

LMS | ACTIVITY REPORT 2023

Courses taught

BA, MA and Doctoral level at EPFL

The column "Credits / Coeff." indicates Coefficient for first-year students (BA1-2), Credits for the others

Spring semester 2023

Teacher(s)	Code	Course title	Section-Semester	Credits / Coeff.	Student number
Laloui, Lyesse (LMS); Fernandez Andrino, Juan (SAR-ENS); Nguyen, Richard (SAR-ENS); Molinas, Margaux (EML)	PENS-211	Terra Epidermis	ENAC-BA4	4	23
Vulliet, Laurent (SGC-ENS)	CIVIL-203	Mécanique des sols et écoulements souterrains	GC-BA4	5	71
Ferrari, Alessio (LMS)	CIVIL-530	Slope stability	GC-MA2, GC-MA4	3	12

Fall semester 2023

Teacher(s)	Code	Course title	Section-Semester	Credits / Coeff.	Student number
Laloui, Lyesse (LMS); Koliji, Azad (SGC-ENS)	CIVIL-402	Geomechanics	GC-MA1, GC-MA3	4	51
Terzis, Dimitrios (LMS)	CIVIL-424	Innovation for construction and the environment	GC-MA1, GC-MA3	3	17

Additional teaching

Teacher(s)	Course title	Section-Semester	Credits	Student number	Institution where taught (if not EPFL)	Additional information on external institution(s)
Ferrari, Alessio (LMS)	A Resilient Future: Science and Technology for Disaster Risk Reduction	EPFLx - edX Course				Silvia Hostettler, Cooperation & Development Center, EPFL
Laloui, Lyesse (LMS); Rotta Loria, Alessandro Francesco	Energy geostructures: analysis and design.	Continuing education	0	18		Continuing education. https://memento.epfl.ch/event/energy-geostructures-analysis-and-design-4/

Advising

Postdoc works (completed in 2023 or ongoing)

Advisee	Research topic	Starting (month/year)	End, if known (month/year)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Bosch Llufriu , Jose Antonio (LMS)	Bio-chemo-hydro-mechanical modelling of microbially induced cementation in soils.	06/2021	07/2023	Laloui , Lyesse (LMS)		
Ravera , Elena (LMS)	Energy geostructures.	12/2021	10/2023	Laloui , Lyesse (LMS)		
Stavropoulou , Eleni (LMS)	Impact of CO2 on the sealing capacity of caprock representative shale	09/2019		Laloui , Lyesse (LMS)		
Terzis , Dimitrios (LMS)	Bio-cementation.	09/2019		Laloui , Lyesse (LMS)		

EPFL PhD theses (completed in 2023 or ongoing)

Advisee	Thesis title	Doctoral Program	Enrolment date	Estimated completion year	Advisor	Co-advisor	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Babiy , Svetlana (LMS)	New insights for chemo-hydro-mechanical modelling of engineered geotechnical barriers	EDCE	01.02.2022		Laloui , Lyesse (LMS)	-			
Elmaloglou , Ariadni	Influence of pore-scale heterogeneity on the precipitation patterns in Microbially Induced Calcite Precipitation (MICP)	EDME	01.09.2018	2023	Laloui , Lyesse (LMS)	Terzis , Dimitrios (LMS)	Cardoso , Rafaela ; Wang , Yuze ; Meibom , Anders (LGB); Farhat , Mohamed (SCI-STI-MF)		
Fuselier , H��lo��se (LMS)	Thermo-hydro-mechanical behaviour of the Callovo-Oxfordian claystone under thermal changes	EDME	01.04.2020	2024	Laloui , Lyesse (LMS)	Ferrari , Alessio (LMS)			

Advisee	Thesis title	Doctoral Program	Enrolment date	Estimated completion year	Advisor	Co-advisor	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Llabjani, Qazim (LMS)	Gas-Induced Impacts on the Barrier Integrity of Deep Geological Repository of Radioactive Wastes	EDME	01.12.2020		Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Parziale, Alessandro (LMS)		EDME	01.11.2023		Laloui, Lyesse (LMS)	-			
Sahlab, Ziad (LMS)	Geomechanical modeling of biocemented soils: applications for geohazard mitigation	EDCE	01.03.2023		Laloui, Lyesse (LMS)	Terzis, Dimitrios (LMS)			
ten Bosch, Sofie Elaine (LMS)		EDME	01.06.2023		Laloui, Lyesse (LMS)	-			
Wojnarowicz, Matthias (LMS)	Performance assessment of a Finite Element model to simulate THM effects in the rock mass around a nuclear waste concept	EDME	16.03.2020	2024	Laloui, Lyesse (LMS)	Madaschi, Aldo (LMS)			

