

EPFL



Master Programs @ IC

Prof. Serge Vaudenay

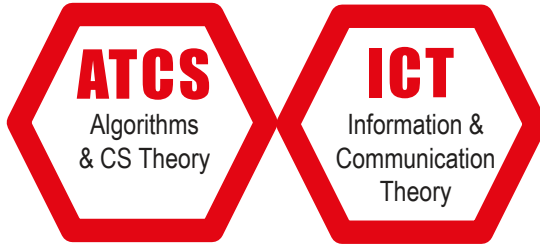
February 28, 2024
SG 1 – 19h15-19h45



School of Computer and Communication Sciences - IC

- Internationally highly ranked
- 54 + (6 joint) professors
- Internationally recognized
- Strong industrial liaison
- Core + interdisciplinary science: Collaboration with Life Sciences, Mathematics, Microengineering, Electrical Engineering, etc.
- Doctoral program (EDIC)

IC Research at a glance



theory, foundations,
fundamental limits...



learning from data, extracting
knowledge, transforming data ...



building real
systems, all layers...



interfacing with
humans ...

Why choose IC ?

CS is everywhere:

- You can work as a Core Engineer at the smallest farm, in the public sector, in the private sector, in the industry, in the research, in the education, in the health, in the environment, in the energy, in the transportation, in the defense, in the space, in the agriculture, in the fishing, in the mining, in the manufacturing, in the construction, in the real estate, in the finance, in the law, in the politics, in the media, in the entertainment, in the sports, in the arts, in the culture, in the religion, in the philosophy, in the psychology, in the sociology, in the anthropology, in the history, in the geography, in the biology, in the chemistry, in the physics, in the astronomy, in the earth sciences, in the environmental sciences, in the life sciences, in the medical sciences, in the behavioral sciences, in the social sciences, in the humanities, in the languages, in the literature, in the music, in the theater, in the film, in the television, in the radio, in the internet, in the mobile phones, in the computers, in the software, in the hardware, in the robotics, in the artificial intelligence, in the big data, in the cloud computing, in the blockchain, in the quantum computing, in the nanotechnology, in the biotechnology, in the space exploration, in the defense, in the intelligence, in the security, in the cybersecurity, in the information technology, in the digital marketing, in the e-commerce, in the online gaming, in the virtual reality, in the augmented reality, in the mixed reality, in the metaverse, in the digital transformation, in the Industry 4.0, in the smart cities, in the smart homes, in the smart grids, in the smart transportation, in the smart agriculture, in the smart manufacturing, in the smart energy, in the smart infrastructure, in the smart mobility, in the smart education, in the smart healthcare, in the smart environment, in the smart governance, in the smart economy, in the smart society, in the smart future.

CS changes fast:

- You won't get bored.
- You can do many different things.

The world in general, and Switzerland in particular, need Scientists and Engineers:

