

ELECTROMAGNETIC COMPATIBILITY IN COMPLEX STRUCTURES

1. KEY INDICATORS

CFU/ECTS: 6

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2. OBJECTIVES OF THE COURSE

Successful students will be able to compute the Green's functions for planar layered structures, to formulate an electromagnetic field problem in differential/integral form, to solve telegraphists equations concerning single or multiconductor transmission lines excited by means of lumped/distributed sources, to solve discontinuities problems in interconnecting structures using quasi-static approaches.

3. ACQUIRED ABILITIES

The EMC course provides the methodologies useful to predict and reduce EMC/EMI problems in devices, circuits and electronic systems working in low- and high-frequency regime. The first part of the course is devoted to the mathematical tools necessary to perform the electromagnetic characterization of the considered structures, while the second one is aimed to the evaluation of the circuital and EMC performances of a class of planar structures and components as well as of devices and circuits employed in modern electronic apparatus and systems. A particular emphasis is devoted to the evaluation of the signal integrity, and to the computation of crosstalk, susceptibility and spurious emission.

These parameters are employed to reduce during the design stage the parasitic phenomena that influence the behavior of the devices taken into consideration during the course.

4. PROGRAM OF THE COURSE

Source Classification

- Natural Sources
 - Electrostatic Discharge
- Artificial Sources
 - Radio Sources
 - Impulsive Sources
 - Nuclear Electromagnetic Pulse (NEMP)

Analytical Techniques for the Evaluation of the Time-Harmonic EM Fields

- Electrodynamical Potentials
- Dyadic Green's Functions

EMC/EMI Characterization of Devices, Circuits and High-Frequency Electronic Systems

- Green's Functions for Planar Layered Structures
- Crosstalk, Signal Integrity
- EMC/EMI Problems in Passive Planar Microstrip Components

Techniques Useful for the Evaluation of the Electromagnetic Susceptibility of Circuits and Interconnecting Structures

- Techniques Based on the Transmission Line Equations
- Disturbances Induced by Far Sources in Electronic and/or Microwave Printed Board:

Microwave Amplifiers
Coaxial and Microstrip Interconnects

Techniques Useful for the Evaluation of the Spurious Electromagnetic Emission

- Techniques Based on the Transmission Line Equations

Techniques Useful to Reduce the EMC/EMI Problems

- Shielding

Emission and Susceptibility Measurements

- EM Field Probes

5. REFERENCES

Clayton R. Paul, "Introduction to Electromagnetic Compatibility", John Wiley & Sons, 1992.

Clayton R. Paul, "Analysis of Multiconductor Transmission Lines", John Wiley & Sons, 1994.

Audone Bruno, "Compatibilità Elettromagnetica", McGraw-Hill, 1993.

4. T.C. Edwards, "Foundations for Microstrip Circuit Design", Second Edition, John Wiley & Sons, 1992.