SGM
Section de Génie mécanique

Mechanical Engineering Master at

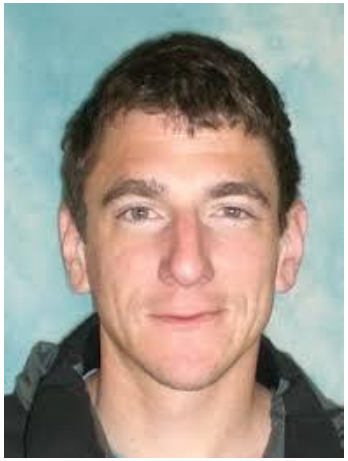
ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

SGM Contacts

Director

Pr. François Gallaire

Deputy



Dr Alain Prenleloup

Secretary

Mme Anne Legrand

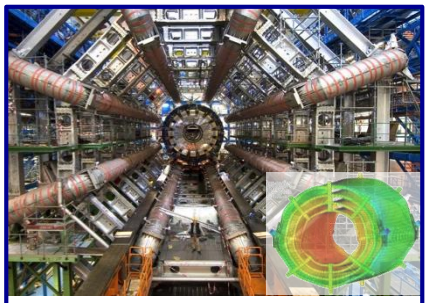
Apprentice

Mme Asha Baskaralingam

MSc curriculum (120 ECTS)

« GROUPE »	Electives in Mechanical Engineering Concentration: ≥18 ECTS (Excel form on sgm.epfl.ch)	≥44 ECTS
« GROUPE »	Other electives / Minor	≥30 ECTS
« BLOC »	1 Semester Project in Mechanical Engineering	10 ECTS
	SHS Course + Project	6 ECTS
	Internship and Master Project in Mechanical Engineering	30 ECTS