- Jobs are easy to find (1000 in the public sector, 1000 in the private sector, 1000 in the industry, 1000 in the research, 1000 in the education, 1000 in the health, 1000 in the environment, 1000 in the energy, 1000 in the transportation, 1000 in the defense, 1000 in the space, 1000 in the agriculture, 1000 in the fishing, 1000 in the mining, 1000 in the manufacturing, 1000 in the construction, 1000 in the real estate, 1000 in the finance, 1000 in the law, 1000 in the politics, 1000 in the media, 1000 in the entertainment, 1000 in the sports, 1000 in the arts, 1000 in the culture, 1000 in the religion, 1000 in the philosophy, 1000 in the psychology, 1000 in the sociology, 1000 in the anthropology, 1000 in the history, 1000 in the geography, 1000 in the biology, 1000 in the chemistry, 1000 in the physics, 1000 in the astronomy, 1000 in the earth sciences, 1000 in the environmental sciences, 1000 in the life sciences, 1000 in the medical sciences, 1000 in the behavioral sciences, 1000 in the social sciences, 1000 in the humanities, 1000 in the languages, 1000 in the literature, 1000 in the music, 1000 in the theater, 1000 in the film, 1000 in the television, 1000 in the radio, 1000 in the internet, 1000 in the mobile phones, 1000 in the computers, 1000 in the software, 1000 in the hardware, 1000 in the robotics, 1000 in the artificial intelligence, 1000 in the big data, 1000 in the cloud computing, 1000 in the blockchain, 1000 in the quantum computing, 1000 in the nanotechnology, 1000 in the biotechnology, 1000 in the space exploration, 1000 in the defense, 1000 in the intelligence, 1000 in the security, 1000 in the cybersecurity, 1000 in the information technology, 1000 in the digital marketing, 1000 in the e-commerce, 1000 in the online gaming, 1000 in the virtual reality, 1000 in the augmented reality, 1000 in the mixed reality, 1000 in the metaverse, 1000 in the digital transformation, 1000 in the Industry 4.0, 1000 in the smart cities, 1000 in the smart homes, 1000 in the smart grids, 1000 in the smart transportation, 1000 in the smart agriculture, 1000 in the smart manufacturing, 1000 in the smart energy, 1000 in the smart infrastructure, 1000 in the smart mobility, 1000 in the smart education, 1000 in the smart healthcare, 1000 in the smart environment, 1000 in the smart governance, 1000 in the smart economy, 1000 in the smart society, 1000 in the smart future.
- Switzerland needs 10'000 fewer than 200 in the top 100 companies, CHF 130K after 3-4 years.

Date: 14.10.2019

LE TEMPS



25 Visionnaires pour la Suisse et l'Europe
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Les entreprises s'arrachent les jeunes informaticiens

CAMILLE CHAPPUIS
RECRUTEMENT La 37e édition du Forum EPFL s'est tenue en fin de semaine dernière au SwissTech Convention Center. Etudiants et recruteurs se sont rencontrés sur les stands des entreprises jeudi et vendredi. Constat: ces dernières déroulent le tapis rouge aux jeunes issus des filières informatiques

Elles représentent toutes une industrie différente, mais elles recherchent toutes la même chose. La semaine dernière, 190 entreprises étaient présentes au Swiss-Tech Convention Center à l'occasion de la 37e édition du Forum EPFL pour tenter d'attirer de nouvelles recrues. Le recrutement de logiciels, apprentissage automatique – une des branches de l'intelligence artificielle – et technologie de l'information). Des branches devenues cruciales à l'heure du tournant numérique imposé aux sociétés.

Non seulement ce type de profils ont la cote, mais surtout ils ne sont pas aisés à recruter. Jennifer Naim, spécialiste en ressources humaines chez Sicipa, active dans les systèmes d'authentification, témoigne: «Nous sommes surtout connus pour nos activités en lien avec les encres de sécurité, mais nous avons de plus en plus de besoins dans le digital et dans le software engineering. Nous

«Les personnes issues des domaines de l'informatique sont compliquées à recruter», confirme Franck Guérin, directeur de Continuum International, cabinet de chasseurs de têtes en Suisse romande et en France. D'une part, parce que le nombre de professionnels disponibles est faible par rapport à la forte demande des entreprises. «D'autre part, parce que, lassées d'être assaillies de sollicitations, notamment sur LinkedIn, ces personnes ne sont pas facilement atteignables», poursuit le chasseur de talents.

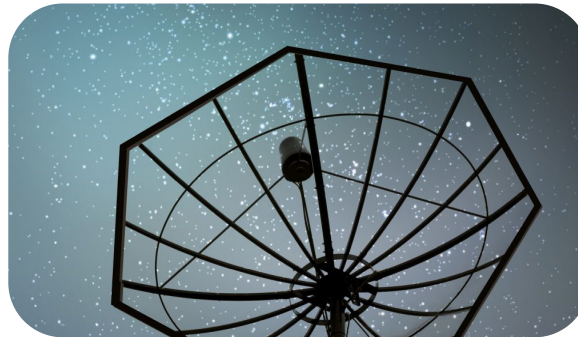
Tapis rouge pour les informaticiens...

