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Central and Southern Italy Chapter  
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### **(1) Metamaterials and composites: electromagnetic description and unexpected effects**

**Date: May 12, 2015, at 15:00**

**Venue: Sala degli Affreschi, Faculty of Engineering  
“La Sapienza” University of Rome  
Via Eudossiana 18, Rome, Italy**

**Abstract:** In the analysis of electromagnetic fields interacting with material structures, the response of medium is condensed in dielectric and magnetic material parameters, like permittivity, conductivity, and permeability. In complicated and anisotropic media, these material parameters may need to be generalized from scalar quantities into matrices, or equivalently dyadics. The complicated response of materials is very often of structural origin, in other words the manner in which a heterogeneous mixture is formed determines its macroscopic electromagnetic material parameters. This lecture deals with the variety of ways how one is able to characterize and effectively describe the macroscopic dielectric and magnetic behavior of composite materials with given properties of the constituents and the geometrical microstructure. Homogenization principles will be applied to analyze and understand mixtures that display very interesting properties that differ strongly from these of the constituent materials. This is the domain of metamaterials, and the talk will shed light into this new paradigm in electromagnetics.