Bienvenue – Welcome

Mechanical Engineering

SGM

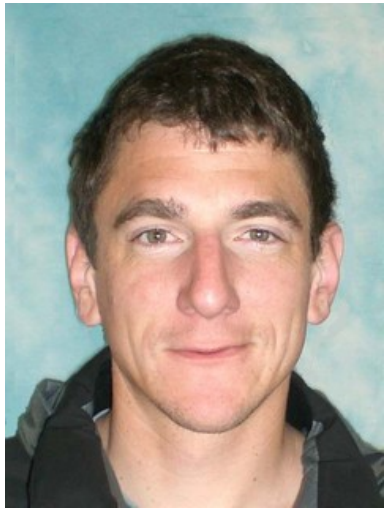
Section de Génie mécanique

SGM Contacts

Director

Prof. Guillermo Villanueva

Deputy



Dr. Alain Prenleloup

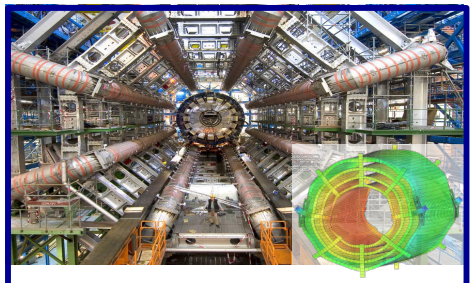
Secretary

Mrs Tamara Pelège

Exchange study advisor:
Prof. Giancarlo Ferrari Trecate

All about your SGM contacts

SGM MSc domains/specializations

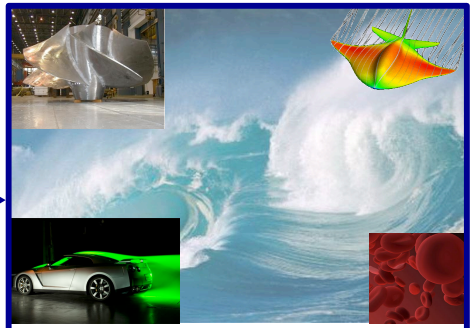


Mechanics of solids and structures

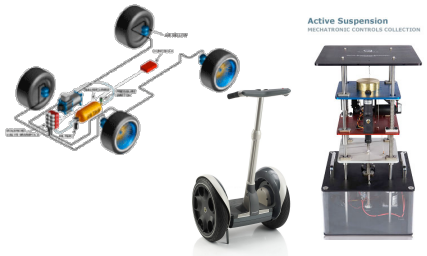
Energy and thermal sciences

Biomechanics

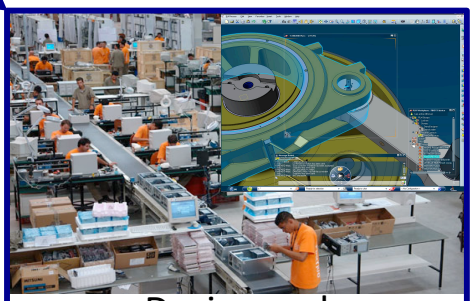
6 DOMAINS



Fluid mechanics

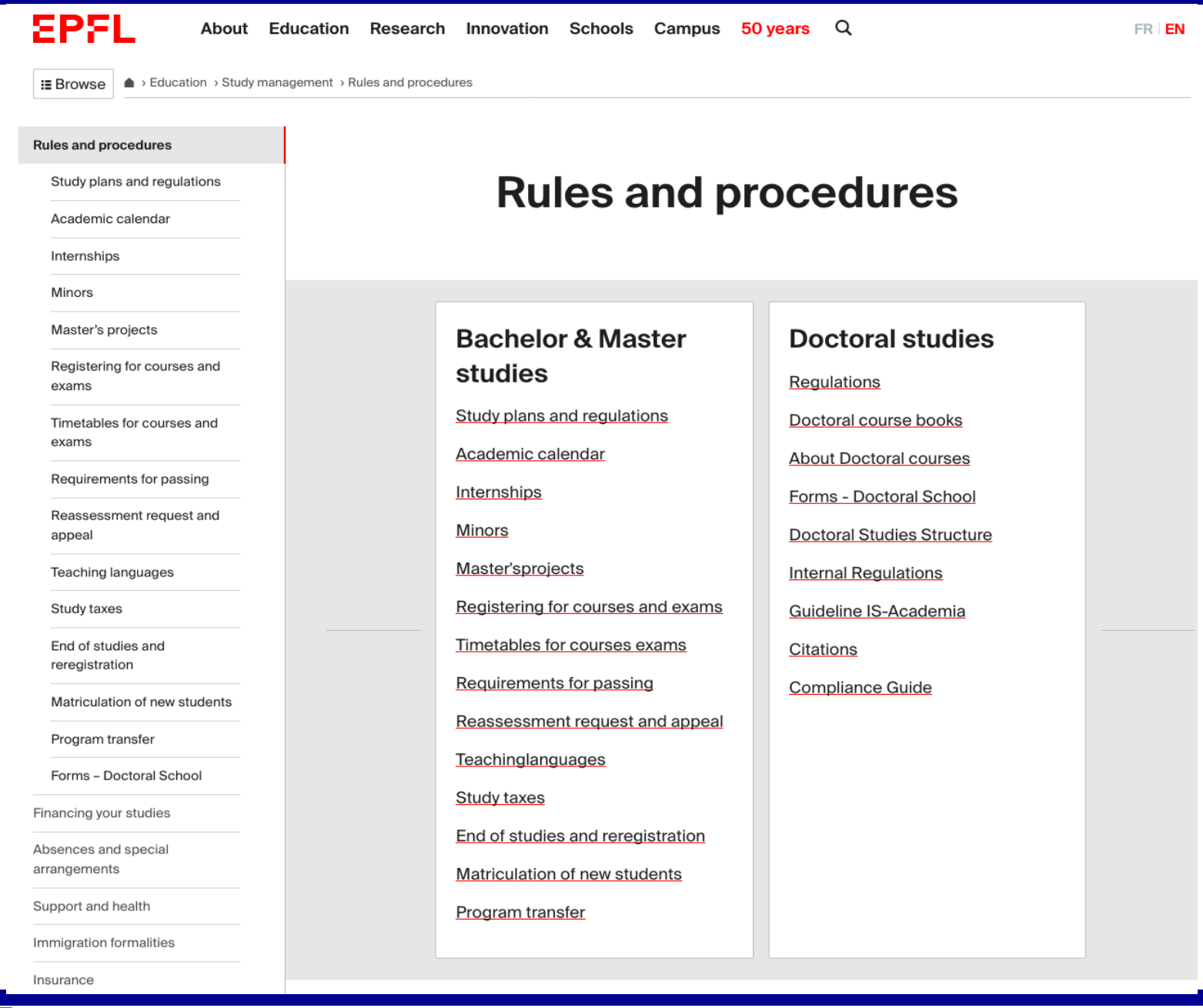


Control and mechatronics



Design and manufacturing

Rules: key webpage



https://www.epfl.ch/education/studies/en/rules-and-procedures/

SGM Section de Génie mécanique

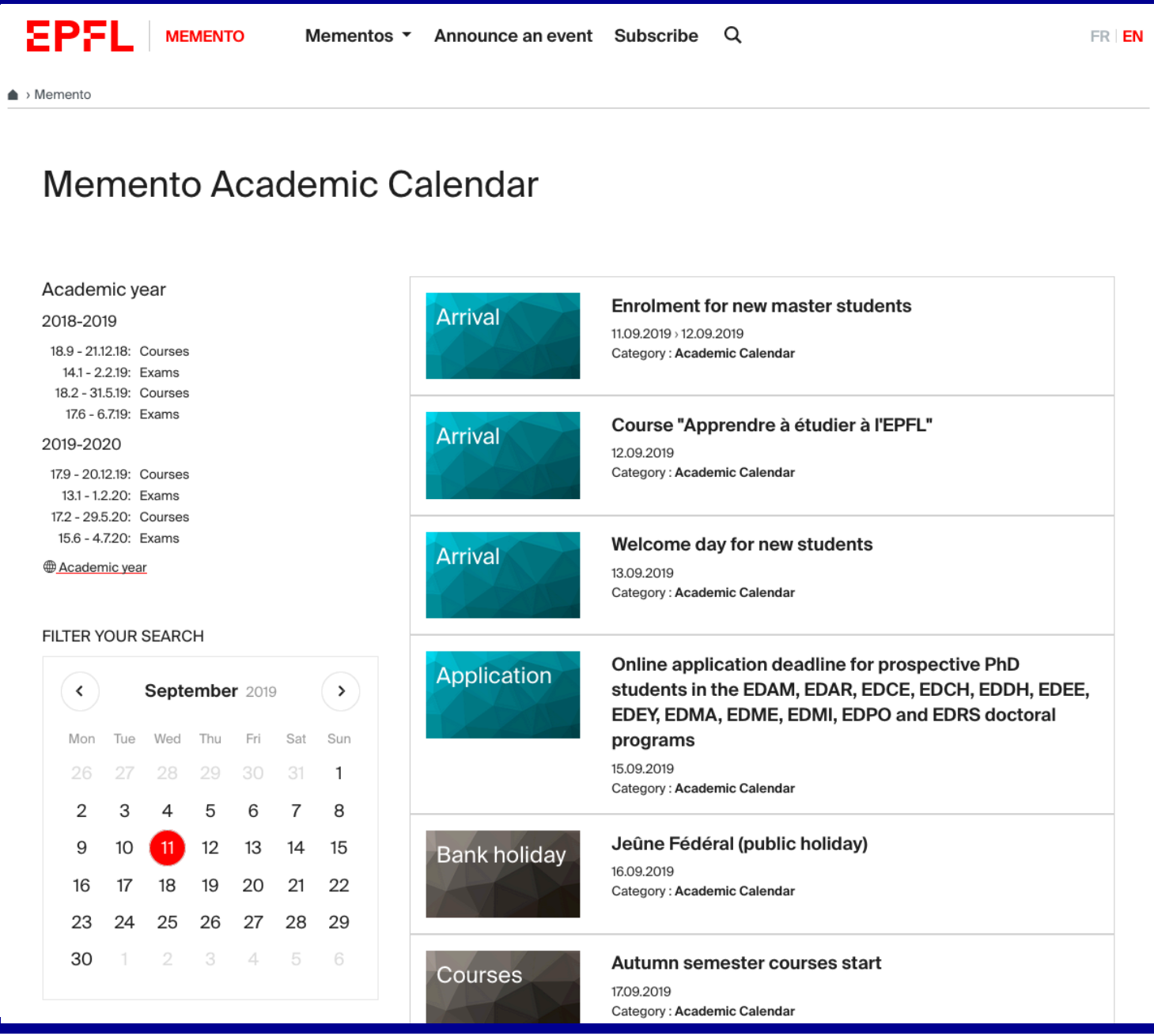
Courses: choice and registration

- Create your study plan for up to 3 semesters
