UNIVERSITÀ DEGLI STUDI DELL'AQUILA
CORSI DI INGEGNERIA

A.A. 2018/2019
Environmental Impact of EM Fields (Impatto ambientale dei campi elettromagnetici) (I4T)
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Contenuti del corso (abstract del programma):
Introduction- National and international laws, and technical standards - Sources at low frequency - Sources at high frequency - Field measurements - Tecniche di mitigazione - Bonifiche ambientali - Effetti biologici.

Programma esteso:
Program 1. Introduction (2h class time) 2. State of the art on biological effects of EMFs (2h) 3. National and international laws, rules, standards and regulations (4h) [1]-[17] 4. Low frequency (LF) electric and magnetic fields (18h) a. Technical standards b. Theory of electro- and magneto-static and quasi-static fields c. Analytical and numerical calculations of LF electric and magnetic fields d. Measurements of LF electric and magnetic fields ? LF instrumentation ? Measurement setup e. Mitigation techniques of LF electric and magnetic fields ? Conductive shielding ? Magnetic shielding ? Compensation loops ? Active coils ? Rearrangement of wires f. Characterization of LF sources ? Power systems - Overhead power lines - Cables - Substations and cabins ? Railway systems ? Electric vehicles ? Industrial and residential environments ? Wireless Power Transfer (WPT) 5. High frequency (HF) fields (18h) a. Technical standards b. Theory of electromagnetic fields c. Analytical and numerical calculations of electro-magnetic fields in frequency and time domains d. Measurements of electromagnetic fields ? Narrowband and wideband instrumentation ? Measurement setup e. Mitigation techniques of electromagnetic fields f. Characterization of HF sources ? Broadcasting systems ? Mobile communications - Radiobase stations - Mobile terminals ? Internet of things (IoT) / Machine-to-machine (M2M) ? RFID, UWB, WSN ? Radars ? Industrial and residential environments 6. Biological effects of of electromagnetic fields (4h) a. Mechanisms of biological interactions ? Dispersive models of human tissues ? LF interactions ? HF interactions 7. Numerical dosimetry (6h) a. Human body models ? Anatomical models ? CAD models b. Numerical dosimetry at low frequency ? Internal electric field and current density calculations c. Numerical dosimetry at high frequency ? SAR/SA calculation ? Thermal effects The Course program includes computer exercises, laboratory activities and homeworks.

Modalità d'esame:
Oral exam and discussion on homewok

Risultati d'apprendimento previsti:

Calculation and measurement of magnetic field generated by power lines. Calculation and measurement of RF fields. Knowledge of mitigation techniques of LF and HF fields. SAR calculation in human body models.

Testi di riferimento:

Notes and slides