MSc Biomedical Engineering Orientation 2018

Who we are

Christian Frei

- Coordinator MSc Biomedical Engineering
- Teaching of biology courses

Reto Kreuzer

- Coordinator of studies D-ITET

Who we are

- Specialized Master of Science (MSc) Programme
  Biomedical Engineering

- Education and research in 5 different tracks
  - Bioelectronics
  - Bioimaging
  - Biomechanics
  - Medical Physics
  - Molecular Bioengineering

Who we are

- Specialized Master of Science (MSc) Programme

  Biomedical Engineering

- Title:

  Master of Science ETH in Biomedical Engineering

  short: MSc ETH BME

Bioelectronics Track

Janos Vörös
Track Advisor
(Fachberater)

- Aim: Understanding, monitoring and controlling of molecular and cellular processes at bio-electronical interfaces

- Nano-micro technology for diagnostics and medical devices

Bioimaging Track

Klaas Prüssmann
Track Advisor
(Fachberater)

- Aim: Development of new imaging techniques for biology and medicine
- New Magnetic Resonance Imaging (MRI) and Spectoscropy (MRS) for human tissues and organ structure/function

University of Zurich[UZH]

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

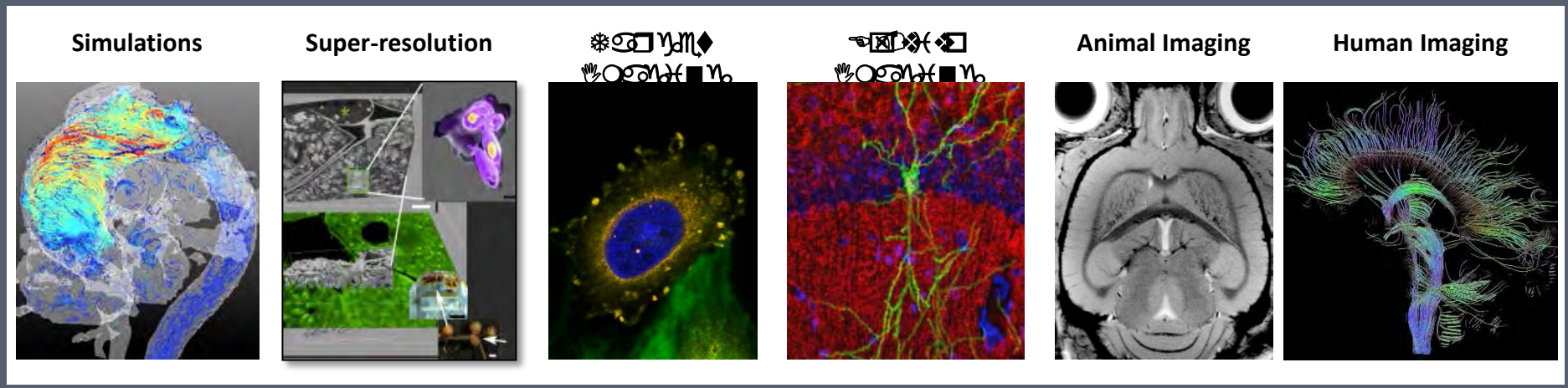
EXCITE ZURICH IMAGING

12th Zurich Summer School on Biomedical Imaging

3 September - 14 September 2018

ETH Zurich, Paul Scherrer Institute, University of Zurich and University Hospital Zurich

Register now: www.excite.ethz.ch (Deadline: Monday, 23 April 2018)



Biomechanics Track

Ralph Müller
Track Advisor
(Fachberater)

- Aim: The application of mechanics on biological systems.

- Liver mechanics and histology
- Cerebrospinal fluid diagnosis
- Control of flow in the alveolar lung
- Orthopedic technologies/Mechanobiology
- Multi-scale biomechanics and systems medicine
- Movement and sports mechanics

Medical Physics Track

Track Advisor (Fachberater)

Tony Lomax

Marco Stampanoni

- Aim: The application of physics to the needs of medicine.

- Radiation therapy
- Medical Imaging
- Radiation and safety
- Biocompatible materials

Medical Physics Track

Track Advisor (Fachberater)

Tony Lomax

Marco Stampanoni

- The MSc runs in parallel with the MAS (Master of advanced studies) in Medical Physics.

- Fachanerkennung *Schweizerische Gesellschaft für Strahlenbiologie und Medizinische Physik* (SGSMP)

Molecular Bioengineering Track

- Aim: Engineering at molecular/nano scale

Marcy Zenobi-Wong
Track Advisor
(Fachberaterin)

- Applied mechanobiology
- Cartilage and scaffold engineering
- Micro- and nanorobotics
- Synthetic biology

Who we are

- Interdisciplinary programme
- Ø 2013-2017: 38.6 new students/year
- International programme

  (Ø 2013-2017: 43.4% CH-Bachelors)
- 4 departments of ETH are involved:

  D-ITET / D-HEST / D-MAVT / D-PHYS

  (D-ITET is the leading house)

