



# Master your Master!

Find out more about your favourite Master's programme  
in engineering and technology at ETH Zurich

# The goal of today's event

- Opportunity to **learn about the details** of all specialized master programs in engineering as well as the master program in management and technology and economics.
- By presenting them **side by side**, you will be able to compare, making it easier for you to pick the program that is most suited to you.
- After this short introduction to the **principle of consecutive and specialized** Master programs, all of these programs present today will give a short pitch.
- Later you will be able to browse through the offerings of these programs in a **fair on D-Floor** and in more **detailed presentations** in various locations in the NO-Building.

# Consecutive or specialized?

ETH offers at least **one consecutive master program to every of its bachelor programs:**

- no additional hurdles/requirements for entering the master program (when bachelor is finished), moving into the master program simply by clicking a checkbox in myStudies.
- "normal" continuation of the bachelor program: statistics show that most students stay with that choice

ETH also offers **specialized master programs:**

- **Require an application** ahead of the start of the study program.
- **Selection** of students based **curricula and grades**. ETH students cannot simply move into these programs but must undergo a rigorous selection process driven by **admission committees**, composed of professors and staff of the departments that offer those programs.

Students from other universities must always apply, both to consecutive and specialized programs.

# What are specialized or interdisciplinary master programs?

- While consecutive master programs cover all the aspects of one field of studies (e.g. mechanical engineering), specialized master programs collect all themed aspects (e.g. Energy) of all participating fields of studies (EE, ME, Environment, Economics).
- Therefore, specialized master programs are always a **collaboration of several departments**.
- One department has the lead, by enrolling to a specialized master program you will be enrolled to that department, e.g. Data Science is a collaboration of D-INFK (lead), D-ITET and D-MAVT.

# Differences?

What separates the specialized master programs from consecutive programs are a few essential things:

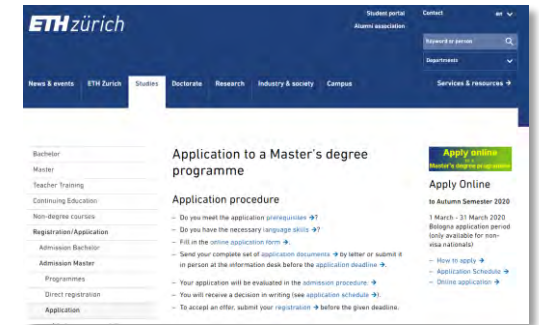
- 1) Other **professors** than in your home department are involved too.
- 2) Other **courses** may be offered than in your home department.
- 3) (With a few exceptions) **higher ratio of students without a bachelor from ETH** than in consecutive master programs.
- 4) (With one notable exception) the **number of students are smaller** than in most consecutive programs.

Of course, students who do not know a tutor system at their home department will get introduced to this in many of the master programs presented today.

# Application

- **Online Application**

<https://ethz.ch/en/studies/registration-application/master/application.html>



- **Application period** (start in fall 2020): March 1 to March 31.

- An **admission committee** composed of faculty members and staff from participating departments will evaluate all applications, and select the best and most suitable students.

- Most **decisions** will be communicated **in May**.

- Fragen zum Bewerbungsprozess? [master@ethz.ch](mailto:master@ethz.ch)