- Can choose courses from other EPFL master programs, if your University allows for it

- MANDATORY: register for courses in IS-Academia before the end of the 2nd week of the semester
  - Your Learning Agreement is not enough
  - Registering implies automatic registration for the exam

- Exam withdraw until the 10th week's semester
  - For some courses (tagged "sans retrait") **withdrawal is not allowed after the registration deadline -** highlighted with an alert in the registration tab on IS-Academia.

Academic calendar



https://memento.epfl.ch/academic-calendar/?period=180

SGM Section de Génie mécanique

Courses: learning prerequisites

FICHES DE COURS

Propédeutique | Cycle Bachelor | Cycle Master | Mineur | Ecole doctorale

PDF

Advanced control systems

ME-524

Enseignant(s) :
Karimi Alireza

Langue:
English

Withdrawal
It is not allowed to withdraw from this subject after the registration deadline.

Summary
This course covers some theoretical and practical aspects of robust and adaptive control. Robust controller design with H-infinity performance, digital controller design with pole placement technique, direct, indirect and switching adaptive control are studied and implemented in a hands-on lab.

Content

Stability, performance and robustness of closed-loop control systems. Robust controller design by loop shaping. Robust H-infinity controller design in the frequency domain. Multivariable decoupling controller design. Gain-scheduled controller design.

Two-degree of freedom RST digital polynomial controller. Pole placement technique and its relation to Internal Model Control (IMC), Model Reference Control (MRC) and Minimum Variance Control (MVC). Robust pole placement with Q parameterization. Parameter adaptation algorithms. Direct and Indirect adaptive control. Switching adaptive control.

Keywords

Adaptive control, robust control, digital RST controller.