How to apply

Qualifying Bachelor degrees

a. for admission to the specialisations in "*Bioelectronics*" and "*Bioimaging*":
   - Biomedical Engineering
   - Biotechnology
   - Chemical Engineering
   - Computational Science and Engineering
   - Computer Science
   - Electrical Engineering
   - Materials Science
   - Mathematics
   - Mechanical Engineering
   - Physics

b. for admission to the specialisation in "*Biomechanics*":
   - all disciplines listed in Subpara. a and
   - Health Sciences and Technology
   - Human Movement Sciences
   - Life Sciences and Technology

Qualifying Bachelor degrees

a. for admission to the specialisations in "*Bioelectronics*" and "*Bioimaging*":
   - Biomedical Engineering
   - Biotechnology
   - Chemical Engineering
   - Computational Science and Engineering
   - Computer Science
   - Electrical Engineering
   - Materials Science
   - Mathematics
   - Mechanical Engineering
   - Physics

c. for admission to the specialisation in "*Molecular Bioengineering*":
   - all disciplines listed in Subpara. a and
   - Biology
   - Chemistry
   - Health Sciences and Technology
   - Human Movement Sciences
   - Life Sciences and Technology
   - Medicine

Qualifying Bachelor degrees

a. for admission to the specialisations in "*Bioelectronics*" and "*Bioimaging*":
   - Biomedical Engineering
   - Biotechnology
   - Chemical Engineering
   - Computational Science and Engineering
   - Computer Science
   - Electrical Engineering
   - Materials Science
   - Mathematics
   - Mechanical Engineering
   - Physics

d. for admission to the specialisation in "*Medical Physics*":
   - all disciplines listed in Subpara. a and
   - Biology
   - Chemistry
   - Health Sciences and Technology
   - Life Sciences and Technology
   - Medicine

Requirements in Mathematics/Physics

- Bioelectronics and Bioimaging: 30 credit points
- Biomechanics and Medical Physics : 22 credit points
- Molecular Bioengineering: 10 credit points

How to apply

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Studienadministration

Rämistrasse 101
8092 Zürich
Tel. +41 44 632 30 00
kanzlei@ethz.ch

Merkblatt für an der ETH Zürich immatrikulierte Bachelor-Studierende

Übertritt vom ETH Bachelor- ins ETH Master-Studium zum Herbstsemester 2018 und Frühjahrssemester 2019

Übersicht Kapitel

Kapitel 1 Vier Varianten des Übertritts in einen Master-Studiengang

Für den Übertritt ins ETH-Master-Studium mit einem ETH-Bachelor-Diplom oder nach Erreichen der Mindestanzahl Kreditpunkte in einem ETH Bachelor-Studiengang gibt es vier Varianten. Der Übertritt ist für diese vier Varianten unterschiedlich geregelt:

How to apply

Kapitel 1 Vier Varianten des Übertritts in einen Master-Studiengang

Für den Übertritt ins ETH-Master-Studium mit einem ETH-Bachelor-Diplom oder nach Erreichen der Mindestanzahl Kreditpunkte in einem ETH Bachelor-Studiengang gibt es vier Varianten. Der Übertritt ist für diese vier Varianten unterschiedlich geregelt:

Variante 1: Übertritt in einen konsekutiven Master-Studiengang *ohne* Wechsel der Studienrichtung
s. Seite 2
Die Mehrzahl der Studierenden tritt nach dieser Variante in einen an ihr Bachelor-Studium anschliessenden konsekutiven Master-Studiengang ein.

Variante 2: Übertritt in einen konsekutiven Master-Studiengang *mit* Wechsel der Studienrichtung
s. Seite 4.

Variante 3: Übertritt in einen spezialisierten Master-Studiengang oder in einen Joint Master-Studiengang mit Einreichung der Bewerbung an der ETH, s. Seite 5.

Variante 4: Übertritt in einen Joint Master-Studiengang mit Einreichung der Bewerbung an einer anderen Hochschule, s. Seite 6.

- All students with an ETH Bachelor degree have to apply as all non-ETH students
- Application through the Rectorate (Admission's Office)
- Application period: March 1 to March 31

  (also November 1 to December 15 accepted)

