

RADIOPROPAGATION AND RADAR METEOROLOGY

1. KEY INDICATORS

CFU/ECTS: 6

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2. OBJECTIVES OF THE COURSE

The course is finalized to the illustration of advanced concepts of the theory of electromagnetic (e.m.) propagation in free media (such as the earth atmosphere) with emphasis on the principal applications of the information engineering. The theory of e.m. radiation is applied to the diffraction and diffusion problems, geometrical optics, tropospheric and ionospheric propagation, surface propagation propagation in complex environment and free space optics. The topics are treated both from a modeling and system point of view with a particular attention to the telecommunication, remote sensing and radionavigation systems.

3. ACQUIRED ABILITIES

Successful students will be able to: to know the theory of electromagnetic radiation using valuable formulas and approximations for near and far fields; to analyze the statistical e.m. fields and quasi-optics methods; to analyze and design radiometeorological systems which use the electromagnetic-channel for various applications.

4. PROGRAM OF THE COURSE

Introduction. Electromagnetics principles. Electromagnetic radiation. Antennas. Noise and radiative transfer theory. Perturbation methods. Geometrical optics. Diffraction and diffusion e.m. theory. Tropospheric propagation in clear air. Tropospheric propagation in presence of hydrometeors. Ionospheric propagation. Effects of the ground. Propagation in urban environment. Free space optics. Radiometeorological systems. Applications to telecommunication, remote sensing and radionavigation systems. Guided visits. Short thesis on Earth-space microwave link design using ITU-R CAD.

5. REFERENCES

F.S. Marzano e L. Pulvirenti, Dispense di Radiopropagazione, Disponibili su sito di rete, 2012.

F.S. Marzano e N. Pierdicca, Fondamenti di antenne, Carocci editore, Roma (I), 2011.

Collin R. E., Antennas and radiowave propagation, McGraw-Hill ISE, New York (NY, USA), 1985.

Paraboni A. e M. D'Amico, Radiopropagazione, McGraw-Hill Libri Italia, Milano (I), 2002.

Ghassemlooy Z., W. Popoola, e S. Rajbhandari, Optical Wireless Communications, CRC Press (UK), 2012.

Bringi V. N. e V. Chandrasekar, Polarimetric Doppler Weather Radar, Cambridge University Press, 2001

Sauvageot, H., Radar meteorology, Artech House, Boston (MA), 1992

Kidder and Von der Haar, Satellite meteorology, Academic Press, 1996

Stull R.B., Meteorology for scientists and engineers, 2nd ed., Brooks-Cole, 2000

6. COURSE WEBSITE

<http://151.100.120.244/personale/marzano/PropagazioneEM.htm>
<http://151.100.120.244/personale/marzano/AntenneIRadMet.htm>