MSc Concentrations

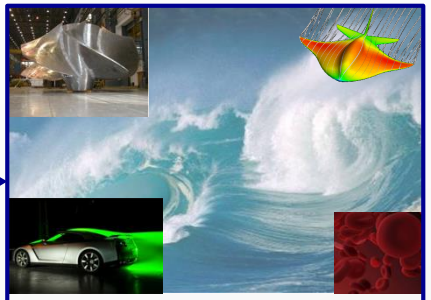


Solids & Structures

Energy

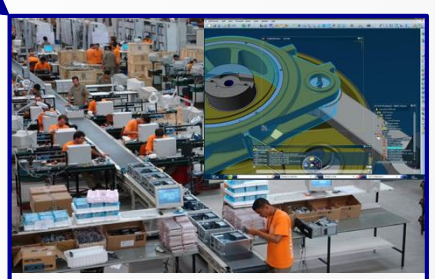
Biomechanics

6 CONCENTRATIONS



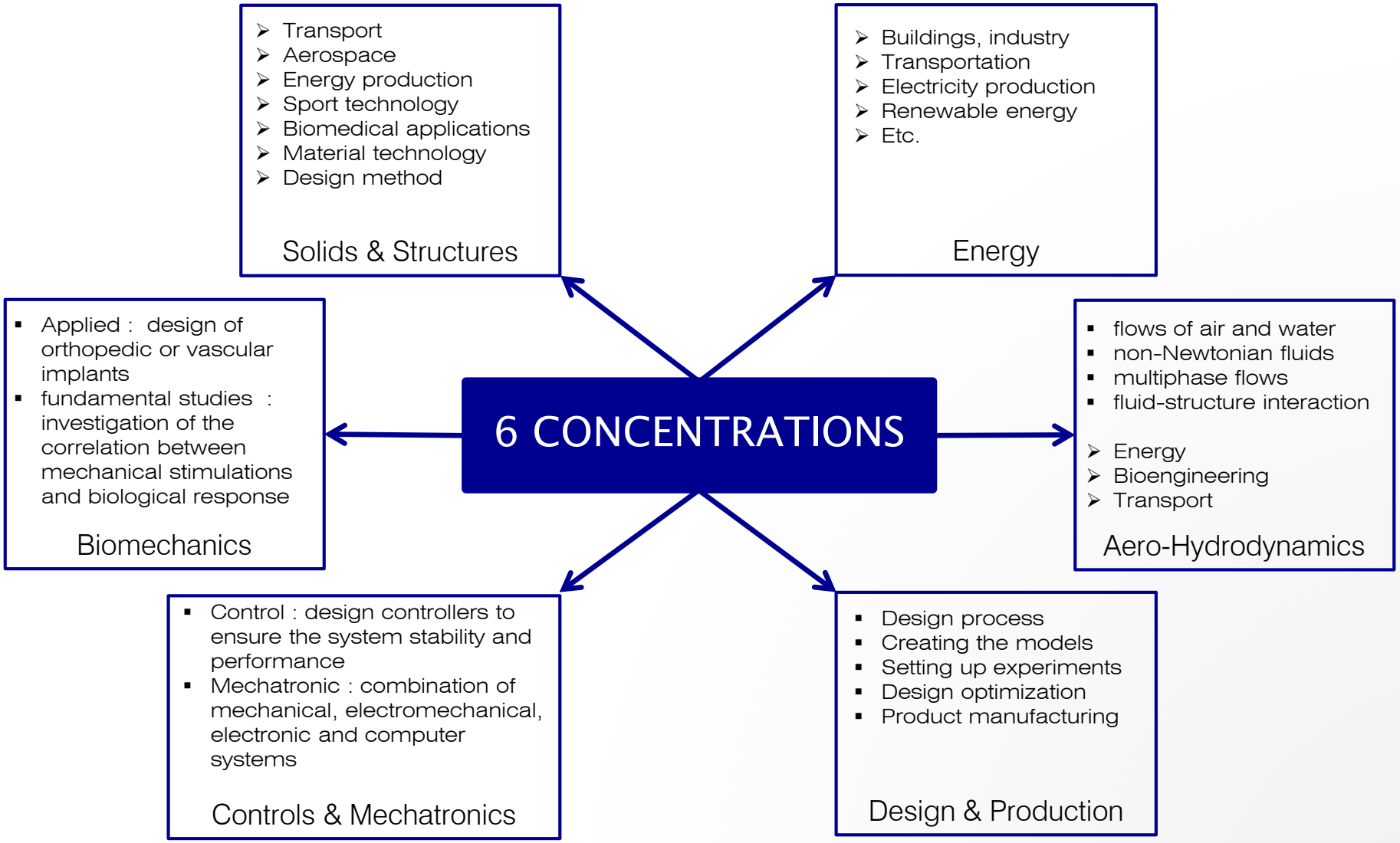
Aero-Hydrodynamics

Controls & Mechatronics

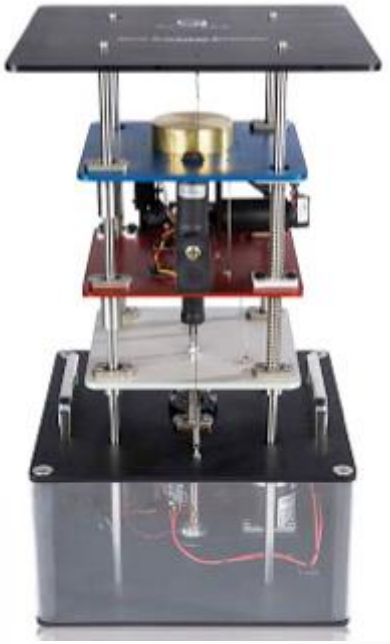


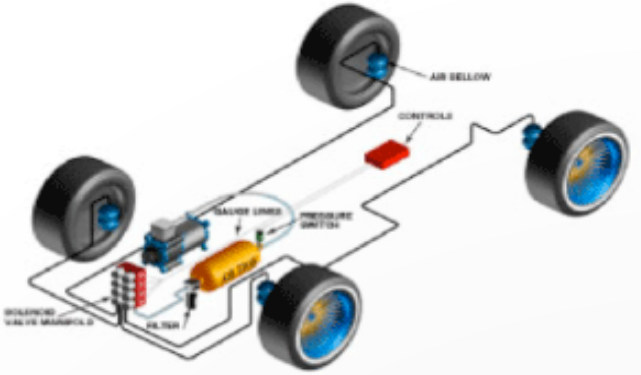
Design & Production

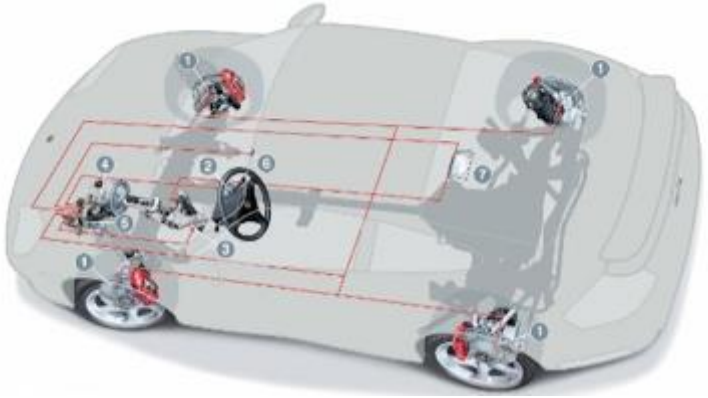
MSc Concentrations



Control and mechatronics



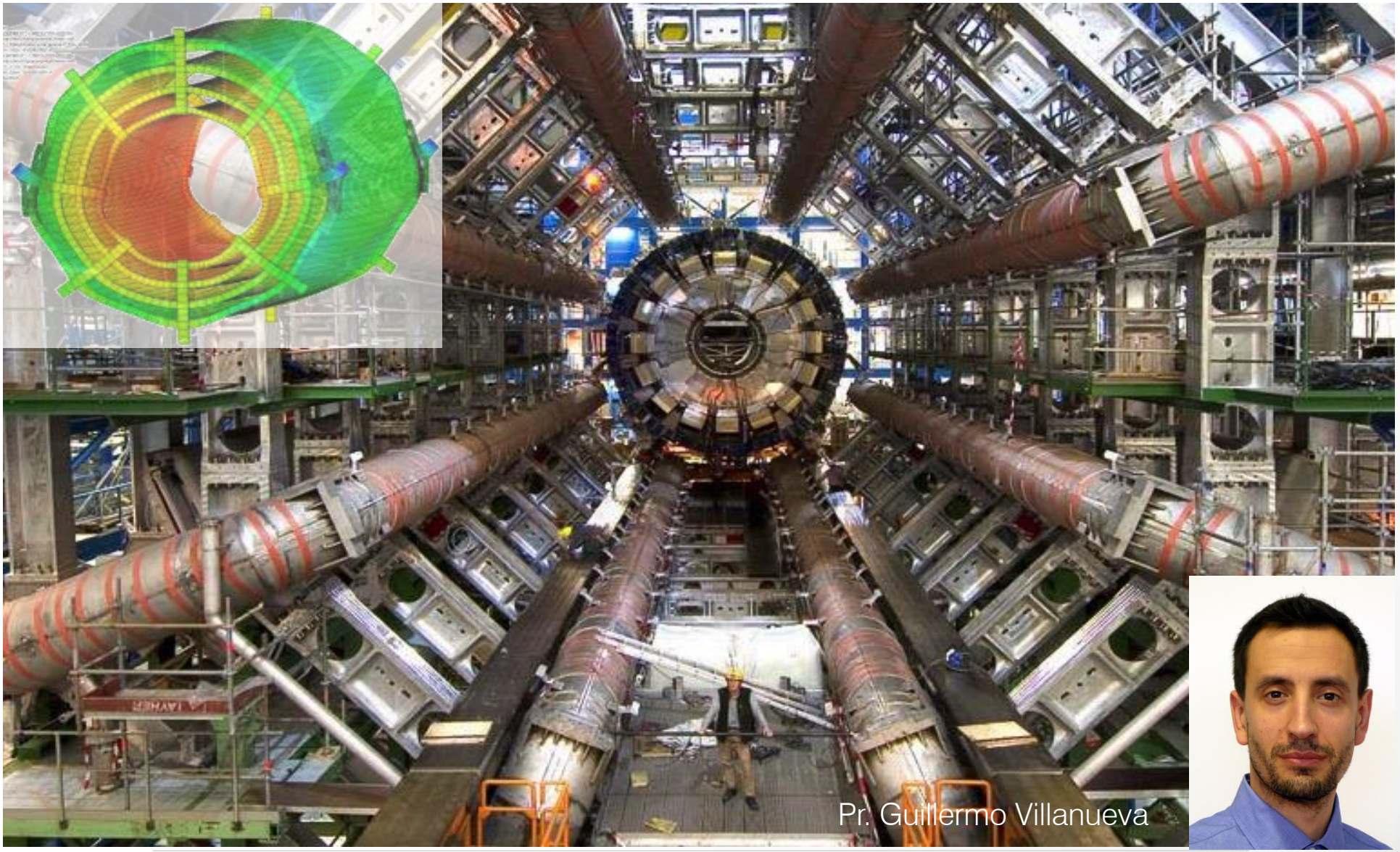




Dr Alireza Karimi

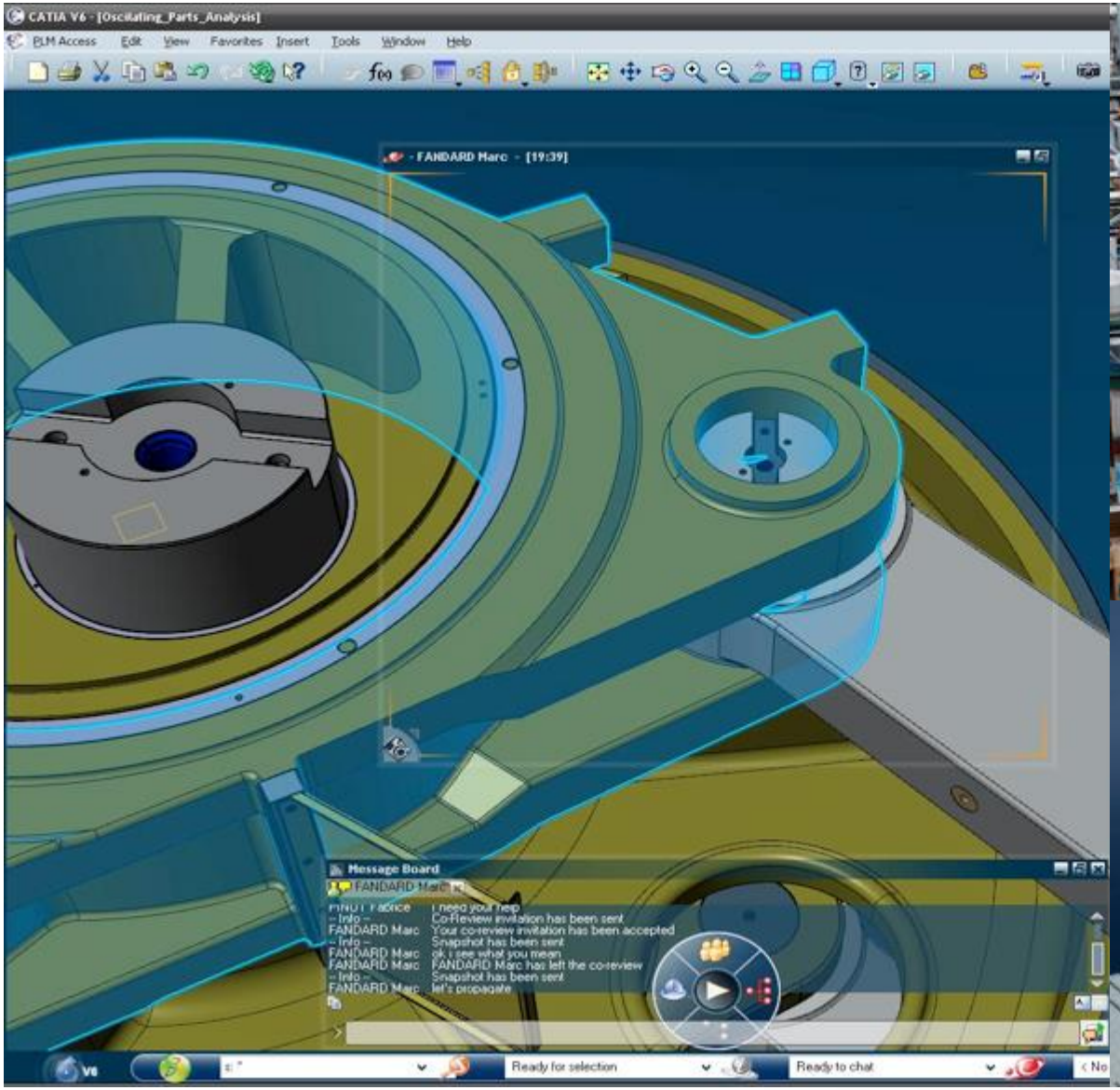
Biomechanics

Mechanics of solids and structures

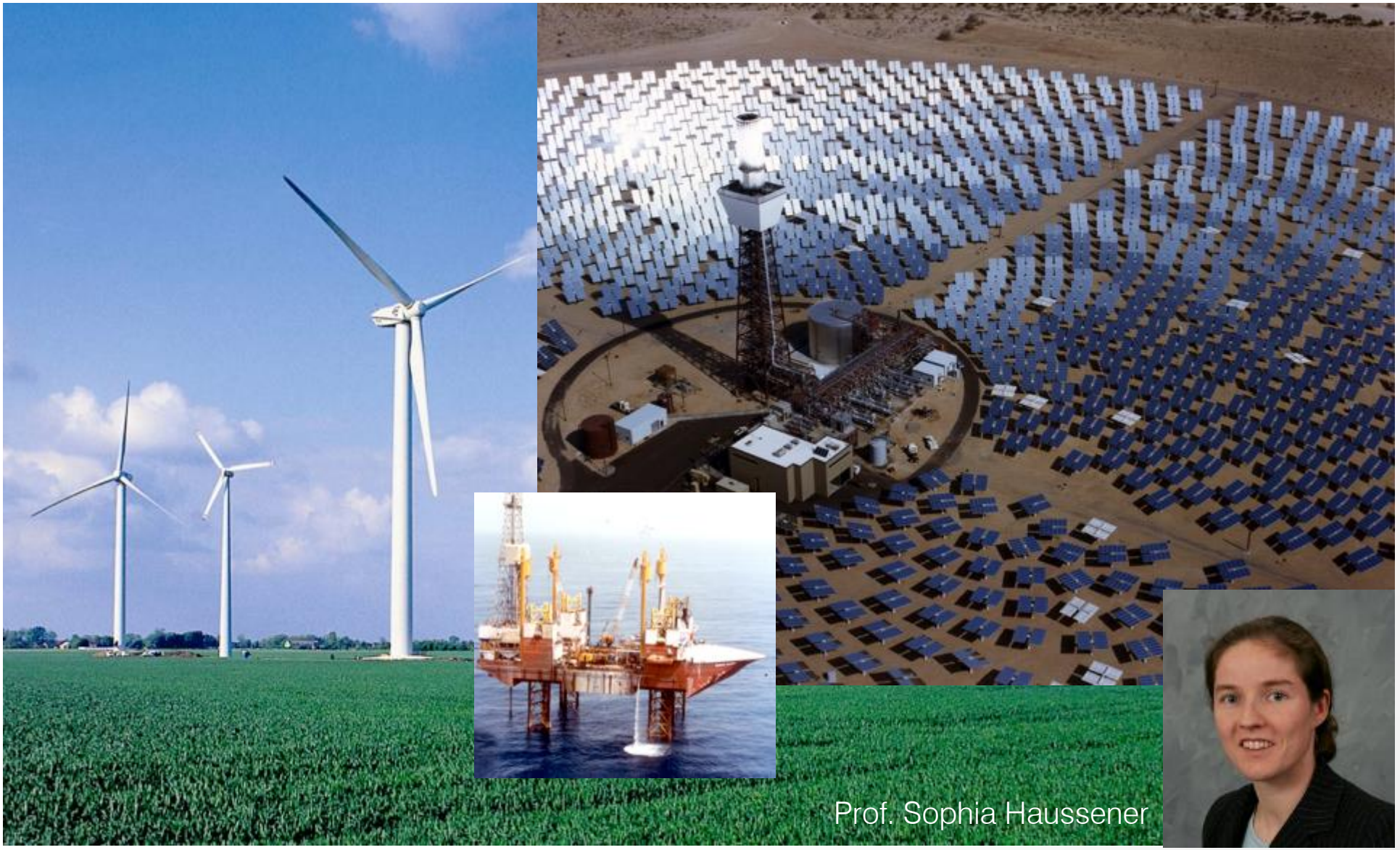


Pr. Guillermo Villanueva

Design and production