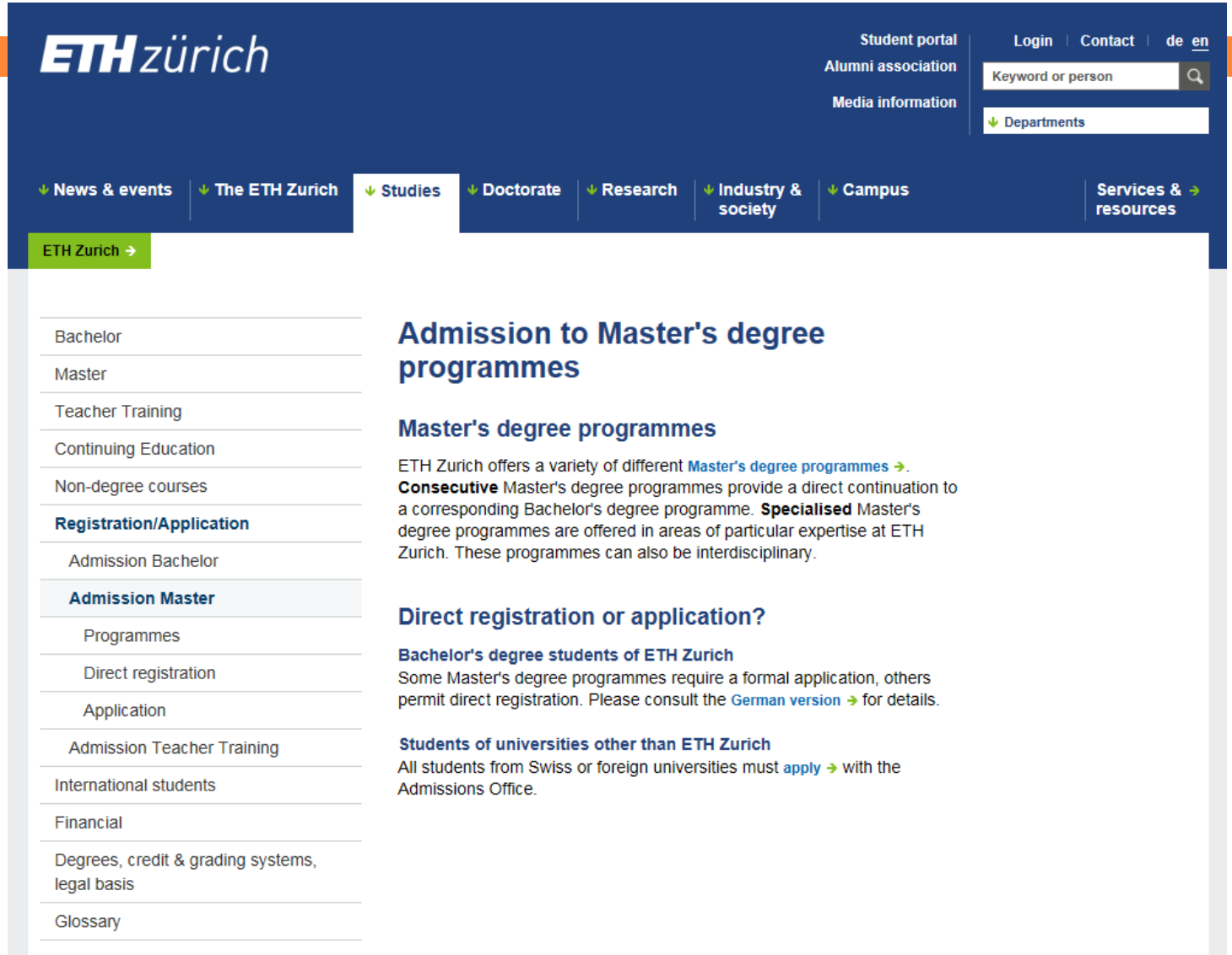
Fellowship Programmes

- Application is mandatory during the November – December window for the fellowship programmes:

  Excellence Scholarship & Opportunity Award (ESOP)

  Master Scholarship (MSP)

www.rectorate.ethz.ch



Documents required

- Bachelor degree (the same rules apply as for the consecutive MSc)
- Transcripts (Pdf of "Leistungsüberblick" from mystudies)
- Motivation letter, CV, GRE (Graduate Record Examinations; suggested) and letter of reference (ETH-Bachelors are exempt)

- ESOP/MSP fellowships: additional documents

- Holders of a Swiss matriculation certificate (Matura) and/or an ETH Bachelor: No English language certificate required
- Note: This list in not exhaustive. Please refer to the guidelines of the Rectorate

Evaluation process

- A selection committee with about 5-8 members will evaluate all applications, and select the best students

- Positive evaluation ⇒ Admission is given for a particular track

The structure of the programme

Art. 37 Kreditpunkte je Kategorie

1 Die für den Erwerb des Master-Diploms erforderlichen 90 KP sind in den nachstehenden Kategorien in der angegebenen Mindestanzahl zu erwerben. Weitere Einzelheiten sind in Abs. 2 – 6 geregelt:

a.	Vertiefungsfächer	50 KP
	1) Kernfächer der Vertiefung (mind. 12 KP)	
	2) Wahlfächer der Vertiefung	
	3) Biologiefächer	
b.	Semesterarbeit	8 KP
c.	Pflichtwahlfach GESS	2 KP
d.	Master-Arbeit	30 KP

Differences to MSc in Health Sciences and Technology (HST)

- MSc HST: Theoretical courses: 30 cp*
  Praktika und/oder Semesterarbeit: 12 weeks; 15 cp
  Forschungspraktikum: 12 weeks; 15 cp

