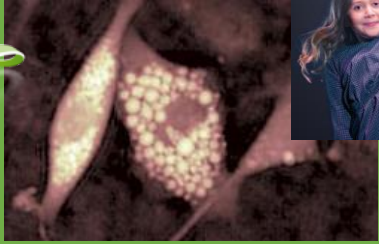
Example of
Industry Players
Optics & Photonics

Laser marking

Laser cutting

EPFL mt microtechnique microengineering section
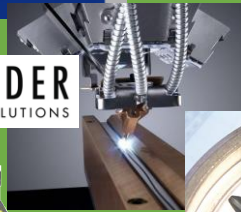
Microfab, MEMS, Sensors and Packaging

ASML

e smart

Systems Engineering

TESA TESA TECHNOLOGY

SUSS MicroOptics

csem

ST life.augmented

NEUROTHERAPEUTICS aleva

Lambda Health System

Example of Industry Players **Micro & Nanosystems**

EMS ELECTRO MEDICAL SYSTEMS

Sensors, Wireless and IOT

logitech

Watchmaking

insolight

Gait up

GEOSATIS securing people

BVLGARI

ROLEX

AIRFLO
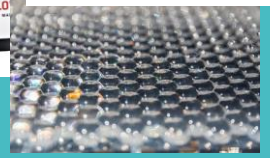
Advanced manufacturing

Supply chain

Example of Industry players
Advanced Manufacturing & Production
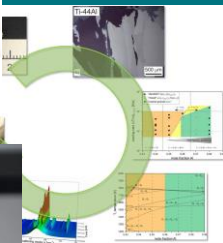
Materials processing
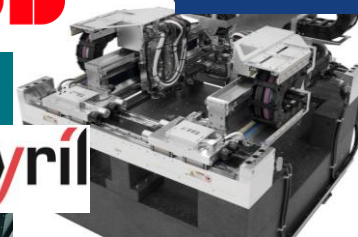
Industrial robotics

Movie to learn more ...

EPFL
mt
microtechnique
microengineering
section

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

0:13 / 10:00

Faites défiler la page pour afficher plus de détails

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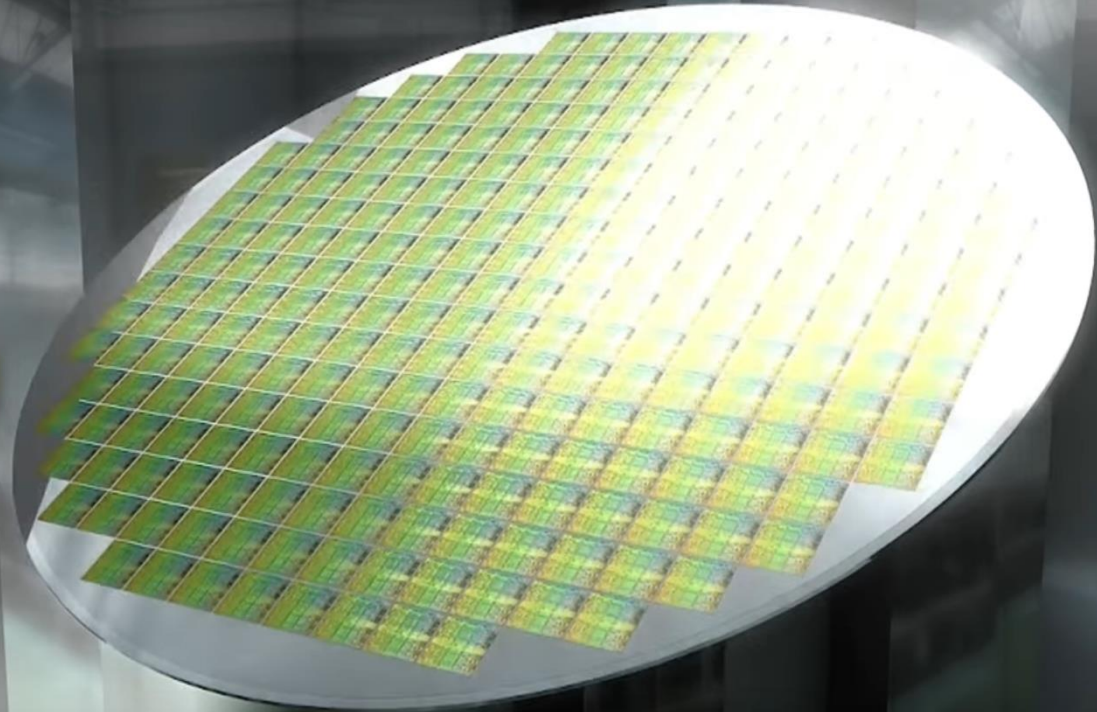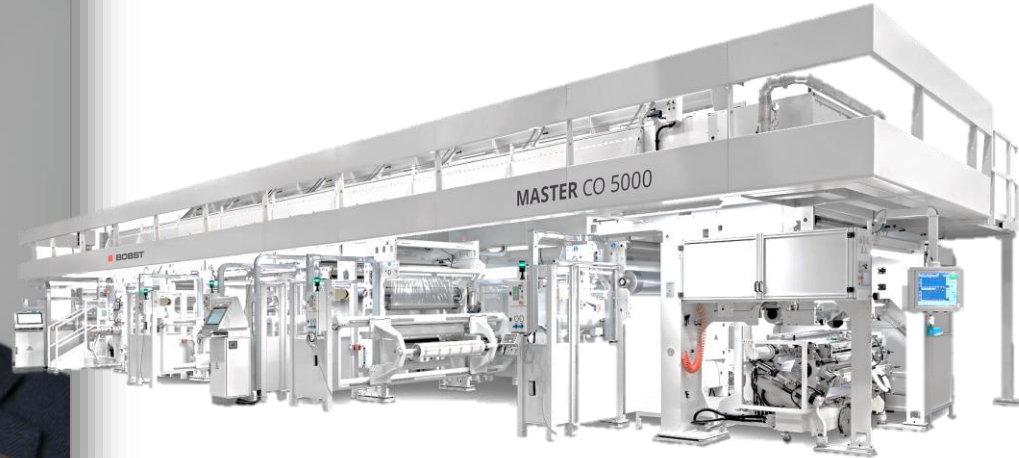
Léonard Badet
Head of Group Technology – Bobst
Master Microtechnique terminé en 2017

Alumni Testimonies

EPFL
Switchtube

SONCEBOZ

Damien Wittwer
Business Unit Manager Associate
Master Microtechnique terminé en 2010

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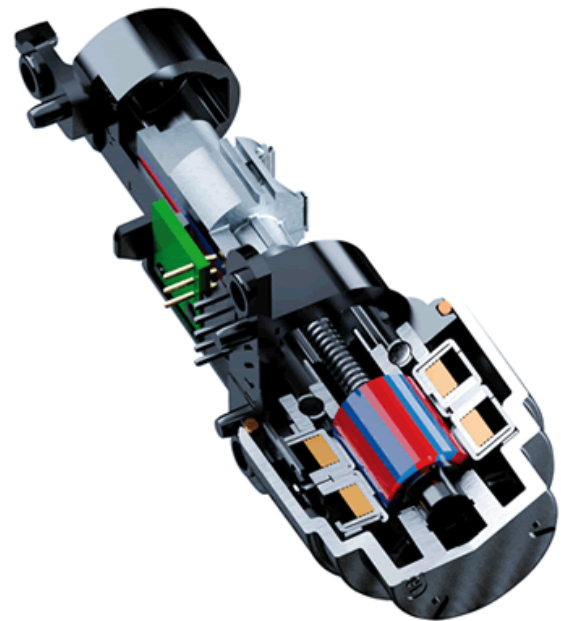
Alumni Testimonies

EPFL
Switchtube

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

EPFL
mt
■ microtechnique
microengineering
section

■ Faculté des Sciences
et Techniques
de l'Ingénieur (STI)
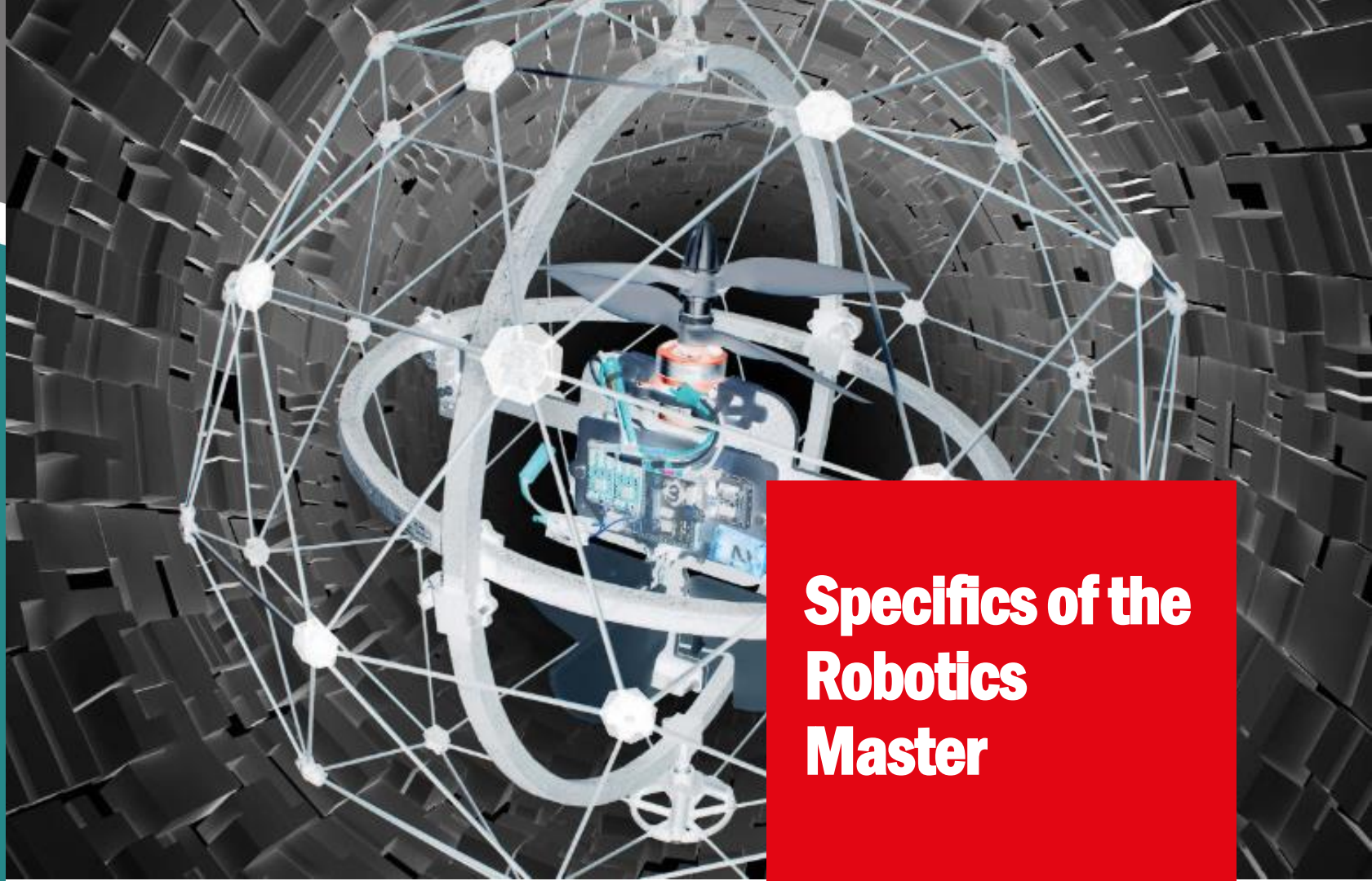
Specifics of the Robotics Master