External PhD students who will receive their PhD diploma from another university (completed in 2023 or ongoing)

Advisee	Thesis title	Doctoral Program	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Lu, Xingbang	The constitutive model for under-consolidated soft clay and hydromechanical analysis of deep excavation in under-consolidated clayey deposit.		2024	Laloui, Lyesse (LMS)			Tongji University, CN (World Universities and Research Centers)	
Vespo, Vincenzo Sergio	Geomechanical behaviour of clays in contact with CO2		2024	Ferrari, Alessio (LMS)	Stavropoulou, Eleni (LMS)		Polytechnic University of Turin, IT (European Universities and Research Centers)	

Master diploma projects in Civil Engineering, Environmental Engineering and other programs (started in spring or fall 2023)

Advisee(s)	Project title	Section-Semester	Advisor(s)	Co-advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Dupont, Marie (GC-PMH)	Étude géotechnique de la patinoire du Trèfle Blanc	GC-PMH	Laloui, Lyesse (LMS)			
Faucheur, Alexis Bernard (GM-PMH)	Renewable Energy potential of Geneva train station	GM-PMH	Laloui, Lyesse (LMS)			
Glaus, Adrian (GC-PME)	Projet de master en entreprise	GC-PME	Vulliet, Laurent (SGC-ENS)			
Gouin, Judith Hélène (GC-PME)	Etude géotechnique de la section Plaines-du-Loup - Blécherette du métro m3	GC-PME	Laloui, Lyesse (LMS)			
Laurent, Lisa Carole Françoise (EL-PME)	Performance study and comparison of Enerdrape system's coupling possibilities with other energy systems	EL-PME	Laloui, Lyesse (LMS)			
Levkov, Joana-Sophia	Probabilistic approach in geotechnical engineering.	GC	Vulliet, Laurent (SGC-ENS)			
Siwar, Othmane	Caractéristiques structurelles des chaussées routières: Calcul inverse des caractéristiques structurelles des chaussées routières à partir de déflexion mesurées avec des véhicules d'auscultation à grand rendement.	2023	Laloui, Lyesse (LMS)			

Master diploma projects in Architecture (completed in spring 2023, retrieved from Infoscience)

Empty category

Prestudies of master projects in Civil Engineering (completed in 2023)

Advisee(s)	Project title	Section-Semester	Tutors(s)	Other advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Dupont, Marie (GC-PMH)	Etude géotechnique de la patinoire du Trèfle Blanc	GC-MA4	Laloui, Lyesse (LMS)			
Mansour, Paolo Mina (GC-MA3)	Constitutive modeling of clayey geomaterials accounting for multistructural fabric levels	GC-MA3	Ferrari, Alessio (LMS)			

Theoretical statements of master projects in Architecture (completed in January 2023, retrieved from Infoscience)

Empty category

Semester projects (completed in 2023)

Advisee(s)	Project title	Section-Semester	Tutor(s)	Other advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Burgaud , Alexandre (GC-MA4)	Hydro-mechanical characterisation of the bentonite/steel interface in the context of radioactive waste storages	Génie civil MA1	Ferrari , Alessio (LMS)	Stavropoulou , Eleni (LMS)		
Ducry , Loris Michel (GC-MA3)	Construction project: Machine learning for the optimization of Thermo-Hydro-Mechanical modeling tasks	GC-MA3	Laloui , Lyesse (LMS)			
Griner , Cesare (GC-E)	Projet spécifique pour étudiant d'échange/visiteur: Hydromechanical impact of CO2 mineralisation in Basalts	GC-E	Laloui , Lyesse (LMS)			
Mansour , Paolo Mina (GC-MA3); Poli , Matteo Lorenzo (GC-MA3)	Civil engineering laboratory: Conception et dimensionnement d'une fouille d'excavation	GC-MA3	Laloui , Lyesse (LMS)			

Other supervisions

Advisee	Type of supervision	Work topic	Starting (month/year)	End, if known (month/year)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Amblard , Anne-Sarah Léorie	Internship	Self-Sealing properties of shales for geological CO2 storage.	02/2023	07/2023	Stavropoulou , Eleni (LMS); Llabjani , Qazim (LMS)	École Nationale des Travaux Publics de l'État, FR (European Universities and Research Centers)	
Birbaum , Julien (LMS)	Apprenticeship	Apprentice, laborant en physique.	08/2022		Dubey , Patrick (LMS); Laloui , Lyesse (LMS)		
Griner , Cesare (GC-E)	Internship	Hydromechanical impact of CO2 mineralisation in Basalts.	02/2023	07/2023	Stavropoulou , Eleni (LMS)	Polytechnic University of Turin, IT (European Universities and Research Centers)	
Romanens , Natacha (LMS)	Apprenticeship	Apprentice, laborant en physique	08/2019	07/2023	Laloui , Lyesse (LMS); Dubey , Patrick (LMS)		
Segaud-Vallot , Rémy Sylvain Damien Jacky	Internship	Machine learning for optimisation of geomechanical modelling.	04/2023	07/2023	Laloui , Lyesse (LMS); Madaschi , Aldo (LMS)	Polytech Clermont, FR (European Universities and Research Centers)	