*: 45 cp for the track Human Health Nutrition and Environment

- MSc BME Theoretical courses: 50 cp
  Semester work: 7 weeks; 8 cp

- MSc BME: Engineering title

The structure of the programme

Art. 37 Kreditpunkte je Kategorie

1 Die für den Erwerb des Master-Diploms erforderlichen 90 KP sind in den nachstehenden Kategorien in der angegebenen Mindestanzahl zu erwerben. Weitere Einzelheiten sind in Abs. 2 – 6 geregelt:

a.	Vertiefungsfächer	50 KP
	1) Kernfächer der Vertiefung (mind. 12 KP)	
	2) Wahlfächer der Vertiefung	
	3) Biologiefächer	
b.	Semesterarbeit	8 KP
c.	Pflichtwahlfach GESS	2 KP
d.	Master-Arbeit	30 KP

Lectures: Track Courses

ETH zürich

Department of Information Technology and Electrical Engineering

Masters in Biomedical Engineering

Student portal | Alumni association | Login | Contact | en

Keyword or person

Departments

Education | Research | Admission | People | Documents | News & Events | Links

ETH Zurich > D-ITET > Masters in Biomedical Engineering

- Bioelectronics
- **Biomechanics**
- Bioimaging
- Medical Physics
- Molecular Bioengineering
- Requirements
- Individual Study Plan
- Semester Project
- Master Project
- GESS Courses

Biomechanics

The track **Biomechanics** gives you in-depth knowledge about the application of mechanics and measurement methods for understanding the structure and function of biological materials at the organism, organ, tissue, cell, and molecular level. The track includes many application fields ranging from cell biomechanics to fracture fixation and provides education and hands-on research opportunities in theoretical, experimental and computational biomechanics. Biomechanics is a discipline of biomedical engineering which is increasingly influenced by cellular and molecular approaches.

Advisor Track Biomechanics
ETH Zurich
Institut für Biomechanik

Prof. Dr. Ralph Müller
HCP H 23.1
Leopold-Ruzicka-Weg 4
8093 Zürich
Switzerland

+41 44 632 45 92
+41 44 633 11 24

Schedule Biomechanics

Schedule Biomechanics_2017-2018 (PDF, 44 KB)

2017 BME Brochure (PDF, 771 KB)

MSc in Biomedical Engineering **"Biomechanics Track"** Track Core Courses | Recommended Elective Courses | Biology Courses | Last update: Nov. 27, 2017

Autumn semester 2017

Time	Monday	Tuesday	Wednesday	Thursday	Friday
08:00		Physiology & Anatomy for Biomedical Engineers I; Rehabilitation Engineering II; Application MATLAB in the Human Movement Sciences	Biomedical Engineering; Colloquium in Biomechanics		Biocompatible Materials; Intro. Finite Elements and Sparse Linear System Solving; Continuum Mechanics I; Multiscale Bone Biomechanics
09:00	Micro and Nano-Tomography Biological Tissues				
10:00	Frontiers in Nanotechnology			Trauma Biomechanics; Nanosystems	
11:00				Microrobotics	
12:00			Continuum Mechanics I		
13:00	Biomedical Imaging	Biomedical Imaging		Image Analysis and Computer Vision; Trauma Biomechanics; Cell and Molecular Biology Engineers I; Energy Conversion Transport in Biosystems	Physics in Medical Research: From Atoms to Cells; Energy Conversion Transport in Biosystems; Frontiers in Nanotechnology; Multiscale Bone Biomechanics
14:00					
15:00	Biomechanics of Sport Injuries and Rehabilitation		Micro/Nano-technology Microfluidics for Biomedical Applications; Clinical and Movement Biomechanics		
16:00	Microrobotics			Biological Methods for Engineers (Basic Lab)	
17:00					
18:00					

