

10706-753 (8) Radiation Protection (1½ ℓ, 1½ p)

2016

Course summary:

Radiological protection, the shielding of neutrons and gamma rays.

Outcomes of course:

To present a sound conceptual foundation in the theory and practice of:

- RADIOLOGICAL PROTECTION
- THE SHIELDING OF IONISING RADIATION

Lecturers:

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Mentor:

The Department of Physics has appointed a staff member as mentor for each year of its physics programme to be available to students for consultation. Students should feel free to discuss general issues related to the physics programme or specific modules in the programme with the relevant mentor, in addition to usual consultations with their individual lecturers of modules.

The mentor for the Honours programme and its modules is Prof HC Eggers eggers@physics.sun.ac.za

Course content:

The contents of the course may, if possible, partially be adapted to the background and/or particular needs of the students. This course is presented by persons actively working in the field of radiological protection.

RADIOLOGICAL PROTECTION

The following subjects are treated, using the 2005 recommendations of the ICRP as basis:

- Physical quantities used in radiological protection: The absorbed dose, equivalent dose, effective dose, and the committed effective dose.
- Radiation and tissue weighting factors.
- Biological aspects of radiological protection.
- Deterministic and stochastic effects of ionising radiation.
- Additive and multiplicative risk projection models.
- Aggregated detriment.
- The conceptual framework of radiological protection.
- Practices and intervention.
- The system of protection in practices.
- Generic scientific principles of radiological protection.
- The control of occupational exposure.
- The control of public exposure.
- Biological dosimetry
- Radiotherapy

THE SHIELDING OF NEUTRONS AND GAMMA-RAYS

1. Fundamental principles of neutron and gamma-ray shielding:
The shielding of neutrons: neutron moderation, neutron reaction dynamics, neutron scattering kinematics, angular distribution of scattered neutrons, average energies and emission angles of scattered neutrons.
2. The shielding of photons:
Bremsstrahlung, photo-electric absorption, Compton scattering and pair production.
3. Complementary shielding materials.
4. Fundamental principles of shield optimisation.

Practical (Tutorials):

Radio Biology Practical: Cytogenetic assessment of damage induced by high and low LET radiations

Study material:

There is no single prescribed handbook.

Learning opportunities:

Radiation instrumentation and applications: iThemba LABS site tour

Assessment:

Methods of Assessments

The students are evaluated continuously by means a number of written tests and assignments at regular intervals during the semester. An examination paper completes the evaluation.

Venue and time of assessment opportunities

Set in consultation with the students.

Availability of marks:

Within a reasonable time

Calculation of class mark:

As determined by the HPCSA.

Calculation of final mark for the module:

As determined by the HPCSA.

Admission to examination:

As determined by the HPCSA.