Research

Funded research projects

Title	Principal Investigator (PI)	Co-PI(s)	EPFL coordinator	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved
InSituStreTech	Horvath Alex Miska		LALOU Lyesse	Off. Conf.; Innosuisse	20,000 out of 20,000	01.04.2023	6	Completed	
Express: a high-speed metro for a sustainable mobility in the Alps	Jaboyedoff Michel		LALOU Lyesse	Divers; CLIMACT	24,383 out of 48,992	01.10.2022	12	Completed	
CS-C Experiment, Phase 28: Experimental assessment of shale properties for safe geological CO2 storage	LALOU Lyesse	Stavropoulou Eleni	LALOU Lyesse	Non lucr.; Mont Terri	10,000 out of 10,000	01.08.2022	12	Completed	
Comportement Thermo-Hydro-Mechanique du Callovo-Oxfordien sous chargement thermique	LALOU Lyesse		LALOU Lyesse	INT Governmental; ANDRA	307,500 out of 307,500	01.08.2019	48	Completed	
InSituStreTech	Horvath Alex Miska		LALOU Lyesse	FNS; BRIDGE	128,065 out of 128,065	01.01.2024	12	Granted	
Use of distributed fibre optics for assessing the strain field evolution of Opalinus Clay during gas invasion	LALOU Lyesse		LALOU Lyesse	; TTO - recherche ind.	40,000 out of 40,000	11.12.2023		Industrial contract	
3ème tranche of research activities within the FE-M Task Force	LALOU Lyesse		LALOU Lyesse	; Ctr Recherche	50,000 out of 50,000	01.09.2023		Industrial contract	
CS-C Experiment, Phase 29: Experimental assessment of shale properties for safe geological CO2 storage	LALOU Lyesse	Stavropoulou Eleni	LALOU Lyesse	Non lucr.; Mont Terri	15,000 out of 15,000	01.07.2023	18	Ongoing	

Title	Principal Investigator (PI)	Co-PI(s)	EPFL coordinator	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved
Bio Inspired Geotechnical Applications to Launch Pan-European Solutions	Prodan Iulia		LALOU Iyesse	Horizon Europe; SERI Horizon Europe	967,020 out of 967,020	01.10.2023	36	Ongoing	
Demonstration and upscaling of carbon dioxide storage solutions for a net-zero Switzerland: DemoUpStorage	LALOU Iyesse	Stavropoulou Eleni	LALOU Iyesse	Off. Conf.; Divers Confédération	90,000 out of 497,710	01.08.2022	24	Ongoing	
New insights in the analysis and prediction of the mechanical behavior of compacted expansive clays as engineered barriers	LALOU Iyesse		LALOU Iyesse	FNS; FNS-Project Funding	672,139 out of 672,139	01.11.2021	48	Ongoing	
European Joint Programme on Radioactive Waste Management	GARCIA Marie	LALOU Iyesse	Ferrari Alessio	H2020; Other	273,862 out of 35,142,221	01.06.2019	60	Ongoing	
BIOGEOS - Bio-mediated Geo-material Strengthening for engineering applications	LALOU Iyesse		LALOU Iyesse	H2020; Excellent Science	2,991,544 out of 2,991,544	01.11.2018	66	Ongoing	
Energy-efficient CCUS for Sustainable and Circular Economy (SusEcoCCUS)	Agrawal Kumar Varoon	Hu Xile; LALOU Iyesse; Maréchal François; Marzari Nicola; Micari Marina; Nick Sascha; Queen Wendy Lee; Schiffmann Jürg Alexander; Schwaller Philippe; Stavropoulou Eleni; Subramanian Vivek; VAN HERLE Jan	Agrawal Kumar Varoon	Divers; S4S	555,235 out of 555,235	01.09.2023	72	Ongoing	