SWI swissinfo.ch
#NOTHING TO HIDE
Science
Des perspectives suisses en 10 langues
Connectez-vous Chercher Menu

La Suisse, un géant discret de la robotique

Forbes
Billionaires Innovation Leadership Money Consumer Industry

How Switzerland Became The Silicon Valley Of Robotics

Andrew Cave Contributor ⓘ

Neue Zürcher Zeitung

Die Schweiz will sich als Drohnen-Mekka positionieren

Ce n'est pas un slogan marketing, c'est un fait: en robotique, la Suisse est championne du monde. «Si l'on prend le top 20 des labos dans le monde, pratiquement un quart sont en Suisse, alors que nous n'avons que huit millions d'habitants», confirme Aude Billard,

Switzerland in top 10 in automatisation

Robot density in the manufacturing industry 2022

Average Europe: 136 (EU: 208)
Average America: 120
Average Asia: 168

World: 151

robots installed per 10,000 employees

Country	Value
Rep. of Korea	1012
Singapore	730
Germany	415
Japan	397
China	392
Sweden	343
Hong Kong	333
Switzerland	296
Chinese Taipei	292
United States	285
Slovenia	284
Denmark	274
Netherlands	248
Italy	219
Austria	219
Belgium and...	216
Canada	198
Czech Republic	189
France	180
Spain	169

Source: International Federation of Robotics

Top 10 in # of manufacturers of service robots
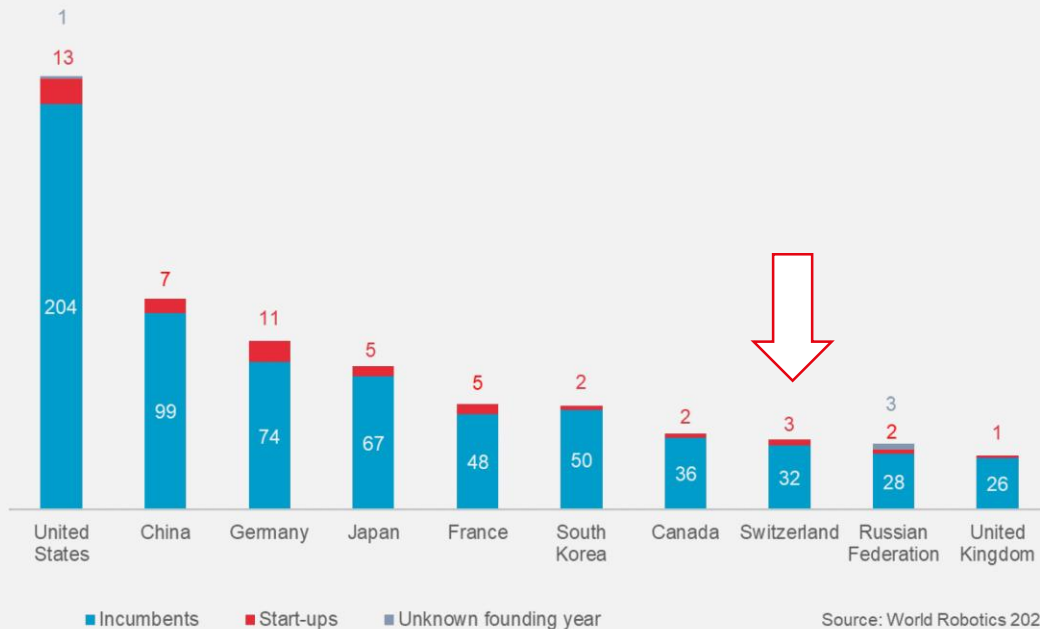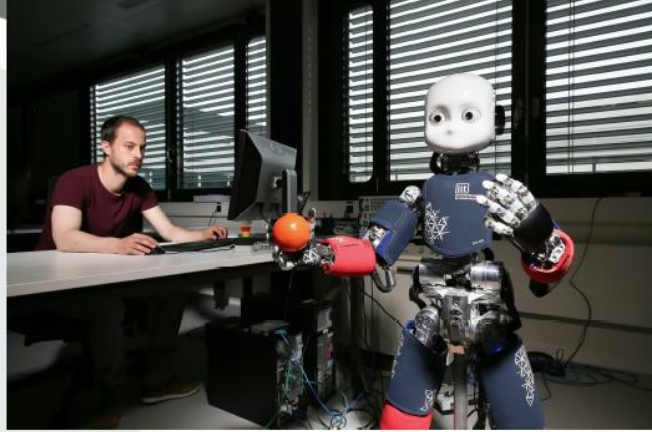
Robotics

Prof. Aude Billard

Prof. Dario Floreano

Prof. Auke Ijspeert

Prof. Silvestro Micera

Prof. Francesco Mondada

EPFL
mt
microtechnique
microengineering
section
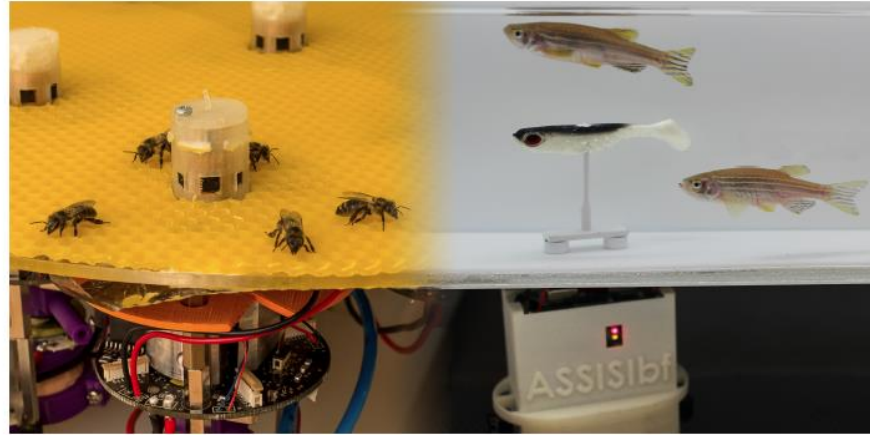
Admission Internationales Master Robotique

Suisse		36
	Ecole polytechnique fédérale de Lausanne EPFL	35
	Haute Ecole du paysage, d'ingénierie et d'architecture	1
Etats-Unis		7
	East Tennessee State University, Johnson City	1
	Georgia Institute of Technology, Atlanta	1
	Massachusetts Institute of Technology, Cambridge	1
	University of California, Berkeley (UCB)	1
	University of California, San Diego	1
	University of Colorado, Boulder	1
	University of Illinois at Urbana-Champaign	1
Italie		6
	Politecnico di Milano	2
	Politecnico di Torino	3
	Università degli Studi di Firenze	1
Chine		6
	Harbin Institute of technology	1
	Shanghai Jiao Tong University	2
	Tsinghua University, Beijing	3
Liban		4
	American University of Beirut	4
Canada		2
	Polytechnique de Montréal	1
	University of Toronto	1

Iran		2
	Sharif University of Technology, Tehran	2
Turquie		2
	Bogazici University, Istanbul	1
	Sabanci University, Istanbul	1
France		2
	CentraleSupelec	1
	Ecole Polytechnique, Palaisea	
Inde		
	Indian Institute of Technology	
	Indian Institute of Technology	
Singapour		
	National University of Singap	
Grèce		
	National Technical University	
Bosnie-Herzégovine		
	University of Sarajevo	
Mexique		1
	Instituto Tecnológico y de Estudios Superiores de Mont	1
Australie		1
	University of Melbourne	1
Royaume-Uni		1
	University of Edinburgh	1

Autre bachelor EPFL:
GM: 23 GM
SV: 6
EL: 2
Info & Syscom: 2
PHYS: 1

Diversité (écoles de provenance de nos candidats externes)

