The doctoral program addresses the science and engineering of advanced manufacturing processes. It is part of the new Micro-Manufacturing Science and Engineering Center (M2C). Advanced manufacturing is diverse, multiscale and multidisciplinary. It requires fundamental knowledge in materials, solid and fluid mechanics, surface and interface science, multiscale modeling, process and system engineering. More specialized topics include control system theory, production flow optimization, micro- and nanofabrication, laser processing, metrology, additive and subtractive 3D manufacturing, assembly and joining processes, sustainability and cost analysis.

Research topics of the advanced manufacturing program include:
Flexure-based oscillators

I am a PhD student working on flexure-based oscillators that aim to replace traditional mechanical watch oscillators (hairspring/balance wheel couple). This would bring many benefits, mostly thanks to the absence of friction in flexure mechanisms. Before reaching this goal however, several challenges need to be overcome and I am eager to tackle them. I am motivated by research that balances a rigorous academic approach with practical applications. This is why my thesis project, which combines scientific methodology and conceptual approach with the realization of prototypes and a possible implementation in a product as outcome, is ideal for me.

I appreciate the environment in my lab, the good relationships with my colleagues, the freedom that I have managing my time and exploring new ideas. It is important for me to evolve in a place where there is space for creativity and initiative.

Being at EPFL also offers numerous advantages such as having the opportunity to teach, give seminars and attend conferences, being surrounded by high level scholars and having access to the resources necessary for innovative research.

Etienne Thalmann, PhD student in Micromechanical Design

Investigating self-organization mechanism

Ultrashort laser pulses allow unique opportunities for tailoring material properties in three dimensions. Interestingly, self-organization phenomena may take place in materials under intense laser beam; inducing high electrical field conditions. These periodic structures can take various forms depending on the laser exposure conditions and form naturally, for instance during continuous scanning a femtosecond laser beam. In my PhD study, I am currently exploring the effect of femtosecond laser regime i.e self-organized nanostructures in various glass systems and crystals. Each of these glass systems have interesting properties and specificities, relevant for technological applications requiring highly periodic elements over large surfaces or lengths. It would open up a broad number of design opportunities for three-dimensional direct writing systems on different materials.

This research is build upon existing experimental laser platforms and advanced material characterization tools to focus on the fine analysis of the material response to the laser exposure with the aim of developing a generic understanding of dielectrics response to femtosecond laser irradiation. In our laboratory, we have state-of-the-art laser facilities consisting of several femtosecond laser sources from a few tens to five hundred femtoseconds and advanced investigation techniques based on optomechanics and photoelasticity developed in the laboratory.

With all the facilities available in here, EPFL, I have the opportunity to conduct high level of research and exchange ideas with the best researchers in their fields. I am also eager to work in such a competitive research group with academic diversity, which I believe crucial for my future endeavors as a researcher.

Gözden Torun, PhD student in Galatea Laboratory
Why choose this doctoral program?

- Access to a large portfolio of laboratories
- Access to state-of-the-art technology platforms and core facilities
- International environment
- Education “à la carte” in a European leading university
- Experience in teaching at the university level
- Access to all EPFL courses and events including seminars, courses, training and industrial network
- Conviviality: participation to student retreat and other get-together activities
- Alumni PhD students have access to Swiss fellowships
- Life in a beautiful environment, Lausanne

Overview of the program

The duration of PhD studies is usually of four years or less. Students will obtain a doctoral degree from EPFL (Swiss Federal Institute of Technology).

During their PhD studies, students will participate in teaching (contact hours, supervision of bachelor students’ projects).

Students will be followed by a PhD committee that offers guidance. A mentor will ensure that the student has settled satisfactorily into the lab and the program.

Graduate students complete their education by attending practical and theoretical courses, as well as seminars. Students are required to accumulate 12 ECTS credits during their doctoral studies.

Starting salary: 51'400 CHF (~44'000 EUR, ~52'000 USD)