Vice Presidency for Research
Research Centers
Technology Platform for Hydraulic Machines

Hydraulic Machinery Engineering 2025 Short Course

Date: September 1 to September 5, 2025

Organized by EPFL

To be held at the EPFL Technology Platform for Hydraulic Machines
Avenue de Cour 33 Bis, 1007 Lausanne, Switzerland

École polytechnique fédérale de Lausanne

EPFL PTMH
Avenue de Cour 33 Bis
1007 Lausanne
Switzerland

Telephone: +41 21 693-54 56
info.ptmh@epfl.ch
Web : ptmh.epfl.ch
Location : Map-Plan classroom PTMH

OVERVIEW

In a context of increasing demand for energy flexibility and sustainability, hydraulic machinery plays a crucial role in ensuring the reliable operation of modern power systems. However, the design, operation, and maintenance of these machines are becoming more complex due to evolving grid requirements, aging infrastructure, and climate-related challenges. This course is developed to address the growing need for specialized knowledge in hydraulic turbomachinery, bridging academic fundamentals with industrial practices. It is tailored for engineers, researchers, and technicians who wish to deepen their expertise or transition into the hydropower sector. Whether you are involved in design, diagnostics, operations, or R&D, this course provides the tools and insights needed to tackle today's technical and strategic challenges in hydraulic machinery.

OBJECTIVES

This course offers a unique opportunity to gain knowledge and practical tools in the field of hydraulic turbomachinery, a key component of hydropower plants. Participants will benefit from the expertise of leading researchers and industry professionals, as well as exposure to real-world applications and operational challenges. Beyond theoretical understanding, the course emphasizes technical insights that participants can apply in their professional roles, whether in design, diagnostics, operations, or innovation of hydropower units. By the end of the course, participants will be able to:

1. Understand the fundamental principles and operating conditions of hydraulic machines such as Pelton, Francis, and reversible pump-turbines.
2. Diagnose and interpret critical phenomena like cavitation, fatigue, and transient events, using both experimental techniques and numerical simulations.
3. Apply modern design approaches and numerical simulation tools to support R&D and performance optimization.
4. Develop strategies for effective monitoring, condition assessment, and maintenance of hydraulic machines to ensure reliability and long-term performance.
5. Integrate insights on flexible operation and market dynamics into the operational planning of hydroelectric units within the broader energy transition context and climate change risks.

PROGRAM

Day 1: *Introduction to Hydraulic Turbomachines*
Cavitation in Hydraulic Machines
Model Testing & On-Site Measurements

Day 2: *Pelton Turbine Engineering*
Advanced Measuring Techniques
Pump Design & Selection Criteria
R&D with Numerical Simulations for Hydraulic Machines

Day 3: *Francis Turbine and reversible pump-turbines Engineering Design*
Dynamic problems and fatigue in hydraulic machines
Transient Phenomena in Hydroelectric Power Plant
Maintenance and monitoring of hydraulic machines

Day 4: *Visit of Veytaux Centrale Plant and Grand Dixance Dam*

Day 5: *Flexible operation and control of hydroelectric units*
Hydro Energy Market
Energy transition and climate change challenges

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CONDITIONS

Short course:
- Duration: 40 hours, 16 lecture modules, 1 site visit, 5 days;
- Prerequisite: Degree in engineering or professional engineering experience in industry;
- Language: English
- Certificate of attendance: at the end of the Short Course.

The course session will be held in week 36 if a minimum of 12 attendees are registered.

Registration:
- By completing the attached form (page 5) to be addressed by e-mail to EPFL-PTMH attention to Mrs Nadia Kaiser, Avenue de Cour 33 Bis, 1007 Lausanne/Switzerland, E-mail: nadia.kaiser@epfl.ch, Tel.: +41 21 693 54 56.

Fees (VAT 8.1% not included)
- CHF 3'500.00* (per person, including technical documentation, technical visit, lunch and coffee break).
- CHF 3'000.00* for the second attendee of the same company or institute;
- **Cancellation fees*: 10% of the amount will be charged.
- Payment in advance by bank or postal transfer in Swiss Franc (CHF) to Swiss Post, Postfinance SA, Mingerstrasse 20, 3030 Bern-Switzerland Swift/Bic POFICHBEXXX, Account no: 17-714571-6, IBAN for Swiss Francs: CH2709000000177145716 Reference: CC 0329 - Funds 111564 + invoice no. to be mentioned
- to be transferred before August 10.