EPFL Our Master programs

School of Computer & Communication Sciences



Computer Science
go.epfl.ch/master-IN



Communication Systems
go.epfl.ch/master-SC



Cyber Security
go.epfl.ch/master-cyber

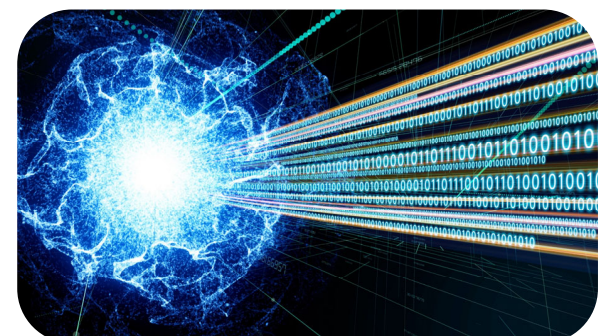


Data Science
go.epfl.ch/master-DS

Cross-School Programs presented separately



Neuro_X (STI-SV-IC)



Quantum Science and
Engineering (IC-STI-SB)

EPFL Master in Computer Science with Specialization in Teaching in collaboration with HEP-VD

COMPUTER SCIENCE MASTER

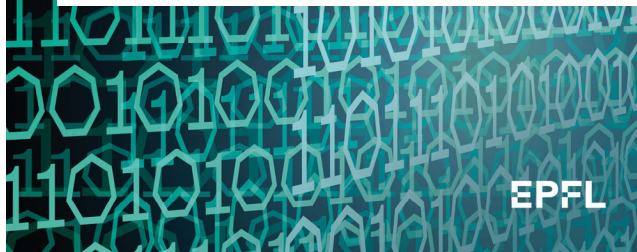
COMMUNICATION SYSTEMS MASTER

DATA SCIENCE MASTER

This is a joint program between EPFL and HEP-VD to train high school teachers in Computer Science in Switzerland.

The program consists of **120 + 9 ECTS credits**:

- 1st year: corresponding to studies in IN, SC or DS
- 2nd year: composed of the Master's project + specialization courses at HEP.



EPFL Our four Master programs

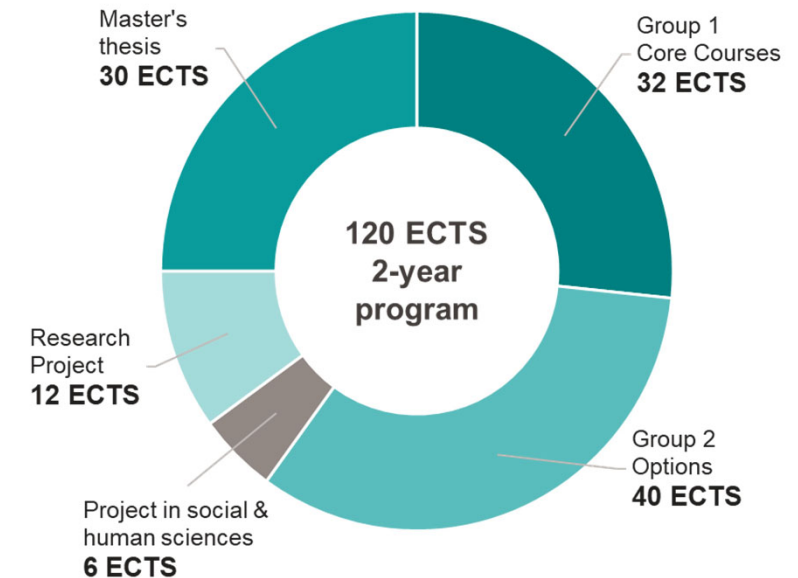
- Our 4 Master's are **designed to be flexible** to allow students to tailor their courses to their ambitions.
- The main difference between the 4 Master's lies in the **choice of Group 1 (Core)** courses.
- The choice of **Group 2 courses (Options)** is very similar across the 4 Master's.
- For Cyber Security, the **depth requirement** must be fulfilled.