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 simple controller for a dynamic system

Learning Outcomes
By the end of the course, the student must be able to:

- Design an advanced controller for a dynamic system, A11
- Assess / Evaluate the stability, performance and robustness of a closed-loop system, A12
- Define (specifications) the adequate control performance for dynamic systems, A13
- Propose several control solutions, formulate the trade-offs, choose the options, A14

DANS LES PLANS D'ÉTUDES

Génie mécanique, 2018-2019, Master semestre 2

Semestre
Printemps

Forme de l'examen
Pendant le semestre

Crédits
3

Matière examinée
Advanced control systems

Cours
2 Heure(s) hebdo x 14 semaines

Projet
1 Heure(s) hebdo x 14 semaines

Génie mécanique, 2018-2019, Master semestre 4

Gestion de l'énergie et durabilité, 2018-2019, Master semestre 2

Gestion de l'énergie et durabilité, 2018-2019, Master semestre 4

Microtechnique, 2018-2019, Master semestre 2

Microtechnique, 2018-2019, Master semestre 4

Robotique, 2018-2019, Master semestre 2

Mineur en Systems Engineering, 2018-2019, Semestre printemps

SEMAINE DE RÉFÉRENCE

	Lu	Ma	Me	Je	Ve
8-9			MEB331		
9-10			MEB331		
10-11					
11-12					
12-13					
13-14					
14-15					
15-16					
16-17					
17-18					
18-19					
19-20					
20-21					
21-22					

Cours | Exercice, TP | Projet, autre

LÉGENDE

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)
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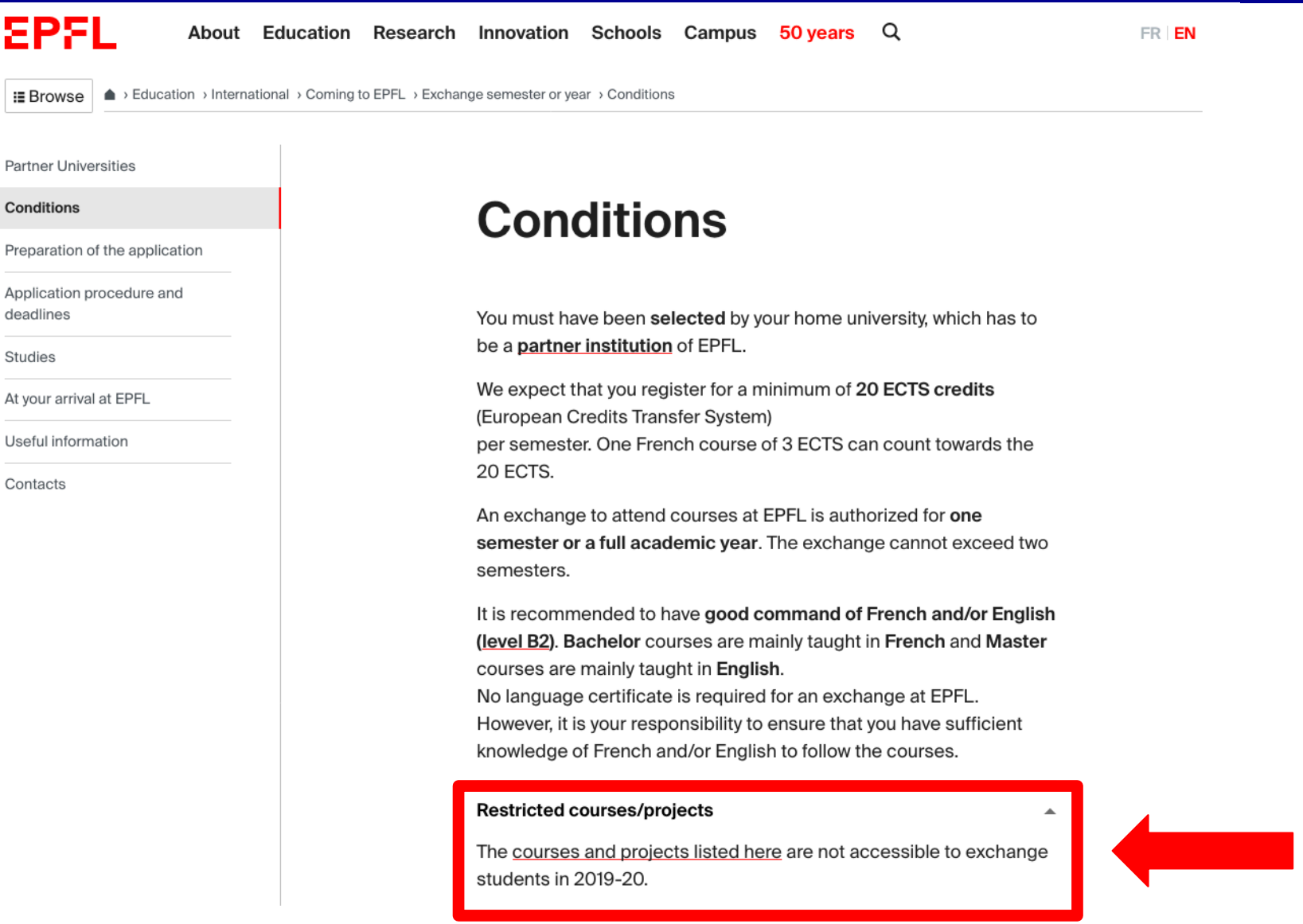
Restricted courses