Spring semester 2018

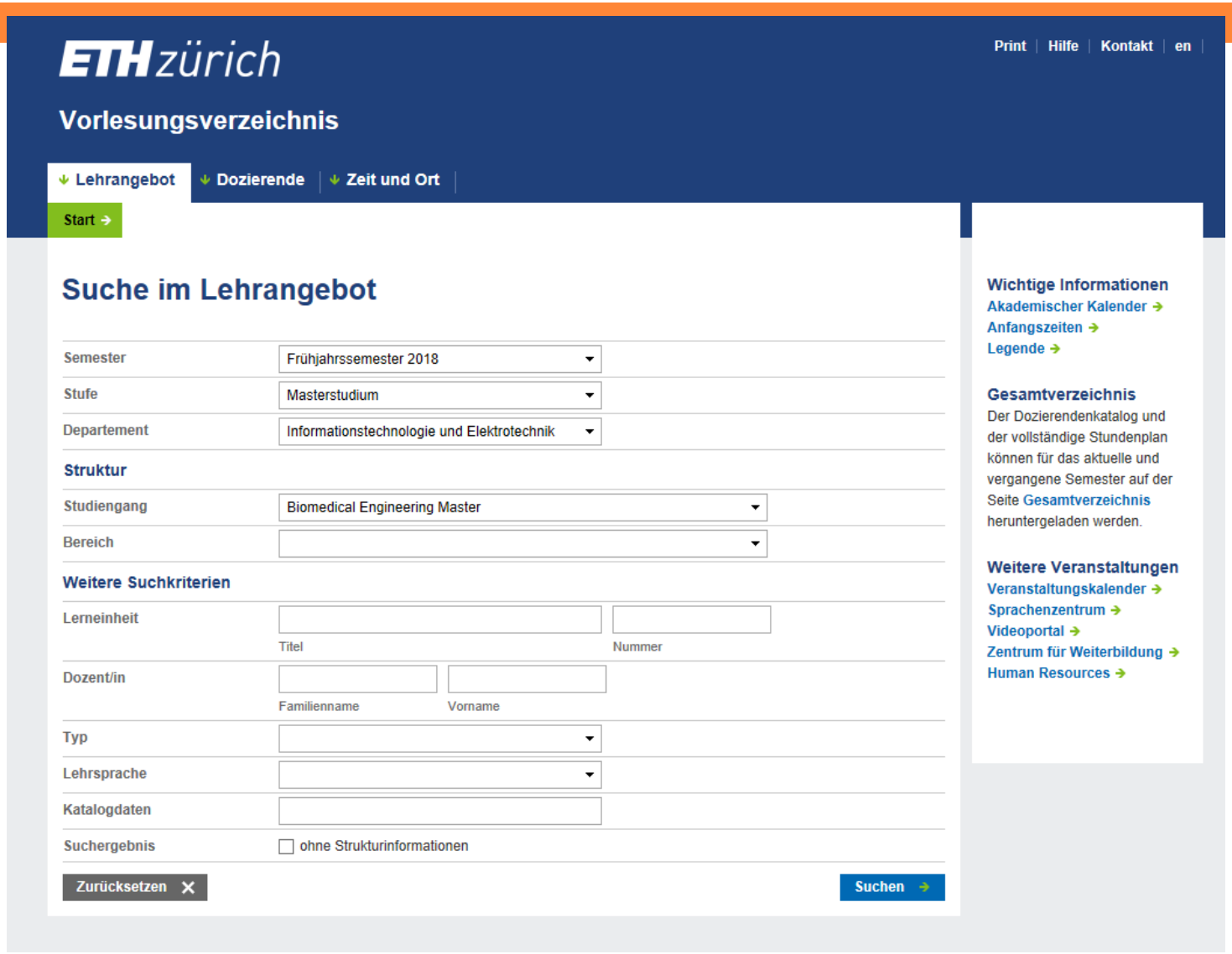
Time	Monday	Tuesday	Wednesday	Thursday	Friday
08:00		Rehabilitation Engineering I: Motor Functions; Physiology and Anatomy for Biomedical Engineers II	Appropriate Health System Design; Colloquium in Biomechanics		Rehabilitation Engineering I: Motor Functions; Numerical Methods for Partial Differential Equations
09:00				Quantitative Big Imaging: From Images to Statistics; Development Strategies Medical Implants; Measuring on the Nanometer Scale; Nanorobotics	Biofluiddynamics; Principles in Tissue Engineering; Experimental Mechanics
10:00	Clinical Challenges Musculoskeletal Disorders	Nanorobotics	Bone Biology and Consequences for Human Health		
11:00					
12:00					
13:00	Orthopaedic Biomechanics; Computer Simulations of Sensory Systems			Development Strategies Medical Implants; Cell and Molecular Biology for Engineers II	Skeletal Repair
14:00					Physics in Medical Research: From Humans to Cells
15:00			Finite Element Analysis in Biomedical Engineering	Mechanobiology: Implications for Development, Regene. Tissue Engineering	
16:00					
17:00					
18:00					

June 2018: Biological Methods for Engineers 227-0949-10L

June 2018: Sports Biomechanics 376-1168.00L

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)

www.vvz.ethz.ch
(Vorlesungsverzeichnis)



Biology Courses

Art. 37 Kreditpunkte je Kategorie

1 Die für den Erwerb des Master-Diploms erforderlichen 90 KP sind in den nachstehenden Kategorien in der angegebenen Mindestanzahl zu erwerben. Weitere Einzelheiten sind in Abs. 2 – 6 geregelt:

a.	Vertiefungsfächer	50 KP
	1) Kernfächer der Vertiefung (mind. 12 KP)	
	2) Wahlfächer der Vertiefung	
	3) Biologiefächer	
b.	Semesterarbeit	8 KP
c.	Pflichtwahlfach GESS	2 KP
d.	Master-Arbeit	30 KP

Biology Courses

- Cell and Molecular Biology for Engineers
- Physiology and Anatomy for Biological Engineers
- Biological Methods for Engineers
  - 2 week course in June; 4 CP
  - 4 afternoons in December; 2 CP