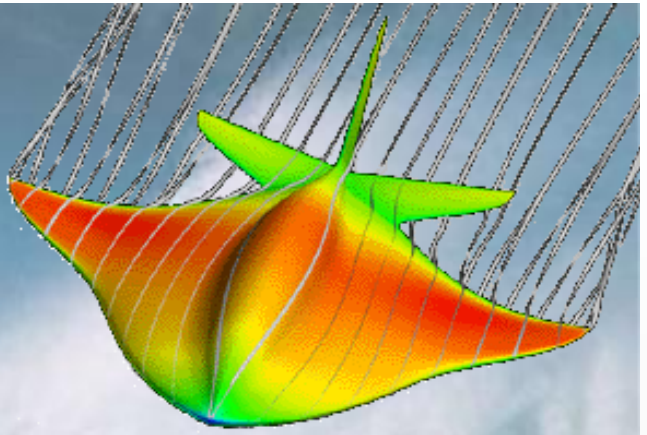


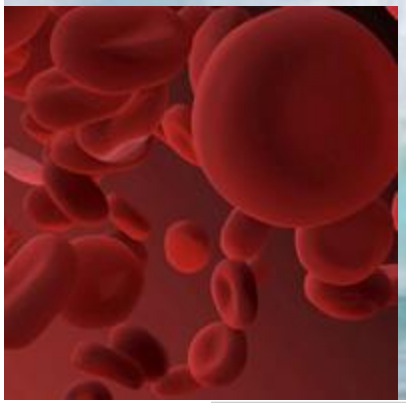
Energy



Prof. Sophia Haussener

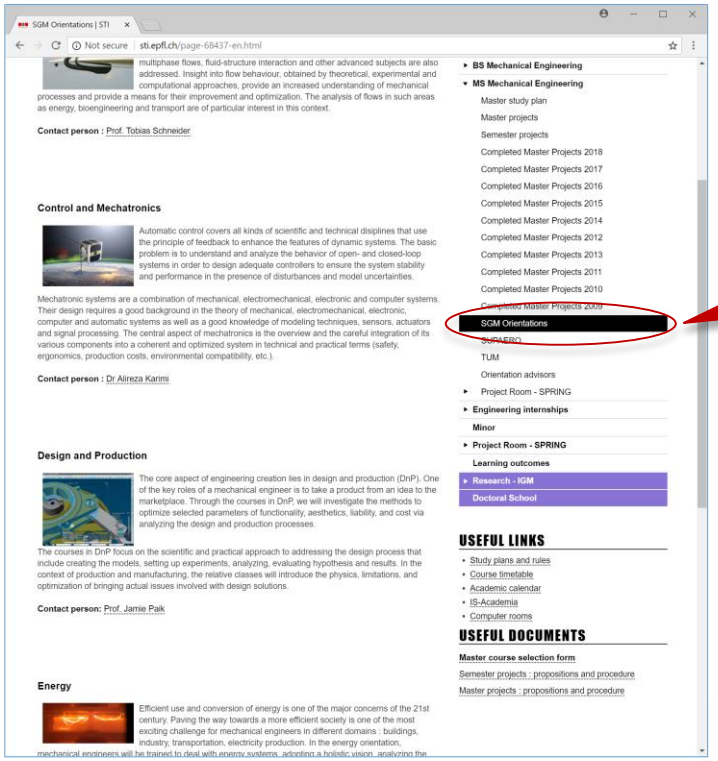
Aero-Hydrodynamics

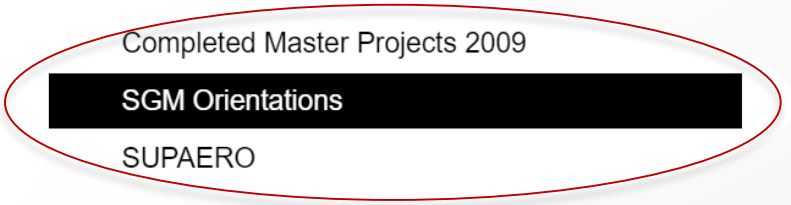




Where to find the orientations ?

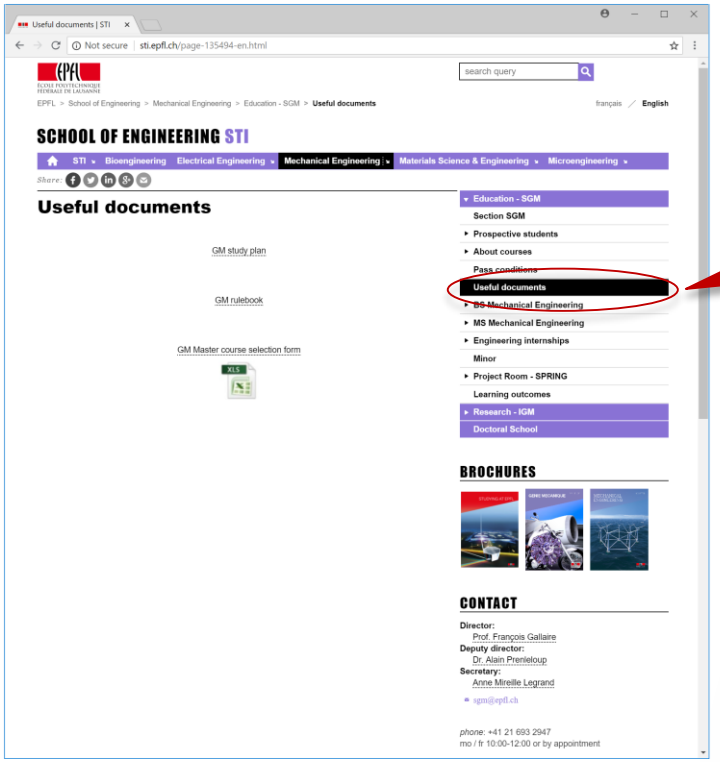
//EPFL/STI/Mechanical engineering/Education-SGM/SGM orientations/

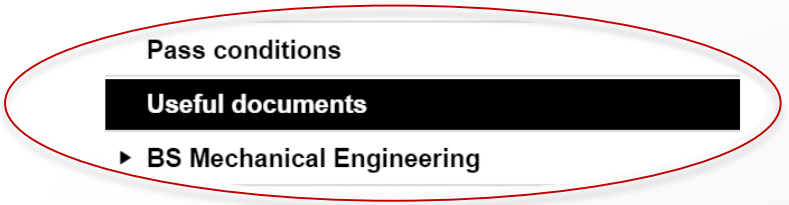




How to choose and register for courses?

//EPFL/STI/Mechanical engineering/Education-SGM/Useful doc/





How to choose and register for courses?

It is the student's responsibility to have a study plan that complies with the rules (Art. 12 al. 5)

Art. 12 - Choix des branches