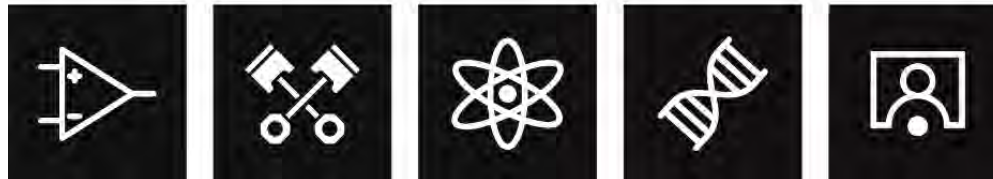
# MSc Biomedical Engineering

- Coordinator  
Christian Frei



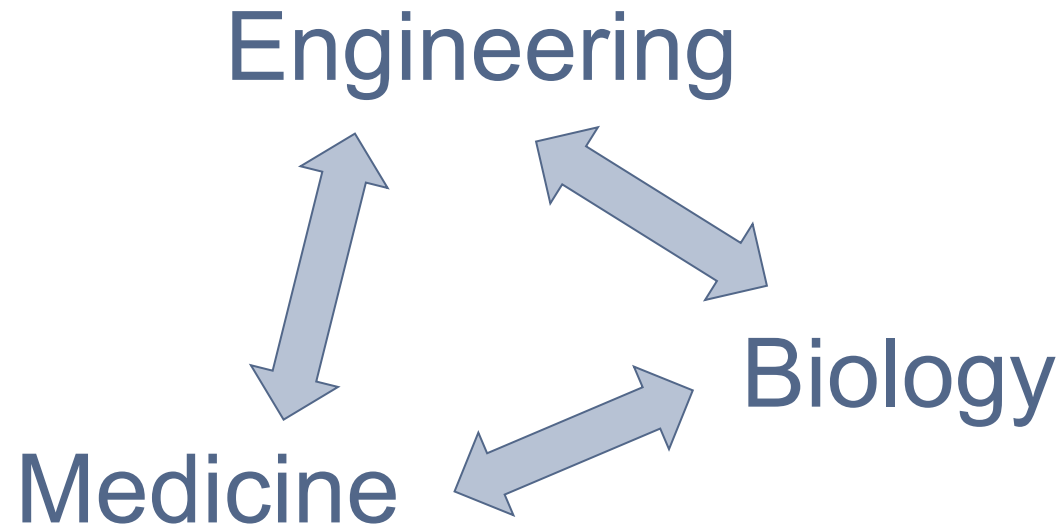
**ETH** zürich

**BIOMEDICAL  
ENGINEERING**



# MSc Biomedical Engineering

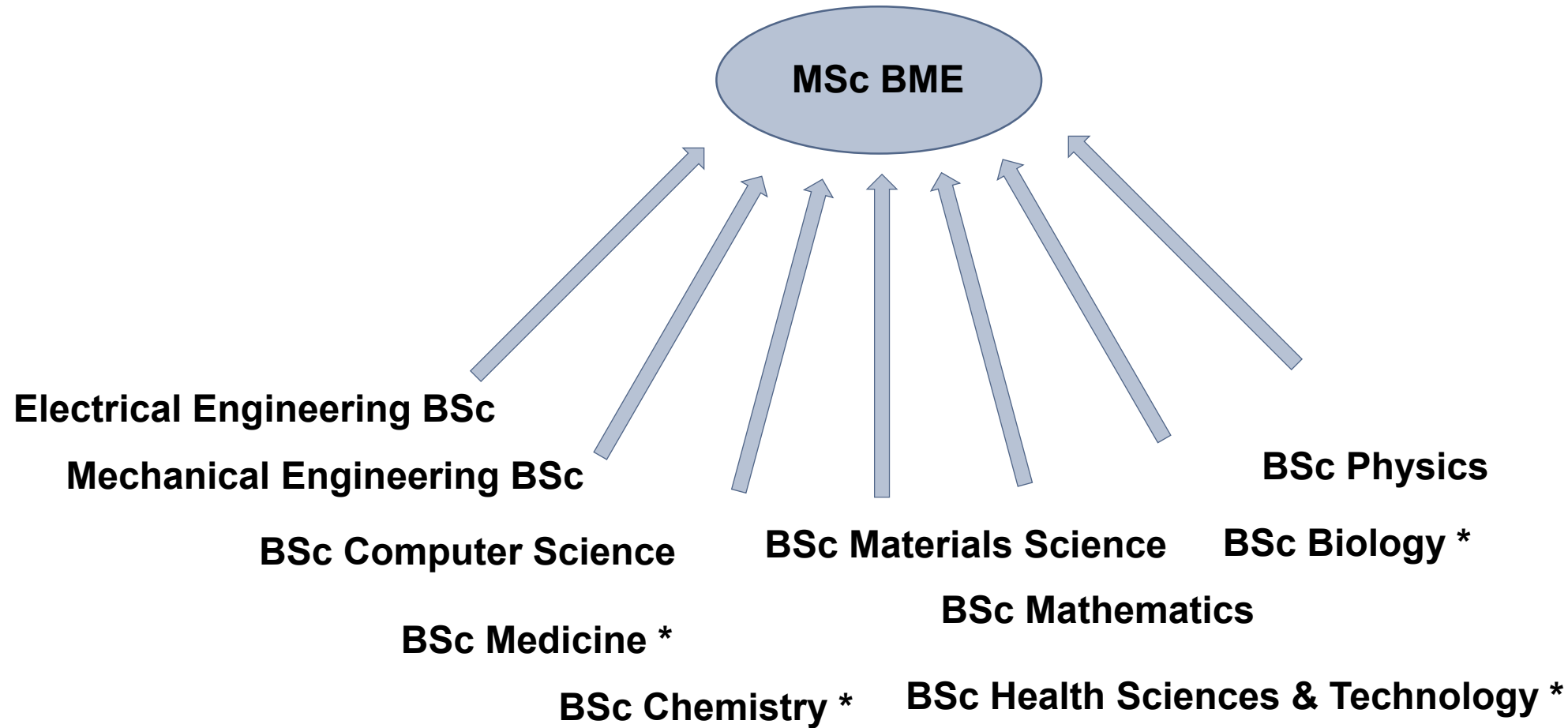
- Research and education at the interface of:



- Five track:
  - Bioelectronics
  - Bioimaging
  - Biomechanics
  - Medical Physics
  - Mol. Bioengineering



# MSc Biomedical Engineering: qualifying BSc degrees



\*: does not qualify for all tracks

# MSc Biomedical Engineering is a 120 CP Master

- a. Specialization courses min. 52 credits
    - Core courses of specialization (min. 12 cp)
    - Elective courses of specialization (-- cp)
    - Biology courses (-- cp)
  - b. Projects and practicals min. 12 credits
    - Semester project (min. 12 cp)
    - Group- and Research projects (24 cp)
    - Internship in industry (12 cp)
  - c. Science in Perspective (D-GESS) min. 2 credits
  - d. Master Thesis 30 credits
- The minima of compulsory cp sum up to 96 cp. The remaining 24 cp can be obtained from categories a. and/or b. (but not c. and d.).



# Information: Joint Degree Master's program Cyber Security ETHZ/EPFL

Friday, 28 February 2020, 15:30 h

# Cyber Security ETHZ/EPFL: Design Principles

- Cyber Security: Security of Connected Computer Systems
  - As opposed to physical security, i.e., door locks, etc.
  - Security of 5G, WiFi, TLS, Internet-of-Things, databases, etc.
- Program provides solid and sound knowledge in
  - Information Security
  - System Security
  - Network Security
  - Cryptography
- Gain competence of applying knowledge and skills in practical projects, and learn underlying formalisms
- Analytical thinking, self-organization, scientific working
- Exciting new area of global importance
  - High demand for graduates

# Cyber Security: Semester in Lausanne

- Students enrolled at ETH must start in Zurich.
- One semester has to be spent at EPF Lausanne:
  - Minimum 20 CP, maximum 35 CP;
  - **Students receive a scholarship and support in searching for accommodation;**
  - Eligible courses published on MSc Cyber Security website;
  - Study Plan for the semester in Lausanne has to be approved by the studies administration.

# Cyber Security: Flexible Course Choices

- More choices in major
  - Different set of courses at Lausanne
- More choices in minor
  - Pick courses out of another major area
  - Not only one of the focused minors offered in general MSc
- Required credits do not sum up to total needed credits
  - Freedom to pick other courses

## Eligibility:

- Consecutive: BSc in Computer Science / Communication systems
- BSc in these may apply: Electrical Engineering and Information Technology, Mechanical Engineering, Mathematics, Physics

# Cyber Security: Job prospects

Excellent job prospects, with high demand in

- Tech sector
  - E.g.: anti-malware vendor, firewall vendor, FAANG, etc.
- Finance Sector
  - E.g.: Banks, stock exchange, etc.
- General Business
  - Any business has many networked systems that need protection
- Government and NGOs
- Academia



# Specialized Master's program Data Science

Friday, 28 February 2020, 14:00 h

NO C 60



# Data Science

## The four paradigms

Thinking

With our brain  
(natural)



Ontological

The world as it must be  
(necessary)

Mathematics

theoretical



Epistemic

The world as it is  
(contingent)

Physics

empirical



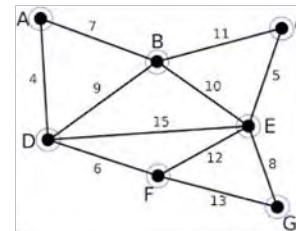
Computing

With a machine  
(artificial)



Computer Science

computational



Data Science

data driven



"The Physics of CS"

# Structure

Master in Data Science		120
Core Courses and Interdisciplinary Electives		72
Core Courses		60
Data Analysis	16	
Information and Learning	8	
Statistics	8	
Data Management and Processing	16	
Core Electives	10	
Interdisciplinary Electives		8
Data Science Lab		14
Seminar		2
Science in Perspective		2
Master's Thesis		30

# Design Principles

- Solid and sound knowledge in analyzing and handling of big data
- Specialized knowledge in a research area
- First experience in handling real data

# Data Science at ETHZ

- **Compact and profound program:**

The specialized Master's program in data science equips students with all relevant knowledge and skills while combining theoretical foundations with practical experience.