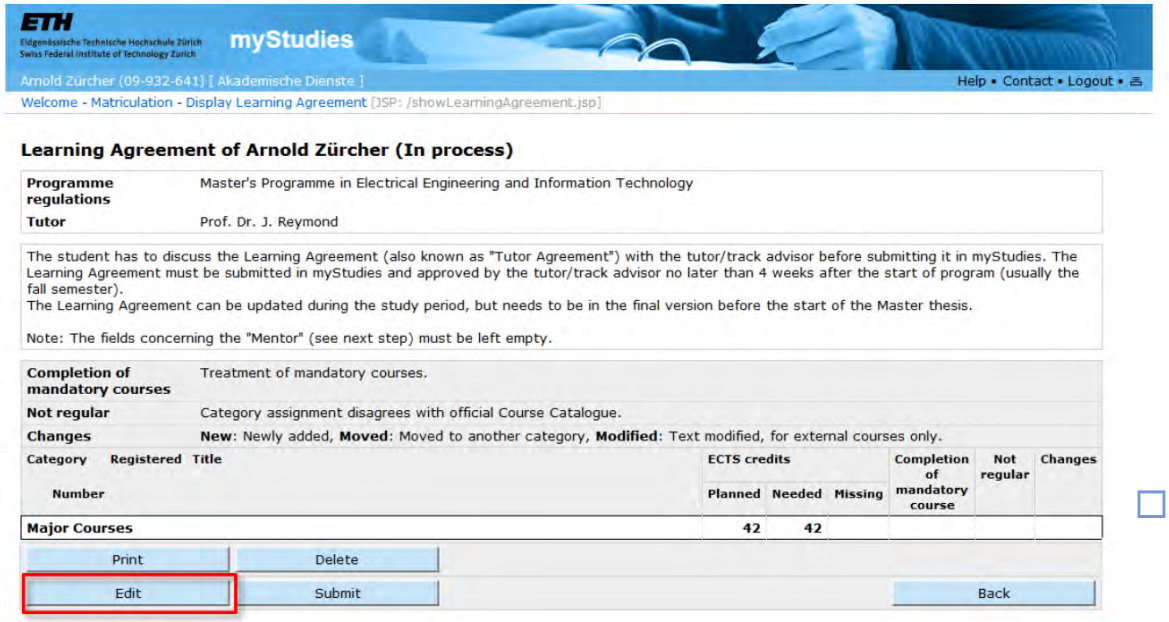
These courses are only intended for students that do not have prior knowledge in these fields