Technische Universität München	Allemagne
Technische Universität Wien	Autriche
Université Catholique de Louvain	Belgique
McGill University, Montreal	Canada
University of British Columbia, Vancouver	Canada
University of Toronto	Canada
University of Waterloo	Canada
Shanghai Jiao Tong University	Chine
The Hong Kong University of Science and Technology	Chine
Tsinghua University, Beijing	Chine
Universitat Politècnica de Catalunya, Barcelona	Espagne
Cornell University, Ithaca	Etats-Unis
Harvard University, Cambridge	Etats-Unis
University of California, Santa Barbara	Etats-Unis
University of Illinois at Urbana-Champaign	Etats-Unis
Ecole Polytechnique, Palaiseau	France
National Technical University of Athens	Grèce
Indian Institute of Technology Delhi	Inde
Indian Institute of Technology Kanpur	Inde
Indian Institute of Technology Madras	Inde
Politecnico di Milano	Italie
Politecnico di Torino	Italie
Università degli Studi di Roma "La Sapienza"	Italie
Delft University of Technology	Pays-Bas
Imperial College London	Royaume-Uni
University of Edinburgh	Royaume-Uni
Nanyang Technological University	Singapour
National University of Singapore	Singapour
Bogazici University, Istanbul	Turquie

Quality

8.1) Overall, I find the Robotics Master of high quality

| 43% | 51% | |

Master Program structure

Structure

Master thesis (30 ECTS)

Industry internship

Optional Group (extended by autorisation) (30 ECTS)

Optional Group (extended by autorisation) (20 ECTS)

Minor without project (30 ECTS

Minor with project (30 ECTS)

MAKE Proj. (10 ECTS)

Project II (10 ECTS)

Project II (10 ECTS)

Project II (10 ECTS)

Optional group (10 ECTS)

Optional Group by orientation (17 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 ECTS)

Robotics practicals (2 ECTS)

SHS project (6 ECTS)

Robotics project I (10 ECTS)

Basic compulsory courses (15 ECTS)

Compulsory courses

Foundations :

- Basics of Mobile Robotics (4 ECTS; Mondada) – fall
- Basics of robotics for manipulation (3 ECTS; Bouri) – fall

Algorithms and Methods for Robotics :

- Machine learning I (4 ECTS; Billard) – fall
- Model Predictive Control (4 ECTS; Jones) – fall

Practicals:

- Robotics Practicals (2 ECTS; Mondada + all) - spring

Orientations

17 optional credits chosen among the optional courses of the chosen orientation, then free choice in robotics options.

Industrial Robotics

Medical Robotics
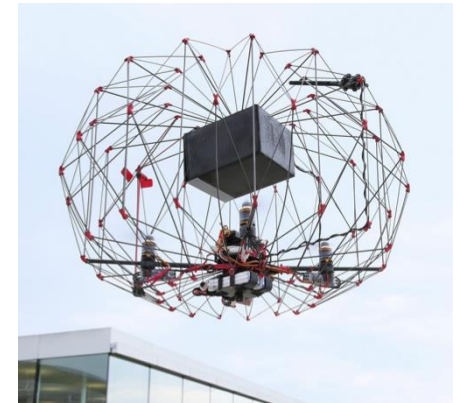
Mobile robotics

Orientations

Students must choose 17 ECTS of optional courses in one of these three orientations:

A Industrial robotics
B Medical robotics
C Mobile robotics

Optional courses and orientation	A	B	C	59
Advanced control systems	A	B	C	3
Advanced machine learning	A	B	C	4
Advanced MEMS & microsystems			C	3
Advanced satellite positionning			C	4
Analyse de produits et systèmes	A			2
Analysis and modeling of locomotion		B	C	4
Biomaterials		B		4
Commande embarquée de moteurs	A			2
Computational motor control		B	C	4
Computer vision	A	B	C	4
Conception mécanique intégrée	A			3
Continuous improvement of manufacturing systems	A			4
Controlling behavior in animal and robots		B	C	4
Deep learning	A	B	C	4
Distributed intelligent systems			C	5
Embedded systems	A	B	C	4
Evolutionary robotics			C	3
Flexible bioelectronics		B		4
Flying robots			C	4
Fundamentals of computer aided manufacturing	A			5
Fundamentals of neuroengineering			C	4
Haptic human robot interfaces	A			3
How technology shapes the workplace of the future	A	B	C	3
Image analysis and pattern recognition		B	C	4
Image processing I		B		3
Image processing II		B		3
Industrial automation	A			3
Industry dynamics, models & trends	A			4
Intelligent agents	A		C	6
Interdisciplinary project				10
				4
				3
				2
				5
				3
				4
				3
				3
				4
				2
				5
Production management	A			
Real-time embedded systems	A	B	C	4
Robotique industrielle et appliquée	A			2
Sensorimotor neuroprosthetics		B		4
Sensor orientation			C	4
Sensors in medical instrumentation		B		3
Signal processing for functional brain imaging		B		3
System identification	A	B	C	3
Systèmes mécatroniques	A	B	C	5

Groupe à options
Grand choix de cours
(17 ECTS)

Master in Robotics - Orientations

Options group : Fall

A: Industrial robotics

- Commande embarqués moteurs
- Intelligent agents
- Production management
- Image processing I

Applied data analysis
Commande non-linéaire
Systems programming for systems on a chip

B: Medical robotics

- Basics of Bioinstrumentation
- Neural interfaces
- Neural signals and signal processing

Machine learning programming
Managment de projet et analyse du risque
Mechanical product design and development

C: Mobile robotics

- Multivariable control
- Intelligent agents
- Legged robots
- Networked control systems

Principles of finance

17-47

Options group : Spring

A: Industrial robotics

- Analyse de produits et systèmes
- Applied and industrial robotics
- Industrial automation
- Optimal decision making
- Haptic human robot interfaces
- Image processing II
- Continuouse improvement of manufacturing systems

B: Medical robotics

- Numerical methods in biomechanics
- Introduction to bioengineering
- Sensors in medical instrumentation

C: Mobile robotics

- Deep learning for autonomouse vehicles
- Advanced MEMS and microsystems
- Deep learning
- Lifecycle performance of products systems
- Sensor orientation
- Advanced Satellite positioning
- Learning and adaptive control for robots
- Aerial robotics
- Evolutionary robotics
- Distributed intelligent systems

Advanced mecanisms for extreme environments
Controlling behavior of animals and robots
Computational motor control

Image analysis and pattern recognition
Organic and printed electronics
Translational neuroengineering

Advanced control systems
Machine learning II
Computer vision
Convex optimization

Deep learning for optical imaging
Machine learning programming
Micro/nanorobotics
Embedded systems design

Reinforcement learning
Software architecture
Systèmes mécatroniques
System identification

Orientation courses examples
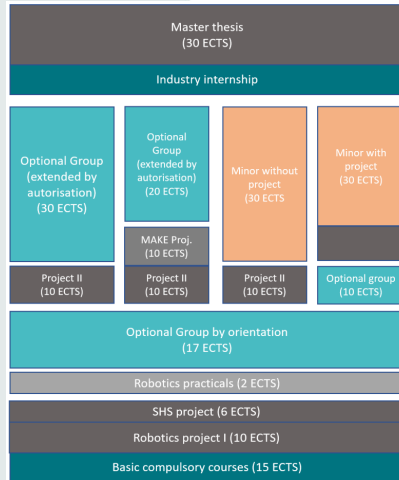
2021-2022	ROBOTICS - Options		
Code	Matières	Enseignants	Crédits
MICRO-502	Aerial robotics	Floreano	3
MICRO-515	Evolutionary robotics	Floreano	3
MICRO-570	Advanced machine learning	Billard	4
EE-559	Deep learning	Fleuret	4
MICRO-514	Flexible bioelectronics	Lacour S.	4
EE-451	Image analysis and pattern recognition	Thiran J.-P.	4
MICRO-462	Learning and adaptative control for robots	Billard	4
MICRO-455	Applied machine learning	Billard	4
MICRO-553	Haptic human robot interfaces	Bouri	3
MICRO-401	Machine learning programming	Billard	2
BIOENG-404	Analysis and modelling of locomotion	Aminian/Ijspeert/Courtine	4
BIOENG-456	Controlling behavior in animals and robots	Ramdya	4
CIVIL-459	Deep learning for autonomous vehicles	Alexandre Alahi	6
ENG-466	Distributed intelligent systems	Martinoli	5
CS-487	Industrial automation	Tournier/Sommer	3
MICRO-507	Legged robots	Ijspeert	3
ENV-548	Sensor orientation	Skaloud	4

Free options
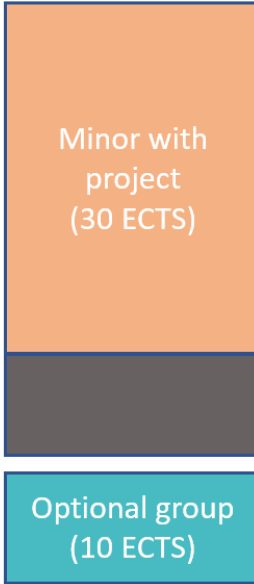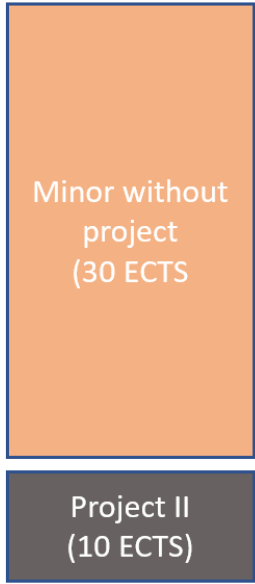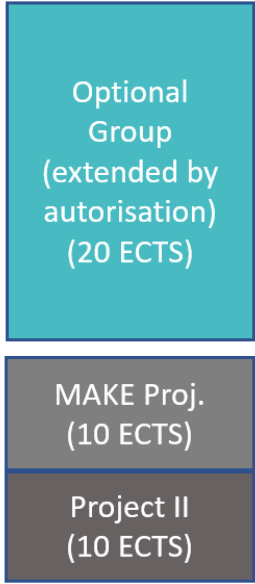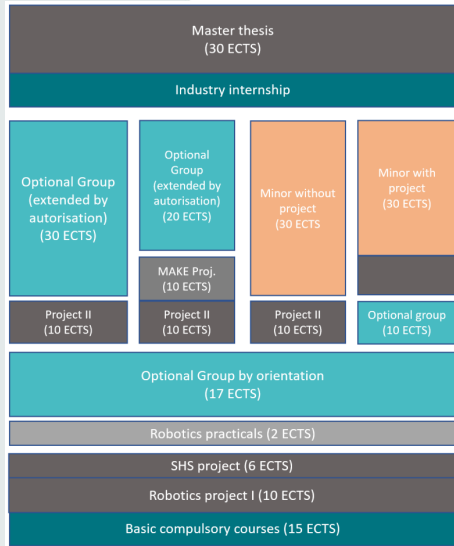
Alumni careers

