

PHY6522: ADVANCED IMAGING PHYSICS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Advanced Imaging Physics

Subject Code

PHY - Physics

Course Number

6522

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

PHY8522 Advanced Imaging Physics

Part II Course Details

Abstract

This course will advance students' understanding of applied imaging technologies from conceptual, theoretical, and clinical aspects. Imaging techniques including radiography, fluoroscopy, mammography, computed tomography, magnetic resonance imaging, and ultrasound imaging will be discussed.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Conceptual and theoretical understanding of the physics of imaging technologies	70		x
2	Practical and clinical use of the imaging technologies	20	x	
3	Basic digital imaging concepts, processing, and reconstruction	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	Lectures	Presentation of course material	1, 2, 3	2
2	Tutorials	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	20
2	Midterm examination	1, 2, 3	30

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

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

Criterion

1. Ability to describe and explain the clinical use of a few key imaging techniques.
2. A solid understanding of the physics theory behind the imaging technologies.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not reaching marginal level

Assessment Task

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

Criterion

1. Ability to describe and explain the clinical use of a few key imaging techniques.
2. A solid understanding of the physics theory behind the imaging technologies.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not reaching marginal level

Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

1. Ability to describe and explain the clinical use of a few key imaging techniques.
2. A solid understanding of the physics theory behind the imaging technologies.

Excellent

(A+, A, A-) Significant

Good

(B+, B) Moderate

Marginal

(B-, C+, C) Basic

Failure

(F) Not reaching marginal level

Assessment Task

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

Criterion

1. Ability to describe and explain the clinical use of a few key imaging techniques.
2. A solid understanding of the physics theory behind the imaging technologies.

Excellent

(A+, A, A-) Significant

Good

(B+, B) Moderate

Marginal

(B-, C+, C) Basic

Failure

(F) Not reaching marginal level

Part III Other Information

Keyword Syllabus

- Week 1. Structure of Matter and Radioactive Decay (chapter 2&3)
- Week 2. Probability and Statistics (chapter 11)
- Week 3. Interactions of Radiation and X-ray (chapter 4&5)
- Week 4. Radiography (chapter 13)
- Week 5. Fluoroscopy (chapter 14)
- Week 6. Radiation Detectors (Chapter 8) and Mammography
- Week 7. Midterm Exam
- Week 8. Computed Tomography (chapter 15)
- Week 9. Ultrasound Waves (chapter 19)
- Week 10. Ultrasound Imaging (chapter 21)
- Week 11. Fundamentals of Magnetic Resonance (chapter 23)
- Week 12. Magnetic Resonance Imaging (chapter 25)
- Week 13. Human radiobiology (chapter 27)
- Week 14. Final exam

Reading List

Compulsory Readings

	Title
1	Medical Imaging Physics, Fourth Edition, (2002) by William R. Hendee and E. Russell Ritenour.

Additional Readings

	Title
1	Nil