

# MSc Biomedical Engineering Orientation 2016



# Who we are



**Christian Frei**

- Coordinator MSc Biomedical Engineering



**Reto Kreuzer**

- Coordinator of studies D-ITET

# Who we are

- Specialized Master of Science (MSc) Program  
Biomedical Engineering
- Education and research in 5 different tracks
  - Bioelectronics
  - Bioimaging
  - Biomechanics
  - Medical Physics
  - Molecular Bioengineering

# Track Advisors



**Tony Lomax**



**Marco Stampanoni**  
Medical Physics



**Klaas Prüssmann**  
Bioimaging



**Ralph Müller**  
Biomechanics



**Janos Vörös**  
Bioelectronics



**Marcy Zenobi-Wong**  
Molecular Bioengineering

# Who we are



John Ribeiro

- BEEZ: Biomedical Engineering Student Association



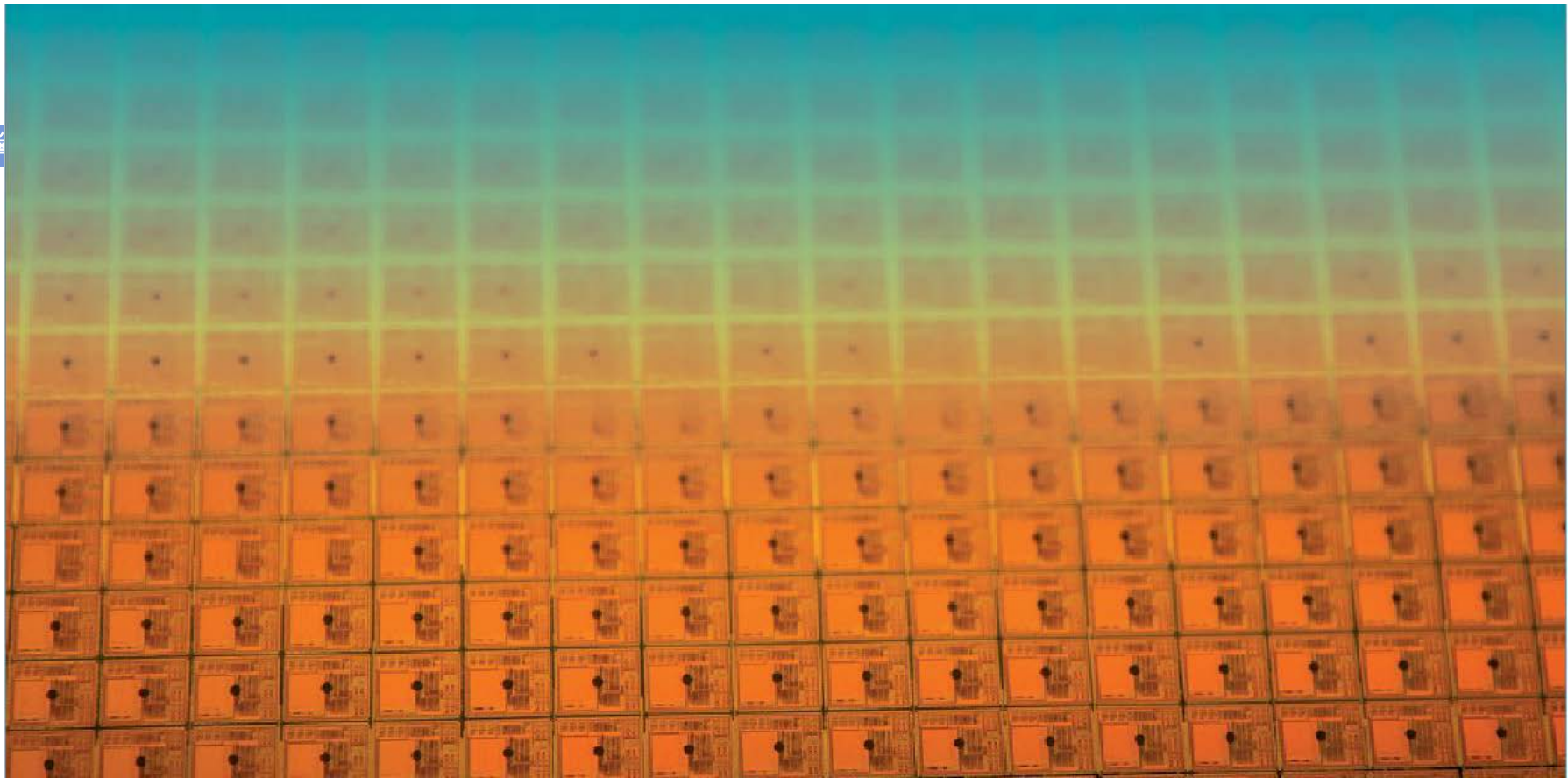
- AMIV: Student's Association of D-ITET and D-MAVT