- **Personal choice of industry:**

Medicine, finance or environment: data science is used in most fields and thus enables graduates of the program to work in their industry of choice.

- **High demand:**

Regardless of the industry, most large companies have data scientists working for or with them (e.g. banking, insurance, pharma, telecommunications).

# Faculty D-INFK, D-ITET, D-MATH

## ■ Core Faculty

Alonso Gustavo, Bandeira Afonso, Bölcskei Helmut, Boeva Valentina, Borgwardt Karsten, Bühlmann Peter, Buhmann Joachim, Gärtner Bernd, Hofmann Thomas, Krause Andreas, Loeliger Hans-Andreas, Maathuis Marloes, Meinshausen Nicolai, Rätsch Gunnar, Uhler Caroline, Van de Geer Sara, Vogt Julia, Zhang Ce

## ■ Adjunct Faculty

Alaifari Rima, Basin David, Benini Luca, Capkun Srdjan, Cheridito Patrick, Dörfler Florian, Ghaffari Mohsen, Göksel Orçun, Gross Markus, Hilliges Otmar, Hoefler Torsten, Lapidoth Amos, Lygeros John, Pollefeys Marc, Püschel Markus, Roscoe Timothy, Singla Ankit, Sorkine Olga, Stephan Klaas Enno, Teichmann Josef, Thiele Lothar, Vanbever Laurent, Van Gool Luc, Vechev Martin, Wattenhofer Roger, Weismantel Robert, Wüthrich Mario, Zenklusen Rico



Building a sustainable energy system:  
can you meet the challenge?

## Master in Energy Science and Technology (MEST)

# We need to get to net-zero-CO<sub>2</sub> emissions by 2050! But how?

## Facts for Switzerland:

- > 70% of CO<sub>2</sub> emissions from energy supply.
- 80% of energy imported – and fossil based.

## Challenge for Switzerland:

- Decarbonise energy sector by 2050!
- Electrification of transportation and heating!
- Improve sufficiency, efficiency!

**We need you!!!**

# MSc in Energy Science and Technology (MEST)

To solve the energy challenge, electrical and mechanical engineering, economics and policy are needed!

MEST provides it all!

Excellent and diverse job opportunities:

- Industry
- Insurance
- Finance
- Administration / Federal Offices
- Consultancies

Small, multidisciplinary and international intake.

Dedicated Case Studies course.

**Build a sustainable energy system:  
Make a significant contribution!**

# The MEST programme

You will need both electrical and mechanical engineering, as well as economics to solve the energy challenge!

MEST provides this all!

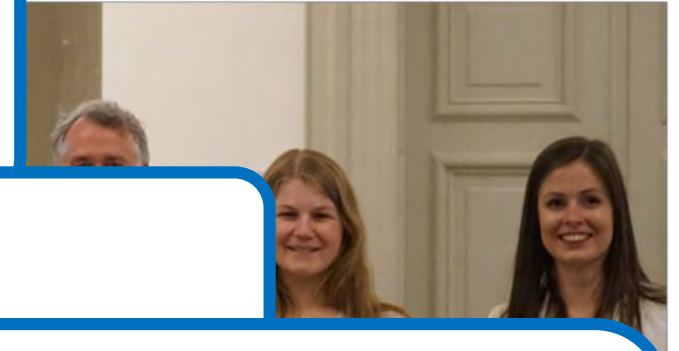
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- Industry
- Insurance
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- Administration
- Policy / Federal Offices
- Consultancies

Small, multidisciplinary and international intake.

Dedicated Case Studies course.

**Build a sustainable energy system:  
Make a significant contribution!**





# Contact information and credits

## **ETH Zurich**

Energy Science Center (ESC)

Sonneggstrasse 28 (SOI)

8092 Zürich

[www.esc.ethz.ch](http://www.esc.ethz.ch)

Publisher: Energy Science Center of ETH Zurich

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# Master's programme Integrated Building Systems

# MSc ETH Integrated Building Systems

- The Master's programme in Integrated Building Systems (MBS) provides a science-based education in building systems and technologies with a strong emphasis on the energy performance and the environmental impacts of buildings.
- Tutor based programme:
  - Each student is assigned to an individual tutor (ETH professor) who will guide them through their studies.
  - In agreement with the students and based on their interests, specialized courses will be defined in the student's „learning agreement“ by the end of the first semester.

# Degree qualifications and Admission

- Admission to the programme presupposes a university's Bachelor degree in one of the following disciplines (in particular):
  - Architecture
  - Civil Engineering
  - Electrical Engineering
  - Environmental Engineering
  - Geomatic Engineering and Planning
  - Mechanical Engineering

# Foundation courses

- Depending on their disciplinary backgrounds, students are normally familiar with only a part of the mathematical, scientific and technical foundations required in the area of “Building Systems”. Foundation courses fill the gaps in the disciplines mentioned and in so doing provide the basis for a common language.
- A minimum of 4 ECTS of foundation courses are given to each student together with the letter of admission to the programme.
- Check: <https://master-buildingsystems.ethz.ch/>



# Welcome to the Master of Science in Management, Technology, and Economics

Professor Stefano Brusoni / Dr Jost Hamschmidt

# Two views on technical change

Science



Trust in gravity

Impact on society

Impact on society



Invest in people

Science

# Change makers welcome!

**Innovation**  
Lukas Falcke  
MTEC student

**Leadership**  
Rea Schegg  
MTEC alumna  
Design Thinking Leader, GF

**Sustainability**  
Silvia Lama  
MTEC student

**Economics**  
Zsolt Kovacs  
MTEC student

**Engineering**  
Dianne Hordborg  
MTEC student

**Curiosity**  
**Passion**  
**Competence**  
**Impact**



# Excellent job perspectives in many sectors

## Public Service/ NGOs



## Engineering and Technology



## Start-up



## Investment Management



## Pharma/ Healthcare



## Insurance



## Management Consulting



## Financial Services



## Mobility



## Energy



## Consumer Goods



## Interested? Learn more...

**Step 1:** Join us today upstairs and ask your questions – join the programme introduction 2.45 p.m. (room C 60)

**Step 2:** Check detailed information on our website & brochures:  
[www.mtec.ethz.ch/studies/links-downloads](http://www.mtec.ethz.ch/studies/links-downloads)

