Master of Science in COMPUTATIONAL SCIENCE AND ENGINEERING

2-year program - 120 ECTS

Core courses 30 ECTS
Semester projects 30 ECTS
Modeling and numerical Methods 30 ECTS
Master's thesis 30 ECTS

Core courses
- Advanced numerical analysis 5
- Algorithms 6
- Computational physics III 3
- Computer simulation of physical systems I 4
- Dynamique moléculaire et simulations Monte Carlo 2
- Image processing I 3
- Numerical analysis and computational mathematics 4
- Numerical integration of dynamical systems 5
- Parallel computing and pthreads 4
- Programming concepts in scientific computing 4
- Software Engineering 6

Semester projects
- Project in computational science and engineering I, II 16
- Industrial internship 8
- Project in human and social sciences 6

Modeling and numerical Methods
- Computational Modeling Based on Differential Equations 8 min.
- Advanced methods in computational solid mechanics 1
- Atomistic and quantum simulations of materials 4
- Biological modeling of neural networks 4
- Dynamical system theory for engineers 4
- Environmental transport phenomena 5
- Hydrodynamics 5
- Instability 5
- Numerical flow simulation 5
- Numerical methods in heat transfer 3
- Particle-based methods 4
- Principles and applications of systems biology 3
- Quantum simulations of materials: Properties and spectroscopies 4
- Turbulence 3

Computational Modeling Based on Discrete Systems 8 min.
- Applied molecular quantum chemistry 4
- Biomolecular structure and mechanics 4
- Computational methods in molecular quantum mechanics 4
- Digital 3D geometry processing 5
- Distributed Intelligent Systems 5
- Image processing II 3
- Introduction to electronic structure methods 4
- Mathematical foundations of signal processing 6
- Mathematical modelling of behavior 4
- Molecular quantum dynamics 2
- Signal processing for communications 6
- Water quality modeling 4

Numerical Methods, Algorithms, High Performance Systems 8 min.
- Advanced Algorithms 7
- Advanced multiprocessor architecture 6
- Convex optimization and applications 4
- Computational Finance 5
- Computational linear algebra 5
- Mathematical modeling of DNA 5
- Computer algebra 5
- Numerical approximation of partial differential equations I 5
- Numerical approximation of partial differential equations II 5
- Numerical integration of stochastic differential equations 5
- Numerical methods for conservation laws 5
- Numerical methods for electromagnetics 5
- Stochastic simulations 5

Data Science 8 min.
- Advanced Algorithms 7
- Applied data analysis 6
- Information security and privacy 6
- Information theory and signal processing 6
- Machine learning 7
- Mathematics of Data: From Theory to Computation 4
- Optimization for machine learning 4
- Statistics for data science 6
- Systems for data science 6

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.

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