Careers after EPFL's MA Program in Robotics

Short Movie to learn more
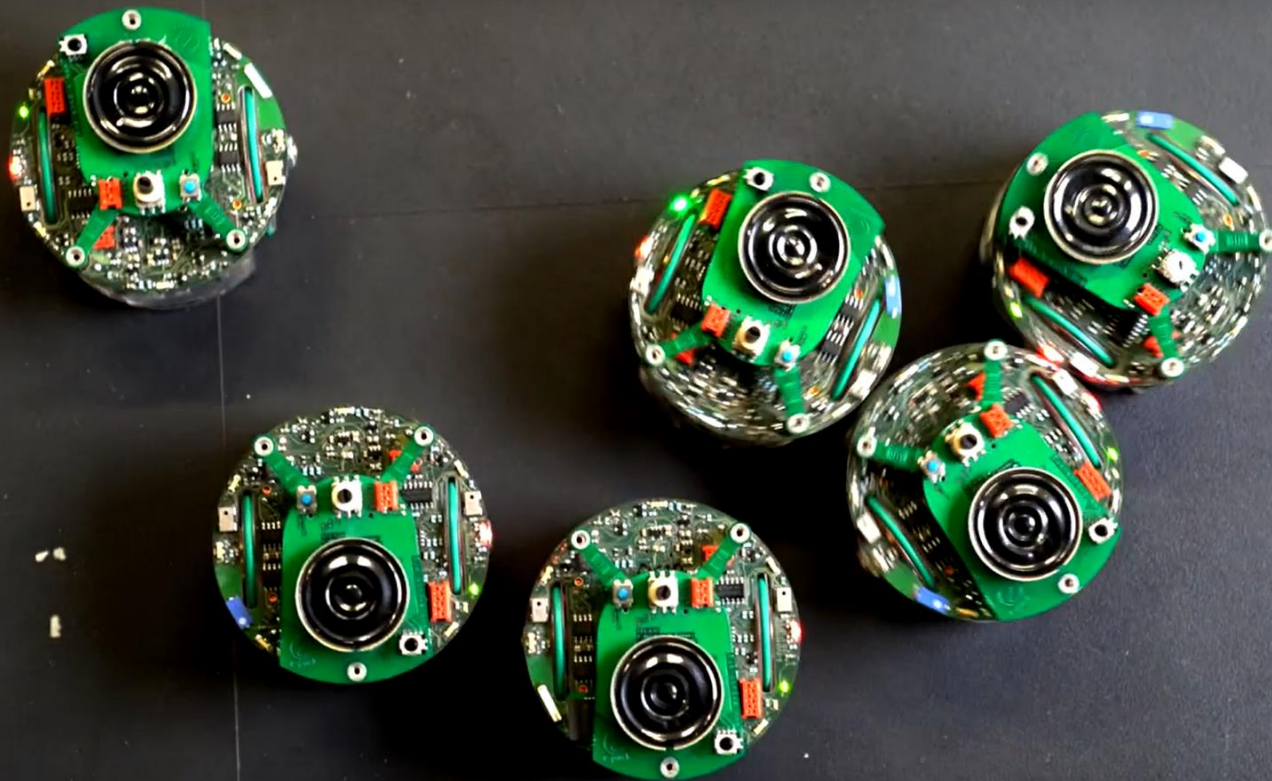
Student Testimony

Sébastien de Rivaz
about the Robotics Master

Student Testimony

Arwen Blanche Giraud
about the Robotics Master

Alumni Testimonies

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

Section Minors

https://sti.epfl.ch/wp-content/uploads/2023/02/Mineur-Technologies-Biomedicales.pdf
https://sti.epfl.ch/wp-content/uploads/2023/02/Prsentation_Mineur-Photonique.pdf
https://imaging.epfl.ch/minor-in-imaging/

Mineur en Photonique

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 !
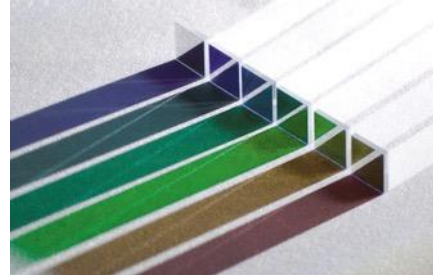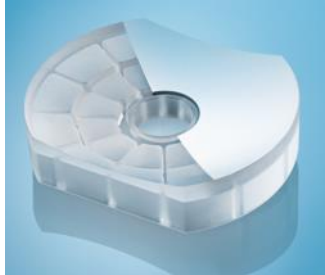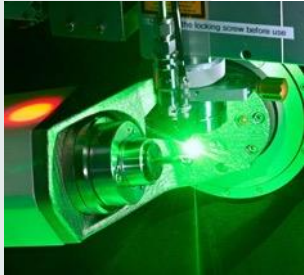
SWISS PHOTONICS

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:
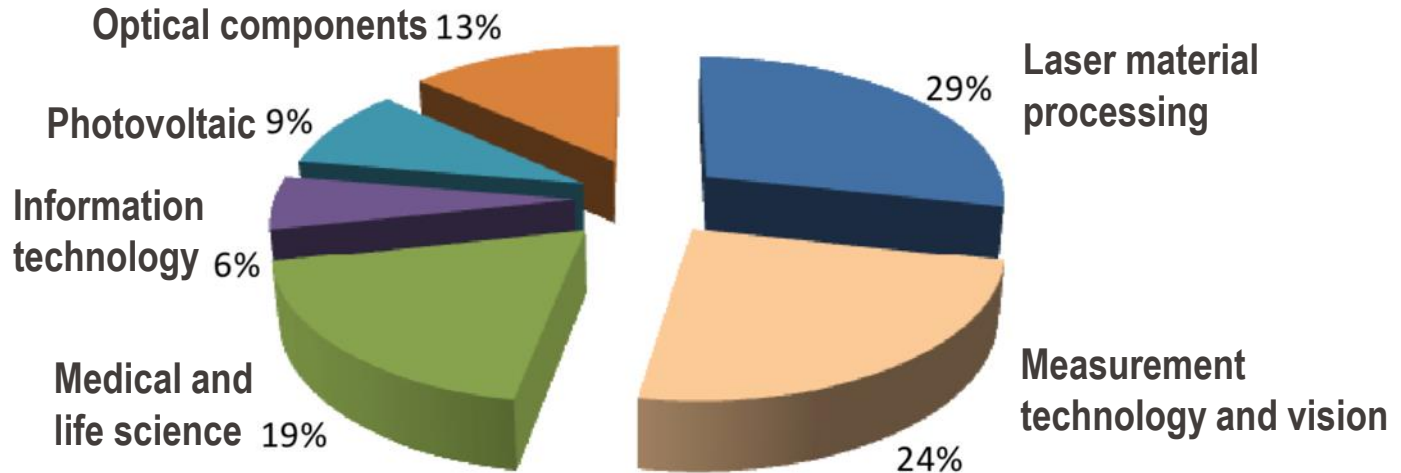
Context for the Minor in Photonics

- 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

Courseplan

CODE	MATIERES	ENSEIGNANTS sous réserve	RET DECOUR	CREDITS ECTS	NBRE PLACES	PERIODE DES COURS	
						AUT	PRI
Groupe "Mineur"				**30**			
Projet obligatoire du mineur en Photonique							
MICRO-488	Project in photonics	Divers enseignants	--	**10**		A	P
Bases en photonique pour étudiants n'ayant aucune formation en photonique							
MICRO-321(a)	Ingénierie optique (pour MT)	Martin + Achouri/Santschi	MT	6		A	
Foundations of photonics							
MICRO-471	Fundamentals of integrated photonic components (pas donné en 2024-25)	Benea-Chelmus	MT	4	20	A	
MICRO-426	Laser fundamentals and applications for engineers	Moser	MT	3			P
MICRO-422	Lasers: theory and modern applications	Moser Ch./Kippenberg + Moser	MT	4		A	
PHYS-501	Nonlinear optics	Roke	MT	4		A	P
PHYS-470	Nonlinear optics for quantum technologies	Galland	PH	4		A	P
MICRO-423	Optics laboratories (spring)	Psaltis/Pu	MT	3			P
MICRO-424	Optics laboratories (autumn)	Psaltis/Pu	MT	3		A	
EE-440	Photonic systems and technology	Brès	EL	4			P
PHYS-434	Physics of photonic semiconductor devices	Grandjean	PH	4			P
PHYS-453	Quantum electrodynamics and quantum optics	Kippenberg	PH	6		A	
PHYS-454	Quantum optics and quantum information	Brantut	PH	6			P
PHYS-425	Quantum physics III	Yazyev	PH	6		A	
MICRO-420	Selected topics in advanced optics	Martin O.	MT	3		A	
PHYS-433	Semiconductor physics and light-matter interaction	Butté	PH	4		A	
MICRO-410	Classical and quantum photonic transducers	Benea-Chelmus	MT	3			P
Applied photonics							
MICRO-565	Fundamentals & processes for photovoltaic devices	Ballif	MT	3			P
BIO-443	Fundamentals of biophotonics	Radenovic	SV	3			P
MICRO-511	Image processing I	Unser/Van de Ville	MT	3		A	
MICRO-512	Image processing II	Liebling/Sage/Unser/Van de Ville	MT	3			P
MICRO-421	Imaging optics Computational Optical Imaging	Psaltis	MT	3			P
MICRO-520	Laser microprocessing	Hoffmann	MT	2			P
MICRO-331	Microfabrication technologies	Brugger/Gijs/Lacour	MT	4		A	
MICRO-516	Nanophotonics	Iadanza/Moselund + Moselund	MT	3			P
MICRO-517	Optical Design with ZEMAX	Pu	MT	3		A	
MICRO-523	Optical detectors	Besse Bruschini	MT	3		A	
MICRO-505	Organic and printed electronics	Briand/Subramanian	MT	2			P
Biomedical photonics							
BIOENG-445	Biomedical optics	Wagnières	SV	3		A	
MICRO-561	Biomicroscopy I	Altug	MT	3		A	
MICRO-562	Biomicroscopy II	Altug + Seitz A.	MT	4			P
CH-448	Photomedicine	Wagnières	CGC	2 3			P

Further information

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

... and don't forget, the photon makes life fun and colorful!