**Step 3:** Get in touch with MSc MTEC students

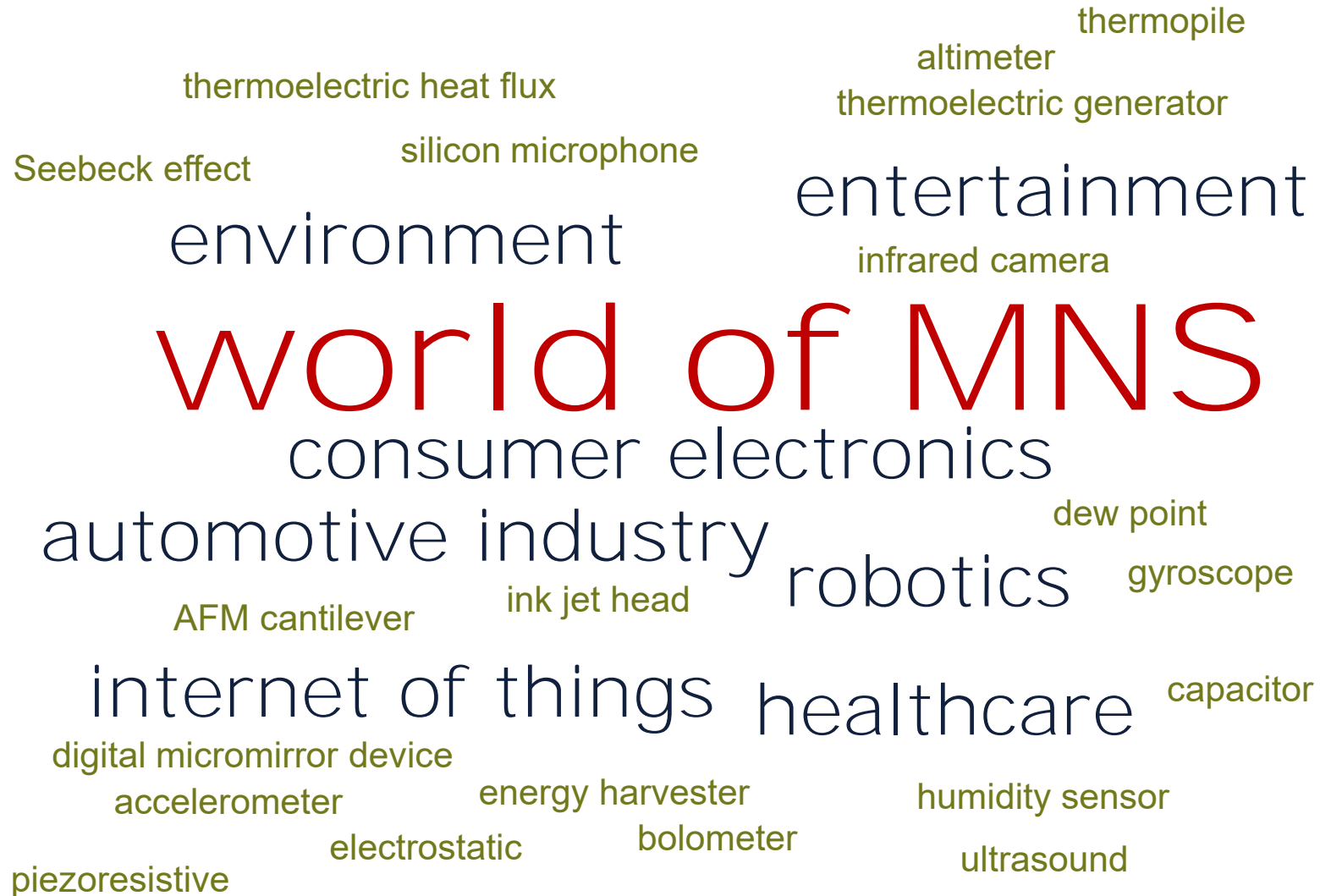
...and if the programme fits with your objectives and ambitions:

**Apply by 31 March 2020**

**(D-MAVT / D-ITET consecutive students: Sign in via myStudies)**



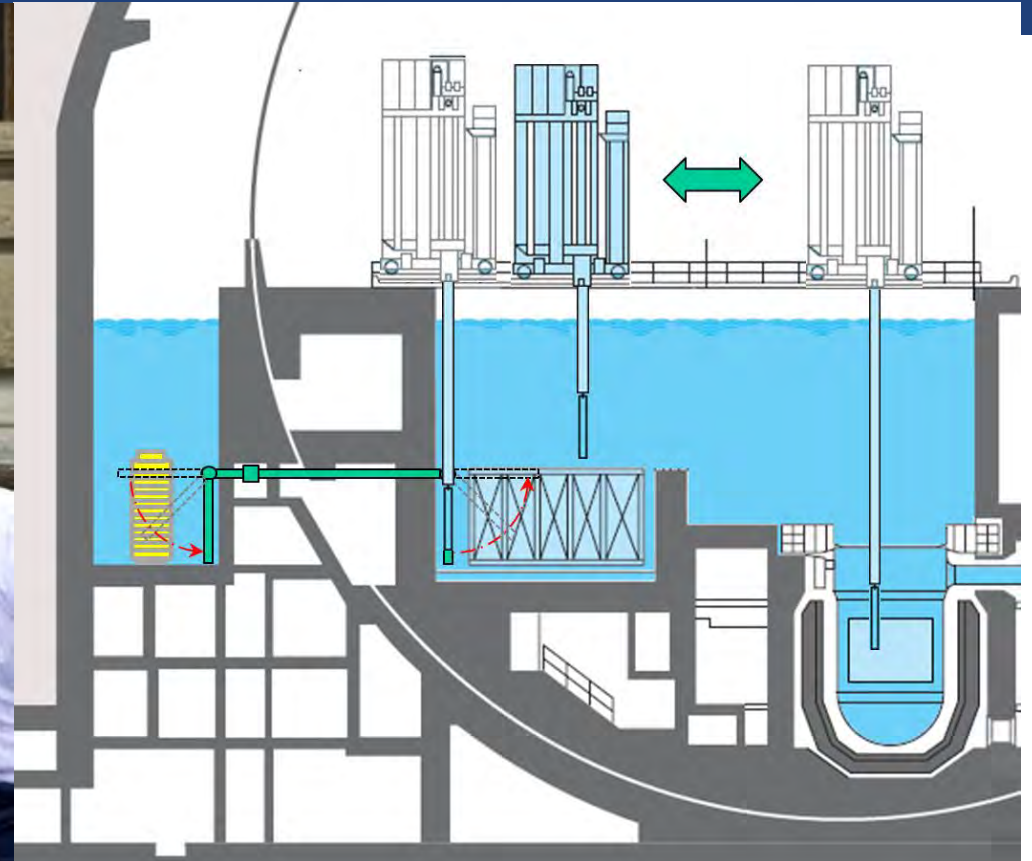
# Micro and nanosystems are all around us



