Mechanical Engineering Master at EPFL
A. Master degree @EPFL
B. Orientations/specializations
C. Where to find SGM information ?
D. Specific information : specializations, minor, Project et SHS
E. Professors and laboratories
A. Master degree @EPFL

Contact:

Director
Pr. François Gallaire

Deputy
Dr Alain Prenleloup

Secretary
Mme Anne Legrand

Apprentice
M. Colin Leder
A. Master degree @EPFL

Statistic: students - teachers

### Students

- BA
- MA

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Student</th>
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<tbody>
<tr>
<td>08-09</td>
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<td>17-18</td>
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### Staff

- Faculty
- Lecturers (in&ext)

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<tr>
<th>Year</th>
<th>Faculty</th>
<th>Lecturers (in&amp;ext)</th>
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<td>17-18</td>
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European Credit Transfer and Accumulation System: 1 ECTS = 30 work hours (60 ECTS per year x 30 work hours / 45 work weeks = 40 hours by weeks)
A. Master degree @EPFL

MSc curriculum (120 ECTS)

- Electives in Mechanical Engineering
  - Specialization: ≥ 30 ECTS
    - (Excel form on sgm.epfl.ch)
    - ≥ 44 ECTS

- Other electives / Minor
  - ≥ 30 ECTS

- 1 Semester Project in Mechanical Engineering
  - 10 ECTS

- SHS Course + Project
  - 6 ECTS

- Internship and Master Project in Mechanical Engineering
  - 30 ECTS
B. Orientations/specializations

Fluid mechanics
Mechanics of solids and structures
Control and mechatronic

Energy and thermal science
Design and manufacturing
Biomechanics
## B. Filières et spécialisations

### 6 Filières et spécialisations

<table>
<thead>
<tr>
<th>Mécanique des fluides</th>
<th>Mécanique des solides et des structures</th>
<th>Contrôle et mécatronique</th>
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<tbody>
<tr>
<td>Drainage of gaseous and liquid fluids</td>
<td>Transport</td>
<td>Control: design of control systems to ensure stability and performance</td>
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<tr>
<td>Non-Newtonian fluid</td>
<td>Aerospace</td>
<td>Mechatronics: electromechanical integration of controlled systems</td>
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<tr>
<td>Multi-phase flow</td>
<td>Power generation</td>
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<tr>
<td>Fluid-structure interaction</td>
<td>Sports Technology</td>
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</tr>
<tr>
<td>Energy</td>
<td>Biomedical applications</td>
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<tr>
<td>Bioengineering application</td>
<td>Materials Technology</td>
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<tr>
<td>Transport</td>
<td>Design method</td>
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### Science thermique et énergie

<table>
<thead>
<tr>
<th>Conception et production</th>
<th>Biomécanique</th>
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<tbody>
<tr>
<td>Building and industry</td>
<td>Applied: design of orthopedic or cardiovascular implants</td>
</tr>
<tr>
<td>Transport</td>
<td>Fundamental: correlation between biological response and predictive simulations</td>
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<tr>
<td>Electricity generation</td>
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<tr>
<td>Renewable Energy</td>
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<tr>
<td>Etc.</td>
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<td>Design process</td>
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<tr>
<td>Modeling</td>
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<td>Experimental Setup</td>
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<td>Design optimization</td>
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<td>Product Manufacturing</td>
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</table>
B. Orientations/specializations

Control and mechatronic

Dr Alireza Karimi
B. Orientations/specializations

Biomechanics

Pr. Salman Sakar
B. Orientations/specializations

Mechanics of solids and structures

Pr. Guillermo Villanueva
B. Orientations/specializations

Design and manufacturing

Pr. Jürg Schiffmann
B. Orientations/specializations

Energy and thermal science

Pr. Sophia Haussener
B. Orientations/specializations

Fluid mechanics

Pr. Tobias Schneider
C. Where to find SGM information?

IGM general webpage: https://sti.epfl.ch/fr/recherche/instituts/igm/

sgm@epfl.ch
C. Where to find SGM information?

