10466-752 (8) Physics of Radiotherapy (1½ ℓ, 1½ p)

2018

Course summary:

Dosimetry of teletherapy, filters, treatment planning, geometry of the beam, teletherapy units, quality assurance, electron therapy, brachytherapy, unsealed sources and beta irradiators.

Module relevance in programme:

This is a compulsory module for Physics students enrolled in the Honours programme in Radiation and Health Physics. On successful completion of this programme students are eligible for entry into a two-year internship in Medical Physics at an academic hospital in South Africa. Successful completion of the internship students is a prerequisite to becoming registered Medical Physicist with the Health Professions Council of South Africa (HPCSA).

The topics covered in this module relate to how radionuclides and accelerators can be used to treat cancers by means administering dose (energy) to relevant locations in the body.

The knowledge gained by students in this module will be directly applicable to much of their future day-to-day activities as a Medical Physicist working in a hospital or specialist consulting rooms where radiation therapy is administered.

Outcomes of course:

The objective of the course is to introduce the student to the basic principles of dose measurements and dose calculations for teletherapy and brachytherapy. The student should further obtain knowledge on beam shaping, shielding and treatment planning of the radiotherapy patient.

Lecturer:

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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 KK Müller-Nedebock kkmn@physics.sun.ac.za.

Course content:

1. **Dosimetry of Teletherapy**
   Phantom materials; Dose parameters: backscattering factor, percentage depth dose, tissue-air-ratio, tissue-phantom-ratio, isodose curves; Dose measuring.
2. **Filters**
   Beam hardening; Shielding; Beam flatness; Compensation; Wedges.
3. **Treatment planning**
   Localisation; Multiple beams; Correction techniques.
4. **Geometry of the Beam**
   Beam shaping; Penumbra.
5. **Teletherapy units**
   Therapeutic x-ray units; Cobalt unit; Medical linear accelerator; Patient set-up.
6. **Quality assurance**
   Acceptance of equipment; Calibration of a teletherapy unit; Quality control programme.
7. **Electron therapy**
   Energy of electron beams; Characteristics of electron beams; Dose distributions; Dose measurement.
8. **Brachytherapy**
   Techniques; Dosimetry; Radiographic techniques; Paris system; Radiation protection.
9. **Unsealed sources and Beta irradiators**
   Radionuclides; Dosimetry; Radiation protection; Surface therapy.

Practical (Tutorials):

Study material:

Study notes. The following text books are not prescribed, but will be used complementary to the study notes.

1. Faiz M Khan, ***The Physics of Radiation Therapy***, Second Edition, Williams and Wilkens, 1994.
2. ***Radiotherapy Physics in practice***, JR Williams and DI Thwaites, Oxford Medical Publications, 1994.
3. HE Johns, JR Cunningham, ***The Physics of Radiology***, Fourth Edition, Charles C Thomas Publisher, 1984.

Learning opportunities:

Assessment:

Methods of Assessments
The students will write a test during the course. At the end of the module a written examination (3 hours paper) will be taken down on the full contents of the specific module.

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 HPCSA requirements

Calculation of final mark for the module:
As determined by HPCSA requirements

Admission to examination:
As determined by HPCSA requirements

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