# Tutors in Micro and Nanosystems

- D-MAVT
  - Jürg Dual
  - Christofer Hierold
  - Dennis Kochmann
  - Brad Nelson
  - David Norris
  - Dimos Poulikakos
  - Sotiris Pratsinis
  - Mark Tibbitt
- D-ITET
  - Jürg Leuthold
  - Janos Vörös
  - Vanessa Wood
- D-PHYS
  - Klaus Ensslin
  - Thomas Ihn
- D-BSSE
  - Andreas Hierlemann



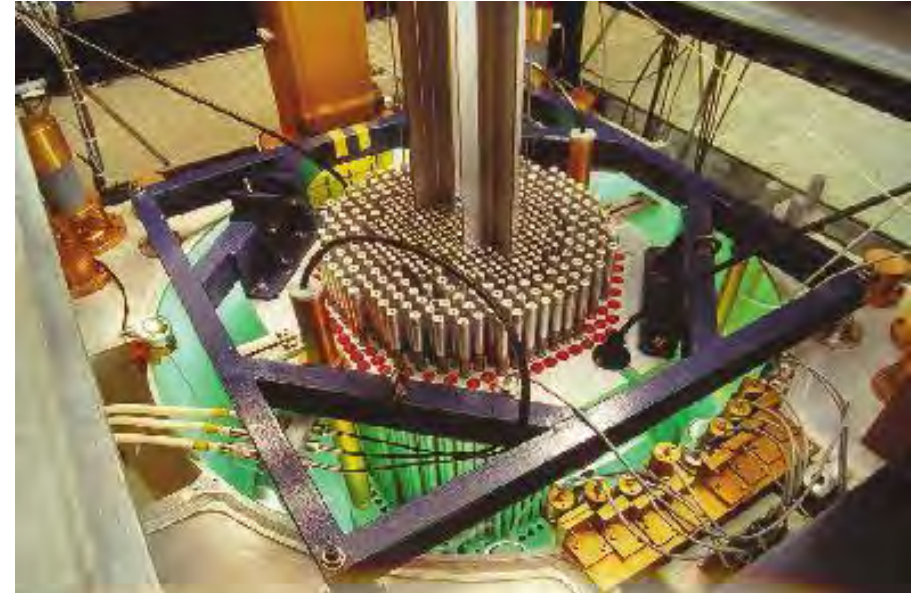


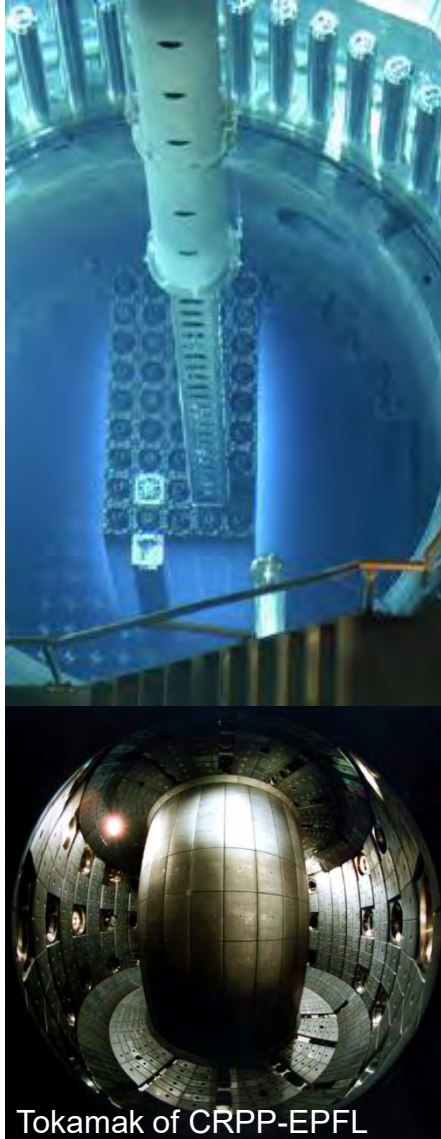
# Nuclear Engineering

Joint master program of ETH Zürich and EPF Lausanne

## Lernziele in 4 Semestern (120 cp)

- Grundlagen der Kernspaltung und der technologischen Umsetzung zur Nutzung als Energiequelle (Effizienz, Sicherheit, Umweltaspekte)
- Wissen zur Kernfusion als Ergänzung
- Nukleare Techniken in Medizin, Forschung und Industrie ausserhalb der Energieversorgung
- Überblick über den gesamten Energieumwandlungszyklus von der Uranmine bis zur Entsorgung
- Integration von Kernenergie in das gesamte Energiesystem, Vergleich mit anderen Energiebereitstellungstechnologien





Tokamak of CRPP-EPFL

## Thesen zur Motivation:

- Einseitige Orientierung auf Erneuerbare führt zu neuen unnötigen Umweltbelastungen durch die benötigten grossen Materialströme
- Keine wirksame und wirklich umweltfreundliche Energiewende ohne Beitrag der Kernenergie
- Gute Jobchancen in der Branche und der Forschung, selbst in Ländern, die heute noch aussteigen wollen
- Interessantes, multidisziplinäres Fach, auch Synergien, die den Einstieg in andere Bereiche erlauben (z.B. Verfahrenstechnik, Umwelttechnik, Materialforschung)

## Kontakt & mehr Informationen:

[www.master-nuclear.ch](http://www.master-nuclear.ch)

[www.lke.mavt.ethz.ch](http://www.lke.mavt.ethz.ch)

[hprasser@ethz.ch](mailto:hprasser@ethz.ch)