**amiv**

# Incoming Class

- 39 students \*
- Austria (2), Bosnia and Herzegovina (1), China (1), France (2), Germany (2), Greece (3), Iceland (1), Italy (3), Lithuania (1), Spain (3), Switzerland (13), Turkey (2), UK (3) and USA (2)
- 13 ETH Bachelors



# Courses, Credits and Exams

# Your studies are subject to regulation



- **Study regulations** (mostly available in German only)

[www.rechtssammlung.ethz.ch](http://www.rechtssammlung.ethz.ch) (complete collection, German)

[www.master-biomed.ethz.ch](http://www.master-biomed.ethz.ch) > Documents (BME regulations in English)

- **Rector's Directives** (some available in German only)

[www.ethz.ch/students](http://www.ethz.ch/students) > Studies > Legal basis > Directives Collection

**International students, please contact Ms Annina Wanner at the Rectorate (HG F 22.3) or the Department Secretariat (ETZ H 85) for help on regulations.**



# Reminder: students online portal



## Your administrative duties on [www.mystudies.ethz.ch](http://www.mystudies.ethz.ch):

- **Enrollment to courses and exams**
  - Register for each semester until the end of the second week.
  - Register for **courses** (early in the semester; you need to be registered for a course to enroll for an exam)
  - Submit a **study plan/tutor agreement** (until the **end of the 4<sup>th</sup> week**).
  - Enroll for **exams** – please enroll during the **3<sup>rd</sup> and 4<sup>th</sup> week** of the semester (withdrawal possible until very late).
  
- **Notify us of your address changes**
  
- **Read your E-Mails!**

# How to choose / enroll for your lectures?



- **Consult your track advisor!**
- **Overview of lectures to choose from:**  
<http://www.master-biomed.ethz.ch/education>
- **Course catalogue:**  
[www.vvz.ethz.ch](http://www.vvz.ethz.ch) > Programme > Biomedical Engineering Master
- **Enrollment through the online-portal:**  
[www.mystudies.ethz.ch](http://www.mystudies.ethz.ch)

# Enrolling for courses in BME



- **All** courses you wish to **count** towards your Master Diploma must be enrolled for (both the course and the exam).
- Only courses agreed upon with the **track advisor** will count.
- In particular, do not forget to enroll for the **Semester Project** and the **Master Thesis**.

# Performance Assessments (examinations)



## Three types of performance assessments:

1. Session examinations (Note registration/deregistration deadlines)  
(Winter session: January/February – Summer session: August)
2. End-of-semester examinations (Note registration/deregistration deadlines)
3. Graded/ungraded semester performance (e.g. semester project or internship in industry) (Note minimum/maximum allowed time)


## Where to find the type of examination and allowed (written) aids?

- Course catalogue > see "Performance assessment"
- Personal exam schedule in myStudies (for session examinations)
- Lecturer/examiner

# Course Requirements

- □ Track Courses 50 CP
  - Track Core Courses, at least 12 CP
  - Recommended Elective Courses
  - Biology Courses
- Semester Project 8 CP
- Master Thesis 30 CP
- Humanities (GESS) 2 CP
- **Total** **90 CP**

# Lectures: Track Courses



Department of Information Technology and Electrical Engineering

## Masters in Biomedical Engineering

Student portal | Alumni association | Login | Contact | en

  
[Departments](#)

