

# PHY4233: IMAGING PHYSICS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Imaging Physics

### Subject Code

PHY - Physics

### Course Number

4233

### Academic Unit

Physics (PHY)

### College/School

College of Science (SI)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

AP4275/PHY4275 Radiological Physics and Dosimetry

### Equivalent Courses

AP4233 Imaging Physics

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

This course aims to lay down the foundation knowledge for X-ray medical imaging and for nuclear medicine medical imaging.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if DEC-A1 app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain and appreciate X-ray medical imaging		x	
2	Explain and appreciate other medical imaging		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 self-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.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Presentation of course material	1, 2	2 hours/week
2	Tutorial	Review of recent assignments	1, 2	1 hour/week

### Additional Information for TLAs

Scheduled activities: 2 hrs lecture + 1 hr tutorial

Lecture activities: Delivery of the course will be achieved through a series of formal lectures supported by practical case studies and laboratory demonstrations.

Tutorial activities: Students will be given problems to solve and will be expected to participate in discussion and/or presentation.

### Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks	
1	Continuous Assessment	1, 2	30	Homework assignments
2	Examination	1, 2		Duration: 2 hours

#### Continuous Assessment (%)

30

#### Examination (%)

70

#### Examination Duration (Hours)

2

### Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained

### Assessment Rubrics (AR)

#### Assessment Task

##### 1. Exam

#### Criterion

The student can thoroughly identify and explain how the principles are applied to science and technology for solving physics and engineering problems.

#### Excellent (A+, A, A-)

The student can, at a high level, identify and explain how the principles are applied to solving the problems.

#### Good (B+, B, B-)

The student can significantly identify and explain how the principles are applied to solving the problems.

#### Fair (C+, C, C-)

The student can moderately identify and explain how the principles are applied to solving the problems.

#### Marginal (D)

The student can, at a basic level, identify and explain how the principles are applied to solving the problems.

#### Failure (F)

The student cannot, even at a basic level, identify and explain how the principles are applied to solving the problems.

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#### Assessment Task

##### 2. Assignments

#### Criterion

The student can thoroughly identify and explain how the principles are applied to science and technology for solving physics and engineering problems.

#### Excellent (A+, A, A-)

The student can, at a high level, identify and explain how the principles are applied to solving the problems.

#### Good (B+, B, B-)

The student can significantly identify and explain how the principles are applied to solving the problems.

#### Fair (C+, C, C-)

The student can moderately identify and explain how the principles are applied to solving the problems.

#### Marginal (D)

The student can, at a basic level, identify and explain how the principles are applied to solving the problems.

#### Failure (F)

The student cannot, even at a basic level, identify and explain how the principles are applied to solving the problems.

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## Part III Other Information

### Keyword Syllabus

- X-ray Imaging Physics:-  
Conventional X-ray systems

Radiographic X-ray image formation and image quality  
 Scatter radiation and contrast  
 Film screen systems and characteristics  
 Fluoroscopic imaging & image quality  
 Digital radiography and computed radiography  
 Mamography  
 Digital subtraction systems  
 Computed tomography  
 Quality assurance  
 · Nuclear Medicine Imaging Physics:-  
 Gamma camera, SPECT and PET  
 Image quality  
 Patient dose  
 Quality assurance

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
1	Selman, Joseph, The fundamentals of imaging physics and radiobiology, Springfield, Ill., U.S.A.: Charles C Thomas, 2000. (9th ed.)
2	Yves Lemoigne, Alessandra Caner, and Ghita Rahal (Eds.) Physics for medical imaging applications, NATO Advanced Study Institute on Optimising Detectors, Imaging and Computing Technologies from Nuclear Physics in General and Security Applications (2005 : Archamps, France) Dordrecht : Springer, c2007.