# Master's programme Quantum Engineering

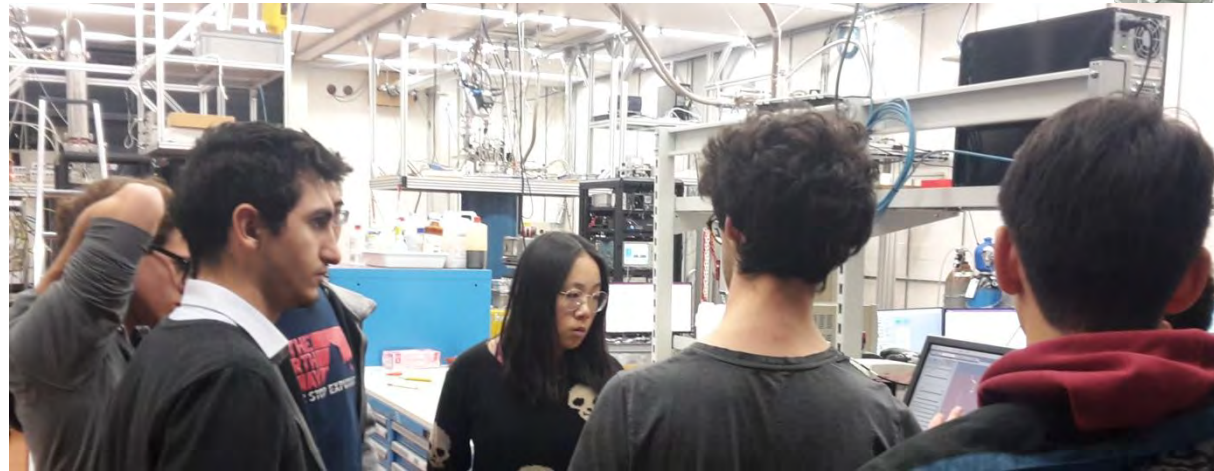
# First generation of QUANTUM ENGINEERING

From the orientation Day to the **ETH quantum labs** in less then a month



ETH zürich

Master of Science in  
Quantum Engineering  
Orientation Day  
Autumn Semester 2019



# MASTER OF QUANTUM ENGINEERING

Joint program between D-ITET (leading house) and D-PHYS

Degree: MSc ETH QE

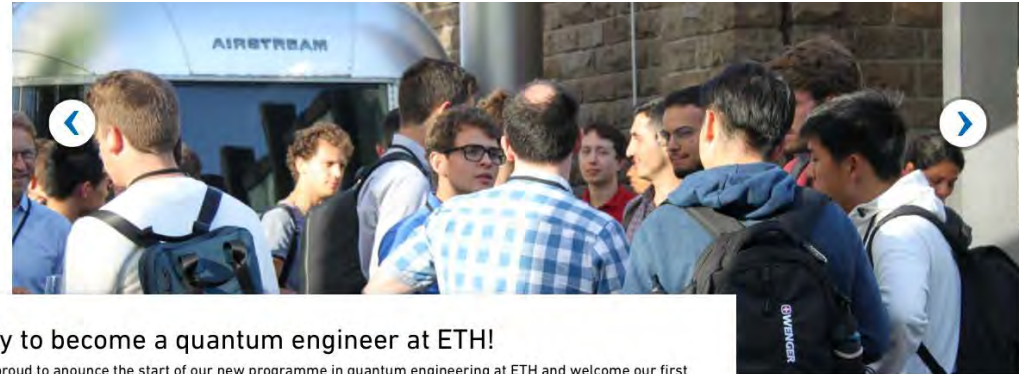
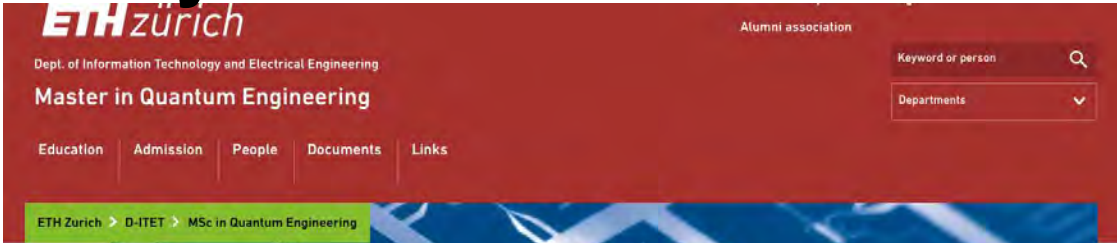
Added Value:

- Training at the interface of science and technology
- Define quantum science as an engineering toolkit
- Quantum technology in the hands of engineers



**Quantum Engineering** is the development of technology that capitalizes on the laws of quantum mechanics

# Why MSc QE?



**Apply to become a quantum engineer at ETH!**

We are proud to announce the start of our new programme in quantum engineering at ETH and welcome our first 25 students!



**Quantum computing and technologies from ETH and industry partners**

Quantum computing and technologies from ETH and industry partners

**Departments involved**

The Master's Degree in Quantum Engineering is a joint program of

- Department of Information Technology and Electrical Engineering → (D-ITET, leading house)
- Department of Physics → (D-PHYS)

**Information**

**Apply till March 30th!**  
Application page →

Join the **Master your Master!** event at ETH and learn more about the MSc QE!

28.02.20, 12:15, NO building C60

Quantum engineering is a new field at the interface of quantum physics, electrical engineering, and IT. It exploits the laws of quantum physics to develop technologies outperforming classical engineering approaches. Quantum technologies will fundamentally change classical engineering paradigms in computing, information processing, and measurement

**Departments involved**

The Master's Degree in Quantum Engineering is a joint program of

- Department of Information Technology and Electrical Engineering → (D-ITET, leading house)
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Download brochure

[Download brochure \(PDF, 548 KB\) ↓](#)

**Quantum Engineering mission statement**

Quantum Technology in the hands of engineers. Quantum Engineering is technology that capitalizes on the

**Information**

**Apply till March 30th!**  
Application page →

Join the **Master your Master!** event at ETH and learn more about the MSc QE!

28.02.20, 12:15, NO building C60

Be the next generation of quantum engineers!  
Join our BSc student lunch for more information in march!

From our latest event, Anja and Moritz, our first MSc QE generation, [share the fresh experience \(PDF, 1.7 MB\) ↓](#).

