Electromagnetic Scattering

1. KEY INDICATORS

CFU/ECTS: 6
Professor: Fabrizio Frezza
Contact Professor: Tel. +39 0644585841, cell. +39 3204357216, fabrizio.frezza@uniroma1.it
Website Professor: http://151.100.120.244/personale/frezza/

2. OBJECTIVES OF THE COURSE

The course is aimed to provide the student with a series of conceptual instruments and mathematical techniques of great scientific generality and utility for the rigorous analysis of electromagnetic structures of remarkable applicative impact. In particular, the concept of representation will be studied, for its synthesis effectiveness.

3. ACQUIRED ABILITIES

Knowledge and understanding: successful students will be able to have an overall vision of modern electromagnetics, with particular reference to the unifying methodological aspects and to the mathematical techniques employed, which will allow them to easily find their bearings in successive study or in job positions, due to the great generality of the faced themes. In particular, the students will have understood in depth the principal concept of guided and free propagation, as well as the approach to the scattering problem, solved both in closed form (canonical problems) and numerically.

4. PROGRAM OF THE COURSE

General introduction to electromagnetic scattering and review of principal applications. Canonical problems: scattering from cylindrical and spherical structures. Recalls on Bessel and Hankel functions. Simulation of generic two- or three-dimensional scatterers through arrays of cylinders or spheres. Wire-grid modeling, Richmond method, point matching. Finite-length wire: Pocklington and Hallen integral equations, finite-length cylinder. Scattering in waveguides: mode-matching method, inductive iris in rectangular waveguide. Scattering from periodic structures: Floquet's theorem, expansions in terms of spatial harmonics, diffraction gratings. Integral representations for the electromagnetic field, integral equations for the scattering from two- and three-dimensional objects of arbitrary shape: EFIE and MFIE formulations, spurious solutions, combined equations.

5. REFERENCES

C.A. Balanis, Advanced engineering electromagnetic, 2nd ed., Wiley, 2012
R.C. Booton, Computational methods for electromagnetics and microwaves, Wiley, New York, 1992.
Materiale integrativo (lucidi/diapositive del corso, articoli) disponibili sul sito web http://151.100.120.244/personale/frezza.

6. COURSE WEBSITE

http://151.100.120.244/personale/frezza , http://labcem2.diet.uniroma1.it