Group 1 – Core courses (min. 32 credits)	IN	Cyber	SC	DS
Advanced computer architecture	8	8		
Advanced probability and applications			8	
Advanced topics on privacy enhancing tech.		8		
Algorithms II	8	8	8	8
Applied data analysis				8
Cryptography and security	8	8	8	
Decentralized systems engineering	8	8		
Distributed algorithms	8	8	8	
Foundations of Data Science				8
Foundations of software	8	8		
Information security and privacy	8	8	8	8
Information theory and coding			8	
Machine learning	8	8	8	8
Mobile networks			8	
Modern digital comm.: a hands-on approach			8	
Modern natural language processing	8			8
Optimization for Machine Learning				8
Statistical signal and data processing through apps.			8	
Statistics for Data Science				8
Systems for data management and data science	8	8		8
TCP/IP networking	8	8	8	
ETHZ courses counting as breadth requirement		X		
Minimum 32 credits	~32	~32	~32	~32

Master of Science in COMPUTER SCIENCE

go.epfl.ch/master-IN

- This Master's program offers a choice of courses that covers all aspects of the discipline, ranging from foundations of computer sciences, software and computer systems to big data and construction of software.
- Students may choose a **30 ECTS specialization** or a **minor** included in the 120 ECTS.
- The program includes a compulsory **internship** of eight weeks during the summer, or six months during the semester. The internship can also be **combined with the master's project**.

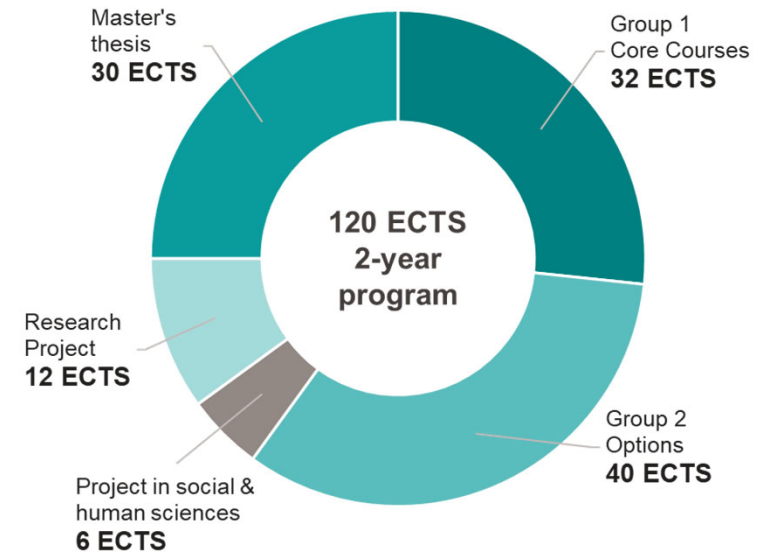


Core courses (min. 32 credits)	cr
Advanced computer architecture	8
Algorithms II	8
Cryptography and security	8
Decentralized systems engineering	8
Distributed algorithms	8
Foundations of software	8
Information security and privacy	8
Machine learning	8
Modern natural language processing	8
Systems for data management and data science	8
TCP/IP networking	8

Master of Science in COMMUNICATION SYSTEMS

go.epfl.ch/master-SC

- This Master's program provides students with a unique education that places emphasis on the interdependence of mathematics, computer science and electrical engineering. It covers fields like wireless communications, networking and mobility, internet computing, information security and signal processing.
- Students may choose a **30 ECTS specialization** or a **minor** included in the 120 ECTS.
- The program includes a **compulsory internship** of eight weeks during the summer, or six months during the semester. The internship can also be **combined with the master's project**.