Title	Principal Investigator (PI)	Co-PI(s)	EPFL coordinator	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved
Use of distributed fibre optics for assessing the strain field evolution of Opalinus Clay during gas invasion	Ferrari Alessio		LALOUI Lyesse	; FNS-SPARK	99,845 out of 99,845	02.05.2023		Pending	
Energy geostorage for single residence and small urban scales	LALOUI Lyesse		LALOUI Lyesse	; FNS-Lead Agency/Weav	324,688 out of 324,688	03.04.2023		Pending	
Enabling Representative Upscaling in Geological Carbon Storage (EnRUp GCS)	Stavropoulou Eleni		Stavropoulou Eleni	; FNS-transitional mea	1,795,437 out of 1,795,437	01.02.2023		Rejected	
InSituStreTech	Horvath Alex Miska		Horvath Alex Miska	; S4S	755,000 out of 755,000	15.01.2023		Rejected	

Other funded research projects

Empty category

Funded equipment

Empty category

Research facilities

Empty category

Awards

Empty category

Publications & Presentations

Resources retrieved from Infoscience

Reviews

Data	Peer reviewed	Key
Harran R., Terzis D., Laloui L., Mechanics, Modeling, and Upscaling of Biocemented Soils: A Review of Breakthroughs and Challenges , in International Journal Of Geomechanics , vol. 23, num. 9, p.03123004 , 2023, Abstract: yes, Status: published	✓	

Journal articles

Data	Peer reviewed	Key
Tuttolomondo A., Ferrari A., Laloui L., Pore-pressure coefficients for unsaturated soils: generalized effective stress approach , in Canadian Geotechnical Journal , 2023, Abstract: yes, Status: published	✓	
Roy N., Frost J., D., Terzis D., 3-D contact and pore network analysis of MICP cemented sands , in Granular Matter , vol. 25, num. 4, p.62 , 2023, Abstract: yes, Status: published	✓	
Harran R., Terzis D., Laloui L., Addressing the challenges of homogeneity, quality control and waste handling in soil bio-cementation: A large-scale experiment , in Soils And Foundations , vol. 63, num. 4, p.101332 , 2023, Abstract: yes, Status: published	✓	
Pintado X., Kumpulainen S., Romero E., Lloret A., Weber R., C., Ferrari A., Villar M., V., Abed A., Solowski W., Heino V., Shear strength and shear stiffness analysis of compacted Wyoming-type bentonite , in Geomechanics For Energy And The Environment , vol. 34, p.100468 , 2023, Abstract: yes, Status: published	✓	
Loria A. F., R., Ravera E., Laloui L., Thermo-hydro-mechanical behavior of energy barrettes: Field experiments and numerical simulations , in Geomechanics For Energy And The Environment , vol. 34, p.100451 , 2023, Abstract: yes, Status: published	✓	
Stavropoulou E., Sannasardo F., Ferrari A., Hydro-mechanical characterisation of bentonite/steel interfaces , in Applied Clay Science , vol. 242, num. 107046 , 2023-06-29, Abstract: yes, Status: published	✓	
Tuttolomondo A., Ferrari A., Laloui L., Pore-pressure coefficients for unsaturated soils: Generalised effective stress approach , in Canadian Geotechnical Journal , 2023, Abstract: no, Status: accepted	✓	
Bosch Lufriu J. A., Ferrari A., Laloui L., Leupin O., Modelling the density homogenisation of a block and granular bentonite buffer upon non-isothermal saturation , in International Journal for Numerical and Analytical Methods in Geomechanics , vol. 47, num. 11, p.1979-2002 , 2023, Abstract: no, Status: published	✓	
Bosch Lufriu J. A., Qiao Y., Ferrari A., Laloui L., Thermo-hydro-mechanical analysis of the complete lifetime of the bentonite barrier in the FEBEX in-situ test , in Geomechanics for Energy and the Environment , 2023, Abstract: yes, Status: published	✓	

Conference papers

Data	Peer reviewed	Key
Ravera E., Rotta Loria A. F., Laloui L., Thermal performance of energy barrettes in an urban environment , SEG 2023: Symposium on Energy Geotechnics. Accelerating the energy transition, Delft, the Netherland, October 3-5, 2023 , Abstract: no	✓	
Rosone M., Rahbari E., Ferrari A., On the Post-peak Behaviour of Remoulded and Jointed Clay Samples During Triaxial Compression Tests , the 8th Italian National Conference of the Researchers of Geotechnical Engineering CNRIG23, Palermo, Italy, July 5-7, 2023 , Abstract: yes	✓	
Starvaggi M., La Rosa S., Rosone M., Ferrari A., On the Fabric of a 3D Printed Soil , 8th Italian National Conference of the Researchers of Geotechnical Engineering CNRIG23, Palermo, Italy, 5-7,07,2023 , Abstract: yes	✓	
Ferrari A., On Multiphysical Couplings in Energy Geotechnics: Relevance and Applications , National Conference of the Researchers of Geotechnical Engineering, Palermo, Italy, 5-7,07,2023 , Abstract: yes	✓	
Rosone M., Ferrari A., Crisci E., Giger S., Hydro-Mechanical Characterization of a Shale by Unusually High-Pressure Oedometric Tests , 2023, Abstract: yes	✓	