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

Plan Individuel d'études Master

SGM
Section de Génie mécanique

Etudiant:	Prénom et nom de l'étudiant
Date:	jj.mm.aaaa
Filière:	aucune
Conseiller:	aucun
Mineur:	aucun
Visa conseiller de filière:	

	Cours	Code	ECTS	Semestre d'enseignement	Semestre dans le plan	Filière
Cours SGM	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
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	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
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	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
	Cours	#N/A	0	#N/A	à définir	aucune
Cours BA					à définir	
					à définir	
Bloc Projets	Projet Génie Mécanique I	ME-401	10	Aut./Prin.	à définir	
	SHS: Introduction au projet		3	Aut.	à définir	
	SHS: Projet		3	Prin.	à définir	
Cours hors SGM					à définir	
					à définir	
					à définir	
					à définir	
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Respect du reglement	
Nombre total d'ECTS (≥ 90)	16
Nombre d'ECTS en SGM (≥ 44)	0
Nombre d'ECTS de filière (≥ 18)	0
Nombre d'ECTS du Mineur (≥ 30)	0
Charge de travail par semestre	
Nombre d'ECTS 1er semestre (≥ 25 et ≤35)	0
Nombre d'ECTS 2ème semestre (≥ 25 et ≤35)	0
Nombre d'ECTS 3ème semestre (≥ 25 et ≤35)	0

Approbation du Directeur de Section pour cours BA requise.

Signature:

al/mg, 16.12.2015

Concentration: not mandatory!

