UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO INTERUNIVERSITARIO DI FISICA

General information		
Academic subject	Health Physics	
Degree course	Physics	
Academic Year	Second year	
European Credit Transfer and Accumulation System (ECTS)	6	
Language	English	
Academic calendar (starting and ending date)	I semester (Sep- Dec)	
Attendance	Recommended	

Professor/ Lecturer	
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Telephone	0805442369 / 3284154618
Department and address	Dipartimento Interateneo di Fisica
Virtual headquarters (Microsoft Teams code)	**b095zmk**
Tutoring (time and day)	Tuesday 15.30 – 17.30 (on request)

Syllabus	
Learning Objectives	Fundamentals of health physics and safe use of ionizing radiation
Course prerequisites	Electromagnetism, atomic and nuclear structure, basic knowledge of particle physics, basic knowledge of particle detectors and counting statistic
Contents	**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. **Nuclear Magnetic Resonance**: Bloch equations and principles of image reconstruction.
Books and bibliography	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
Additional materials	Lecture Notes provided by the teacher

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	32	30	88
ECTS			
	4	2	

Teaching strategy	
	Lectures in the teaching room with the aid of a laptop and a projector Case-based learning

Expected learning outcomes	
Knowledge and understanding on:	• *dose evaluation* • *radiation protection* • *real system modeling ionizing radiation risks*
Applying knowledge and understanding on:	• *ability to estimate the dose and the risk associated with the use of ionizing radiation with regard to their industrial, research and medical applications*

Soft skills	• **Making informed judgments and choices**
	  ○ Apply the notions learned in multi-disciplinary contexts
	  ○ Apply health physics concepts to real systems
	• **Communicating knowledge and understanding**
	  ○ Use of rigorous and precise language,
	  ○ Use of logical arguments
	• **Capacities to continue learning**
	  ○ Problem-solving strategies
	  ○ Modelling real systems

Assessment and feedback	
Methods of assessment	Oral exam

Evaluation criteria	• **Knowledge and understanding**
	Consistency of answers according to formulated questions
	• **Applying knowledge and understanding**
	  ○ Setting up and carrying out numerical examples
	• **Autonomy of judgment**
	  ○ Consistency with the subject of the program
	• **Communicating knowledge and understanding**
	  ○ Clarity and precision of presentation
	• **Communication skills**
	  ○ Ability to identify interconnection between the subjects of study
	• **Capacities to continue learning**
	  ○ Cross-discipline applications

Criteria for assessment and attribution of the final mark	Adequate comprehension and global knowledge of concepts and arguments at the basis of health physics described throughout the course.
Additional information	