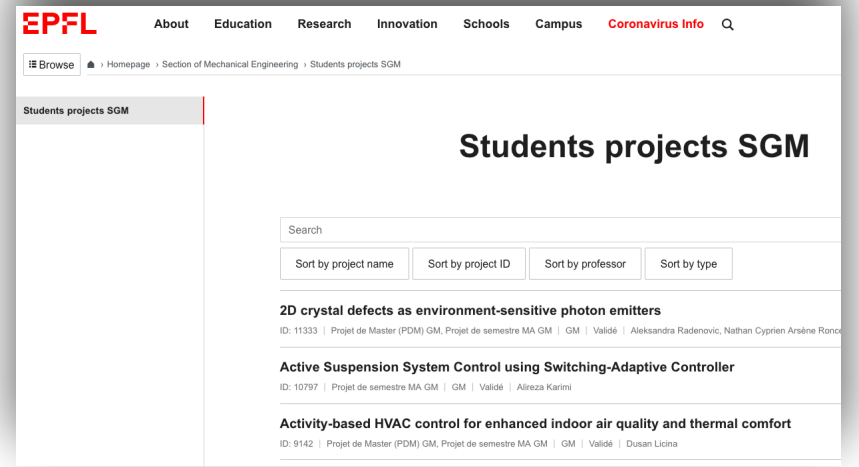
https://www.epfl.ch/education/international/fr/venir-etudier-a-l-epfl/semestres-cours/conditions/

Semester projects

- Semester projects in Mechanical Engineering
  - Project I: mandatory for EPFL students (10 ECTS)
  - Project II: elective for EPFL students (10 ECTS)
    - Starting date: semester's starting day
    - Report handing-in date: a few days before the corresponding exam session

- Registration procedure
  - Find the project by yourself

    https://inside.epfl.ch/projets-etudiants-sti/students-projects-sgm/
  - 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



Other types of projects

- Specific for exchange students
  - EPFL-301 “Project specifique pour etudiant d’échange et visiteur". The number of credits can be adapted.
    - As for semester projects, you have to find the project by yourself

- Bachelor-level project
  - “Projet d'Ingegnerie Simultanée» – 5 credits
    - During the spring semester
    - MANDATORY registration before November 30th – send an email to the SGM secretary Mme Pelège

SHS courses

Social and Human Sciences (SHS) Program

The SHS program is an integral part of all study plans at EPFL, from the first year of a Bachelor's degree to the first year of the Master's degree. It offers students a great freedom of choice, **from around 150 courses** that cover a wide range of humanities and social sciences.

Among these courses, 18 are also **open to UNIL students**, 5 of them on a permanent basis.

Courses' timetables

BA 1st year propedeutic, spring: **Tuesday 5.15 pm-7 pm**
BA semester 3 and 4: **Tuesday 3.15 pm-5 pm**
BA semester 5 and 6: **Tuesday 1.15 pm-3 pm**
Master semester 1 and 2: **Wednesday 4.15 pm-7 pm**
> Download the SHS 2022-2023 course brochure (pdf)

→ Search for SHS course

The SHS program is over two semesters (fall and spring)

