

Bachelor's Degree and Master's Program in Electrical Engineering and Information Technology

Teaching Area

Computers and Networks

Key research topics at D-ITET

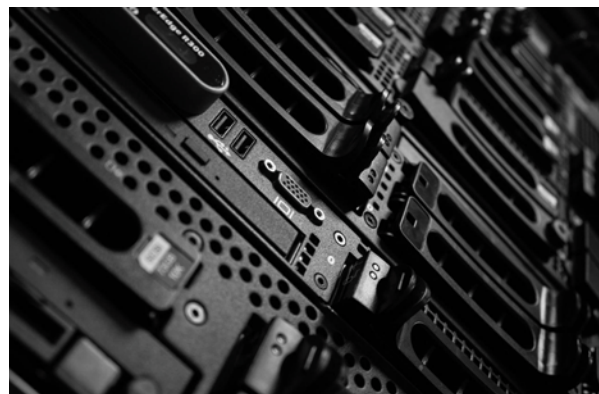
- Computer Architecture
- Computer Networks
- Computer Vision
- Distributed Systems
- Hardware-Software Co-Design
- Hardware Security

Building a truly interconnected and secure society requires the development and deployment of robust, efficient, and high-performing computing systems. Computing is indeed an integral part of everyday life, powering everything from wearable devices to autonomous systems and driving an exponential growth in data traffic. This surge in data demands innovative, scalable solutions in both hardware and

software. Networked systems, including the Internet, are critical to supporting infrastructure, communication, and commerce, making secure, high-speed, and sustainable networks essential. At the same time, artificial intelligence (AI) and its applications, such as Computer Vision, are transforming industries by enabling breakthroughs in areas like autonomous vehicles, surveillance, and medical imaging. These advancements require unprecedented computational performance, efficient algorithms, and specialized hardware architectures to process massive data volumes. Meeting these challenges depends on innovations in automation, distributed computing, networking, data processing, amongst many others.

Students choosing the "Computers and Networks" specialization will build upon their foundations in electrical engineering and information technology to deepen their expertise in topics such as communication systems, network security, embedded systems, distributed computing, computer architecture, and hardware security. They will explore challenges such as designing resilient communication networks capable of handling high traffic loads, developing secure and high-speed protocols to safeguard sensitive data, optimizing distributed systems for performance and scalability, engineering embedded control systems for real-time applications, and developing hardware and software systems tailored for AI workloads.

Artificial intelligence (AI), digitalization, pervasive connectivity, and security dominate the agenda in industries and organizations of all sizes and across various domains. Thus, computer and network engineers have excellent job prospects in Switzerland and beyond. These engineers are equipped to design, develop, and optimize the computing and networking infrastructure required for modern applications, from small-scale embedded systems to large-scale cloud and AI platforms. They possess the skills to work as part of research and development teams, lead infrastructure deployment projects, design secure and high-performance systems, and advise organizations on strategic technological initiatives.



Curriculum

Bachelor (min. 18 CP)

Third Year Core Courses (min. 18 CP)

Discrete Event Systems	227-XXX
Communication Systems	227-XXX
Embedded Systems	227-XXX
Communication Networks	227-XXX
Fundamentals of Computer Architecture	227-XXX

Master (min. 64 CP)

Advanced Core Courses (min. 24 CP)

Students, in particular those joining ETH for the master, can also take Bachelor core courses in this category.

Computer Architecture	227-XXX-00L
Advanced Topics in Communication Networks	227-XXX-00L
Hardware Security	227-XXX-00L
System Security	227-XXX-00L
Network Security	227-XXX-00L
Principles of Distributed Computing	227-XXX-00L
Introduction to Estimation and Machine Learning	227-XXX-00L

Specialisation Courses (min. 40 CP)

Discrete-Time and Statistical Signal Processing	227-0	-00L
Control Systems	227-0	-00L
VLSI 1: HDL Based Design for FPGAs	227-0	-00L
Physics of Failure and Reliability of Electronic Devices and Systems	227-0	-00L
Image Analysis and Computer Vision	227-0	-00L
Distributed Systems	227-0	-00L
Seminar in Computer Architecture	227-0	-00L
Embedded Control Systems	227-0	-00L
Security of Wireless Networks	227-0	-00L
Algebraic Methods in Combinatorics	227-0	-00L
Information Theory II	227-0	-00L
Seminar in Deep Neural Networks	227-0	-00L
Cryptographic Protocols	227-0	-00L
Communication and Detection Theory	227-0	-00L
Synthesis of Digital Circuits	227-0	-00L
Systems-on-Chip for Data Analytics and Machine Learning	227-0	-00L
Neural Network Theory	227-0	-00L
Deep Generative Models	227-0	-00L
Mathematics of Information	227-0	-00L
Advanced Operating Systems	227-0	-00L
Introduction to Mathematical Optimization	227-0	-00L
Convex Optimization	227-0	-00L
Seminar in Communication Networks	227-0	-00L

The courses that are offered in this area of specialisations can be found [here](#) (follow the link under Course offer to the ETH Zurich course catalogue (www.vvz.ethz.ch)).

Information and Advice

For advice regarding this specialisation, students may contact the track advisor

Prof. Dr. Laurent Vanbever,
Networked Systems Group (NSG)
Gloriastrasse 35, ETZ G90
8092 Zürich
lvanbever@ethz.ch