PHY4233: IMAGING PHYSICS

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 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 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.

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 (e.g. Parameter for GenAI use)
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.

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.

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.