UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applications of Materials for Ionizing Radiation Detection

2324-1-FSM01Q011

Aims

The detection of ionizing radiation such as X-ray, ?-ray, ?-particle, and neutrons has been widely required in many industrial areas, such medical, environmental, aerospace….
Starting from an overview about the interaction of ionizing radiation with matter, pointing out the dependence on energy and type of target material, the aim is to highlight the requirement of material properties for high performance ionizing radiation detection.
The course provides knowledge about the energy transfer from ionizing radiation, both charged and uncharged particles (photons and neutrons), to matter and it introduces some applications based on the mechanisms between ionizing radiation and materials.

Contents

Fundamental nuclear physics. Radioactivity. Sources of ionizing radiation. Energy transfer from radiation to materials. Dosimetry. Application of experimental techniques based on the interaction radiation-matter.

Detailed program

Important topics are:

- Interaction cross sections (classical);
- mechanisms for interaction of photons, neutrons and charged particles;
- fundamental on dosimetry, defects induced by radiation;
- Experimental techniques for the study of the effects of the interaction radiation-matter on the physical properties of the materials with particular focus on semiconductors and scintillators, representing the two

primary classes of radiation detector materials that are of interest;
- Ionizing radiation detectors, scintillators properties and key characteristics, dosimeters.

Students during the course will attend research laboratories where they will be able to carry out experimental activities concerning the luminescence techniques applied in the dosimetry field and the X-ray Fluorescence technique applied in the material charactherisation.

Prerequisites

Basic knowledge of physics of matter

Teaching form

Classroom lectures and experimental activities. Visits to research laboratories.

Textbook and teaching resource

Slides and "ad hoc" textbook provided by the professor

Semester

Second semester (March-June)

Assessment method

• A discussion about the topics treated during the lessons ;
• a discussion on the experimental activity carried out in the laboratory, also on the basis of the written report.
• Students are requested to send the report to the professor by e-mail in word or pdf format at least one week before the exam.

Office hours

8 - 18
Appointments between professor and students can be agreed by e-mail.

Sustainable Development Goals

QUALITY EDUCATION | AFFORDABLE AND CLEAN ENERGY | INDUSTRY, INNOVATION AND INFRASTRUCTURE