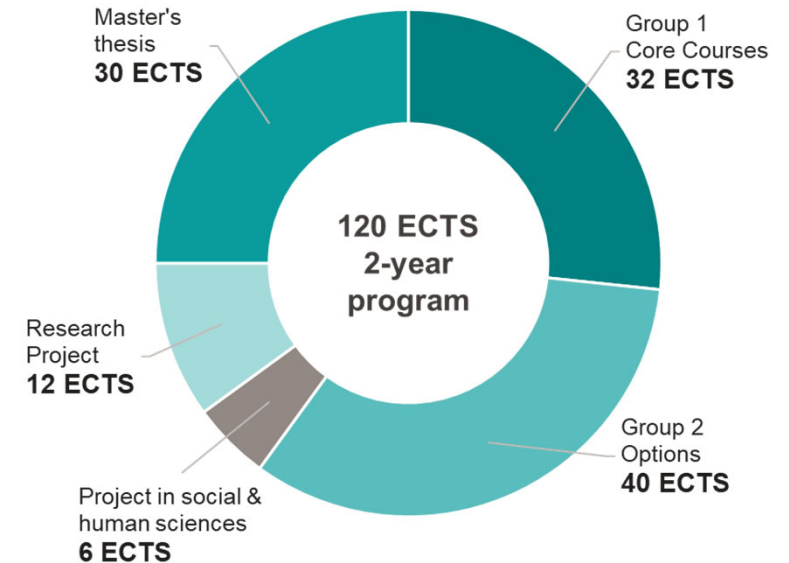


Core courses (min. 32 credits)	cr
Advanced probability and applications	8
Algorithms II	8
Cryptography and security	8
Distributed algorithms	8
Information security and privacy	8
Information theory and coding	8
Mobile networks	8
Modern digital communications	8
Machine learning	8
Statistical signal and data processing	8
TCP/IP networking	8

Master of Science in DATA SCIENCE

go.epfl.ch/master-DS

- The Master's program in data science equips students with all relevant knowledge and skills while combining theoretical foundations with practical experience. It covers a comprehensive education, from the foundations to implementation, from algorithms to database architecture, and from information theory to machine learning.
- Students may choose a **30 ECTS minor** included in the 120 ECTS.
- The program includes a **compulsory internship** of eight weeks during the summer, or six months during the semester. The internship can also be **combined with the master's project**.



Core courses (min. 32 credits)	Cr
Algorithms II	8
Applied data analysis	8
Foundations of data science	8
Information security and privacy	8
Machine learning	8
Modern natural language processing	8
Optimization for machine learning	8
Statistics for data science	8
Systems for data management and data science	8

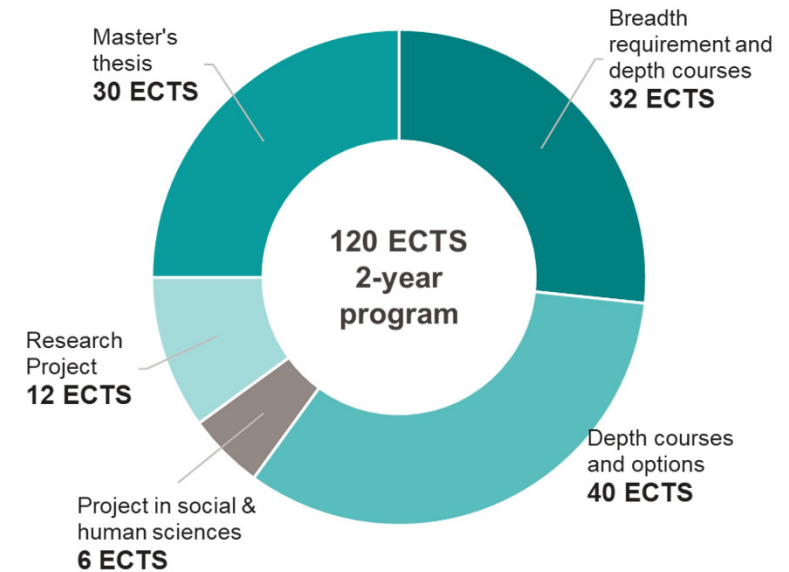
EPFL Master of Science in Cyber Security

go.epfl.ch/master-cyber

Joint master EPF Lausanne – ETH Zürich

- In collaboration with ETHZ, this **joint-degree program** offers a broad set of courses such as cryptography, formal methods, systems, network and wireless security. It aims to provide both foundational and applied knowledge in this quickly expanding domain by leveraging expertise from both universities.
- Students are required to spend **one semester at ETHZ**.
- To satisfy the “depth requirement” **at least 30 ECTS** must be **tagged “depth” (security courses)**, which may be part of Group 1 or 2 & may be taken at EPFL / ETHZ.
- The program includes a **compulsory internship** of eight weeks during the summer, or six months during the semester. The internship can also be **combined with the master's project**.
- The research project and the Master’s project must be **in the field of cyber security**.

