UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

ELECTROMAGNETIC FIELDS

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-INF/02 (ELECTROMAGNETIC FIELDS)
Department	DEPARTMENT OF PUBLIC HEALTH, NEUROSCIENCE, EXPERIMENTAL AND FORENSIC MEDICINE
Course	ENVIRONMENT AND WORKPLACE PREVENTION TECHNIQUES
Curriculum	PERCORSO COMUNE
Year of study	2°
Period	(01/10/2021 - 14/01/2022)
ECTS	2
Lesson hours	16 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	PERREGRINI LUCA (titolare) - 2 ECTS
Prerequisites	Basic knowledge of mathematics and physics
Learning outcomes	This module aims to introduce the students of the course to the techniques of assessment and measurement of the potential risk associated with non-ionizing electromagnetic radiation, from very low frequencies to optical frequencies. Students will acquire the typical language of this discipline, which will allow them to interface with the experts, necessarily involved in the assessment and reduction of the possible electromagnetic risk. At the end of the lessons the students will have seen an exhaustive overview of the fields of application of electromagnetic waves, and will have to be able to make a rough assessment of the potential risk. The quantitative aspects linked to the timely verification of the emission limits of the devices go beyond the scope of this course, since they require a technical knowledge that can only be acquired in specialized courses.

Course contents	1) Elements of mathematics and physics: derivative, integral, vector, scalar and vector product, unit of measure, force, work, energy, power. 2) Elements of electromagnetism: electric charge, electric current, voltage, electric field, magnetic field, Lorentz force, Maxwell's equation, electric and magnetic properties of matter, electromagnetic waves, electromagnetic spectrum. 3) Elementary concepts on propagation, radiation, antennas: guided and radiated propagation of electromagnetic energy, hints on antennas (types, gain, radiation pattern). 4) Applications of electromagnetic fields: radio and television broadcasting, mobile phones, terrestrial and satellite radio links, radar, radionavigation, global positioning system (GPS), remote sensing, scientific applications, industrial applications, medicine (diagnosis and therapy). 5) Risk and legislation: biological effects of low frequency and microwave electromagnetic fields, risk associated with interaction with electromagnetic fields, current legislation. 6) Measurement of electromagnetic fields and dosimetry: measurements of exposure to electromagnetic fields, notes on measuring instruments, measurement uncertainty and repeatability, specific absorption rate (SAR), SAR measurement techniques, predictive techniques of electromagnetic simulation. 7) Risk reduction techniques: case study of high voltage ELF lines. 8) Laser: operating principle, applications, risk and legislation.
Teaching methods	Frontal lessons with multimedia aids. The teacher encourages the students to interact during the lesson and to discuss the proposed topics.
Reccomended or required readings	Slides and notes provided by the teacher
Assessment methods	Oral examination
Further information	
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile