

PHYC 560 Introductory Nuclear Techniques

Course Description

Emphasizes experimental studies of radioactive disintegrations and decay products and their relation to nuclear structure. Instrumentation in radioisotope measurements. Two lectures and two two-hour laboratory periods a week. (3 credit hours)

Prerequisite: PHYC 260.

This course is taught as a dual undergraduate/graduate course. Students will be required to complete activities appropriate for the level of the course in which they are enrolled. Student performance on labs and exams will be evaluated using different standards for undergraduate and graduate students.

Course Objectives

The course provides an opportunity for the students to prepare themselves for experimental studies in the field nuclear physics, particle physics, nuclear astrophysics, radiations physics, health physics, etc.

Course Rationale

The course provides an opportunity for the students to understand operation and use of different kinds of detectors for nuclear radiations and their applications. Students gain experience and skill in nuclear techniques which will be immensely helpful for those who want to pursue higher studies in nuclear physics or related field.

Course Content, Format, and Bibliography

Content

Radioactive Decay

- Production and Decay of Radioactivity

- Growth of Daughter Activities

- Natural Radioactivity

- Radioactive Dating

Detection and Measurements of Radiation

- Interaction of Radiation with Matter

- Counters and Detectors of Nuclear Radiations

- Energy Measurements and Counting Statistics

Coincidence Measurements and Time Resolutions

A Sample of List of Experiments

Geiger Counting and Statistical Analysis

Gamma-Ray Spectroscopy Using NaI(Tl) Detectors

Alpha Spectroscopy Using Surface Barrier Detectors

Energy Loss of Charged particles (Alphas)

Beta Spectroscopy

High Resolution Gamma-Ray Spectroscopy (HPGe detector)

Gamma-Gamma Coincidence

Time Coincidence Techniques and Absolute Activity Measurements

Decay Scheme and Angular Correlation of ^{60}Co

Nuclear Lifetimes and Coincidence Methods

Compton Scattering

Experiments are not limited to the list above. Additional experiments may be added, if necessary.

Format

Laboratory reports and examinations

Students may be assigned one or more of the following, at the instructor's discretion:

Individual experimental project

Extra or different examination requirements

Oral examination

Class lecture on assigned topic

Assigned readings/report on the literature

This course is taught as a dual undergraduate/graduate course. Students will be required to complete activities appropriate for the level of the course in which they are enrolled. Student performance on homework, exams and/or labs will be evaluated using different standards for undergraduate and graduate students.

Bibliography

Radiation Detection and Measurement by Glenn F. Knoll ISBN 978- 0-471-07338-3

AN34 Laboratory Manual (EG&ORTEC) are normally used as references

Introductory Nuclear Physics by Kenneth S. Krane

Introduction to Nuclear Physics by Harald A. Enge