COURSE OF STUDY: *Physics (LM-17)*

ACADEMIC YEAR: *2024-2025*

ACADEMIC SUBJECT: *Health Technologies*

General information	
Year of the course	2nd
Academic calendar (starting and ending date)	1st semester: September - December 2024
Credits (CFU/ECTS):	3
SSD	FIS/07
Language	ENGLISH
Mode of attendance	Compulsory

Professor/ Lecturer	
Name and Surname	Sabina Tangaro
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Department and address	c/o Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti di UNIBA, room 73
Virtual room	Microsoft Teams code: g9qmelu
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Students are invited to send an e-mail to arrange individual or group meetings.

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
CFU/ECTS			
3	2	1	

Learning Objectives	The course aims to provide knowledge on the laws of physics underlying the instruments for the acquisition of medical images and on advanced medical data analysis models in order to acquire skills useful for understanding medical imaging systems.
Course prerequisites	Knowledge of basic mathematics and statistics. Basic knowledge of computer programming.

Teaching strategies	Lectures (with slides). Laboratory exercises in small groups.
Expected learning outcomes in terms of	
Knowledge and understanding:	o Ability to develop software applications for data acquisition from electronic devices / sensors interfaced with computers. o Ability to use frameworks for the representation and analysis of collected data.
Applying knowledge and understanding:	o Ability to apply most commonly used I/O techniques for computer-based data acquisition. o Ability to develop simple high-level software applications for data-acquisition using computer-controlled electronic devices.

Soft skills	• *Autonomy of judgement; At the end of the course the student must be able to:* o *Apply the concepts learned to multi-disciplinary contexts* Teamwork skills. o *Apply healthcare physics concepts to real imaging systems*Ability to work in a laboratory. • *Communicating knowledge and understanding* o Ability to use adequate technical language. o Teamwork skills. • *Capacities to continue learning* o Ability to consult bibliographic/technical material in Italian or English o Adopt problem solving strategies o Analyze acquired data and model real systems
Syllabus	
Content knowledge	• Radioactive decays and interaction of radiation with matter • Production of X-rays: traditional X-ray tubes; emission spectrum; filtering. • Quality and quantity of radiation: radioprotection quantities, half-value layer, detectors for quantitative measurements. • Imaging with ionizing radiation for medical diagnostics: radiography, fluoroscopy, computed tomography • Imaging with non-ionizing radiation: structural and functional magnetic resonance imaging, electroencephalography • Preprocessing and processing of medical images: quantities for image quality assessment, image analysis methods including explainable artificial intelligence. Laboratory: practical exercises in the acquisition and processing of electroencephalographic signals
Texts and readings	Medical Imaging Physics, William R. Hendee, E. Russel Ritenour, Wiley-Liss
Notes, additional materials	Lecture slides. Additional material on specific topics provided during the course.
Repository	Teaching material uploaded to the Microsoft TEAMS platform

Assessment	
Assessment methods	The exam consists of an oral test which includes an interview regarding the main topics of the program.
Assessment criteria	• Knowledge and understanding: the level of knowledge and understanding of the physical laws and phenomena taught is assessed. • Applied knowledge and understanding: the ability to apply the physical laws learned to interpret phenomena and solve problems within the course program is assessed. • Autonomy of judgment: autonomy in analyzing the phenomena and physical laws presented during the course. • Communication skills: the mastery of the use of the Physics language and the overall quality of the presentation are assessed. • Ability to learn: the ability to organize knowledge, critical reasoning and any independent study is assessed.

Final exam and grading criteria	The oral test consists of an exam in which the understanding, knowledge and ability to discuss the topics of the course program are assessed. Particularly significant are the mastery of the topics and the ability to reason independently. The final grade is awarded out of thirty and the exam is considered passed if the final grade is at least 18/30. In the case of a particularly brilliant oral exam for clarity and completeness, praise may be awarded.
Further information	Attendance of lessons and exercises is strongly recommended
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