System Development with STMicroelectronics

Proposal A.Y. 2024-2025

	Topic
Day 1 – 3hh	• *Course opening* • Company presentation • System presentation: • Electronic system general description and main components • Marketing: a customer journey
Day 2 – 3hh	• Introduction to microcontrollers • STM32 family overview and main peripherals
Day 3 – 3hh	• Introduction to microcontrollers • STM32ODE overview: Nucleo, X-Nucleo, Function Packs • Summer campus
Day 4 – 3hh	• Introduction to microcontrollers • Programming tools
Day 5 – 3hh	• Microcontrollers – practical example on STM32
Day 6 - 3hh	• Electric motors and actuators – introduction and ST solutions
Day 7 - 3hh	• Electric motors and actuators – practical session
Day 8 - 3hh	• Introduction to MEMS sensors & practical session
Day 9 - 3hh	• Energy-autonomous and maintenance-free wireless sensor node
Day 10 - 3hh Tot: 30 hours	• Deep learning & STM32Cube A.I. • Human resources • *Course closure*

IPCEI on Microelectronics

STEM your way
Innovation depends on you

Antennas Simulation by ANSYS HFSS

3CFU (18 hours). In English.

15:00 – 18:00, Lab. Inf. A

Ing. Giorgio S. Mauro (INFN-LNS)

The course "Antennas Simulation by ANSYS HFSS" offers a practical introduction to commercial electromagnetic simulators, which is taught through case studies on antennas and other guiding structures (waveguides, resonant cavities). The course covers the steps required to perform an electromagnetic simulation, including defining the system geometry, setting boundary conditions and performing a frequency sweep to analyze the system behaviour in terms of scattering parameters and electromagnetic fields (far-field in the case of an antenna). Additionally, parametric sweeps and optimization are explained and introduced with examples.

The proposed case studies include: evaluating scattering parameters and line impedance for waveguides, evaluating main antenna parameters (return loss, gain, efficiency, radiation pattern, etc), design of a quarter-wave impedance adapter, design of resonant cavities for filtering and particle accelerator applications.

The course employs **ANSYS HFSS** software (Electronics Desktop) to carry out practical examples of electromagnetic simulation, illustrating the practical workflow adopted in INFN (and in general in companies and research institutions) for simulation and result analysis.

Overall, the course offers a valuable training on the practical application of electromagnetic simulators to design electronic devices, antennas and communication systems.

A detailed list of the argument covered by the course is given below.

Introduction to electromagnetic simulators:

- The role of electromagnetic simulation in the design of electronic devices and communications
- Description of pre-processor, solver, and post-processor
- Main electromagnetic simulators available

The steps to perform an electromagnetic simulation:

- Defining the system geometry
- Setting boundary conditions
- Defining frequency sweep to analyse the system response in different frequency bands
- Visualization of electromagnetic results obtained with the simulation
- Use of parametric sweeps and optimization

Case studies on antennas and guiding structures:

- Evaluation of scattering parameters and line impedance for waveguides and microstrip lines
- Quarter-wave impedance adapter (microstrip line and waveguide)
- Antenna simulation and evaluation of fundamental parameters (return loss, gain, efficiency, radiation pattern, etc.) for elementary dipole, patch antenna (linear and circular polarization) and helix antenna
- Resonant cavities for filtering and particle accelerator applications