Mineur en Technologies Biomédicales

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

Source : SMTI, 2018

CHIFFRES-CLÉS

1400
entreprises

58500
collaborateurs

15,8
milliards de
CHF de chiffre d'affaires

2,3
% du PIB

Sources : SMTI, 2018

MEDTECH
UNE INDUSTRIE ROMANDE

5000 chercheurs sont actifs dans le secteur

+10% par an tel est le taux de croissance des secteurs de la biotech et de la medtech

80 à 90% des technologies médicales produites en Suisse sont exportées

BIOTECH	MEDTECH	RECHERCHE	INCUBATEURS	FONDATIONS

450 entreprises développent et/ou produisent des médicaments et diverses substances thérapeutiques innovants, notamment par génie génétique.

300 sociétés développent et/ou fabriquent des implants, prothèses, dispositifs implantables, équipements de laboratoire et autres technologies utiles dans le secteur de la santé.

500 laboratoires de sciences de la vie sont implantés dans les hautes écoles, universités et hôpitaux universitaires de la région. Rapporté au nombre d'habitants, leur taux de publications scientifiques les place au 3e rang en Europe (après Cambridge et Oxford en Grande-Bretagne).

8 «pouponnières d'entreprise» et parcs scientifiques favorisent l'émergence et le développement des start-up en mettant à leur disposition des locaux et du coaching et en les aidant à obtenir les capitaux nécessaires pour démarrer leur activité.
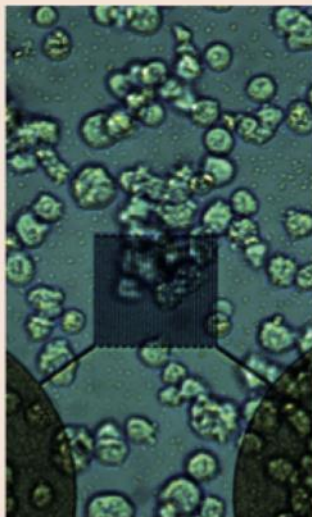
9 fondations internationales et suisses sont implantées dans la région. Elles soutiennent financièrement les entreprises et les centres de recherche travaillant dans les sciences de la vie. La présence de l'OMS (Organisation mondiale de la santé) à Genève participe au rayonnement de la région.

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, <u>mandatory</u>) 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

Courseplan

| CODE	MATIERES	ENSEIGNANTSsous réserv	LIVRET DE COURS	REDITSECTSBREPLACES			PERIODE DES COURS	
							AUT	PRI
Groupe "Mineur"				**30**				
Projet obligatoire du mineur en Technologies biomédicales								
MICRO-563	Project in biomedical technologies	Divers enseignants	--	**8**			A	P
Bases biomédicales 1)								
PHYS-301	Biophysics : physics of the cell	Manley	PH	3				P
BIO-105	Cellular biology and biochemistry for engineers	Zufferey	IN	4			A	
BIO-377	Physiologie par systèmes	Roy	SV	4				P
MICRO-568	Seminar in physiology and instrumentation	Radenovic	EL	2			A	
Autres cours								
PHYS-XXX	MRI Practicals on CIBM preclinical imaging systems	Cudalbu / Lanz	PH	3			A	
NX-XXX	Regulatory, quality and Clinical affairs	Kim Rochat	NX	2			A ?	P?
EE-518	Analog circuits for biochip	Carrara/Schmid/Skrivervik	EL	3				P
EE-512	Applied biomedical signal processing	Lemay	EL	4			A	
EE-519	Bioelectronics and biomedical microelectronics	Schmid	EL	3			A	
BIO-410	Bioimage informatics	Sage/Seitz	SV	4				P
BIOENG-421	Basics in bioinstrumentation *	Merten	SV	4	18		A	
NX-465	Computational neurosciences: neuronal dynamics	Gerstner	NX	5				P
ME-481	Biomechanics of the cardiovascular system	Stergiopulos	GM	3				P
ME-482	Biomechanics of the musculoskeletal system	Pioletti	GM	5				P
BIOENG-445	Biomedical optics	Wagnières G.	SV	3			A	
MICRO-561	Biomicroscopy I	Altug	MT	3			A	
MICRO-562	Biomicroscopy II	Altug+Seitz A.	MT	4				P
EE-517	Bio-nano-chip design	Carrara	EL	3			A	
PHYS-302	Biophysics : physics of biological systems	Rahi Sahand J.	PH	4			A	
PHYS-438	Fundamentals of biomedical imaging	Gruetter	PH	4				P
BIO-443	Fundamentals of biophotonics	Radenovic A.	SV	3				P
EE-515	Fundamentals of biosensors and electronic biochips (pas donné en 2023-2	Guiducci	EL	3	70		A	
MICRO-321(a)	Ingénierie optique (pour MT)	Martin + Achouri/Santschi	MT	6			A	
MICRO-390	Light, liquids and interfaces	Roke S.	MX	4				P
ME-480	Mechanobiology: how mechanics regulate life	Persat/Sakar	GM	3			A	
MICRO-331	Microfabrication technologies	Brugger/Gijs/Lacour	MT	4			A	
CH-413	Nanobiotechnology	Steinauer	CGC	3				P
NX-422	Neural interfaces	Lacour/Shoaran	NX	6			A	
NX-421	Neural signals and signal processing	Micera/Van De Ville	NX	6			A	
BIO-482	Neuroscience: cellular and circuit mechanisms	Crochet/Petersen	SV	5			A	
BIO-491	New tools & research strategies in personalized health	Friedli/Trono + Friedli	SV	4				P
ME-484	Numerical methods in biomechanics	Terrier A.	GM	3				P
EE-511	Sensors in medical instrumentation	Chételat/Ionescu	EL	3				P
NX-423	Translational neuroengineering	Blanke/Courtine/Hummel/Mi	NX	6				P

Minor in Imaging

Imaging: from nano to macro
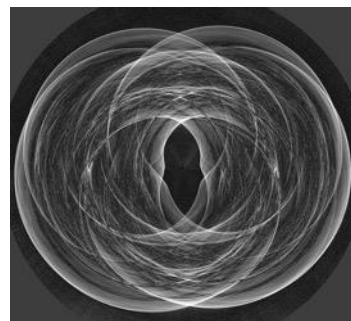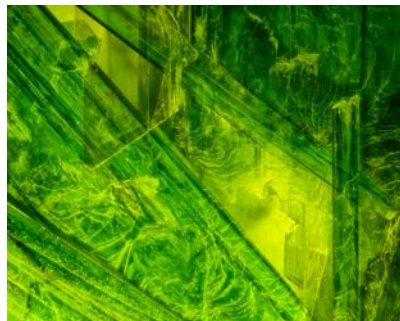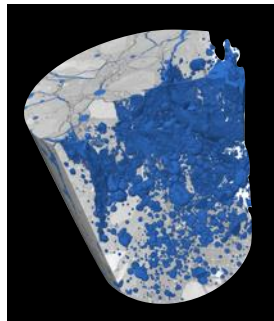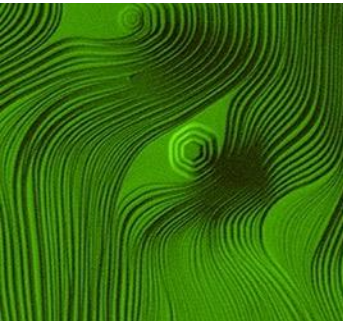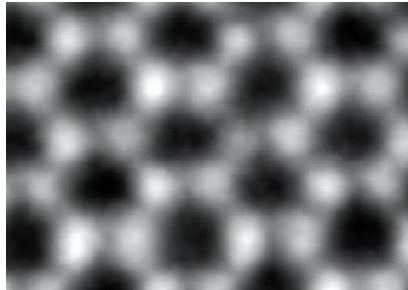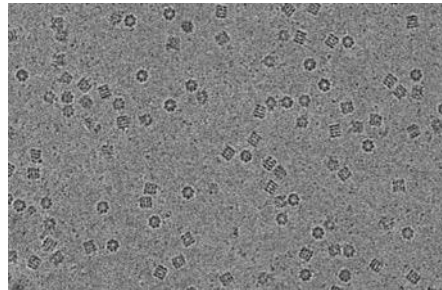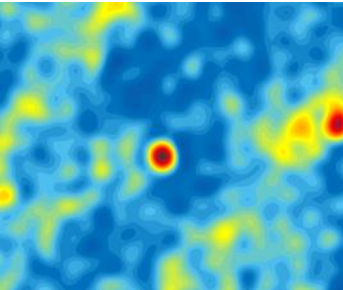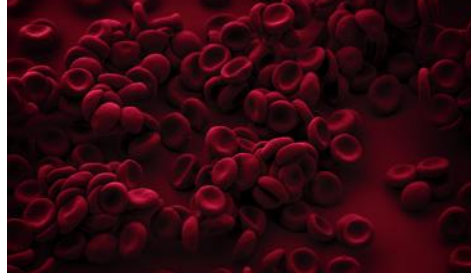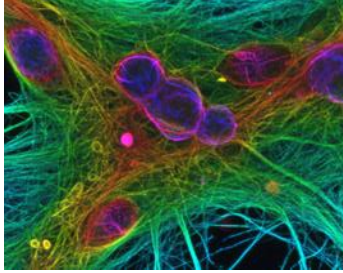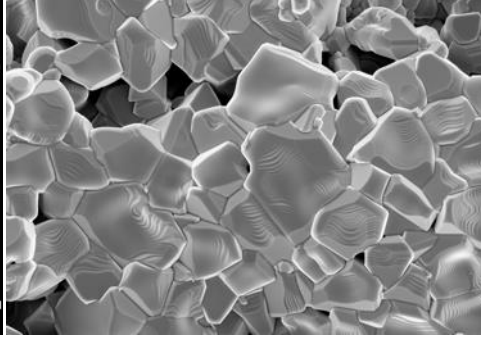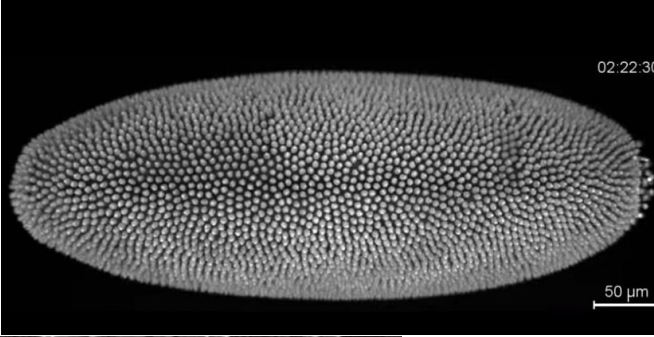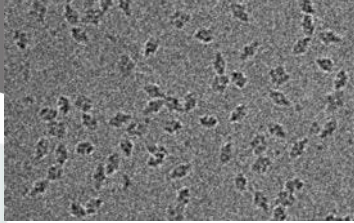
Rich but scattered
imaging curriculum