[Education](#) | [Research](#) | [Admission](#) | [People](#) | [Documents](#) | [News & Events](#) | [Links](#)

[ETH Zurich](#) → [D-ITET](#) → [Masters in Biomedical Engineering](#) →

### Bioelectronics

- Biomechanics
- Biomedicine
- Medical Physics
- Molecular Bioengineering
- Requirements
- Individual Study Plan
- Semester Project
- Master Project
- GESS Courses

## Bioelectronics

The track **Bioelectronics** provides in-depth knowledge of the development and use of instruments and signal processing theory to measure physical, physiologic or biologic signals in humans and other living organisms. The development of instrumentation is based on technologies including bioMEMS, micro- and nanosystems, biophotonics, sensors, optics and micro-fluidics. These technologies are applied to a wide array of instruments and devices including hearing aids, biosensors, labs-on-a-chip, and electrograms.


### Advisor Track Bioelectronics

ETH Zurich  
Institute for Biomedical Engineering (IBT)


Prof. Dr. Janos Vörös  
Deputy Head of Institute for Biomedical Engineering  
ETZ F 82  
Gloriastrasse 35  
8092 Zürich  
Switzerland

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+41 44 632 11 93 →  
janos.voros@biomed.ee.ethz.ch →

### Schedule Bioelectronics



Schedule Bioelectronics  
2016 (PDF, 200 KB) ↓



2015  
Brochure  
(PDF, 770 KB) ↓

### Core courses, spring semester 2016

Number	Unit	Lecturer
227-0393-10L	<a href="#">Bioelectronics and Biosensors</a> →	J. Vörös, M. F. Yanik, T. Zambelli
227-1032-00L	<a href="#">Neuromorphic Engineering II</a> →	T. Delbrück, G. Indiveri, S.-C. Liu
227-1038-00L	<a href="#">Neurophysics</a> →	J.-P. Pfister, R. Hahnloser

### Recommended elective courses, spring semester 2016



MSc in Biomedical Engineering "Bioelectronics Track"

last update: May 20, 2016

Autumn semester 2016

Track Core Courses (Yellow) | Recommended Elective Courses (Orange) | Biology Courses (Green)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
08:00		Physiology and Anatomy Biomedical Engineers I	Biomedical Engineering		Bio-compatible Materials
09:00		Rehabilitation Engineering II		Introduction to Neuro-informatics	Signal and Information Processing Modeling, Filtering, Learning
10:00	Frontiers in Nano-technology	Cross-Disciplinary Research & Development		Nano-systems	
11:00					Analog Integrated Circuits
12:00		Biomicrofluidic Engineering			
13:00	Neuromorphic Engineering I	Biomedical Imaging	Bio-electronics and Biosensors	Micro-scale Acousto-fluidics	Physics in Medical Research: From Atoms to Cells
14:00				Microsystems Technology	Frontiers in Nano-technology
15:00	Biological Engineering and Bio-technology		MicroNano-technology and Microfluidics for Biomedical Applications	Cell and Molecular Biology Engineers I	Analog Integrated Circuits
16:00	Bio-microfluidic Engineering			Biological Methods Engineers (Basic Lab)	Energy Conv. and Transport Biosys.
17:00				Image Analysis and Computer Vision	
18:00					

Spring semester 2016

Time	Monday	Tuesday	Wednesday	Thursday	Friday
08:00		Rehabilitation Engineer. I	Appropriate Health System Design		Rehabilitation Engineering I
09:00	Bio-electronics and Biosensors			Quantitative Big Imaging: From Images to Statistics	
10:00	Elements of Microscopy	Physiology and Anatomy for Biomedical Engineers		Nano-robotics	Principles in Tissue Engineering
11:00		Nano-robotics		Development strategies Medical Implants	Physics Against Cancer: The Physics of Imaging ...
12:00				Measuring on the Nanometer Scale	Advanced Topics in Control
13:00					Physics Against Cancer ...
14:00	Orthopaedic Bio-mechanics			Cell and Molecular Biology for Engineers II	
15:00	Computer Simulations of Sensory Systems	Lasers in Medicine	Finite Element Analysis in Biomedical Engineer.	Devices and Systems	Physics in Medical Research: From Atoms to Cells
16:00	Neuro-physics	Advanced Topics in Control			
17:00		Neuro-morphic Engineering II			
18:00					