■ Master Info Days – February 2024



Breadth / depth courses (min. 32 credits)	cr
Advanced computer architecture	8
Advanced topics on privacy enhancing tech.	8
Algorithms II	8
Cryptography and security	8
Distributed algorithms	8
Decentralized systems engineering	8
Foundations of software	8
Information security and privacy	8
Machine learning	8
Systems for data management and data science	8
TCP/IP networking	8
ETHZ courses counting as breadth / depth	

Specializations and Minors

Specializations (IN & SC only)

- Computer Engineering
- Computer Science Theory
- Cyber Security
- Data Analytics
- Foundations of Software
- Internet Information Systems
- Networking and Mobility
- Signals, Images & Interfaces
- Software Systems
- Wireless Communications

go.epfl.ch/IC-master-specializations

Some examples of Minors taken by IC students

- Computational Biology
- Computational Science & Eng.
- Cyber Security (DS only)
- Engineering for Sustainability
- Financial Engineering
- Imaging
- Management, Technology and Entrepreneurship
- Mathematics
- Neuro-X
- Quantum Science & Eng.
- Spatial Technologies

go.epfl.ch/IC-master-minors

Industry Internships

go.epfl.ch/IC-internships

- Mandatory for all EPFL MS students since 2010.
- Gain valuable work experience, develop and refines your skills.
- Explore a career path.
- Can be done in Switzerland or abroad. IC has a database of more than 3000 industry contacts.
- Internship models
 - **Short, 8 weeks** minimum during the summer.
 - **Long, 6 months** during a semester.
 - Integrated with your **Master's Project** (26 weeks), at the end of the Master's cycle.

EPFL

MAKE CONTACTS IN THE INDUSTRY
 CONVERT ACADEMIC KNOWLEDGE INTO INDUSTRY SKILLS
 TRAVEL
 UNFORGETTABLE LIFE EXPERIENCE
 POSSIBLY LAND A FULL-TIME JOB

INTERNSHIP OFFICE ASSISTANCE
 MORE THAN 5'000 CONTACTS
 APPROXIMATELY 1'000 INTERNSHIP PROPOSALS PER YEAR

INTERNSHIP OF 8 WEEKS DURING THE SUMMER
 INTERNSHIP OF 6 MONTHS DURING THE SEMESTER
 MASTER'S PROJECT IN A COMPANY

Every year, more than 300 students do an internship or a master's project in a company in Switzerland or abroad

INDUSTRY INTERNSHIPS

GOOGLE, SWITZERLAND & USA
 FACEBOOK, USA & UK
 SWISSCOM DIGITAL LAB, SWITZERLAND
 IBM RESEARCH LAB, SWITZERLAND
 LOGITECH, SWITZERLAND
 NEC LABS, GERMANY, USA & JAPAN
 SONY, GERMANY & JAPAN
 ORACLE, SWITZERLAND
 UBISOFT, FRANCE
 CREDIT SUISSE, SWITZERLAND
 AMAZON, IRELAND, SPAIN
 MICROSOFT, USA & EUROPE
 DATHENA SCIENCE PTE LTD, SINGAPORE

EPFL Internships: Host testimonials

"Since we started hosting several interns as part of the EPFL internship program, we have been pleased with these students' hard work and contributions. I always enjoy interacting with these bright young students. We look for unique views these interns can bring. I hope they see IBM Research as a very exciting place to work."