Data	Peer reviewed	Key
Llabjani Q., Vespo V. S., Stavropoulou E., Ferrari A., Musso G., <i>Experimental and Numerical Investigation on Water Exchange of Opalinus Clay Samples</i> , 2023, Abstract: yes	✓	
Sütman M., Laloui L., <i>Editor(s): Zhussupbekov A., Sarsembayeva A., Energy geotechnology: A new era for geotechnical engineering practice</i> , 17th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, Astana, Kazakhstan, 14-18 August, 2023, Abstract: yes	✓	

Conference proceedings

Data	Peer reviewed	Key
<i>Geotechnical Engineering in the Digital and Technological Innovation Era</i> , 8th Italian National Conference of the Researchers of Geotechnical Engineering CNRIG23, Palermo, Italy, 5-7,07,2023, Abstract: yes, Status: published	✓	

Theses

Data	Key
Elmaloglou A., <i>Advisor(s): Laloui L., Terzis D., Influence of pore-scale heterogeneity on the precipitation patterns in Microbially Induced Calcite Precipitation (MICP)</i> , Thèse EPFL, n° 9919, 2023, Abstract: yes, Status: published	

Other Open Resources

Other Open Research Datasets

Empty category

Open research scripts and software

Empty category

Open Research scripts and software - Important recent updates

Empty category

Any other open research outputs from your lab?

Empty category

Outreach

Current ongoing collaborations

People involved at ENAC & EPFL wide	Collaborating institution(s) (if not EPFL)	Additional information on cooperation partner(s)	Project topic/Description, Financial support (CHF) if any	Collaboration includes...
Laloui, Lyesse (LMS)	Northwestern University, US (World Universities and Research Centers)	Prof. Alessandro Rotta Loria.	Link(s) to publication: 303665 ; 307378 ;	joint publication(s) other
Laloui, Lyesse (LMS); Ferrari, Alessio (LMS)	National Cooperative for the Disposal of Radioactive Waste (NAGRA), CH (Private sector)	NAGRA	Experimental and constitutive analysis of the Opalinus Clay shale Link(s) to publication: 302216 ; 307294 ;	joint publication(s)

Innovation – Technology Transfer – Start-ups

Empty category

Distinguished work

Author(s)	Article title	Journal & Pages	Publication date
Laloui, Lyesse (LMS); Rotta Loria, Alessandro Francesco ; Di Donna, Alice	Scott Sloan Best Paper Award 2021, attributed on 27 February 2023. "A fully coupled three-dimensional hydro-mechanical finite discrete element approach with real porous seepage for simulating 3D hydraulic fracturing." https://www.sciencedirect.com/journal/computers-and-geotechnics/about/awards#scott-sloan-best-paper-award-2021	Computers and Geotechnics	February 2016

Appointments at other institutions

Name	Title	Institution	Additional information on institution
Ferrari, Alessio (LMS)	Full professor - part time	University of Palermo, IT (European Universities and Research Centers)	
Laloui, Lyesse (LMS)	Sabbatical at Northwestern University	Northwestern University, US (World Universities and Research Centers)	

Visiting scholars

Visitor	Home Institution	Additional information on home institution	Aim of visit, Duration
Narsilio Ferrero, Guillermo Andres	University of Melbourne, AU (World Universities and Research Centers)	Prof. L. Laloui, Dr. A. Ferrari	Joint research activities in the field of Geomechanics for Energy applications. Gave a seminar: Shallow geothermal energy: R&D and commercialisation experience in Australia. 1 month stay.
Prodan, Iulia	Technical University of Cluj-Napoca, RO (European Universities and Research Centers)	Prof. Laloui	2 months. Energetic geostructures.
Rotta Loria, Alessandro Francesco	Northwestern University, US (World Universities and Research Centers)	Prof. Laloui	3 months. Geomechanics for energy production and storage and preparation of a new book.