Concentration advisor's signature: needed only if you do a concentration

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

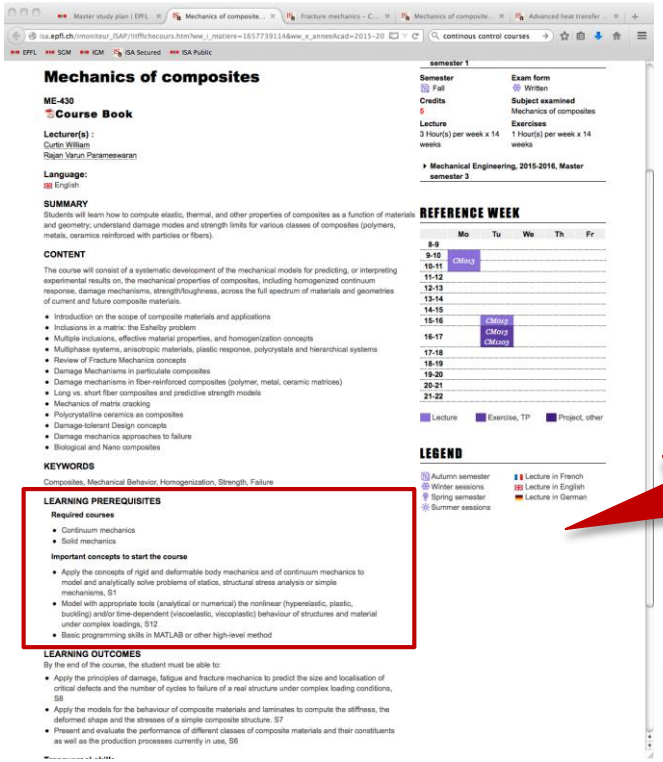
	Cours	Fiche	Code	Enseignant	Filière A Aéro-Hydrodynamique	B Automatique et Mécatronique	C Conception et Production	D Énergie	E Mécanique des solides et des structures	F Biomécanique	ECTS	Sem.	Exam.
Cours gérés par la SGM	Advanced control systems	link	ME-524	Karimi		B	C	D		F	3	Prin.	sans retrait/no withdrawal
	Advanced energetics	link	ME-451	Maréchal				D			5	Aut.	
	Advanced heat transfer	link	ME-465	Haussener				D			3	Prin.	
	Aerodynamics	link	ME-445	Mulleners	A			D	E		3	Aut.	
	Aeroélasticité et interaction fluide-structure	link	ME-435	Farhat	A			D	E		3	Aut.	
	Applied mechanical design	link	ME-403	Schiffmann			C				4	Aut.	sans retrait/no withdrawal
	Bases de la robotique	link	MICRO-450	Bleuler/Bouri		B	C				3	Aut.	
	Biomechanics of the cardiovascular system	link	ME-481	Stergiopulos	A				E	F	3	Prin.	
	Biomechanics of the musculoskeletal system	link	ME-482	Pioletti					E	F	5	Aut.	
	Cavitation et phenomènes d'interface	link	ME-462	Farhat	A			D			3	Aut.	
	Commande non linéaire	link	ME-523	Mullhaupt		B	C			F	3	Aut.	
	Composites polymères + TP	link	MSE-340	Bourban/Michaud					E	F	4	Aut.	
	Computer-aided engineering	link	ME-417	Stroud			C				3	Prin.	
	Conception mécanique intégrée	link	ME-418	Schorderet			C		E	F	3	Prin.	
	Dynamique numérique des solides et des structures	link	ME-473	Gmür	A		C		E	F	5	Prin.	
	Engines and fuel cells	link	ME-551	van Herle	A			D			4	Aut.	
	Fabrication assistée par ordinateur	link	ME-416	Kyritsis			C				5	Aut.	
	Flow of dispersed media	link	ME-463	vacat.	A				E		3	Aut.	
	Fracture mechanics	link	ME-432	Botsis/Cugnoni			C		E	F	4	Prin.	
	Hydraulic turbomachines	link	ME-453	Avellan	A			D			4	Aut.	
	Hydrodynamics	link	ME-444	Gallaire	A			D	E	F	5	Prin.	
	Hydrodynamique acoustique	link	ME-443	Nicolet	A			D		F	3	Prin.	
	Instability	link	ME-466	Gallaire	A						3	Aut.	
	Introduction to nuclear engineering	link	ME-464	Pautz/Hursin				D			2	Prin.	
	Lifecycle performance of product systems	link	ME-516	Kyritsis			C	D			3	Prin.	
	Mechanical product design and development	link	ME-410	Paik			C				4	Aut.	sans retrait/no withdrawal
	Mechanics of composites	link	ME-430	Curtin			C		E	F	5	Aut.	
	Methods for rapid production and development	link	ME-415	Boillat E.			C				3	Aut.	
	Model predictive control	link	ME-425	Jones		B					3	Prin.	
	Modelling and optimization of energy systems	link	ME-454	Maréchal				D			4	Prin.	
	Multi-body simulation	link	ME-475	Sakar				D			3	Prin.	
	Numerical flow simulation	link	ME-474	Sawley	A			D		F	5	Aut.	
	Numerical methods in biomechanics	link	ME-484	Terrier						F	3	Prin.	
	Numerical methods in heat transfer	link	ME-571	Magnini	A			D			3	Prin.	sans retrait/no withdrawal
	Particle-based methods	link	ME-476	Sawley	A				E	F	4	Prin.	sans retrait/no withdrawal
	Production management	link	ME-419	Yoo			C				5	Aut.	
	Projet Génie mécanique II	link	ME-402	Divers enseignants							10	Aut./Prin.	sans retrait/no withdrawal
	Renewable energy (for ME)	link	ME-460	Haussener/Van Herle	A			D			4	Prin.	
	Robotique industrielle et appliquée	link	MICRO-451	Bleuler/Bouri		B	C				2	Prin.	
	Simulation and optimisation of industrial applications	link	ME-499	Yoo			C				4	Prin.	sans retrait/no withdrawal
	System identification	link	ME-421	Karimi		B	C	D	E	F	3	Aut.	sans retrait/no withdrawal
	Systèmes mécatroniques	link	ME-424	Agbeviade		B	C				5	Prin.	
	Thermal power cycles and heat pump systems	link	ME-459	Kane				D			2	Prin.	
	Turbomachines thermiques	link	ME-455	Ott	A			D			5	Aut.	
	Turbulence	link	ME-467	Schneider	A						3	Aut.	
	Two-phase flows and heat transfer	link	ME-446	Thome/Saenen/Marcinichen	A			D			5	Aut.	sans retrait/no withdrawal
Cours choisis gérés par une autre Section	Advanced satellite positioning	link	ENV-542	Botteron/Skaloud		B					4	Prin.	
	Applied machine learning	link	MICRO-455	Billard		B					4	Aut.	
	Assembly techniques	link	MSE-464	Plummer/Weber					E		2	Prin.	
	Biophysics I	link	PHYS-301	Manley						F	3	Prin.	
	Biophysics II	link	PHYS-302	Verkhovskiy						F	4	Aut.	
	Capteurs	link	MICRO-330	Renaud/Boero		B					4	Prin.	
	Commande d'actionneurs à l'aide d'un microprocesseur + TP	link	MICRO-510	Koechli+Koechli/Hodder/Perriard		B					2	Prin.	
	Composites technology	link	MSE-440	Bourban/Michaud					E		3	Aut.	
	Computational motor control	link	CS-432	Ijspeert		B					4	Prin.	
	Computer simulation of physical systems I	link	PHYS-403	Pasquarello	A						4	Aut.	
	Convex optimization and applications	link	CS-454	Lebret		B					4	Prin.	
	Corrosion et protection des métaux + TP	link	MSE-311	Mischler			C				3	Prin.	
	Déformations des matériaux	link	MSE-310	Logé					E		4	Aut.	
	Distributed intelligent systems	link	ENG-466	Martinoli		B					5	Aut.	
	Dynamical system theory for engineers	link	COM-502	Thiran		B					4	Aut.	
	Environmental transport phenomena	link	ENG-420	Porté Agel+Crouzy	A						5	Aut.	
	Evolutionary robotics	link	MICRO-515	Floreano						F	4	Prin.	
	Haptic human robot interfaces	link	MICRO-553	Bleuler/Bouri		B					3	Prin.	
	Image optics	link	MICRO-421	Herzig/Scharf							3	Prin.	
	Industrial automation	link	CS-487	Pignolet-Oswald/Tournier		B					3	Prin.	
	Integrated transducers and drives	link	EE-461	Kochli		B					3	Aut.	
	Laser microprocessing	link	MICRO-520	Hoffmann			C				2	Prin.	
	Life cycle engineering of polymers	link	MSE-430	Leterrier					E		2	Aut.	
	Materials selection	link	MSE-474	Vaucher/Michler/Siegmann					E		2	Prin.	
	Numerical approximation of PDE's I	link	MATH-451	Nobile	A						5	Aut.	
	Numerical methods for conservation laws	link	MATH-459	Hesthaven	A						5	Aut.	
	Physiologie par systèmes II	link	BIO-377	Roy						F	4	Prin.	
	Propagation of acoustic waves	link	EE-549	Martin					E		3	Aut.	
	Recycling of materials	link	MSE-463	Leterrier			C				2	Prin.	
	Robotics practicals	link	MICRO-453	Billard/Floreano/Mondada		B					2	Prin.	sans retrait/no withdrawal
	Space mission design and operations	link	EE-585	Nicollier			C				2	Prin.	
	Statique II	link	CIVIL-224	Lestuzzi/Vurpillot					E		4	Prin.	
	Supply chain management	link	MGT-526	Seifert			C				4	Prin.	
	Surface analysis	link	MSE-351	Muralt/Stolichnov/Mischler			C				3	Aut.	
	Systèmes embarqués microprogrammés	link	EE-310	Atienza		B					4	Aut.	
	Techniques d'assemblage	link	MICRO-440	Chautems			C				3	Prin.	
	Technologie et mise en oeuvre des polymères +TP	link	MSE-360	Månson/Plummer+Plummer					E		4	Aut.	
	Tribology	link	MSE-485	Mischler					E		2	Aut.	