June 2016: Biological Methods for Engineers (Advanced Lab) 227-0949-10L

Note: This list is an informal help for students. The official courses can be seen on the Course Catalogue of ETH (www.vzz.ethz.ch)

Recommended elective courses, spring semester 2016

The screenshot shows the ETH Zürich Course Catalogue search page. The header features the ETH Zürich logo and navigation links for Print, Help, Contact, and language options (de). The main navigation bar includes 'Courses', 'Lecturers', and 'Time and Place', with a 'Start' button. The search section is titled 'Search for Courses' and contains several filter categories: Semester (Autumn Semester 2016), Level (Master's Degree Programme), Department (Information Technology and Electrical Engine), Structure (Programme: Biomedical Engineering Master, Section), Further criteria (Course unit: Title and Number, Lecturer: Last name and First name, Type, Language of instruction, Catalogue data), and Search result (checkbox for 'without structural information'). A 'Reset' button and a 'Search' button are at the bottom of the search form. On the right side, there are three informational sections: 'Important Information' with links to Academic calendar, Starting times, and Key; 'Complete Catalogue' with a link to the complete schedule; and 'Further Events' with links to Events Calendar, Language Center, Multimedia Portal, Centre for Continuing Education, and Human Resources Department.

**ETH zürich**

Print | Help | Contact | de

Course Catalogue

↓ Courses | ↓ Lecturers | ↓ Time and Place

Start →

### Search for Courses

Semester: Autumn Semester 2016

Level: Master's Degree Programme

Department: Information Technology and Electrical Engine

**Structure**

Programme: Biomedical Engineering Master

Section:

**Further criteria**

Course unit: Title [ ] Number [ ]

Lecturer: Last name [ ] First name [ ]

Type: [ ]

Language of instruction: [ ]

Catalogue data: [ ]

Search result:  without structural information

Reset × Search →

**Important Information**

[Academic calendar](#) →

[Starting times](#) →

[Key](#) →

**Complete Catalogue**

The catalogue of lecturers and the complete schedule can be downloaded for the current and past semesters from the page [Complete Catalogue](#).

**Further Events**

[Events Calendar](#) →

[Language Center](#) →

[Multimedia Portal](#) →

[Centre for Continuing Education](#) →

[Human Resources Department](#) →



## Course Catalogue

[Courses](#) | [Lecturers](#) | [Time and Place](#)
[Start](#) →

## Search result: Course units in Autumn Semester 2016

[Course units](#) | [Catalogue data](#) | [Courses](#)

&lt;&lt; &lt; Page 1 of 6 &gt;&gt; &gt;&gt; All

Biomedical Engineering Master ?

## ▶ Track Courses

## ▶ ▶ Bioelectronics

## ▶ ▶ ▶ Track Core Courses

| During the Master program, a minimum of 12 CP must be obtained from track core courses.

Number	Title	Type	ECTS	Hours	Lecturers
151-0604-00L	<b>Microrobotics</b> <span>?</span>   Does not take place this semester.	W	4 credits	3G	B. Nelson
151-0605-00L	<b>Nanosystems</b>	W	4 credits	4G	A. Stemmer, J.-N. Tisserant
151-0621-00L	<b>Microsystems Technology</b> <span>?</span>	W	6 credits	4G	C. Hierold, M. Haluska
227-0385-10L	<b>Biomedical Imaging</b>	W	6 credits	5G	S. Kozerke, K. P. Prüssmann, M. Rudin
227-0386-00L	<b>Biomedical Engineering</b> <span>?</span>	W	4 credits	3G	J. Vörös, S. J. Ferguson, S. Kozerke, U. Moser, M. Rudin, M. P. Wolf, M. Zenobi-Wong
227-0393-10L	<b>Bioelectronics and Biosensors</b>   New course. Not to be confounded with 227-0393-00L last offered in the Spring Semester 2015.	W	6 credits	2V + 2U	J. Vörös, M. F. Yanik, T. Zambelli
227-0427-00L	<b>Signal and Information Processing: Modeling, Filtering, Learning</b> <span>?</span>	W	6 credits	4G	H.-A. Loeliger
227-1037-00L	<b>Introduction to Neuroinformatics</b>	W	6 credits	2V + 1U	K. A. Martin, M. Cook, V. Mantle, M. Pfeiffer
376-1714-00L	<b>Biocompatible Materials</b>	W	4 credits	3G	K. Maniura, J. Möller, M. Zenobi-Wong
402-0674-00L	<b>Physics in Medical Research: From Atoms to Cells</b> <span>?</span>	W	6 credits	2V + 1U	B. K. R. Müller

