Antennas A

Finalità
The course will introduce the student to the basic technical knowledge of the electromagnetic radiation phenomena, will illustrate common type of antennas, their applications and design issues related to their use.

Programma
Introduction to the electromagnetic field propagation. Field sources. Field polarizations and exercises. Sommerfeld radiation conditions, impedance law and electromagnetic Ohm law.
Wave equation solution; plane and spherical waves. Examples and exercises on plane waves. Standing wave and interference, forward and backward propagating wave. Reflection, refraction and Snell law. Fresnel coefficients, TEM, TE and TM waves. Normal incidence. Applications.
Parabolic antennas, rectangular and circular horn antennas and generated far field. Examples.
Geometric optics and ray tracing techniques applied to parabolic reflectors and radio communication.
Antenna radiation characteristics; directivity, gain, efficiency, radiation intensity, radiation patterns, effective area and length. Near field, far field, Fresnel and Fraunhofer zones.
Short dipole and irradiated field. Half-wave and full-wave dipole. Magnetic dipole, loop antennas.
Reflections and multiple path.
Antenna array and radiation pattern design. Yagi-Uda and log-periodic antennas; exercises and applications. Printed and dielectric antennas.
Friss transmission formula and radar equation. Attenuation phenomena. Exercises on a radio link power budget.

Modalità d'esame
Written test

Propedeuticità
Elettrotecnica AB, Propagazione Guidata.

Testi consigliati
F.T. Ulaby “Applied Electromagnetics”, Prentice Hall, 1999.
J.D. Kraus, D.A. Fleisch “Electromagnetics with Applications”, McGraw Hill, 1999.
C.A. Balanis “Antenna Theory, Analysis and Design”, Wiley, 1997.