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

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

- Only these courses can be accounted for the final degree

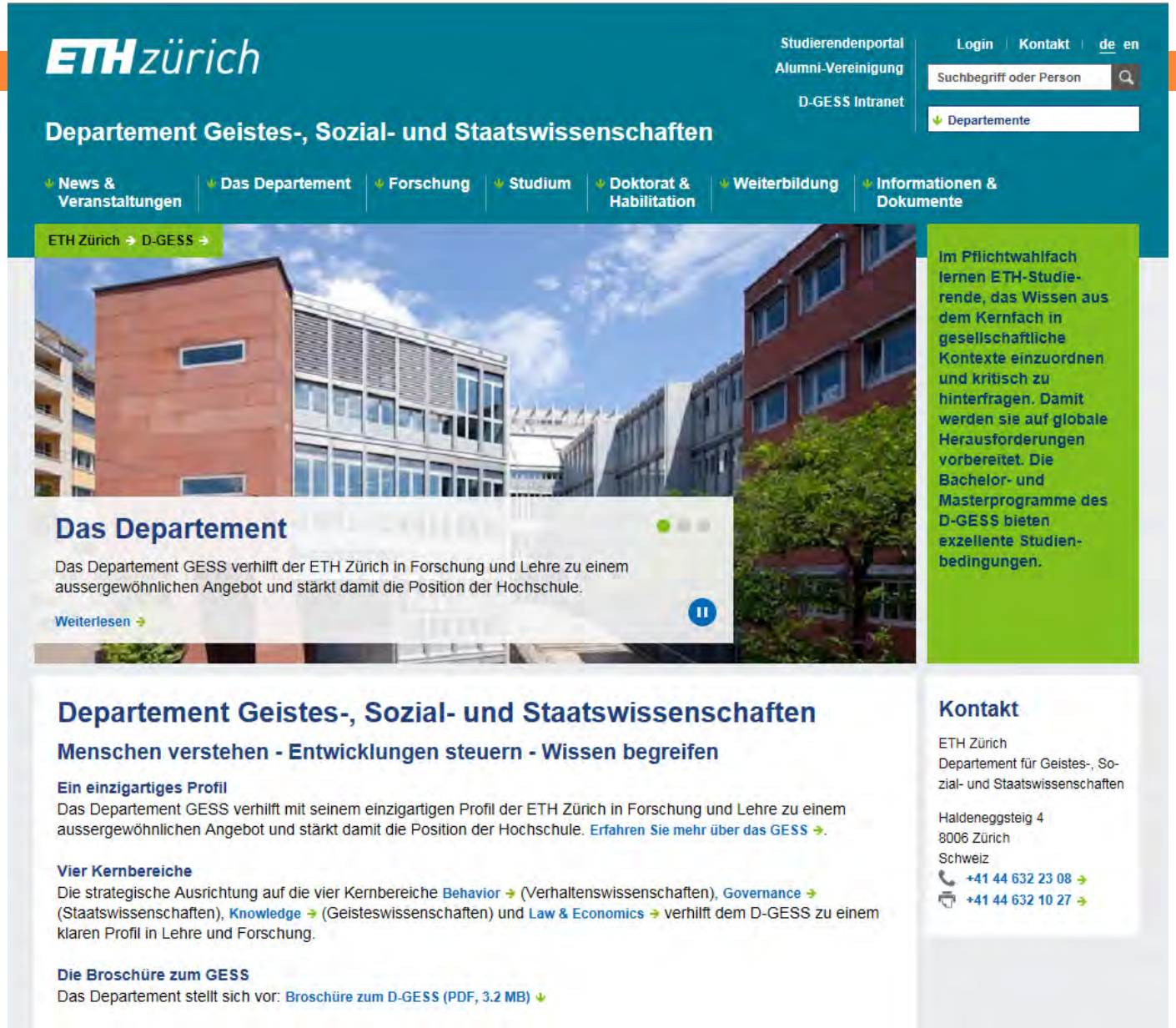
GESS

Art. 37 Kreditpunkte je Kategorie

1 Die für den Erwerb des Master-Diploms erforderlichen 90 KP sind in den nachstehenden Kategorien in der angegebenen Mindestanzahl zu erwerben. Weitere Einzelheiten sind in Abs. 2 – 6 geregelt:

a.	Vertiefungsfächer	50 KP
	1) Kernfächer der Vertiefung (mind. 12 KP)	
	2) Wahlfächer der Vertiefung	
	3) Biologiefächer	
b.	Semesterarbeit	8 KP
c.	Pflichtwahlfach GESS	2 KP
d.	Master-Arbeit	30 KP

GESS / «Science in Perspective»



Course Requirements

Art. 37 Kreditpunkte je Kategorie

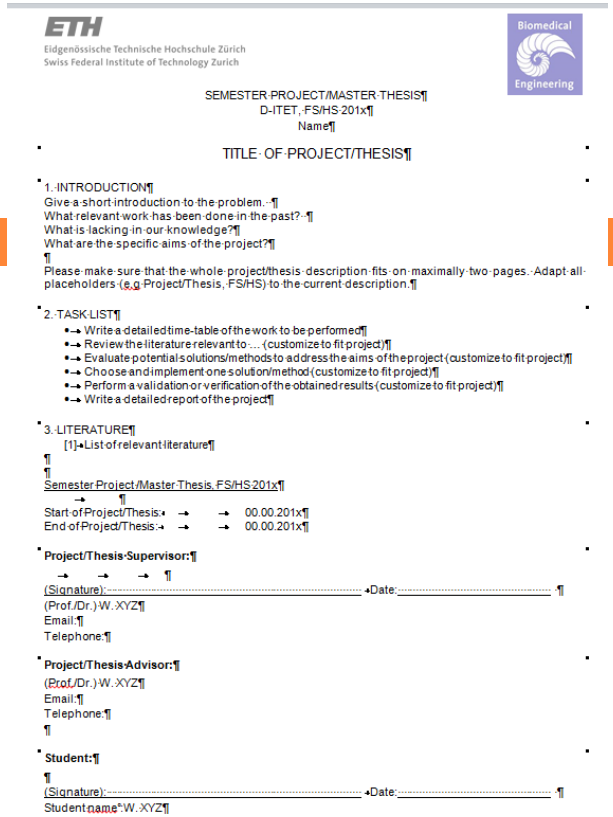
1 Die für den Erwerb des Master-Diploms erforderlichen 90 KP sind in den nachstehenden Kategorien in der angegebenen Mindestanzahl zu erwerben. Weitere Einzelheiten sind in Abs. 2 – 6 geregelt:

a.	Vertiefungsfächer	50 KP
	1) Kernfächer der Vertiefung (mind. 12 KP)	
	2) Wahlfächer der Vertiefung	
	3) Biologiefächer	
b.	Semesterarbeit	8 KP
c.	Pflichtwahlfach GESS	2 KP
d.	Master-Arbeit	30 KP

Semester/Master Projects

- Semester Project 14 week 50% or 7 week 100%
- Master Project, 6 months, 100%

- Can be supervised by any professor from one of the four participating departments (D-ITET, D-HEST, D-MAVT and D-PHYS)
- The description of the project and the starting/finishing dates are signed in a written document
- Register at *myStudies* before you start your project



ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Biomedical Engineering

SEMESTER·PROJECT/MASTER·THESIS¶
D-ITET,·FS/HS·201x¶
Name¶

TITLE·OF·PROJECT/THESIS¶

1.·INTRODUCTION¶
Give·a·short·introduction·to·the·problem.·¶
What·relevant·work·has·been·done·in·the·past?·¶
What·is·lacking·in·our·knowledge?¶
What·are·the·specific·aims·of·the·project?¶
¶
Please·make·sure·that·the·whole·project/thesis·description·fits·on·maximally·two·pages.·Adapt·all·placeholders·(e.g.·Project/Thesis,·FS/HS)·to·the·current·description.¶

