Basic/Essential Course Information	
Course title	HEALTH PHYSICS
Degree Course title	Physics (Master Degree)
ECTS	6
Compulsory attendance	Yes
Course teaching language	ENGLISH

Teacher	Tommaso Maggipinto	tommaso.maggipinto@uniba.it

ECTS Details	Disciplinary broad area	SSD	ECTS
	Applied Physics	FIS/07	6

Time management and teaching activity type	Period	Year	Lesson type
	1st semester	2nd	Lessons (40 h) Exercises (15 h)

Time management	Total hours	in-class hours	out-of-class study hours
	140	55	85

Course calendar	Starting date	Ending date

Syllabus	
Prerequisites	Electromagnetism, atomic and nuclear structure, basic knowledge of particle physics, basic knowledge of particle detectors and counting statistic
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** • *The aim of the course is that the participants acquire knowledge and understand the problems connected with Health Physics and Radiation Protection* • *For this purpose, the conceptual bases of Health Physics are provided, explaining and deciphering the characterizing concepts of this discipline in the specific operational aspects of the subject itself.* **Applying knowledge and understanding:** • *ability to estimate the dose and the risk associated with the use of ionizing radiation with regard to their industrial, research and medical applications* **Making judgements:** • *Ability to identify the main risk sources associated with ionizing radiation and to design proper solutions for mitigating the risk* **Transferable Communication skills:** • *communication skills in English;* • *computer skills related to data processing and analysis as well as presentation of data sample;*

	• *presentation skills* • *skills in the exposition of experimental results using appropriate scientific language;* • *ability to work in a group, and to be inserted quickly and effectively in a workplace* **Lifelong learning skills:** • *ability to learn and to transfer new knowledges.* • Problem solving skills • Ability to apply radiation protection paradigm in real life constrained systems
Course contents summary	Ionizing radiation: interaction with matter, detection, dose evaluation. Radiation Protection.
detailed syllabus	Radioactivity: alpha beta and gamma decay. Radioactive series. Secular Equilibrium. Ionizing radiation: Interactions of high-energy photons with matter: photoelectric effect, Rayleigh scattering, Compton scattering, pair production, photonuclear interactions. Interactions of charged particles with matter. Bethe-Bloch formula. Bragg peak and particle range. Interactions of neutrons with matter. LET (Linear Energy Transfer). Dosimetry of ionizing radiation**:** main dosimetric quantities: exposure, absorbed dose, equivalent dose and effective dose. Basics of biological effects of ionizing radiation: deterministic and stochastic effects. Weight factors for different types of ionizing radiation and for the different tissues of the human body. Radiation detection: Ionization chambers, counters, free-air chamber, air-wall chamber. Bragg-Gray principle. Dose measurement. TLD dosimeters. Counting statistic. Minimum Detectable Activity. Alpha and gamma spectra analysis Operational radiation protection: external and internal exposure. Principle of radiation protection. Shielding design. Basic concepts of Italian radiation regulatory system. Introduction to X-ray imaging techniques: X-ray tubes. Basics of Computed Tomography and its applications in the medical, industrial and Cultural Heritage fields. Numerical dosimetry: simulations of radiation interactions with matter through Monte Carlo methods; numerical simulation application in radiation dosimetry and radiation protection. Nuclear Magnetic Resonance: Bloch equations and principles of image reconstruction.
books	H. Cember "Health Physics", Mc Graw Hill E.B. Podgorsak "Radiation Physics for medical Physicist", Springer J.E. Turner 'Atoms, Radiation and radiation Protection', Wiley
notes	Lecture Notes provided by the teacher
Teaching methods	Lectures with slides. Exercises.

Assessment % of final mark	Oral exam
Evaluation criteria	the student • **knows** the physics of ionizing radiation and the basics on NMR • **knows and knows how to derive** the dose due to exposure to ionizing radiation; • **knows and knows how to derive** the most important relations that describe the interaction of ionizing radiation with matter; • **knows how to evaluate and measure** the most important parameters to be used in barrier design; • **knows how to cope with** external and internal exposure; • **knows how to write** a technical radiation protection report; • **knows how to present** the results of on field measurement in written and oral forms;
other	