In addition to its two renowned specializations in Micro and Nanoelectronics and in Information technologies, the Section of Electrical Engineering offers to its students a new high-level teaching program on Smart Grids Science and Technologies. The electricity sector is experiencing deep changes and evolutions, and the new challenges of Smart Grids require high-profile engineers capable of understanding and solving multi-disciplinary problems that integrate energy conversion systems together with power and telecommunication networks. You are invited to join us in one of these three inspiring programs.
Human Brain Imaging
Diffusion MRI is a special magnetic resonance imaging technique that allows to reconstruct the axonal tracts that connect the different regions of the brain. This is very useful in order to understand topics like fundamental human brain anatomy, neurodegenerative diseases or psychiatric disorders.

Diffusion MRI image processing is an emerging field with much to explore and great potential for the further evolution of medical imaging. It offers a wide range of signal and image processing problems such as improving the modeling of diffusion at the local level, reducing the needed scan time to acquire an image, developing global optimization algorithms to derive the axonal tracts from the raw data, graph analysis on one of the most complex networks known to man, or transferring those developments to clinical practice by studying the connectivity of real pathological brains as compared to normal controls.

EE student projects in this field of research consist for instance in developing a global optimization algorithm to infer the most probable set of neuronal bundles from diffusion MR images of a brain. This kind of project involves image processing, mathematics, statistics, and computer science - it allows EE students and graduates to contribute to the understanding of the fascinating human brain.

The Real-Time and High Performance System-on-Chip Development for High Resolution Stereo Camera Depth Map Estimation
Depth estimation is an algorithmic step in a variety of image processing applications such as autonomous navigation, robot and driving systems, 3D geographic information systems, object detection and tracking, medical imaging, computer games and advanced graphic applications, 3D television, multiview coding for stereoscopic video compression, and disparity-based rendering.

The target of this project is to develop real-time and high resolution depth map estimation system using Virtex-7 FPGA. While FPGA computes the depth map in real-time, the depth map results and the original images will be displayed in PC using QT based Graphical User Interface (GUI). Moreover, some depth map estimation based simple applications, such as measuring the exact distance of the objects (with meters and centimeters) and computing the speed of the object, will be developed in PC.

The engineer working on the project will improve his knowledge about embedded systems, Xilinx tools, Modelsim, QT, Ethernet Protocol, using high-end Xilinx Virtex 7 FPGA, hardware implementation using Verilog, image processing, and MATLAB.
# Master of Science in Electrical and Electronic Engineering

**2-year program - 120 ECTS**

- **30 ECTS** Master's thesis
- **20 ECTS** Labs and Projects
- **according to list**

### Core courses in chosen track
- **20 ECTS**

### Courses and Projects for Specialization or MINOR
- **30 ECTS**

### Labs and Projects
- **20 ECTS**

### Possible Minors:
- Biomedical Technologies
- Computational Science & Engineering
- Energy
- Management, Technology and Entrepreneurship
- Science, Technology and Area Studies
- Space Technologies

### or 30 ECTS internship (4-6 months)

### Possible specializations:
- A Digital Design and Computer Engineering
- B Analog, Mixed-Signal and RF Design
- C Data, Signal & Image Science
- D Communication Technologies
- E Optoelectronics and Optics
- F Advanced Control and Communication for Power Systems Operation
- G Renewables and Energy Conversion Systems

### Industrial internship
- The program includes a minimum 8-week long compulsory internship.
- A longer internship may be done instead of a specialization or in combination with the Master's thesis.

### School of Engineering
master.epfl.ch/electricalengineering
contact: philippe.gay-balmaz@epfl.ch

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### Credits

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