

ENG-272

**Fluid mechanics (for SIE)**

Porté-Agel Fernando

Cursus	Sem.	Type
Environmental Sciences and Engineering	BA4	Obl.
HES - SIE	E	Obl.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>5 weekly</b>
Lecture	3 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

This course helps students acquire basic knowledge of the main concepts and equations of fluid mechanics and develop the skills necessary to work effectively in professional engineering practice.

**Content**

- Introduction: Continuum assumption, basic fluid properties
- Fluid statics: pressure, forces on immersed body
- Flowing fluids and pressure variation: continuity, momentum, energy equations, applications in engineering
- Dimensional analysis and similitude
- Surface resistance
- Flow in conduits
- Flow in open channels
- Flow measurement

**Learning Prerequisites****Recommended courses**

Physics, Mathematics, Mechanics

**Learning Outcomes**

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

- Describe basic fluid and flow characteristics such as density, viscosity, surface tension, shear stress, pressure and velocity.
- Apply the hydrostatic equation and the buoyancy equation to predict forces and moments.
- Apply the Bernoulli equation to calculate pressure and velocity variations in a fluid flow.
- Apply the continuity equation to draining tanks and reservoirs.
- Apply the momentum equation to stationary and moving control volumes.
- Apply the energy equation to predict variables such as pressure drop and head loss.
- Apply the Buckingham-Pi theorem to determine dimensionless variables.
- Design pipes and pumps based on pressure drop and head loss calculations.

- Apply Manning's equation to uniform open channel flow and find the best hydraulic section.

### Teaching methods

Ex cathedra, exercises, practical work

### Expected student activities

Attending lectures and exercises and participation in laboratories (practical work).

### Assessment methods

Exercises (10%)

Written midterm tests (40%)

Written final exam (120 min) during exam session (50%)

### Supervision

Office hours	Yes
Assistants	Yes
Forum	No

### Resources

#### Bibliography

D. F. Elger et al., "Engineering Fluid mechanics", 10th ed. (Librairie la Fontaine)  
Course materials in internet

#### Ressources en bibliothèque

- [D. F. Elger et al., "Engineering Fluid mechanics"](#)

#### Moodle Link

- <https://go.epfl.ch/ENG-272>