Summary
An introductory course in the basic concepts of radiation detection and interactions and energy deposition by ionizing radiation in matter, radioisotope production and its applications in medicine, industry and research. The course includes presentations, lecture notes, problem sets and seminars.

Content
• Basics: radiation sources and interaction with matter, radioisotope production using reactors and accelerators, radiation protection and shielding.
• Medical applications: diagnostic tools, radiopharmaceuticals, cancer treatment methodologies such as brachytherapy, neutron capture therapy and proton therapy.
• Industrial applications: radiation gauges, radiochemistry, tracer techniques, radioisotope batteries, sterilization, etc.
• Applications in research: dating by nuclear methods, applications in environmental and life sciences, etc.

Learning Outcomes
By the end of the course, the student must be able to:
• Explain the basic physics principles that underpin radiotherapy, e.g. types of radiation, atomic structure, etc.
• Explain the interaction mechanisms of ionizing radiation at keV and MeV energies with matter.
• Explain the principles of radiation dosimetry.
• Explain the principles of therapeutic radiation physics including X-rays, electron beam physics, radioactive sources, use of unsealed sources and Brachytherapy.
• Describe how to use radiotherapy equipment both for tumour localisation, planning and treatment.
• Define quality assurance and quality control, in the context of radiotherapy and the legal requirements.
• Explain the principles and practice of radiation protection, dose limits, screening and protection mechanisms.
• Explain the use of radiation in industrial and research applications.

Assessment methods
written exam

Resources
Bibliography
Handouts will be distributed

Ressources en bibliothèque
• Physics for Radiation Protection / Martin
• The Physics of Radiation Therapy / Khan
• Practical Applications of Radioactivity and Nuclear Reactions / Lowenthal
• Nuclear and Radiochemistry / Lieser