Alumni

Alumnus	Level	First position out of lab	Country	Sector of activity
Bosch Llufrui, Jose Antonio (LMS)	Post doc	Project Manager · Nesol	Switzerland	Start up, self-employed

Alumnus	Level	First position out of lab	Country	Sector of activity
Elmaloglou, Ariadni	Post doc	DTU Offshore (Danish Offshore Technology Centre)	Denmark	Academia
Ravera, Elena (LMS)	Post doc	Director of Operations - GEOEG	Switzerland	Start up, self-employed

Distinguished alumni

Empty category

Organization of events

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Description / URL
10/2023	STCC	Symposium: Perspectives in Geotechnical Engineering	Laloui, Lyesse (LMS); Smith, Brendan (LMS); Tinguely, Barbara (LMS)	To celebrate the honorary lecture of Professor Laurent Vulliet on the 4th of October, the Laboratory of Soil Mechanics (LMS) hosted a Symposium: "Perspectives on Geotechnical Engineering." Invited speakers: Dr. Anne Ackhardt (ENSI Board), Florian Fischer, EPFL H.Prof. Dominique Perrault, Prof. J. Carlos Santamarina (Georgia Tech Inst. of Technology) Prof. Alexandre Alahi (VITA, EPFL) https://memento.epfl.ch/event/symposium-perspectives-in-geotechnical-engineering/

Invited talks and contributions to events

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
09/2023	CM 1 4	Geomechanics Course (GC)	Laloui, Lyesse (LMS); Llabjani, Qazim (LMS)	Multiphysical Modeling for Geotechnical and Geomechanical Applications. by Dr A. Madaschi (NESOL, CH)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		
10/2023	CM 1 4	Geomechanics Course (GC)	Laloui, Lyesse (LMS); Llabjani, Qazim (LMS)	Value Engineering Practices in Geotechnical & Foundation Applications in GCC Area (Arabian Gulf Area), by Emad Sharif (GTC, UAE)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		
10/2023	CM 1 4	Geomechanics Course (GC)	Laloui, Lyesse (LMS); Llabjani, Qazim (LMS)	Metro Paris - Extension of Line 11: "The impact of the urban context on the choice of excavation methods and site logistics", by Alexander Heim, IMPLENIA (FR)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
11/2023	CM 1 4	Geomechanics Course (GC)	Laloui , Lyesse (LMS); Llabjani , Qazim (LMS)	M3, a New Metro Line for Lausanne, by Etienne Garin, WSP-BG (CH)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		
11/2023	CM 1 4	Geomechanics Course (GC)	Laloui , Lyesse (LMS); Llabjani , Qazim (LMS)	Geomechanical Aspects of Embankment Dams, by Dr François Laigle, WSP-BG (FR)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		
12/2023	CM 1 4	Geomechanics Course (GC)	Laloui , Lyesse (LMS); Llabjani , Qazim (LMS)	Analysis of an active landslide under static and seismic actions, by Prof. Nuria Pinyol - Universitat Politècnica de Catalunya (ES)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		
12/2023	CM 1 4	Geomechanics Course (GC)	Laloui , Lyesse (LMS); Llabjani , Qazim (LMS)	The Geomechanics of Underground Climate Change, by Prof. Alessandro Rotta-Loria - Northwestern University (USA)	In the context of the EPFL master course entitled "Geomechanics", the Laboratory of Soil Mechanics (LMS) is pleased to invite you to a seminar series where experts will present examples of geomechanical and geotechnical projects from across the world. This represents a unique opportunity to connect with professionals and EPFL students.		

News / Actus

News channel	Title, Date	Heading	Authors	Links
LMS	LMS Carbon Capture and Storage project wins EPFL innovation grant. 18.01.2023	LMS Carbon Capture and Storage project wins EPFL innovation grant.		
LMS	The Laloui Group wins the Scott Sloan Best Paper Award 14.03.2023	A paper written by the Laloui Group Director, Prof. Laloui, and two alumni, Dr. Alice Di Donna and Dr. Alessandro F. Rotta Loria, has received the Scott Sloan Best Paper Award 2021 from the journal Computers and Geotechnics.		Computers and Geotechnics

News channel	Title, Date	Heading	Authors	Links
LMS	<i>InSituStreTech Project on track with new grant</i> 05.04.2023	The Laloui Group's new start-up project InSituStreTech continues progressing through its research and development phase with an Ignition Grant from EPFL's Tech Launchpad technology incubator. The Ignition Grant is a recognition of the Project's progress, allowing the start-up to begin validating the technology.	Smith Brendan	Tech Launchpad technology incubator.
LMS	<i>"The key skill I've learnt is perseverance"</i> 23.07.2023	Congratulations to LMS apprentice Natacha Romanens who has successfully completed her studies to become a physics laboratory assistant.	Smith Brendan	
LMS	<i>Demonstrating geological CO2 storage on the EPFL campus</i> 06.11.2023	The Laloui Group is developing a first-of-its-kind geological CO2 storage simulator to ensure safe and reliable carbon capture and storage.	Smith Brendan	
LMS	<i>BIGALPS consortium awarded EIC Transition Grant.</i> 14.12.2023	The Laloui Group to expand its bio-cementation technology into real-world situations with a European Innovation Council (EIC) grant.	Smith Brendan	BIGALPS website ; EIC ; INRAE ; UTCN