[03.12.19 ETZ E6 12:15 \(JPEG, 241 KB\) ↓](#)

Check our newest ETH podcast about the MSc Quantum Engineering.  
Anja, Andreas, Sadik,

Quantum engineering is a new field at the interface of quantum physics, electrical engineering, and IT. It exploits the laws of quantum physics to develop technologies outperforming classical engineering approaches. Quantum technologies will fundamentally change classical engineering paradigms in computing, information processing, and measurement technology.

**Application open till March 30<sup>th</sup>**  
Join us in 2020!

[ETH Master of Science Quantum Engineering →](#)

# MASTER OF QUANTUM ENGINEERING

D-ITET and D-PHYS

Degree: MSc ETH QE

Added Value:

- **small and familiar** student group (journal club and more)
- each students has **his own tutor** professor
- **Case Studies** and **Quantech Workshop** – unique offering
- **Internship** with the industry partners

Semester

1	2	3	4	ECTS
Core Courses				24
Electives				40
		Intern./QTech. <sup>1</sup>		12
		Sem. Project <sup>2</sup>		12
			Master's Thesis	30
Science in Perspective (SiP)				2
Master of Science ETH in Quantum Engineering (MSc ETH QE)				120

<sup>1</sup> each student has to carry out EITHER an industry internship OR a QuanTech lab;  
can be carried out in 2nd or 3rd semester

<sup>2</sup> semester project can be carried out in 2nd or 3rd semester



# MSc QE – enclosed by quantum research and quantum industry

The screenshot shows the top navigation bar of the ETH Zurich website. On the left is the ETH Zurich logo and the department name: 'Dept. of Information Technology and Electrical Engineering'. The main heading is 'Master in Quantum Engineering'. Below this are tabs for 'Education', 'Admission', 'People', 'Documents', and 'Links'. A breadcrumb trail at the bottom reads 'ETH Zurich > D-ITET > MSc in Quantum Engineering'. On the right side, there are links for 'Student portal', 'Login', 'Contact', and 'en'. Below these are search and department selection options.

- Curriculum
- Individual Study Plan
- Industry and laboratory internship**
- Semester Project
- Master Project
- Science in Perspective

## Industry and laboratory internship

Quantum Engineering students are required to perform an internship either in (i) industry or (ii) an ETH laboratory. Both options amount to 12 credit points. The internship should last at least 12 weeks. It should be primarily technical in nature.

(i) The industry internship is full-time, that is, it cannot be combined with classes.



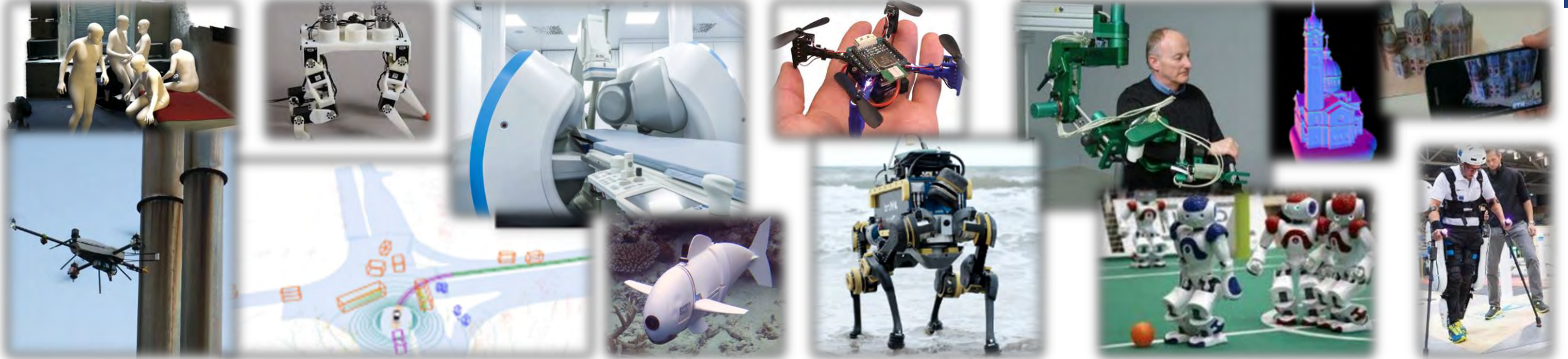
The MSc QE and the Quantum Industry Day in Switzerland (QIDIS 2020) are closely linked.

### INDUSTRIAL PARTNERS



(ii) The QuanTech workshop (ETH internship) can be performed in parallel with classes.

The screenshot shows the Twitter profile for 'Quantum Flagship' (@QuantumFlagship). The profile bio states: 'One of Europe's largest initiatives bringing together scientists and engineers from academia and industry, as well as future users of quantum technologies'. It lists 'Europe' as a location and 'Beigetreten Februar 2018' as a date. There are 857 tweets, 122 followers, and 703 likes. Two tweets are visible: one from March 7th about a video, and another from 56 minutes ago about the Master of Science in Quantum Engineering program. The second tweet includes a link to 'master-qe.ethz.ch' and a deadline of December 15th.

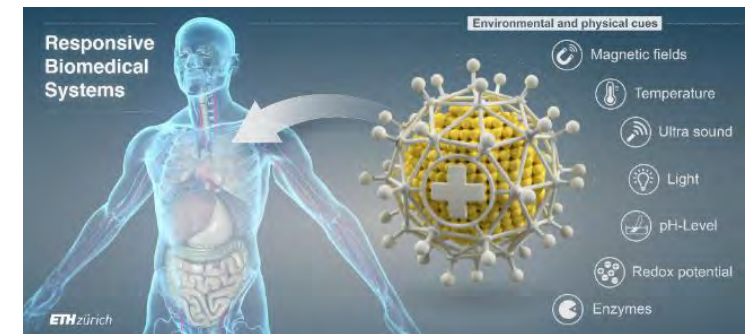
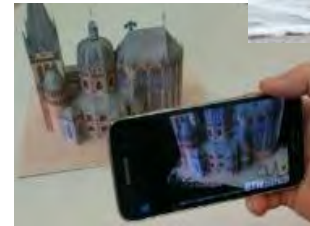
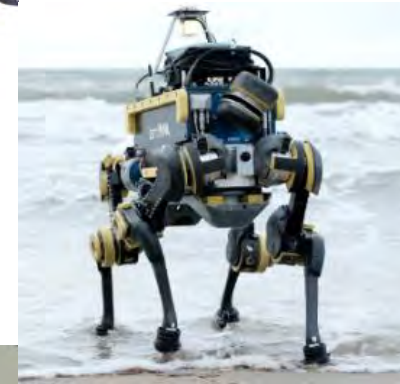


# Master in Robotics, Systems and Control

Find out more about this *interdisciplinary* and *exciting* Master program in engineering and technology  
ETH Zurich, D-MAVT, D-INFK, D-ITET, D-HEST

## Key Topics

- Systems Engineering
  - design and optimization of systems and products
- Physical Modelling and Simulation
- Optimization and Control
- Perception, Graphics, Virtual Reality
- Embedded and Distributed Computing
- Artificial Intelligence
- Robotics
  - design, modelling, and control
- Challenging Applications
  - energy technology, biomedical, autonomous vehicles and transportation, space technology, search and rescue, smart agriculture and construction, and much more.