Skills in high demand by
industry and academia
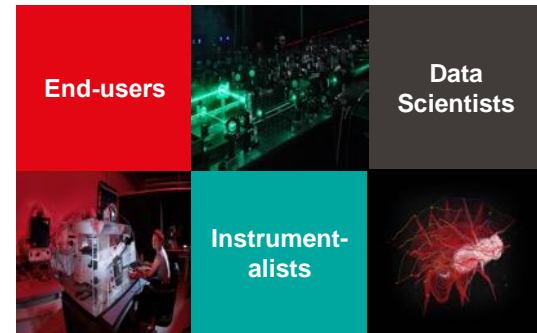
Interdisciplinary field
par excellence

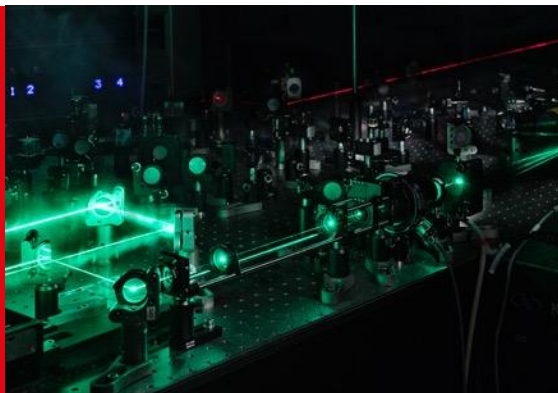EPFL: unique concentration
of academic strengths

Strategical context

Imaging: a transversal field

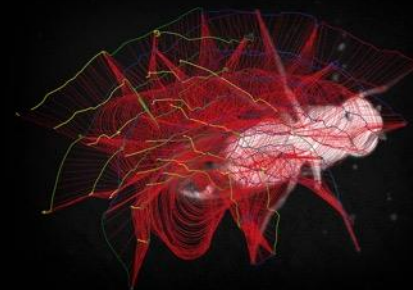Most of the future progress will likely result from **cross-fertilisation between various disciplines.**


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**

Imaging@EPFL Initiative
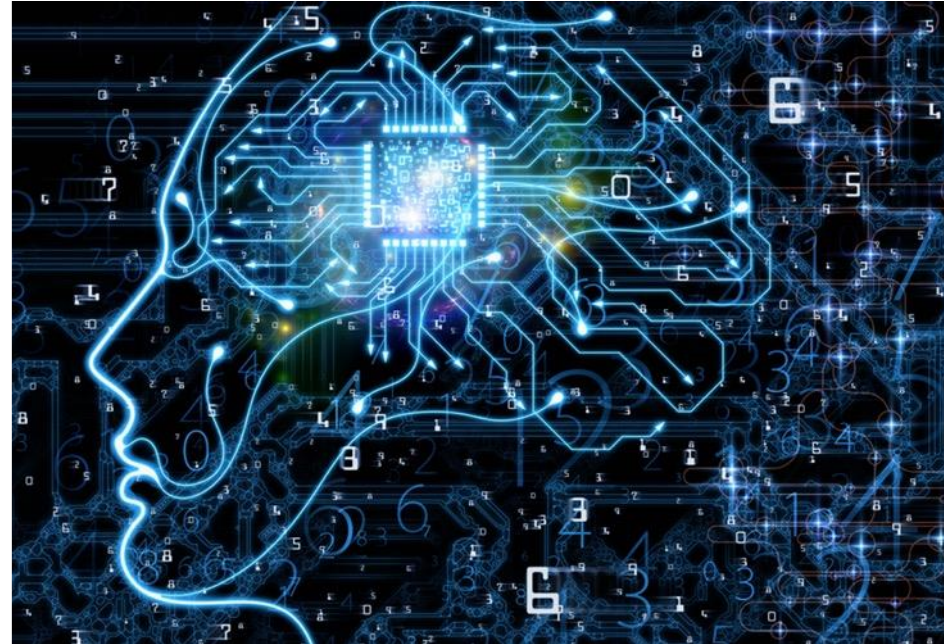
Pedagogical Concept

- **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.**
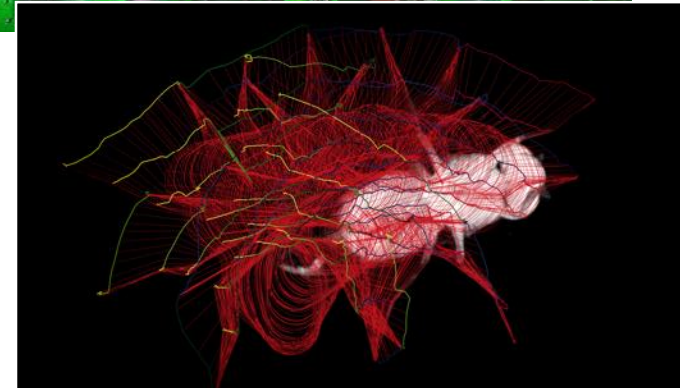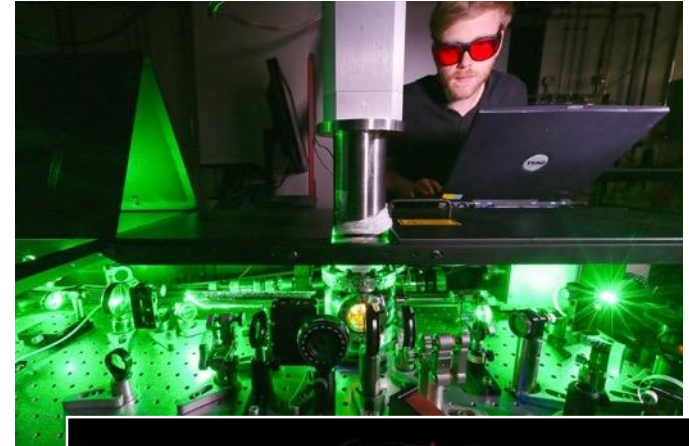
Interest from (Swiss) Industry

- 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.
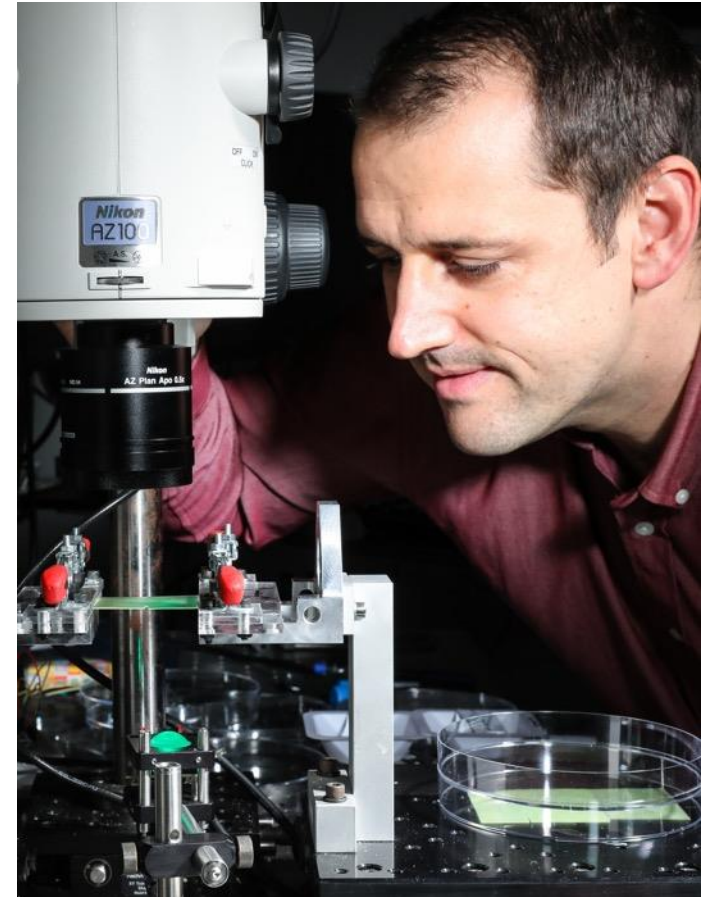
Nurturing advanced imaging at EPFL, across scales and domains
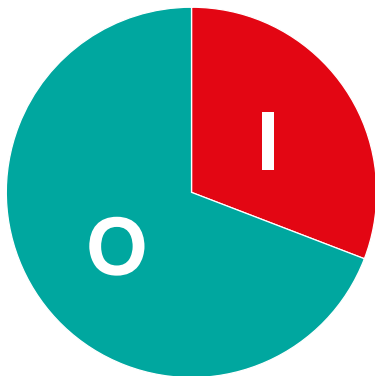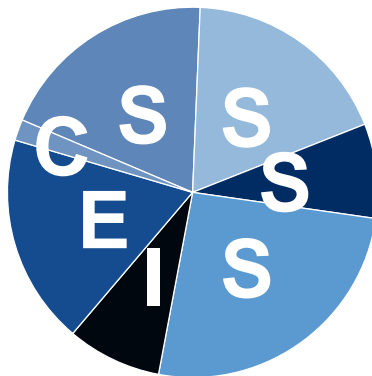