Orientation: [https://sti.epfl.ch/fr/recherche/instituts/igm/](https://sti.epfl.ch/fr/recherche/instituts/igm/)

[...] *enseignement/master-en-genie-mecanique/filieres-sgm/*
C. Where to find SGM information?

Usefull documents: [https://sti.epfl.ch/fr/recherche/instituts/igm/](https://sti.epfl.ch/fr/recherche/instituts/igm/)

[...] enseignement/documents-utiles-memsc/
Plan Individuel d'études Master

<table>
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<tr>
<th>Course</th>
<th>Code</th>
<th>ECTS</th>
<th>Semestre d'enseignement</th>
<th>Semestre d'examens</th>
<th>Filière</th>
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<th>Bloc Projet</th>
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<thead>
<tr>
<th>Concentration: not mandatory!</th>
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<tbody>
<tr>
<td>Concentration advisor’s signature: needed only if you do a concentration</td>
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</tbody>
</table>

44+ ECTS
From the list on the 2nd sheet + 2 Bachelor courses (to be approved by Section Director)

16 ECTS
Semester project + SHS

30+ ECTS
Minor or any courses including those from the list on the 2nd sheet

Becomes green if your plan complies with the rules

Suggested workload 25-35 ECTS / semester
Already proposed by IS-Academia in the Groupe « Options »

To be looked up and placed in the Groupe « Options »
C. Where to find SGM information?

What are the learning prerequisites?

Learning Prerequisites

| Required courses
| Control systems + Lab
| Recommended courses
| 1. Control Systems
| 2. System Identification
| 3. Multivariable systems

Important concepts to start the course

- Analyze a linear dynamical system (both time and frequency responses)
- Represent a linear system by a transfer function
- Identify a dynamic system using experimental data
- Design a PID controller
- Design a state controller for a dynamic system

Learning Outcomes

At the end of the course, the student must be able to:

- Design an advanced controller for a dynamic system, A11
- Assess the stability, performance and robustness of a closed-loop system, A12
- Design (specific cases) the adequate control performance for dynamical systems, A13
- Propose several control solutions, formulate the trade-offs, choose the options, A14
D. Specific information

How to choose and register for courses?

1. Create your study plan for the 3 semesters (Excel form)
2. If you do a specialization: submit it for approval to the concentration advisor and then to SGM secretariat
3. A course can count once either in a Minor or in Groupe « options »
4. Register for courses in IS-Academia (mandatory) before September 25th (covid – extension)
5. Announce all major modification (ex: minor surrender) of your study plan to our secretariat (update and submit your form)
6. Exam withdraw until the 10th week’s semester, except for semester courses (November 20)
7. 2 Bachelor courses may eventually be accepted with the section’s Director prior agreement
General exam withdrawal deadline for 2020-21 Winter Session: 20 November 2020

It is not possible to withdraw after 25th September from the semester courses listed here:

- ME-401 Projet Génie mécanique I (semester project)
- ME-402 Projet Génie mécanique II (semester project)
- ME-524 Advanced control systems
- ME-403 Applied mechanical design
- ME-412 Experimental methods in engineering mechanics
- ME-410 Mechanical product design and development
- ME-476 Particle-based methods
- ME-499 Simulation and optimisation of industrial applications
- ME-421 System identification
- ME-446 Two-phase flows and heat transfer

How to choose and register for courses?

D. Specific information
D. Specific information

How to choose and register for courses?

Art. 12 - Choix des branches

(5) L’étudiant est responsable de la conformité au règlement du choix des branches

Art. 12 al. 5 (english)

It is the student’s responsibility to have a study plan that complies with the section rules
D. Specific information

Minors: subscription before the end of the first semester

Recommended Minors

- Energy
- Area and cultural studies
- Management of technology and entrepreneurship
- Computational science and engineering
- Materials science and engineering
- Biomedical technologies
- Spatial technologies

Any other EPFL Minor is accepted
Minors

D. Specific information

Registration deadline

- End of the first semester
- Better at the beginning of the semester

Procedure

- Select the minor in IS-Academia
- Contact the Minor advisor
- Fill-in the registration form (copy to SGM)
- Register for courses in IS-Academia
- Withdrawal from a Minor: contact SGM to convert part of the Minor’s ECTS to electives
Specialization is elective

- Domain consolidation
- 30 ECTS with variable fundamental base courses
- EPFL rule under modification: minor vs specialization!!!