Services

EPFL committees and services

Name	Service	Role	Role in funding allocation
Ferrari, Alessio (LMS)	Doctoral School in Mechanics (EDME)	Commission member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Digital Infrastructure	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Human-Centric Emerging Mobility	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Sustainable Civil Engineering	Member	no
Laloui, Lyesse (LMS)	Civil Engineering Section	Director	yes
Laloui, Lyesse (LMS)	Direction of the School of Architecture, Civil and Environmental Engineering (ENAC)	Member	yes

Other committees and services (national including the EPF domain, international...)

Name	Service	Role	Role in funding allocation
Ferrari, Alessio (LMS)	Geotechnique	Member of Editorial Board	no
Ferrari, Alessio (LMS)	Acta Geotechnica	Member of Editorial Board	no
Ferrari, Alessio (LMS)	Soils and Rocks	Member of Editorial Board	no
Ferrari, Alessio (LMS)	International School on "Landslide Risk Assessment and Mitigation" (LARAM)	Member of the Scientific Committee	no
Ferrari, Alessio (LMS)	Journal Geomechanics for Energy and the Environment	Editor-In-Chief	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) TC 308 "Energy Geotechnics"	Vicechair of the technical committee	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) TC 101 "Unsaturated Soils"	Member of the technical committee	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) TC 106 "Laboratory Testing"	Member of the technical committee	no
Laloui, Lyesse (LMS)	ISSMGE - International Society for Soil Mechanics and Geotechnical Engineering	Vice-President for Europe.	no
Laloui, Lyesse (LMS)	Swiss Academy of Engineering Sciences SATW	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Underground Construction at ETHZ	Member	no
Laloui, Lyesse (LMS)	Acta Geotechnica	Member of Editorial Board	no
Laloui, Lyesse (LMS)	Chinese Journal of Geotechnical Engineering	Member of Editorial Board	no
Laloui, Lyesse (LMS)	European Journal of Environmental and Civil Engineering	Member of Editorial Board	no

Name	Service	Role	Role in funding allocation
Laloui, Lyesse (LMS)	Journal of Coupled Systems and Multiscale Dynamics	Member of Editorial Board	no
Laloui, Lyesse (LMS)	Environmental Geotechnics	Advisory Board Member	no
Laloui, Lyesse (LMS)	International Journal for Numerical and Analytical Methods in Geomechanics	Member of Editorial Board	no
Laloui, Lyesse (LMS)	International journal Geomechanics for Energy and the Environment	Editor-in-Chief	no

Vision & Outlook

Highlights

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Upcoming highlights

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Goals

Goals

The LMS activities will continue to cover education, research and technology transfer in the larger field of Geomechanics. The vision aims at contributing to the sustainable development of our built and natural environment by addressing selected key questions with the highest possible academic standard within transdisciplinary internal and international collaborations and through contacts with industry with long-term research focuses.

The research activities will focus on problems involving a variable environment and new advances in existing energy production technologies. These two areas: environment and energy, are expected to dominate the technological agenda for forthcoming years. The reason is two-fold: first, there is an increasing global threat related to the geosphere: soil and groundwater pollution by accidental spills, CO₂ emission driving the need to reduce fossil fuel usage and/or inadequate isolation of pollutants. Secondly, there is a host of new sources of energy related to the geosphere. In both cases, new fundamental research is emerging concerning the effects of chemical, thermal and biological variables on mechanical properties and mechanical variables of soils and shale. Conversely, mechanical variables such as stress and strain affect chemical, biological, physical or thermal processes and properties that require a multi-disciplinary approach. The levels of these couplings are multiple and often poorly recognized.

As nascent technologies related to energy production emerge, it is prudent to include the environmental considerations early in the phase of development rather than seek remedies post factum, or after the damage has been induced. For example, it may refer to the production of natural gas from shales, the techniques of hydraulic and chemical fracturing, CO₂ sequestration technologies, nuclear waste isolation (long and short term), heat and fuel storage in the underground and under structures, geothermal fluid energy, energy from methane hydrates, oil production from high temperature, high-pressure deposits, and many others. Effects of chemical and biological pollution on isolation geo-structures constitute a separate class of problems. Finally, chemical and biological improvement technologies of mechanical and hydraulic quality of soils and shales involve knowledge and methods based on the same principles.