Giovanni Pacifici, IBM T.J. Watson

"EPFL has been doing an excellent job at providing us the best internship candidates for our needs. Everything from selecting the candidates to managing administrative issues has been handled smoothly and efficiently, allowing us to focus on the students and the work to be done."

Stein Lundby, Qualcomm Inc.

EPFL Life after EPFL

COMPUTER SCIENCE

What I liked the most was everyone's commitment, the experience of being there with all these motivated people.

Acacio Da Silva Martins
Senior Software Engineer, AdNovum



DATA SCIENCE

I feel like I have a tailored, personalized master's degree with exactly the courses I wanted. It's the dream scenario.

Emma Lejal Glaude
Data, Analytics and AI Engineer, Swisscom



CYBER SECURITY

The teaching team is really great, it's so motivating to be working alongside the very best and life on campus is excellent. There is some much to do!

Mathilde Aliénor Raynal
PhD student, EPFL Doctoral program in computer and communication sciences



COMMUNICATION SYSTEMS

It's been almost 10 years since my master's and our group are still very good friends, even if we are spread out all around the world!

Arthur Germain
CEO, OneDoc



For IC BS students: Choice of Master's program in IC (IN, Cyber, SC or DS)

- Upon successful completion of your Bachelor, you are directly admitted to a Master's program in IC. External students have to pass through a highly selective application process.
- You can continue your studies in one of the four consecutive Master IC programs: IN, Cyber, SC or DS. The choice is made via the FRAC.
- For holders of a Bachelor SC, the Master Neuro-X is consecutive. Registration is done via the FRAC.
- For the Quantum Science and Engineering Master's degree, an application is required.
- Deadline for change of Master's degree in IC (e.g. SC -> DS, Cyber -> IN): end of 1st semester of Master's studies. In this case, please contact the Section.
- It is possible to take a gap year between the Bachelor's and Master's degrees, and re-enrol in one of our consecutive Master's degrees, if other studies have not been undertaken.

For BS students from other sections: Admission bachelor courses

- If you are thinking of changing your field of study, prepare by taking these BS courses **during your bachelor**.
- **Admission is competitive.** We want to see that you do well in our courses and that you are motivated.

▪ For Computer Science

- Software Construction, 8 cr, 2nd year, fall
- Algorithms I, 8 cr, 2nd year, spring
- Computer systems, 8 cr, 2nd year, spring

▪ For Cyber Security

- Software Construction, 8 cr, 2nd year, fall
- Computer Systems, 8 cr, 2nd year, spring
- Computer Security and Privacy, 6 cr, 3rd year, fall
- Algebra, 4 cr, 3rd year, fall (except for MA, PH, & CH)

▪ For Communications Systems

- Computer Systems, 8 cr, 2nd year, spring
- Modèles Stochastiques pour les Communications, 6 cr, 3rd year, fall
- Signal Processing, 8 cr, 2nd year, fall (except EL, MT, SV)

▪ For Data Science

- Algorithms I, 8 cr, 2nd year, spring
- Data-Intensive Systems, 6 cr, 3rd year, spring
- Prob Stats, 6 cr, 2nd year, fall (only external EPFL candidates)

BS students from other sections: What happens if I do not take the admission courses during my bachelor?

- Should you be admitted, your admission to the Master's program will be conditional on acquiring the additional credits.
- Priority must be given to acquiring these credits during your first-year of study.
- The credits will not count towards your Master's degree.
- You may take Master's courses in parallel with your admission conditions, but it will be your responsibility to deal with schedule overlaps, etc.
- Admission conditions are non-negotiable and cannot be modified.
- **It's best to take these courses during your Bachelor to show your motivation to apply.**