30 credits fundamental base courses:

- A Mécanique des fluides: 16
- B Automatique et systèmes: 9
- C Conception et Production: 17
- D Sciences thermiques: 15
- E Mécanique des solides et des structures: 17
- F Biomécanique: 8
Semester Projects in Mechanical Engineering

- Projects I: mandatory (10 ECTS)
- Project II: elective (10 ECTS)

Registration procedure

- Find a project (Lab websites, contact an SGM teacher)
- Register for the project in IS-Academia and print the registration form
- Get the form signed by the SGM teacher in charge of the project
- Submit the signed form to SGM
D. Specific information

SHS (social and Human sciences)


The SHS program is over two semesters (Fall-Spring)

REGISTER NOW!
**D. Specific information**

**Industrial internship**

When?

- Before the Master Project (PDM)
- With the Master Project (PDMe)

Duration

- $\geq 8$ weeks, $\leq 6$ months
- 25 weeks if combined with the Master Project

Full presentation the 26th October

Sebastian Gautsch
D. Information spécifique

Industrial internship

- **Fall**: Master cycle (60 credits), Internship (8 weeks)
- **Spring**: Master cycle (60 credits), Minor/spec (30 credits)

- **Fall**: Master project in Industry, 25 weeks
- **Spring**: PDM in academia, 17 to 25 weeks

- **Fall**: Master project in Industry, 25 weeks
2 alternatives

- At EPFL under the (co)supervision of an SGM teacher
- Outside EPFL (University or company, combined or not with the internship) under the (co)supervision of an SGM teacher

Duration

- at EPFL: 17 weeks
- outside EPFL: 25 weeks
- You need to pass each exam
- The 44 ECTS in Mechanical Engineering can only come from the list in the Excel sheet
- You need 30 ECTS for a specialization
- If you do a Minor you are not allowed to take any additional ECTS outside Mechanical Engineering
- Begin your SHS this Fall
- To begin you Master Project you must have passed at least 82 ECTS
- Dedicated presentation with Q&A: Monday 21 September, 13:15 by zoom
E. Professors and laboratories

- **ECPS**: Emergent Complexity in Physical Systems
- **LFMI**: Laboratory of Fluid Mechanics and Instabilities
- **UNFOLD**: Unsteady Flow Diagnostics Laboratory
- **LMH**: Hydraulic Machines Laboratory

- **IPESE**: Industrial process and Energy Systems Engineering
- **LRESE**: Laboratory of Renewable Energy Science and Engineering
- **SCI-STI-JVH**: JVH Group: Solid Oxide Fuel Cells
- **SCI-STI-PO**: PO Group: Turbomachines
### E. Professors and laboratories

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Description</th>
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<tbody>
<tr>
<td>LMAF</td>
<td>Laboratory of Applied Mechanics &amp; Reliability Analysis</td>
</tr>
<tr>
<td>LAMMM</td>
<td>Laboratory for Multiscale Mechanics Modeling</td>
</tr>
<tr>
<td>FLEXLAB</td>
<td>Flexible Structures Laboratory</td>
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<tr>
<td>EMSI</td>
<td>Engineering Mechanics of Soft Interfaces</td>
</tr>
<tr>
<td>NEMS</td>
<td>Advanced Nano-electromechanical Systems Laboratory</td>
</tr>
<tr>
<td>LAMD</td>
<td>Laboratory for Applied Mechanical Design</td>
</tr>
<tr>
<td>RRL</td>
<td>Reconfigurable Robotics Lab</td>
</tr>
<tr>
<td>SCI-STI-DK</td>
<td>DK Group: Closed Loop Lifecycle Management</td>
</tr>
</tbody>
</table>
E. Professors and laboratories

**LA3**
Automatic Control Laboratory 3

**SCI-STI-GFT**
GFT-Group Control (microgrids, systems)

**MICROBS**
MicroBioRobotic Systems Laboratory

**LBO**
Laboratory of Biomechanical Orthopedics
Thanks for your attention

Questions?