Already proposed by IS-Academia
in the Groupe « Options »

To be looked up and placed
in the Groupe « Options »

What are the learning prerequisites ?

//edu.epfl.ch/studyplan/master/mechanical-engineering



Mechanics of composites

ME-430

Course Book

Lecturer(s) :
Curtin William
Rajan Varun Parameswaran

Language:
English

SUMMARY
Students will learn how to compute elastic, thermal, and other properties of composites as a function of materials and geometry; understand damage modes and strength limits for various classes of composites (polymers, metals, ceramics reinforced with particles or fibers).

CONTENT
The course will consist of a systematic development of the mechanical models for predicting, or interpreting experimental results on, the mechanical properties of composites, including homogenized continuum response, damage mechanisms, strength/toughness, across the full spectrum of materials and geometries of current and future composite materials.

- Introduction on the scope of composite materials and applications
- Inclusions in a matrix: the Eshelby problem
- Multiple inclusions, effective material properties, and homogenization concepts
- Multiphase systems, anisotropic materials, plastic response, polycrystals and hierarchical systems
- Review of Fracture Mechanics concepts
- Damage Mechanisms in particulate composites
- Damage mechanisms in fiber-reinforced composites (polymer, metal, ceramic matrices)
- Long vs. short fiber composites and predictive strength models
- Mechanics of matrix cracking
- Polycrystalline ceramics as composites
- Damage-tolerant Design concepts
- Damage mechanics approaches to failure
- Biological and Nano composites

KEYWORDS
Composites, Mechanical Behavior, Homogenization, Strength, Failure

LEARNING PREREQUISITES
Required courses
- Continuum mechanics
- Solid mechanics

Important concepts to start the course
- Apply the concepts of rigid and deformable body mechanics and of continuum mechanics to model and analytically solve problems of statics, structural stress analysis or simple mechanisms, S1
- Model with appropriate tools (analytical or numerical) the nonlinear (hyperelastic, plastic, buckling) and/or time-dependent (viscoelastic, viscoplastic) behaviour of structures and material under complex loadings, S12
- Basic programming skills in MATLAB or other high-level method

LEARNING OUTCOMES
By the end of the course, the student must be able to:
- Apply the principles of damage, fatigue and fracture mechanics to predict the size and localisation of critical defects and the number of cycles to failure of a real structure under complex loading conditions, S8
- Apply the models for the behaviour of composite materials and laminates to compute the stiffness, the deformed shape and the stresses of a simple composite structure. S7
- Present and evaluate the performance of different classes of composite materials and their constituents as well as the production processes currently in use, S6

semester 1

Semester	Exam form
Fall	Written
Credits	**Subject examined**
5	Mechanics of composites
Lecture	**Exercises**
3 Hour(s) per week x 14 weeks	1 Hour(s) per week x 14 weeks

