EPFL

Master of Science in

COMPUTATIONAL SCIENCE AND ENGINEERING

2-year program - 120 ECTS

Master's thesis
30 ECTS

Project in social and human sciences
6 ECTS

Internship
8 ECTS

Semester projects
16 ECTS

Core courses
24 ECTS

Modeling and numerical methods
36 ECTS
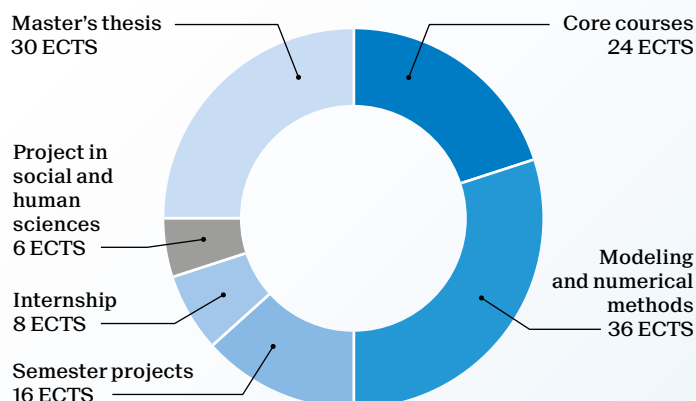
In the Modeling and numerical methods group, students have to choose 3 out of the 4 lists and complete at least 8 ECTS in each of them.

Internship

The program includes a compulsory 8-week internship which can be extended to 6 months.

Career prospects

EPFL is a world leader in computing, engineering and fundamental sciences. A Master in Computational Science and Engineering from EPFL opens the door to top employment with computational skills in a broad spectrum of industries, not only in all branches of engineering, but also in emerging and vibrant market sectors including energy, financial and pharmaceutical R&D.
It is also a strong asset for a PhD in Computational Science.

	Credits
Core courses	**24**
Advanced numerical analysis	5
Algorithms	8
Computer simulation of physical systems I	4
Image processing I	3
Machine learning	8
Molecular dynamics and Monte-Carlo simulation	2
Numerical analysis and computational mathematics	4
Parallelism and concurrency in software	6
Parallel and high-performance computing	4
Programming concepts in scientific computing	4

Modeling and numerical methods	**36**
Computational modeling based on differential equations	8 min.
Atomistic and quantum simulations of materials	4
Computational neurosciences: neuronal dynamics	5
Dynamical system theory for engineers	6
Environmental transport phenomena	5
Hydrodynamics	5
Instability	3
Numerical flow simulation	5
Principles and applications of systems biology	3
Turbulence	5

Computational modeling based on discrete systems	8 min.
Computational methods in molecular quantum mechanics	4
Distributed intelligent systems	5
Geometric computing	6
Image processing II	3
Introduction to electronic structure methods	4
Mathematical modeling of behavior	5
Molecular quantum dynamics	3
Structural biology	4
Understanding advanced molecular simulation	4

Numerical methods, algorithms, high performance systems	8 min.
Advanced multiprocessor architecture	8
Computational linear algebra	5
HPC for numerical methods and data analysis	5
Kinetic and non-equilibrium conservation laws	5
Numerical approximation of PDEs	5
Numerical integration of dynamical systems	5
Numerical integration of stochastic differential equations	5
Numerics for fluids, structures and electromagnetics	5
Randomized matrix computations	5
Stochastic simulation	5

Data science	8 min.
Algorithms II	8
Applied data analysis	8
Deep learning	4
Deep learning in biomedicine	6
Deep reinforcement learning	6
Foundations of data science	8
Information security and privacy	8
Mathematics of data: from theory to computation	6
Optimization for machine learning	8
Systems for data management data science	8