Core Pillars

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

The EPFL landscape in imaging

Imaging Labs at EPFL (Overall)

Imaging Labs per EPFL School

- A fantastic **concentration of academic strengths** in imaging

- Covers **all scales** and spanning a **broad range of applications**

- **Cutting-edge facilities** for image acquisition

- Trained and **skilled staff**

- Wide array of imaging courses (**imaging curriculum**)

In Summary

The EPFL Minor in Imaging:

- **Holistic program**:
    - imaging from instrumentation to computation
    - theoretical and practical aspects

- **25 courses (90ECTS)**

- Mostly **application-agnostic**

- Mandatory (interdisciplinary) **student project**

- Open to all EPFL Master students

- **Strong interest from industry and academia**

Courseplan

CODE	MATIERES	ENSEIGNANTSsous réserve de	RET DECOUR	CREDITSECTS	NBRE PLACES	PERIODE DES COURS	
						AUT	PRI
Groupe "Mineur"				30			
Projet obligatoire du mineur en Imagerie							
MICRO-489	Project in Imaging	Divers enseignants	--	**8**		A	P
Bases en imagerie							
MATH-xxx	Mathematics of imaging (dès 2024-2025)	Unser/Simeoni/Guizar		3		A	
	Autres cours						
	Instrumentation and Optics						
MSE-450	Electron microscopy: advanced methods	Alexander	MX	3			P
BIO-443	Fundamentals of biophotonics	Radenovic	SV	3			P
MICRO-421	Computational Optical Imaging	Psaltis	MT	3			P
MICRO-428	Metrology	Bruschini/Charbon/Fantner	MT	3			P
MICRO-429	Metrology practicals	Bruschini/Charbon/Fantner	MT	2			P
MICRO-523	Optical detectors	Bruschini	MT	3		A	
	Image Processing and Analysis						
CS-413	Computational photography	Süsstrunk	IN	6			P
CS-442	Computer vision	Fua	IN	6			P
MICRO-573	Deep learning for optical imaging	Psaltis	MT	3			P
EE-451	Image analysis and pattern recognition	Bozorgtabar/Thiran	EL	4			P
MICRO-511	Image processing I	Unser/Van de Ville	MT	3		A	
MICRO-512	Image processing II	Liebling/Sage/Unser/Van de Ville	MT	3			P
EE-490(f)	Lab in signal and image processing	Thiran	EL	4			P
COM-514	Mathematical foundations of signal processing	Fageot/Simeoni	SC	6		A	
CS-503	Visual intelligence : machines and minds	Zamir	IN	6			P
	Application-Specific Courses						
BIO-410	Bioimage informatics	Sage/Seitz	SV	4			P
MICRO-561	Biomicroscopy I	Altug	MT	3		A	
MICRO-562	Biomicroscopy II	Altug/Seitz	MT	4			P
PHYS-438	Fundamentals of biomedical imaging	Gruetter	PH	4			P
ENV-540	Image processing for Earth observation	Tuia	SIE	4		A	
NX-421	Neural signals and signal processing	Micera/Van De Ville	NX	6		A	
CIVIL-510	Quantitative imaging for engineers	Andò	GC	3		A	
ENV-408	Sensing and spatial modeling for earth observation	Berne/Skaloud/Tuia	SIE	5			P
PHYS-XXX	MRI Practicals on CIBM preclinical imaging systems	Cudalbu / Lanz	PH	3		A	

EPFL
mt microtechnique
microengineering
section

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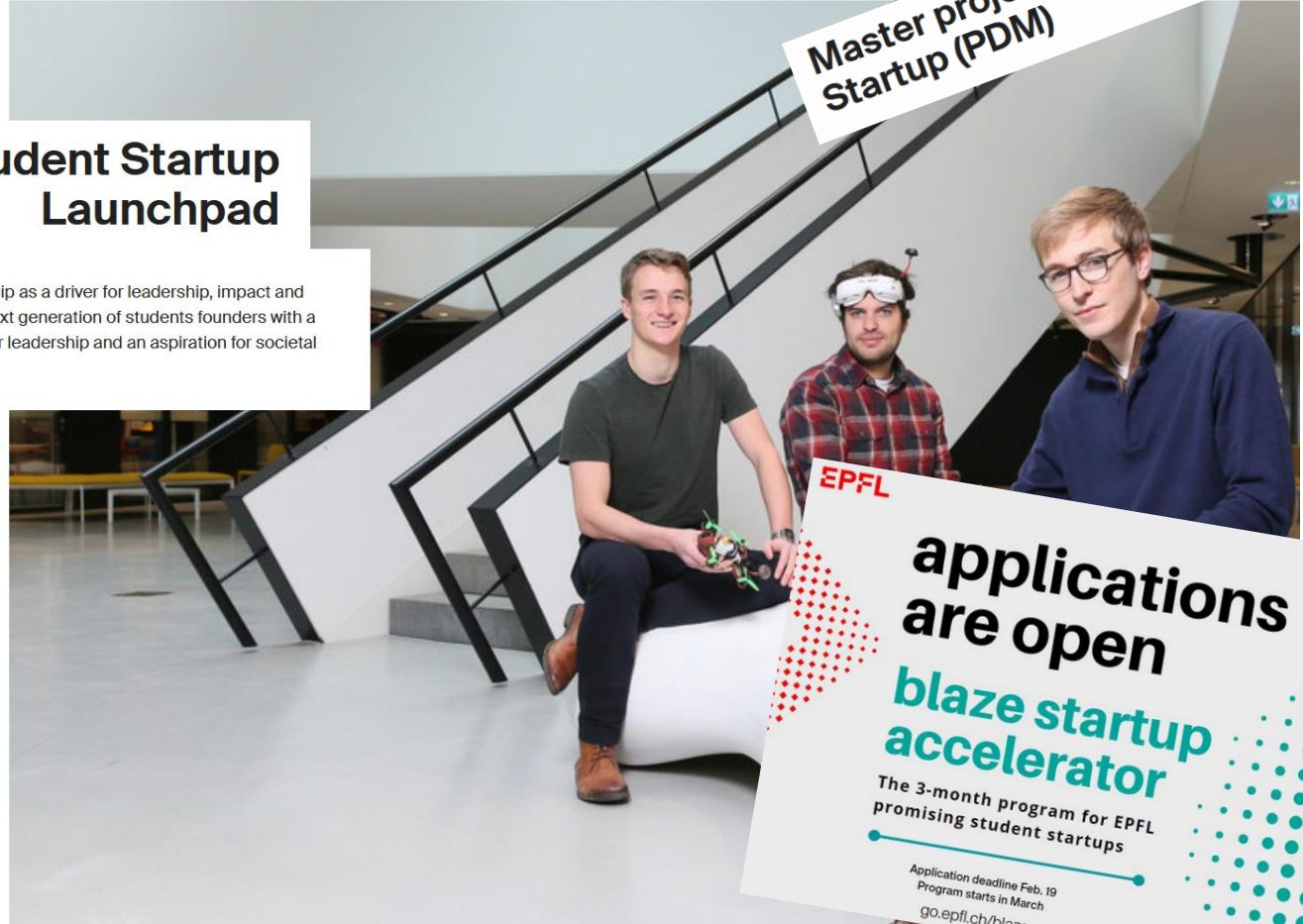de l'Ingénieur (STI)