Mechanical Engineering, 2015-2016, Master semester 3

REFERENCE WEEK

	Mo	Tu	We	Th	Fr
8-9					
9-10	CMx13				
10-11					
11-12					
12-13					
13-14					
14-15					
15-16	CMx13				
16-17	CMx13				
	CMx103				
17-18					
18-19					
19-20					
20-21					
21-22					

Lecture · Exercise, TP · Project, other

LEGEND
Autumn semester · Winter sessions · Spring semester · Summer sessions
Lecture in French · Lecture in English · Lecture in German

LEARNING PREREQUISITES
Required courses
- Continuum mechanics
- Solid mechanics

Important concepts to start the course
- Apply the concepts of rigid and deformable body mechanics and of continuum mechanics to model and analytically solve problems of statics, structural stress analysis or simple mechanisms, S1
- Model with appropriate tools (analytical or numerical) the nonlinear (hyperelastic, plastic, buckling) and/or time-dependent (viscoelastic, viscoplastic) behaviour of structures and material under complex loadings, S12
- Basic programming skills in MATLAB or other high-level method

How to choose and register for courses ?

- Create your study plan for the 3 semesters (Excel form)
- If you do a concentration: submit it for approval to the concentration advisor and then to SGM
- A course can count once either in a Minor on in Groupe « options »
- Register for courses in IS-Academia (mandatory)
- Course registration deadline 18-19 Fall semester: 28 Sept.
- You will probably have to modifiy your study plan every semester: update and submit your form

How to withdraw from exams ?

General exam withdrawal deadline for 2018-19 Winter Session: 23 November 2018

It is not possible to withdraw after 28 September from the following courses:

- 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 inengineering 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

Minors

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

Additional information available on Sections' websites and https://sac.epfl.ch/

Minors

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 four courses in IS-Academia
- Withdrawal from a Minor: contact SGM to convert part or all the Minor's ECTS to electives

Semester Projects

Semester projects in Mechanical Engineering

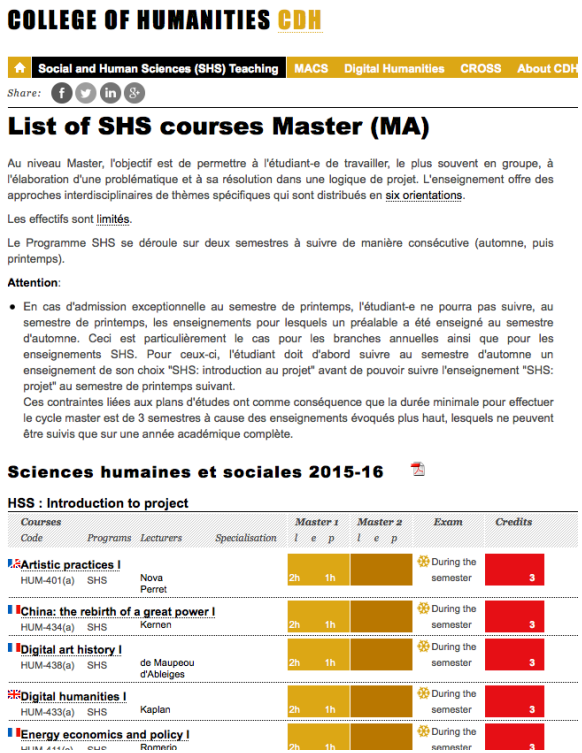
- Projects I: mandatory (10 ECTS)
- Project II: elective (10 ECTS)

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

SHS (social and human sciences)

//EPFL/CDH/Education/List of SHS courses Master



COLLEGE OF HUMANITIES CDH

Social and Human Sciences (SHS) Teaching | MACS | Digital Humanities | CROSS | About CDH

Share:

List of SHS courses Master (MA)

Au niveau Master, l'objectif est de permettre à l'étudiant-e de travailler, le plus souvent en groupe, à l'élaboration d'une problématique et à sa résolution dans une logique de projet. L'enseignement offre des approches interdisciplinaires de thèmes spécifiques qui sont distribués en six orientations.

Les effectifs sont limités.

Le Programme SHS se déroule sur deux semestres à suivre de manière consécutive (automne, puis printemps).

Attention:

- En cas d'admission exceptionnelle au semestre de printemps, l'étudiant-e ne pourra pas suivre, au semestre de printemps, les enseignements pour lesquels un préalable a été enseigné au semestre d'automne. Ceci est particulièrement le cas pour les branches annuelles ainsi que pour les enseignements SHS. Pour ceux-ci, l'étudiant doit d'abord suivre au semestre d'automne un enseignement de son choix "SHS: introduction au projet" avant de pouvoir suivre l'enseignement "SHS: projet" au semestre de printemps suivant.
  Ces contraintes liées aux plans d'études ont comme conséquence que la durée minimale pour effectuer le cycle master est de 3 semestres à cause des enseignements évoqués plus haut, lesquels ne peuvent être suivis que sur une année académique complète.

Sciences humaines et sociales 2015-16

HSS : Introduction to project

Courses Code	Programs	Lecturers	Specialisation	Master 1 l e p	Master 2 l e p	Exam	Credits
Artistic practices ! HUM-401(a)	SHS	Nova Perret		2h 1h		During the semester	3
China: the rebirth of a great power ! HUM-434(a)	SHS	Kernen		2h 1h		During the semester	3
Digital art history ! HUM-438(a)	SHS	de Maupeou d'Ableiges		2h 1h		During the semester	3
Digital humanities ! HUM-433(a)	SHS	Kaplan		2h 1h		During the semester	3
Energy economics and policy !		Romerio		2h 1h		During the semester	3

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

REGISTER NOW!

Internships

When?

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

Duration

- ≥8 weeks, ≤6 months
- 25 weeks if combined with the Master Project

Master Project

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

Be aware that !

- You need to pass each exam
- The 44 ECTS in Mechanical Engineering can only come from the list in the Excel sheet
- You need 18 ECTS for an orientation
- 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 25, 13:15 room CM 1 2