Joachim Buhmann  
Machine Learning Lab



Otmar Hilliges  
Advanced Interactive  
Technologies Lab

**Artificial Intelligence**

Andreas Krause  
Learning and  
Adaptive Systems

Marco Hutter  
Robotic Systems  
Lab



Brad Nelson  
Multi-Scale Robotics  
Lab

Roger Gassert  
Rehabilitation Engineering Lab



Salvador Pane  
Multi-Scale Robotics  
Lab



Robert Riener  
Sensor Motor Systems Lab



Daniel Ahmed  
Acoustic Robotics

**Medical /Biomedical Robotics**



Roland Siegwart  
Autonomous Systems Lab

**Autonomous Robots**

Robert  
Katzschmann  
Soft Robotic



Emilio Frazzoli  
Information and Decision  
Systems



Simone Schürle  
Responsive Biomedical  
Systems Lab



Marc Pollefeys  
Computer Vision  
and Geometry Lab

Margarita Chli  
Vision for Robotics Lab



**Raffaello D'Andrea**  
Dynamic Systems  
and Control



Roy Smith  
Automatic Control Lab



Melanie Zeilinger  
Intelligent Control  
Systems



**Automation and Control**

John Lygeros  
Automatic Control Lab



**Computer Vision**

Luc van Gool  
Computer Vision  
Laboratory



Siyu Tang  
Computer Vision  
and Learning Group



Stelian Coros  
Computational  
Robotics Lab

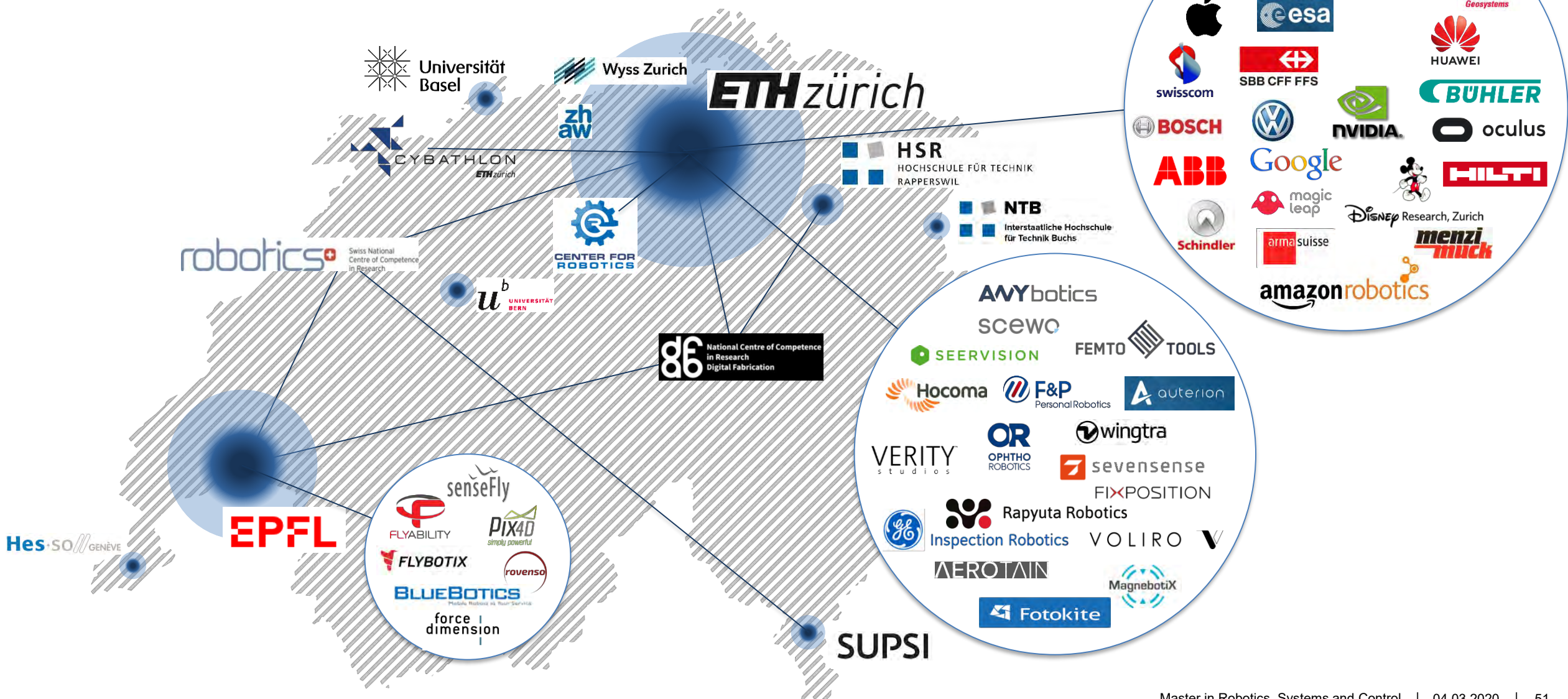


Lino Guzzella  
Dynamic Systems  
and Control



Florian Dörfler  
Automatic Control Lab





# Master your Master!

Find out more about your favourite Master's programme in engineering and technology at ETH!

	NO C 60	NO C 6	NO C 44	NO D 11	NO E 11
12.15	Introduction Event	-	-	-	-
13.15	MSc Robotics, Systems and Control	-	-	-	-
14.00	MSc Data Science	MSc Biomedical Engineering	MSc Energy Science and Technology	MSc Quantum Engineering	MSc Micro- and Nanosystems
14.45	MSc Management, Technology, and Economics	MSc Micro- and Nanosystems	MSc Energy Science and Technology	MSc Nuclear Engineering	MSc Integrated Building Systems
15.30	-	MSc Quantum Engineering	MSc Cyber Security	MSc Biomedical Engineering	MSc Integrated Building Systems

**Thank you!**

