# PHY6524: ADVANCED RADIOTHERAPY PHYSICS

**Effective Term**
Semester B 2024/25

## Part I Course Overview

**Course Title**
Advanced Radiotherapy Physics

**Subject Code**
PHY - Physics
**Course Number**
6524

**Academic Unit**
Physics (PHY)

**College/School**
College of Science (SI)

**Course Duration**
One Semester

**Credit Units**
3

**Level**
P5, P6 - Postgraduate Degree

**Medium of Instruction**
English

**Medium of Assessment**
English

**Prerequisites**
NA

**Precursors**
NA

**Equivalent Courses**
NA

**Exclusive Courses**
PHY8524 Advanced Radiotherapy Physics

## Part II Course Details

**Abstract**

This course will advance understanding of radiotherapy related physics and modern radiotherapy methods. The latter includes external beam radiotherapy with x-ray and proton sources, and also brachytherapy.

**Course Intended Learning Outcomes (CILOs)**

| | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | Physics principles related to radiotherapy. Emphasis will be on production of ionizing radiation and subsequent interactions with matter. | 50 | | x | |
| 2 | Physics of external beam radiotherapy. | 40 | | x | |
| 3 | Physics of Brachytherapy. | 10 | | x | |

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

**Learning and Teaching Activities (LTAs)**

| | LTAs | Brief Description | CILO No. | Hours/week (if applicable) |
|---|---|---|---|---|
| 1 | Lecture | Presentation of course material | 1, 2, 3 | 2 |
| 2 | Tutorial | Review of course material | 1, 2, 3 | 1 |

**Assessment Tasks / Activities (ATs)**

| | ATs | CILO No. | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|---|---|---|---|---|
| 1 | Monthly assignments | 1, 2, 3 | 30 | |

**Continuous Assessment (%)**

30

**Examination (%)**

70

**Examination Duration (Hours)**

2

**Assessment Rubrics (AR)**

**Assessment Task**

Exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Having an in-depth understanding of radiotherapy related physics and modern radiotherapy methods; and ability of applying the knowledge and theory to solve problems independently.

**Excellent**
(A+, A, A-) High

**Good**
(B+, B, B-) Significant

**Fair**
(C+, C, C-) Satisfactory

**Marginal**
(D) Basic

**Failure**
(F) Below marginal level

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**Assessment Task**
Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**
The student completes all assessment tasks/activities and the work demonstrates correct understanding of the key concepts.

**Excellent**
(A+, A, A-) High

**Good**
(B+, B, B-) Significant

**Fair**
(C+, C, C-) Satisfactory

**Marginal**
(D) Basic

**Failure**
(F) Below marginal level

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**Assessment Task**
Exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**
Having an in-depth understanding of radiotherapy related physics and modern radiotherapy methods; and ability of applying the knowledge and theory to solve problems independently.

**Excellent**
(A+, A, A-) High

**Good**
(B+, B) Significant

**Marginal**
(B-, C+, C) Satisfactory

**Failure**
(F) Below marginal level

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**Assessment Task**
Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**
The student completes all assessment tasks/activities and the work demonstrates correct understanding of the key concepts.

**Excellent**
(A+, A, A-) High

**Good**
(B+, B) Significant

**Marginal**
(B-, C+, C) Satisfactory

**Failure**
(F) Below marginal level

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# Part III Other Information

**Keyword Syllabus**
Physics of radiotherapy:
- X-ray/gamma ray scattering and absorption
- Particle (eg. proton, electron, neutron) scattering and absorption
- X-ray/gamma ray production and attenuation
- High-energy particle production and stopping
- Dosimetry (calculations and measurements)

External beam radiotherapy:
- Linear accelerator (LINAC) therapy
- Proton beam therapy
- Boron neutron capture therapy
- Treatment planning
- Quality assurance

Brachytherapy:
- Source production, transfer, storage, and handling
- Afterloading
- Treatment planning
- Quality assurance

**Reading List**

**Compulsory Readings**

| | Title |
|---|---|
| 1 | Nil |

**Additional Readings**

| | Title |
|---|---|
| 1 | Radiation Physics for Medical Physicists |