## ▶ ▶ ▶ Recommended Elective Courses

| These courses are particularly recommended for the Bioelectronics track. Please consult your track advisor if you wish to select other subjects.

Number	Title	Type	ECTS	Hours	Lecturers
227-0166-00L	<b>Analog Integrated Circuits</b> <span>?</span>	W	6 credits	2V + 2U	Q. Huang
227-0447-00L	<b>Image Analysis and Computer Vision</b> <span>?</span>	W	6 credits	3V + 1U	L. Van Gool, O. Gökseel, E. Konukoglu
227-0468-00L	<b>Analog Signal Processing and Filtering</b> <span>?</span>   Suitable for Master Students as well as Doctoral Students.	W	6 credits	2V + 2U	H. Schmid

Course Catalogue

[Courses](#) | 
 [Lecturers](#) | 
 [Time and Place](#)

Start →

## 151-0605-00L Nanosystems

Semester	Autumn Semester 2016
Lecturers	<a href="#">A. Stemmer, J.-N. Tisserant</a>
Periodicity	yearly course
Language of instruction	English



[Catalogue data](#) | 
 [Performance assessment](#) | 
 [Learning materials](#) | 
 **[Courses](#)** | 
 [Restrictions](#) | 
 [Offered in](#) | 
 [▶ Overview](#)

**Abstract** From atoms to molecules to condensed matter: characteristic properties of simple nanosystems and how they evolve when moving towards complex ensembles. Intermolecular forces, their macroscopic manifestations, and ways to control such interactions. Self-assembly and directed assembly of 2D and 3D structures. Special emphasis on the emerging field of molecular electronic devices.

**Objective** Familiarize students with basic science and engineering principles governing the nano domain.

**Content** The course addresses basic science and engineering principles ruling the nano domain. We particularly work out the links between topics that are traditionally taught separately.

Special emphasis is placed on the emerging field of molecular electronic devices.

Topics are treated in 2 blocks:

(I) From Quantum to Continuum  
From atoms to molecules to condensed matter to complex ensembles.

(II) Interaction Forces on the Micro and Nano Scale  
Intermolecular forces, their macroscopic manifestations, and ways to control such interactions. Self-assembly and directed assembly of 2D and 3D structures.

- Literature**
- Kuhn, Hans; Försterling, H.D.: Principles of Nanoscience. 2nd ed., Wiley, ISBN: 0-471-95902-2
  - Chen, Gang: Nanoscale Energy Transport. Wiley, ISBN: 0-471-24247-0
  - Ouisse, Thierry: Electron Transport in Nanoscale Systems. Wiley, ISBN: 0-471-24247-0
  - Wolf, Edward L.: Nanophysics and Nanotechnology. Wiley, ISBN: 0-471-24247-0

- Israelachvili, Jacob N.: Intermolecular and Surface Forces. 2nd ed., 1992, Academic Press, ISBN: 0-12-375181-0
- Evans, D.F.; Wennerstrom, H.: The Colloidal Domain. Where Physics, Chemistry, Biology, and Technology Meet. Advances in Interfacial Engineering Series. 2nd ed., 1999, Wiley, ISBN: 0-471-24247-0
- Hunter, Robert J.: Foundations of Colloid Science. 2nd ed., 2001, Oxford, ISBN: 0-19-850502-7

**Prerequisites / Notice**

Course format:

Lectures and Mini-Review presentations: Thursday 10-13, ML F 36

ETH Zürich - Vorlesungsverzeichnis - Microsoft Edge


www.ethz.ch/Vorlesungsverzeichnis/belegungsreihe.do?semkz=2016W&belegungsreiheid=400150&lang=en

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Exact starting time: 10:15  
(unless otherwise agreed)

Close X

# Course Requirements

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  -  - Biology Courses
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- Humanities (GESS) 2 CP
- **Total** **90 CP**

# Biology Courses

- Cell and Molecular Biology for Engineers (Autumn)
- Anatomy and Physiology for Biomedical Engineers (Spring)
- Biological Methods for Engineers Basic Lab (December)
- Biological Methods for Engineers Extended Lab (June)

**These courses should only be taken by students that do not have prior knowledge in these topics**

# Individual Study plan

- Contains all core courses, recommended elective courses and biology courses
- Track Medical Physics: Select Tutor
- All other tracks: the track advisor is preselected as the tutor



**ETH**  
Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zürich

**myStudies**

Arnold Zürcher (09-932-641) [ Akademische Dienste ]

Welcome - Matriculation [JSP: /studImmatrikulation.jsp] Help • Contact • Logout • 𠂇

### Matriculation

**Electrical Engin. + Information Technology MSc**  
Current semester: Spring Semester 2016, enrolled

**Deadlines: latest possible date**  
Master degree: End of Spring Semester 2016

**Tutor:** [Select Tutor](#)

Register for course units and courses [Course registration](#)

Register, view and change research projects, papers and Master's theses. [Projects/papers/theses](#)

Register for examinations or withdraw from examinations; registration deadline is 2016.07.25 [Examinations](#)

Show transcript of records and assign performance assessments to categories [Transcript of records](#)

Compose your individual learning agreement in accordance with your tutor. [Learning Agreement](#)

Show and print study overview and course attendance confirmation sheets [Studies overview](#)

Request for degree certificate [Degree request](#)

**Contact**  
For administrative questions, please contact the Registrar's Office, Tel. 044 632 30 00  
For programme specific questions, please contact your Study Administration Office.  
» <https://www.ethz.ch/students/en.html>

# Individual Study plan

*myStudies*: called “Learning Agreement”

- Discuss your choice with the track advisor, edit and submit the list in *myStudies* by the end of the fourth week of the semester

The screenshot shows the 'myStudies' interface for a Learning Agreement. At the top, it identifies the user as Arnold Zürcher and the program as 'Master's Programme in Electrical Engineering and Information Technology'. Below this, there is a section for 'Completion of mandatory courses' with a table showing 42 planned and 42 needed ECTS credits. At the bottom, there are buttons for 'Print', 'Delete', 'Edit', 'Submit', and 'Back'. The 'Edit' button is highlighted with a red box.

**ETH**  
Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zürich

**myStudies**

Arnold Zürcher (09-932-641) [ Akademische Dienste ]

Welcome - Matriculation - Display Learning Agreement [JSP: /showLearningAgreement.jsp]

**Learning Agreement of Arnold Zürcher (In process)**

**Programme regulations** Master's Programme in Electrical Engineering and Information Technology

**Tutor** Prof. Dr. J. Reymond

The student has to discuss the Learning Agreement (also known as "Tutor Agreement") with the tutor/track advisor before submitting it in myStudies. The Learning Agreement must be submitted in myStudies and approved by the tutor/track advisor no later than 4 weeks after the start of program (usually the fall semester).  
The Learning Agreement can be updated during the study period, but needs to be in the final version before the start of the Master thesis.

Note: The fields concerning the "Mentor" (see next step) must be left empty.

**Completion of mandatory courses** Treatment of mandatory courses.

**Not regular** Category assignment disagrees with official Course Catalogue.

**Changes** **New:** Newly added, **Moved:** Moved to another category, **Modified:** Text modified, for external courses only.