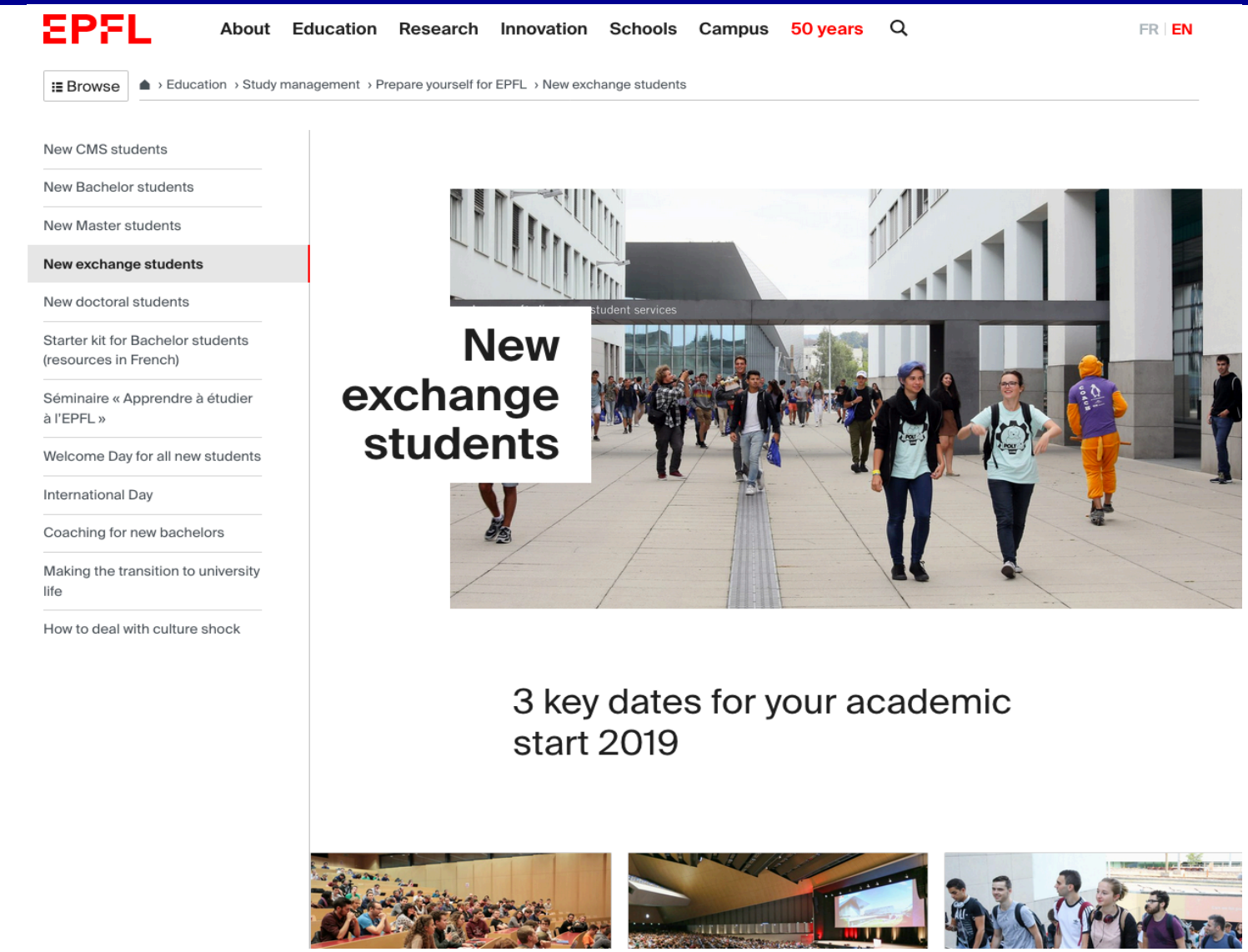
REGISTER NOW!

Important for exchange students

- For students who followed courses at EPFL as exchange students and apply for an EPFL Master's Program:

  - **If some Master credits obtained during your exchange program were not used at your university of origin, you will be able to validate them for your Master's Program at EPFL (30 credits maximum).**

Welcome page for exchange students



https://www.epfl.ch/education/studies/en/preparation-epfl/new-exchange-students/

SGM student association

STUDENTS ASSOCIATION IN MECHANICAL ENGINEERING

-> Your association !

https://amac.epfl.ch/

Association for exchange students

https://epfl.esn.ch/

Individual support for students

EPFL

Soutien
Conseils
Ecoute

Pour étudiant-e-s et doctorant-e-s

Problèmes financiers

Stress et difficultés d'organisation

Mal-être (anxiété, tristesse, isolement, dépendances, pression...)

Soucis familiaux et relationnels (intégration, harcèlement...)

Questionnements sur les études (motivation, orientation...)

Aménagement des études (maladie chronique, situation de handicap, difficulté d'apprentissage...)

go.epfl.ch/soutien-individuel

Guichet étudiants
services.etudiants@epfl.ch
+41 21 693 43 45

Questions ?