

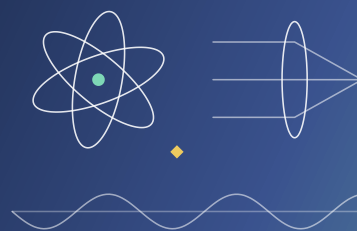
Module code

SPP-2204

Type of module

Undergraduate: Applied Physics – Major Core

Concepts in Modern Physics



Modular credits

4

Total student
engagement

56 hours

Prerequisite

None

Anti-requisite

None

Aims

To equip students with a foundational and applied understanding of modern physics principles, including relativity, quantum mechanics, atomic and nuclear phenomena, by examination of theoretical models, experimental evidence and technological applications.

Module learning outcomes (MLO)

On successful completion of this module, a student will be expected to be able to:

MLO 1

Apply the principles of special relativity to analyse changes in time, length, momentum, and energy in moving reference frames using appropriate equations.

MLO 2

Interpret and evaluate the concept of wave–particle duality, and apply matter wave equations to explain quantum behaviour in atomic and subatomic systems.

MLO 3

Use atomic energy quantisation models to explain electronic transitions and predict spectral outcomes in X-ray and laser generation processes.

MLO 4

Analyse nuclear structure and quantised properties of nuclei.

MLO 5

Critically communicate and evaluate modern physics concepts effectively through group discussions, demonstrating both independent reasoning and collaborative problem-solving skills.

Module contents

Einstein's special theory of relativity

Lorentz transformation equations

Einstein's mass-energy relationship ($E=mc^2$)

Wave-particle duality	Photons, matter waves and de Broglie hypothesis	Wave function and Schrödinger's equation
Heisenberg uncertainty principle	Quantisation of atomic energies	Electronic and atomistic process for X-ray and laser generation
Quantum nature of nuclear contents and their applications		

Assessment

60%

Examination

40%

Coursework



■ Examination — 60% ■ Tests — 30% ■ Assignments — 10%

Formative assessment

Weekly discussions, tutorial and feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	60%
Coursework	40%
Individual	40%
Tests	30%
Assignments	10%

Graduate attributes and skills

Programme learning objectives (PLO) addressed

1 PLO 1 (Core Disciplinary Knowledge)	2 PLO 2 (Critical Thinking and Comparative Analysis)
4 PLO 4 (Numerical and Analytical Competence)	

Sustainability concept addressed

4 SDG 4 Quality Education

Digital skills/software used (not limited to)

- Word processing software (e.g. Microsoft Word)
- Learning Management Systems (e.g. Canvas)
- Communication software (e.g. Microsoft Teams)

Micro-credentialling option No	Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes No
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Document details

Office **ODVCE** Document date **23 June 2026** Status **New** Approval **GBF (12/02/2026)**