2.·TASK·LIST¶
- Write a detailed time-table of the work to be performed¶
- Review the literature relevant to … (customize to fit project)¶
- Evaluate potential solutions/methods to address the aims of the project (customize to fit project)¶
- Choose and implement one solution/method (customize to fit project)¶
- Perform a validation or verification of the obtained results (customize to fit project)¶
- Write a detailed report of the project¶

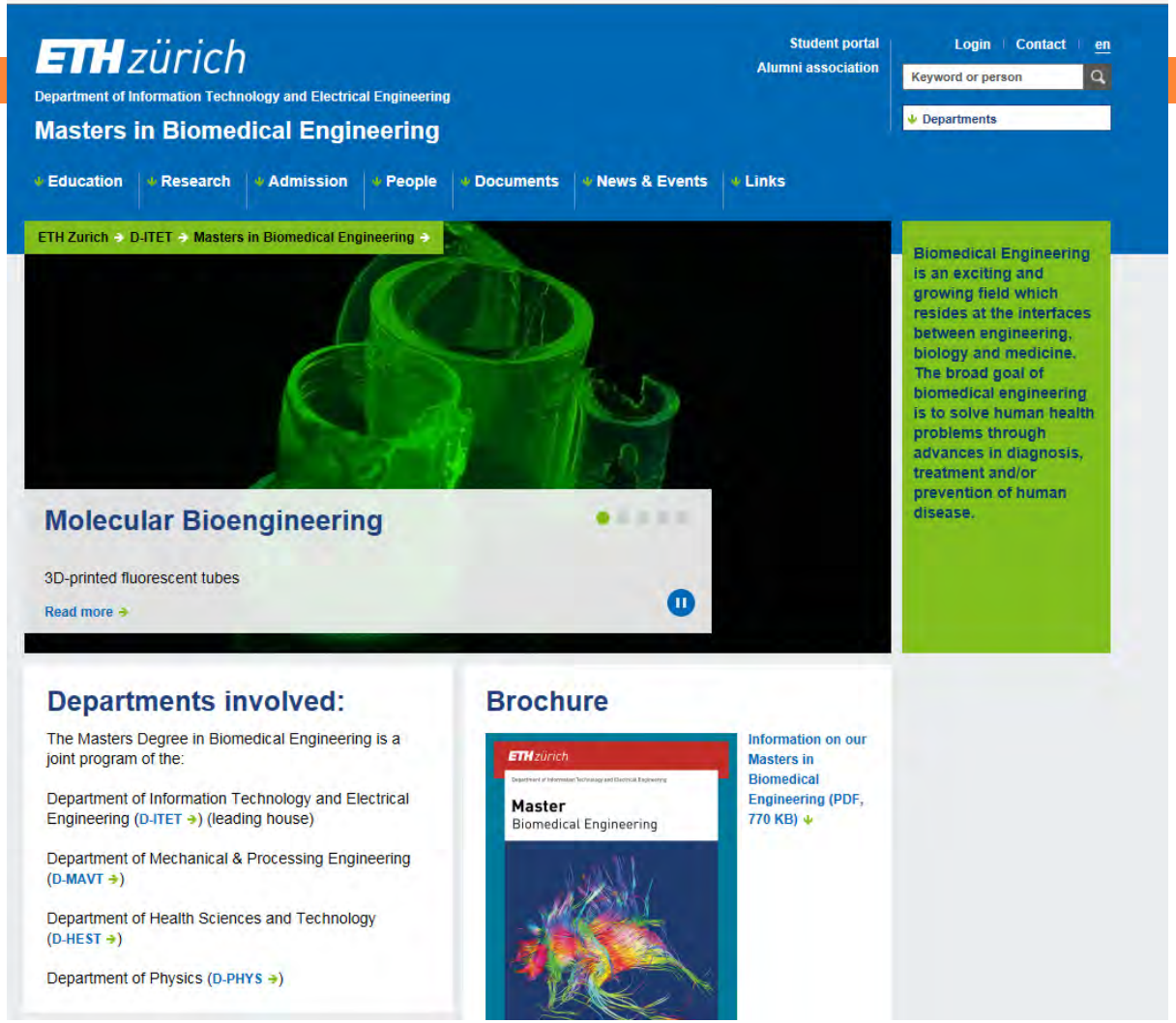
3.·LITERATURE¶
[1] List of relevant literature¶
¶
¶
Semester·Project/Master·Thesis,·FS/HS·201x¶
→ ¶
Start·of·Project/Thesis:· → → 00.00.201x¶
End·of·Project/Thesis:· → → 00.00.201x¶

Project/Thesis·Supervisor:¶
→ → → ¶
(Signature):·····Date:·····¶
(Prof./Dr.)·W.·XYZ¶
Email:¶
Telephone:¶

Project/Thesis·Advisor:¶
(Prof./Dr.)·W.·XYZ¶
Email:¶
Telephone:¶
¶

Student:¶
¶
(Signature):·····Date:·····¶
Student·name·W.·XYZ¶

Information: www.master-biomed.ethz.ch



A Pdf of this presentation can be seen under “News&Events”