UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Electromagnetic Radiations

2425-1-F1701Q138

Aims

Provide basic knowledge of the physics of non-ionizing electromagnetic radiation and skills in the field of protection against it, intercepting the most relevant topics to work in the field of environmental, health and workplace protection, both in the field of public control and in support of operators.

Contents

Physics of radio frequency electromagnetic radiation, interaction with matter, environmental sources of radio frequency electromagnetic radiation, broadcasting and telecommunication technologies, basic modalities for assessing personal exposures, interaction of radio frequency electromagnetic radiation with the human body and physiological response, legislation and its origin.

Detailed program

History of generators and applications of RF non-ionizing radiation; Review of electrostatics and electrodynamics; Maxwell's equations in vacuum and propagation of the EM field; periodic and harmonic quantities - RMS values; formulation of the dissipated power; EM field energy; S vector power density and wave impedance of the vacuum; antennas - applications and propagation diagrams; near-field and far-field; calculation of exposure of targets; radioelectric signals: analogue and digital encodings; personal telecommunication techniques: 1, 2, 3, 4, 5 generations; interaction with dielectrics of time-varying fields: complex dielectric constant; relaxation of polarization and energy absorption; conductivity; specific absorbtion rate (SAR) and relationship with the power density vector; SAR in the human body; physiological response to the increase in tissue temperature due to interaction with EM fields; systemic and localized deterministic damage; limitation system: guidelines, international and national legislation; epidemiology and hypothesis of stochastic damage.

Prerequisites

Knowledge of electromagnetism; general knowledge acquired during the three years of a technical-scientific bachelor's degree.

Teaching form

21 two-hour lectures delivered in face-to-face delivery mode ("modalità erogativa"), possibly including seminars with the participation of experts from the public and private sectors.

Textbook and teaching resource

Documentation in slide format provided by the lecturers.
Classical electromagnetism textbooks (for example: J.D.Jackson, Classical Electrodynamics).
Radiofrequency Radiation Dosimetry Handbook.
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans - Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields.
D. Andreuccetti, Protezione dai campi elettromagnetici non ionizzanti, IROE – CNR, 2001.

Semester

Second semester

Assessment method

Oral examination, possibly supported by the voluntary presentation of a short in-depth text on topics similar to those of the course; possession of the knowledge provided and related skills are assessed, through the discussion of theoretical and practical aspects of the physics of non-ionising radiofrequency radiation and protection against it.
There will be no partial tests during the course.
The examination will be held in Italian, or in English on request for Erasmus students.

Office hours

By appointment, to be defined by email with the course lecturers (emilio.martines@unimib.it, giuseppe.sgorbati@unimib.it).

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | INDUSTRY, INNOVATION AND INFRASTRUCTURE