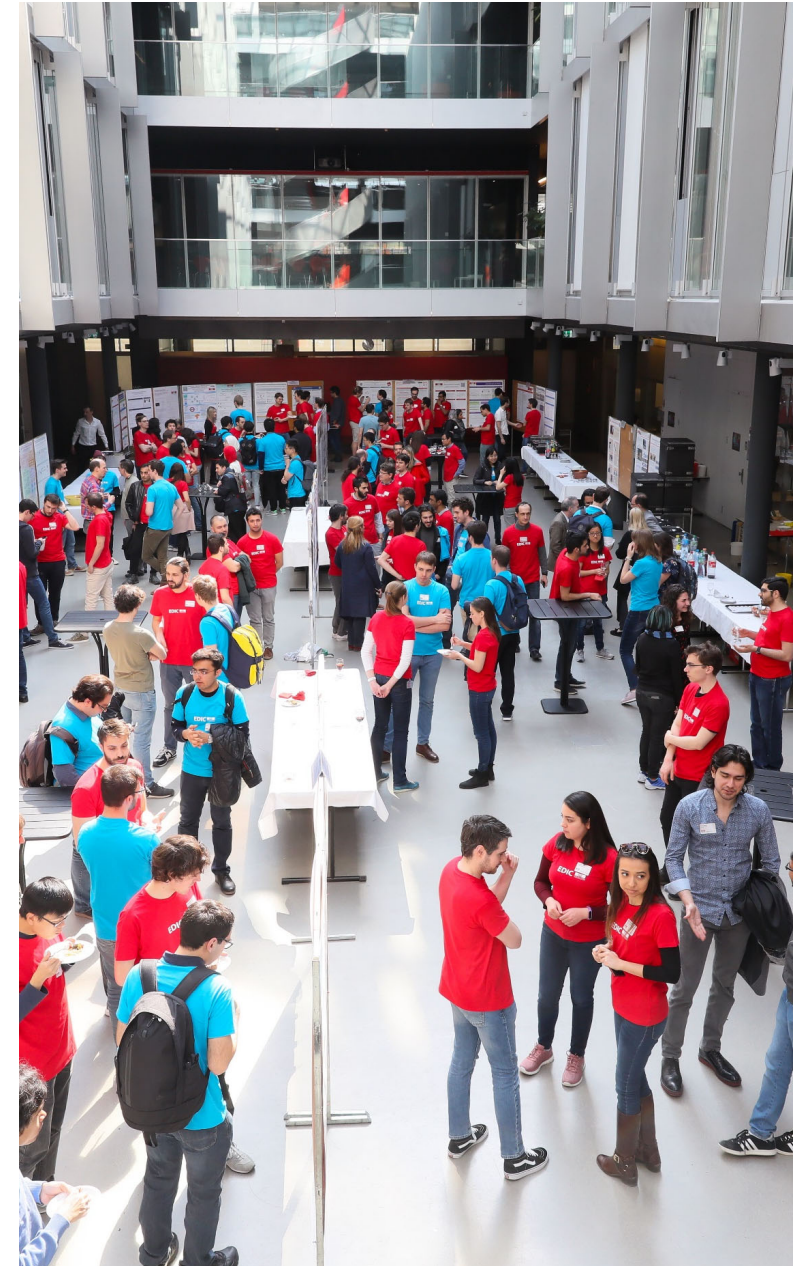
BS students from other sections: How to apply?

go.epfl.ch/master-application

- 1st admission cycle
 - deadline December 15
- 2nd admission cycle
 - deadline March 31

Criteria for admission

- Necessary requirement min. GPA 4.5
- Taken some BS admission courses with good results
- Quality of application, relevance of BS program compared to the MS cursus of interest, motivation, ...



For students in other sections: Minors offered by IC

go.epfl.ch/IC-master-minors

- We also offer several minors. This can be a very good option if you are hesitant to change section (field of study).
- Condition: min 30 credits from a list of pre-defined courses in:
 - Computer Science
 - Communication Systems
 - Data Science
 - Cyber Security
 - Computational Biology

Your contacts in the section



Prof. A.-M. Kermarrec
Associate Dean for Education



Prof. Karl Aberer
Director IN-Cyber



Prof. Serge Vaudenay
Director SC-DS



Eileen Hazboun
Deputy, all programs



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Carole Dauphin
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Jasmine Locatelli
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Patricia Genet
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EPFL



Merci

■ École
polytechnique
fédérale
de Lausanne