Category	Registered	Title	ECTS credits			Completion of mandatory course	Not regular	Changes
			Planned	Needed	Missing			
<b>Major Courses</b>			42	42				

Print Delete

Edit Submit Back

- Only these courses can be accounted for the final degree

# Course Requirements

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- **Total** **90 CP**

# Semester/Master Projects



- Semester Project 14 week 50% or 7 weeks 100%
- Master Project, 6 months, 100%
  
- Register with *myStudies*



# Course Requirements

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- □ Humanities (GESS) 2 CP
- **Total** **90 CP**

The screenshot shows the website for the Department of Humanities, Social and Political Sciences at ETH Zurich. The header features the ETH Zurich logo and navigation links for Student portal, Alumni association, D-GESS Intranet, Login, Contact, and language options (de, en). A search bar and a Departments dropdown menu are also present. The main navigation menu includes News & Events, The Department, Research, Studies, Doctoral Studies, Continuing Education, and Information & Documents. The main content area features a large image of a man in a suit, with a breadcrumb trail 'ETH Zurich → D-GESS →'. Below the image is a section titled 'Standing on the shoulders of a giant' with a sub-headline 'Understanding People - Steering Developments - Grasping Knowledge'. The text describes three public lectures marking the inauguration of the Turing Centre Zurich's teaching and research activities. A 'Read more' link is provided. To the right of the image is a green box with text about the course program 'Science in Perspective', which contextualizes knowledge students have acquired in their core subjects according to societal criteria and analyze it critically. Below the main content is a 'Department of Humanities, Social and Political Sciences' section with a sub-headline 'Understanding People - Steering Developments - Grasping Knowledge'. It includes a 'A unique profile' section, a 'Four core areas' section, and a 'Learn more about D-GESS' section. To the right of this section is a 'Contact' section with the department's address, phone numbers, and a 'Science in Perspective' section with a graphic. At the bottom right, there is an 'Open positions' section and a 'D-GESS in' section.

**ETH zürich**

Student portal | Login | Contact | de | en  
Alumni association | Keyword or person  
D-GESS Intranet | Departments

**Department of Humanities, Social and Political Sciences**

News & Events | The Department | Research | Studies | Doctoral Studies | Continuing Education | Information & Documents

ETH Zurich → D-GESS →

### Standing on the shoulders of a giant

Three public lectures mark the inauguration of the Turing Centre Zurich's teaching and research activities.

[Read more](#)

The course program "Science in Perspective" contextualize the knowledge students have acquired in their core subjects according to societal criteria and analyze it critically. Students are thus better prepared for global challenges. In addition, Bachelor's and Master's programs taught at D-GESS offer excellent conditions for studying.

### Department of Humanities, Social and Political Sciences

#### Understanding People - Steering Developments - Grasping Knowledge

**A unique profile**  
With the D-GESS department, ETH Zurich can offer an extraordinary range of research and teaching, which strengthens the university's position. [Learn more about D-GESS](#)

**Four core areas**  
Its orientation towards the four core areas of [Behavior](#) (behavioral science), [Governance](#) (political science), [Knowledge](#) (humanities) and [Law & Economics](#) helps D-GESS maintain a clear profile in teaching and research.

**Learn more about D-GESS**  
D-GESS departement proudly presents its [new brochure \(PDF, 1.7 MB\)](#)

### Contact

ETH Zürich  
Department of Humanities, Social and Political Sciences

Haldeneggsteig 4  
8006 Zürich  
Schweiz

+41 44 632 23 08  
+41 44 632 10 27

### Open positions

The [Center for Law & Economics](#) is currently looking for two new law professors. [Job ad](#)

### Science in Perspective

SCIENCE IN PERSPECTIVE

### D-GESS in

# Humanities, Social and Political Sciences, GESS



- The GESS "Compulsory Elective" courses are mandatory for all students at ETH, all students must earn 2 cp during their MSc studies.
- For language courses, special rules apply (see [directives collection](#)).
- GESS courses are selected and offered by the Department of Humanities, Social and Political Sciences (D-GESS).

**Contact:** Study admin D-GESS, Viola Gloor, [viola.gloor@gess.ethz.ch](mailto:viola.gloor@gess.ethz.ch)

**On the web:** [www.gess.ethz.ch](http://www.gess.ethz.ch)

# Questions



- Come to us
- This document can be downloaded from the “news & events” section of the BME website:

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