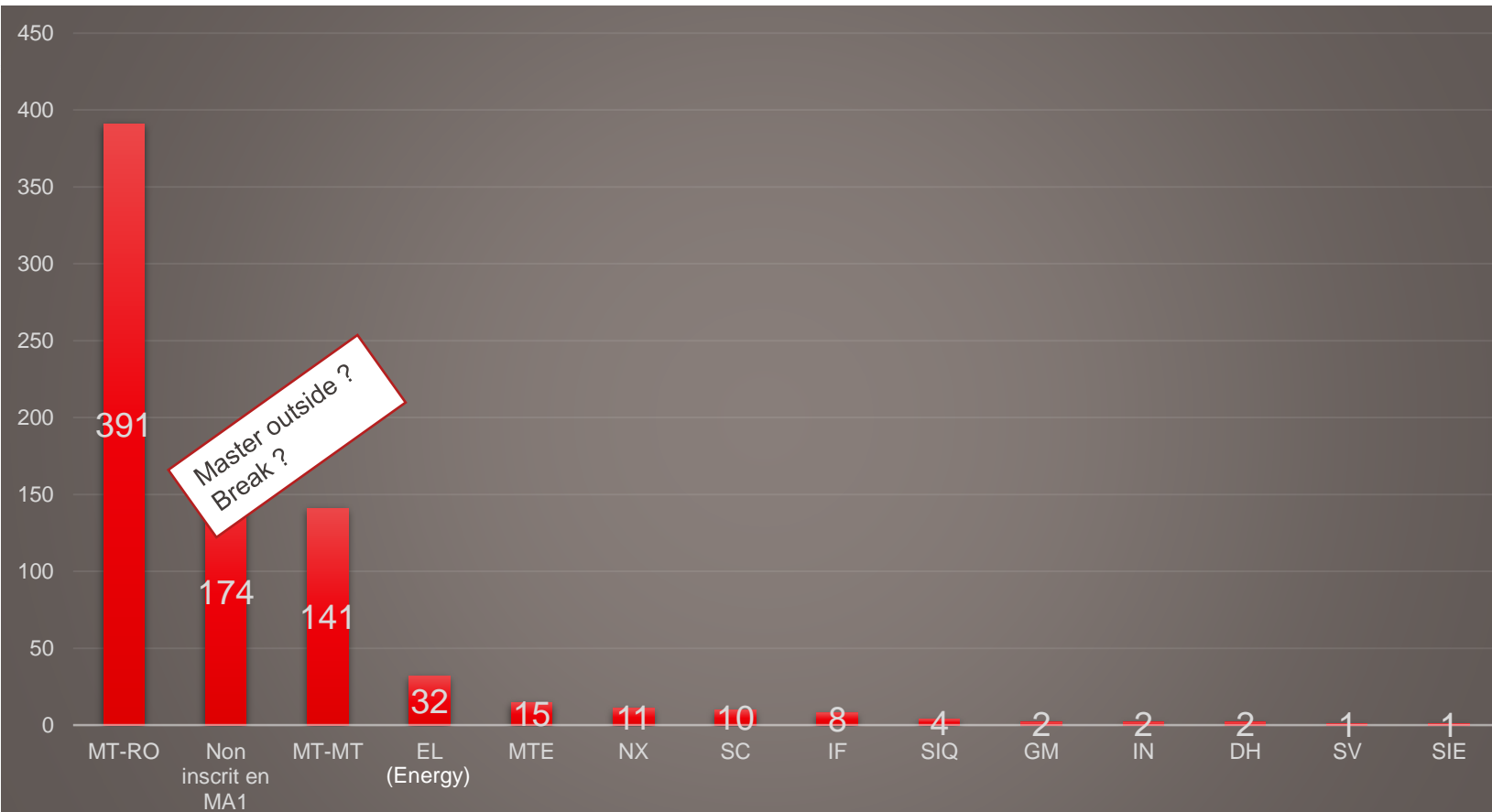# Beyond your studies

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.

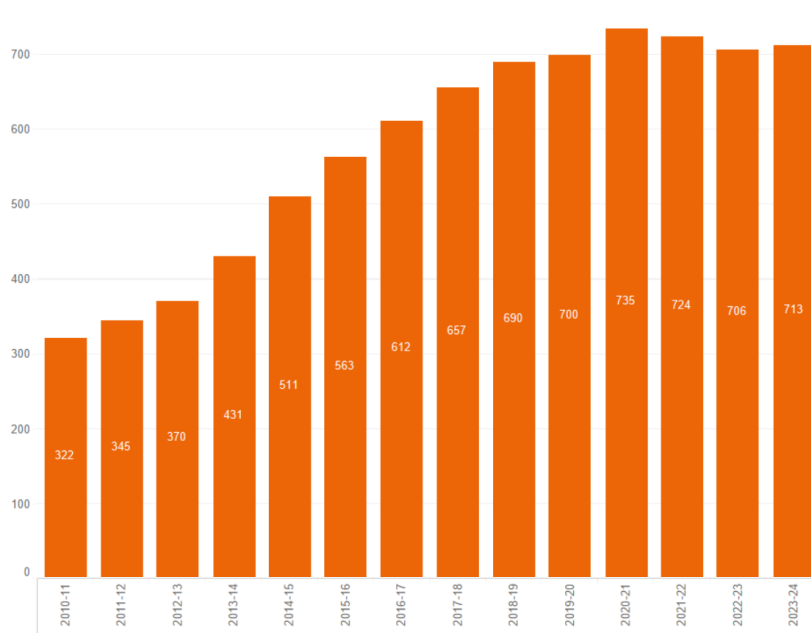**Master project in your Startup (PDM)**

EPFL

applications are open

blaze startup accelerator

The 3-month program for EPFL promising student startups

Application deadline Feb. 19
Program starts in March

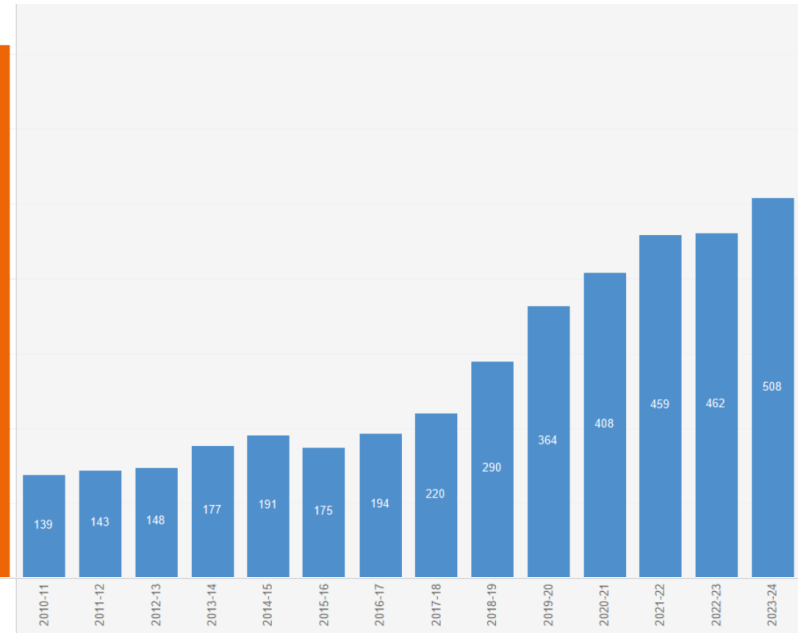go.epfl.ch/blaze

Master studies after MT Bachelor 2019 -2023

Successful curricula (>1200 students)

Bachelor
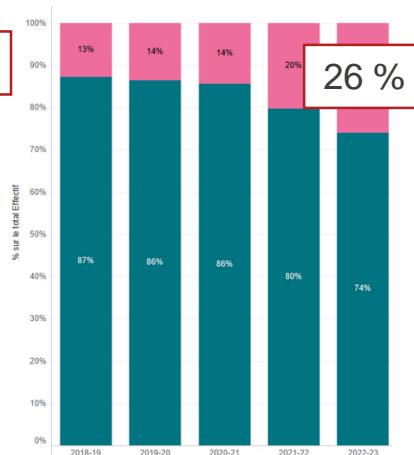
Master
Microengineering & Robotics

Gender balance

Bachelor

21 %

Master
MT

26 %

Master
RO

16 %
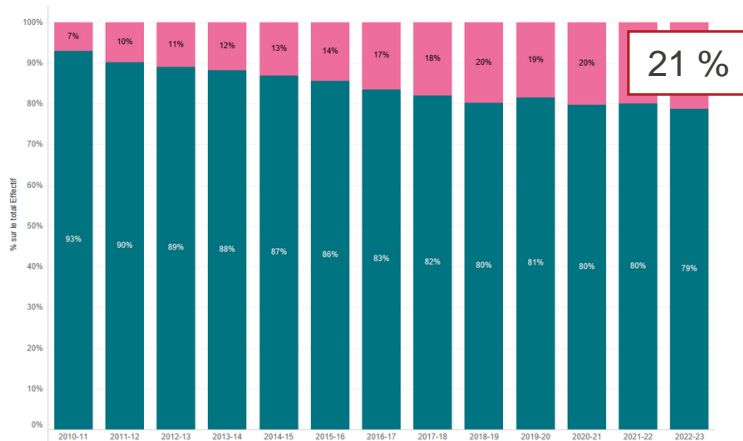
Fall 2023
32% female

84 female
261 male

Fall 2023
25% female
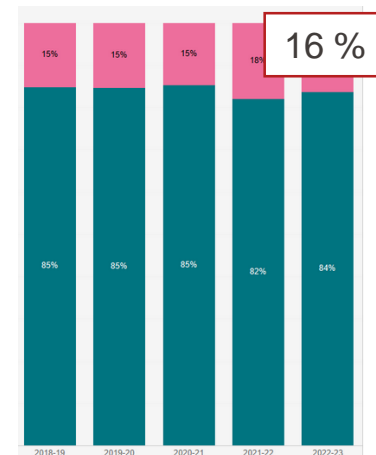
Fall 2023
21% female

Worldwide recognition

EPFL
mt
microtechnique
microengineering
section

EduRank

28. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Engineering

#4 in Europe

#1 in Switzerland

Enrollment 12,576

EPFL

8. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Robotics

#1 in Europe

#1 in Switzerland

EPFL

14. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Nanotechnology

#2 in Europe

#1 in Switzerland

Enrollment 12,576

EPFL

8. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Electrical Engineering

#1 in Europe

#1 in Switzerland

EPFL

20. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Materials Science

#3 in Europe

#1 in Switzerland

EPFL

23. Federal Institute of Technology Lausanne

🇨🇭 Switzerland | Lausanne

For Optical Engineering

#4 in Europe

#1 in Switzerland

EPFL

Course attendance and online offer

- Take profit as much as possible from **presential courses** and interact with teachers and assistants
- 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 welcome you in class in order to have the best dynamic and pedagogical teaching style possible

Course evaluations

- Each semester, all courses given at EPFL are evaluated by registered students (week 5 and week 14)

- 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

Before contacting the Section ...

smt.epfl.ch

Master FAQs

Microenginering

Robotics

Get in touch with your study advisors

- Advanced Manufacturing : Yves Bellouard

- Micro/nanosystems : Giovanni Boero

- Photonics : Olivier Martin

- Robotics Master and orientations : Francesco Mondada

Minors

- Biomedical Technologies Minor : Philippe Renaud / Carlotta Guiducci

- Photonics Minor : Olivier Martin

- Imaging Minor : Daniel Sage

Industry internship

- Industry Internships : Hind Klinke

Administration : Isabelle Schafer

Infos et bureau de la section MT

Le secrétariat (BM1136) est à votre disposition tous les jours de 8h à 14h non-stop pour les questions administratives :

- Isabelle Schafer (assistante administrative)

Pour les questions de **Cursus et plans d'études, merci de prendre rendez-vous avec**

- Sebastian Gautsch (adjoint)

Q & A

All the Best for your Master studies !