The intrinsic nature of coupling of chemical, biological, thermal and mechanical properties, variables and fields distinguishes the related problems from those in classical geomechanics. Therefore, it is believed that continuing and establishing new research activities dedicated to these Energy and Environmental Geomechanics issues is an excellent opportunity for LMS and ENAC.

Some examples of activities for the coming years would be in the following areas:

Geo-energy structure

Efforts are being devoted to understand better the physical mechanisms and phenomena characterizing the operation of energy geostructures for ensuring an optimal geotechnical, structural and energy performance of such ground structures. The LMS has more than 15 years of experience in this scope and is internationally recognized by Universities and Companies as the leading research group in this field. The analyses that are being performed are focused on various aspects that characterize energy geostructures, including the non-isothermal behaviour of soils when subjected to cyclic temperature variations, the interaction (soil-structure) with the concrete composing these ground structures, the structural behaviour of the concrete itself subjected to temperature changes, the hydraulic aspects related to the fluid flow inside of the pipes embedded in the concrete that allow for the heat exchange between the soil and the ground structure, and the optimal practices for equipping the considered elements. It is believed that the exploitation of shallow geothermal energy for satisfying the energy needs of building environments in an environmentally-friendly way will increase and spread worldwide more and more in the foreseeable future. Through its expertise in this subject matter, the LMS aims to represent this revolutionary approach.

Deep Geo-Energy

Advanced theoretical, experimental and computational knowledge was developed in recent years at the LMS for assessing and predicting the behaviour of geomaterials subjected to changes in temperature and at different states of saturation. This state-of-the-art expertise has been mainly applied in underground nuclear waste storage and the geothermal use of building foundations. The research activities are now devoted to (i) the enhancement of the understanding of the thermo-hydro-chemical-mechanical behaviour of shales (including gas shales and host rock formations for waste disposal) and bentonites and the prediction of their long-term behaviour, and (ii) the development of computational design tools for geo-energy structures.

Several highly sophisticated and unique experimental tools were developed at the lab recently with an investment of about 1000.- Kfrs (from FNS, EPFL and industry). It is planned to develop the knowledge and the understanding on the behaviour of soils and shales in the light of the extreme loading conditions that the equipment allows. There is a huge room for fundamental research on the running of coupled thermo (until 150°C) – hydro (until 400 MPa of suction)-mechanical (until 30 MPa) testing as well as on the behaviour of the materials in such conditions. The laboratory facilities also serve research to micro-scale observations (i.e. neutron tomography) for a better insight into the fundamental physical mechanism governing the thermo-hydro-mechanical behaviour of the involved materials.

Environmental Geomechanics

Efforts will be devoted to maintaining the current research activities in multi-physical coupling processes in soils at the leading edge of technology with expertise in the fundamentals of soil mechanics.

Goals
<p>LMS has a long tradition in the domain of landslide analysis. In the past years, early warning system methods have been developed. Climate change and its effects on the earth's equilibria and water budget are studied all around the world by thousands of researchers. Following this trend, the current researches at LMS focus on the effects of climate variations on the stability of slopes. To do so, interactions between the soil and the atmosphere must be studied to understand the exchanges between the two systems. Using climate change scenarios, this research would aim to take a step forward in managing natural hazards by predicting the situation in the next century. As dry Summers aare becoming more frequent in the 21st century, the focus will be set on the mechanism of desiccation cracking in soils. The room for research on this phenomenon is significant, and its implications on landfill liner integrity, stability of foundations, agriculture, and stability of slopes have to be assessed.</p> <p>The project of bio-improved soils currently carried out at LMS has proven great potential in building a sustainable, environmental-friendly method for stabilizing soils and preventing failures in a vast range of engineering problems. Furthermore, the project has already offered the chance for interdisciplinary collaboration between LMS and EML and offers common ground for collaboration with other ENAC laboratories. As a foreseen step, a pilot, large-scale application of the technique is planned in order to design better and suggest an efficient method adaptable to the needs of the geotechnical problem.</p> <p>CO2 storage</p> <p>The financial support of Petrosvibri to the Chair has allowed the development of a deep knowledge in the area of CO2 storage. Experimental facilities devoted to this topic have been developed. Also, computational tools at the basin scale were introduced for the analysis of the various scenarios.</p> <p>These objectives would help the ENAC to strengthen its research and teaching profile and to play an important national and international role in the most advanced and strategically important areas of research in Energy and Environmental Geomechanics.</p>

Any message to the Dean?

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Any other comments?

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The activity report has not been validated by the head of the unit and can still be modified.