The Doctoral Program in Civil and Environmental Engineering (EDCE) at EPFL is a multi-disciplinary program designed to tackle the most challenging problem of our time: fostering a vibrant and productive society while ensuring environmental sustainability.

This challenge is being addressed by creative interactions between science and engineering. The strength of EDCE is that it spans a remarkably broad research spectrum: from rock mechanics to microbiology, from rivers to roads and from the dams to glaciers. EDCE offers the educational model necessary to become a leader in fast-paced, high-tech industries and academia.

The laboratory of Ecohydrology focuses on research at the interface of hydrology, geomorphology and ecology under an integrated framework of analysis with an aim for a general theory. The main effort in the doctoral program is devoted to the development of a new research field across physical and biological sciences: spatial epidemiology of waterborne disease, with significant impacts on science and public health practice. Waterborne diseases are infections that predominantly are transmitted through contact with or consumption of contaminated water. They can strike humans, animals and even plants. Spatially explicit mathematical models of waterborne infections are fast revolutionizing epidemiology as they can provide key insights into the course of an ongoing epidemic, potentially aiding real-time emergency management in allocating resources and anticipating the impact of alternative interventions. We aim at a new generation of spatially explicit multilayer-network models of waterborne epidemics and epizootics. Specifically we study cholera, one of the most important global health hazards, and proliferative kidney disease in salmonids, which has a critical impact on fish-stock with major ecological and bio-economic consequences.
Designing earthquake resistant buildings

Currently I am a PhD student in my 3rd year in the Earthquake Engineering and Structural Dynamics Laboratory. My research focuses on developing the seismic design guidelines for reinforced concrete core walls. What attracted me very much to this topic and EPFL was the practical nature of the research topic as well as the opportunity to perform large-scale testing. Moreover the project is quite comprehensive involving numerical, analytical as well as experimental tasks. No time to get bored... During the two years already spent at EPFL, I have discovered here a very high level of research and education. Of course, it asks for a lot of work but also brings a lot of satisfaction. People here are very passionate about their work and at the same time supportive and helpful to yours. The university environment is really nice and international. When I first came here I didn’t really knew anybody but I remember that my colleagues really made me feel welcome and tried to help me integrate socially. I now also try to do the same thing with all the newcomers to sort of keep the tradition going...

Using lasers to study the internal dynamics of idealized avalanches to understand the mechanisms of material entrainment from below.

Snow and debris avalanches pose a threat to life and have the potential to greatly damage communities in mountainous areas, yet their properties and internal dynamics are highly complex and difficult to investigate. Understanding the processes at play within such flows is key to the prediction of their eventual size and velocity, as well as the areas at risk, and the aim of my research is to study the effects of material entrainment from below on the dynamics of idealized avalanches in the lab. This allows a tight control of the avalanche properties, without the complications and dangers associated with these phenomena.

In the experiments an avalanche of fluid is seeded with tiny fluorescent particles and released by a dam-break. A laser sheet illuminates a stream-wise slice of the flow allowing measurements of the internal velocities to be taken without intrusively disturbing the flow.

The avalanche may travel over an entrainable region, and we can examine how this alters the dynamics. Parameters are varied one by one: with the final goal of linking all of this together in a theory able to describe more complex natural flows. Hopefully this work will play a part in improving the models used for the prediction of such natural hazards.

This project combines lab work and data analysis with fluid dynamical theory and numerical methods, and it is this variety that I enjoy. Coming from a theoretical background, I was excited to start performing experiments, and during my PhD studies so far I have learnt how to apply sophisticated laser and imaging techniques to laboratory avalanches with differing levels of complexity.

With the facilities available at EPFL, I have the opportunity to use cutting-edge procedures, which allows me to present my results at international conferences alongside some of the best researchers in the field - which is an incredibly nerve-wracking, but really valuable, experience!

Raluca Tereza Constantin, PhD Student

Belinda Margaret Bates, PhD student
Application Deadlines:
The applications to the doctoral program in Civil and Environmental Engineering (EDCE) can be received by January 15, April 30 and September 15. Your complete application material must be received by the doctoral program at EPFL prior to the deadline at which you wish your application to be considered.

Research opportunities:
More than 40 labs, mainly from the School of Architecture, Civil and Environmental Engineering, but also from the School of Basic Sciences and of Engineering, are offering PhD research opportunities along 4 main streams:
- Structural Engineering
- Systems Engineering
- Environmental Resources Engineering
- Chemical & Biological Processes

Job market:
Some of our PhD graduates have joined the faculty of good universities around the world. To facilitate the access to the academic market, EDCE is encouraging the mobility of its students through “mobility awards” to increase their visibility and, therefore, their competitiveness on this market.
Many other PhD graduates have been hired by companies or consultants offices, or have established their own start-up based on the tools and skills developed during their PhD thesis. To foster this line, EDCE encourages participation in research projects with the industry by providing sufficient flexibility to allow the students to accomplish the requirements of the program in this context, while not compromising on the quality of their research.

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