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2025 Short Course
Time Schedule

Week 36	Monday 01.09.2025	Tuesday 02.09.2025	Wednesday 03.09.2025	Thursday 04.09.2025	Friday 05.09.2025
06:45				Departure visit	
08:15	Participants Welcome				
08:30	Introduction to Hydraulic Turbomachines E. VAGNONI (EPFL PTMH)	Pelton Turbine Engineering N. GERVAIS (ANDRITZ HYDRO)	Francis Turbine and reversible pump-turbines Engineering Design Y. LAURANT (GE VERNOVA)	Centrale de Veytaux 	Flexible operation and control of hydroelectric units F. GERINI (SWISSGRID)
10:15	Coffee Break	Coffee Break	Coffee Break		Coffee Break
10:45	Cavitation in Hydraulic Machines A. JUNG (VOITH HYDRO)	Advanced measurement techniques E. VAGNONI & M SUAREZ (EPFL PTMH)	Dynamic phenomena and fatigue in hydraulic machines F. DUPARCHY (GE VERNOVA)		Hydro Energy Market M. MURET (CITY WORKS OF LAUSANNE)
12:45	Lunch	Lunch	Lunch		Lunch
13:30	Cavitation and advanced monitoring M. FARHAT (EPFL CAVITATION RESEARCH GROUP)	Pump Design & Selection Criteria S. BERTEN (SULZER PUMPS)	Transient Phenomena in Hydroelectric Power Plant C. NICOLET (POWER VISION ENGINEERNG)	Grande Dixence Dam 	Energy transition and climate change challenges E. VAGNONI (EPFL PTMH)
15:00	Coffee Break	Coffee Break	Coffee Break		Coffee Break
15:30	Model Testing & Demonstration M. SUAREZ (EPFL PTMH)	R&D with Numerical Simulations for Hydraulic Machines C. MUNCH-ALLIGNE (HESSO)	Maintenance and monitoring of hydraulic machines S. ROTH (HYDRO EXPLOITATION)		Certificates and farewells
17:15	Welcome Aperitif				
19:00				Dinner	

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Registration Form
e-mail: nadia.kaiser@epfl.ch - Fax: +41 21 693 54 56

Title	☐ Mr. ☐ Ms. ☐ Mrs. ☐ Prof. ☐ Dr.
First name	
Last name	
Position	
Company Name	
Street, No.	
City	
Zip Code	
Country	
Tel. (country + area code)	
Invoice e-mail	
e-mail	
Dietary restrictions if any	

Please take note that the EPFL-LMH is located downtown Lausanne, not on the main campus of EPFL in Ecublens. If you book a hotel room in Lausanne, you are eligible for the public transport card gratuity, valid for the duration of your stay.

Hotels situated nearby EPFL-PTMH with whom we have an agreement in 2025 (breakfast included) with the promo code "EPFL HME":

- Carlton Hotel via web site
- Bellerive Hotel via e-mail: info@hotelbellerive.ch or by phone +41 21 614.90.00
- Continental Hotel via e-mail: booking@hotelcontinental.ch

Other Hotels situated nearby EPFL-LMH are the following:

- Hotel Agora Swiss Night, asn@byf.ch
- Hotel A la Gare, info@hotelalagare.ch
- Hotel le Boulevard, info@boulevard51.ch
- Hotel Victoria, info@hotelvictoria.ch
- Hotel Elite, info@elite-lausanne.ch
- Hotel Alpha Palmiers, ap@byf.ch

Registration to reach our office by June 30 the latest, registration will be confirmed.

Payment in CHF, invoice will be sent per e-mail (pdf), please provide the invoicing address if different.

Fees (VAT 7.7% not included)

- CHF 3'500.00* (per person, including technical documentation, technical visit, lunch and coffee break).
- CHF 3'000.00* for the second attendee of the same company or institute;
- * Cancelation fees: 10% of the amount will be charged.
  Pour toute inscription annulée le 10% du montant sera facturé.