Course Syllabus for
Smart and Sustainable Industry PhD Program
(years 2024-25/2025-26)

Course title	**Nuclear Techniques and Innovative Sensors for Medical Applications**
Scientific Discipline Sector	FIS/01 – FIS/07
Hours of instruction	20 hours
CFU	2 CFU
Semester	Second
Goal	The course introduces basic concepts of nuclear physics applied in medicine, reaching advanced radiotherapies and modern tools of particle simulation studies. The additional goal is to provide a deep understanding of sensor technologies and contribute to the field by developing and implementing innovative dosimetry sensors. Graduates should be capable of conducting cutting-edge research, advancing the field, and addressing challenges in areas such as medical, environmental, and industrial applications of radiation. The program aims to foster critical thinking, research skills, and a strong sense of ethical responsibility in the domain of dosimetry.
Syllabus	• Introduction to the interaction of radiation with matter and dosimetry • Radio isotopes in medical diagnosis • Gamma Camara, Computational tomography basics • PET/SPECT imaging techniques • Innovative radiation therapy with hadrons: HT and BNCT • Monte Carlo on medical physics, Tool for Particle Simulation (TOPAS) • Introduction to Dosimetry • Sensor Technologies • Radiation Detection Techniques • Use of innovative sensors in medical radiation therapy
Bibliography	- Physics in Nuclear Medicine, 4th Edition 2012, Simon R. Cherry, James A. Sorenson, Michael E. Phelps. - Radiation Detection and Measurements, 4th Edition 2010, Glenn F. Knoll. - TOPAS User Guide (http://topas.readthedocs.org/) - Ciofani, G., Genchi, G. G., Liakos, I., & Athanassiou, A. (2018). "Innovative materials for sensors in radiation dosimetry." Journal of Materials Chemistry C, 6(16), 4374-4396. - Attix, F. H. (1986). "Introduction to Radiological Physics and Radiation Dosimetry." John Wiley & Sons.
Examination method	Oral exam by seminary (PP presentation)