

MSc Physics - SC530 (Under Review)

1. Specific Titles

- 1) MSc Physics
- 2) Postgraduate Diploma in Physics
- 3) Postgraduate Certificate in Physics

2. Objectives

This Programme aims at enhancing the knowledge and skills of graduates in the established and emerging fields of physics. Graduates will thus benefit from better career prospects and a sound understanding of the physical world.

3. General Entry Requirements

Successful completion of an undergraduate degree with

- at least a Second Class or CPA $\geq 50\%$, whichever is applicable or
- a GPA not less than 2.5 out of 4 or equivalent, from a recognised higher education institution.

OR alternative qualifications acceptable to the University of Mauritius.

4. Programme Requirements

BSc (Hons) Physics or BSc (Joint Hons) Degree with Physics as one of the subjects or equivalent qualifications acceptable to the University of Mauritius.

5. General and Programme Requirements – Special Cases

The following may be deemed to have satisfied the General and Programme requirements for admission:

- (i) Applicants who do not satisfy any of the requirements as per Regulations 3 and 4 above but who submit satisfactory evidence of having passed examinations which are deemed by the Senate to be equivalent to any of those listed.
- (ii) Applicants who do not satisfy any of the requirements as per Regulations 3 and 4 above but who in the opinion of Senate submit satisfactory evidence of the capacity and attainments requisite to enable them to pursue the programme proposed.
- (iii) Applicants who hold a full practising professional qualification obtained by examination.

6. Programme Duration

The Programme is offered either on a full-time (F/T) and/or a part-time (P/T) basis. The duration of the Postgraduate Programme should normally not exceed 2 years (4 semesters) for F/T and 4 years (8 semesters) for P/T.

7. Credits per Semester: Minimum 3 credits subject to Regulation 6.

8. Minimum Credits Required for Awards

| | |
|---------------------------|----|
| Master's Degree: | 39 |
| Postgraduate Diploma: | 24 |
| Postgraduate Certificate: | 12 |

Breakdown as follows:

| | Core Taught modules | Project | Electives |
|--------------------------|----------------------------|----------------|------------------|
| Master's Degree | 18 | 12 | 9 |
| Postgraduate Diploma | 18 | | 6 |
| Postgraduate Certificate | 12 | | |

9. Assessment

Each module can either be taught in semester 1 only or in semester 2 only or throughout the two semesters.

Modules wholly taught in one semester are termed semester modules whereas modules taught throughout the two semesters are termed yearly modules.

Each module will carry 100 marks and will be assessed as follows (unless otherwise specified):

Assessment will be based on a written examination of 3-hour duration and continuous assessment carrying a range of 30% to 40% of total marks. Continuous assessment may be based on laboratory works and/or assignments and/or seminars and should include at least 1 class test.

Written examinations for semester modules will be held in the semester they are taught in. Yearly modules will be examined at the end of the year.

An overall total of 40% for combined Continuous Assessment and Written Examination components would be required to pass a module, without minimum thresholds within the individual Continuous Assessment and Written Examination.

PHYSI 6009(7) will be assessed solely by Continuous Assessment.

10. Plan of Study

Students are required to submit at the end of Semester 1 a Plan of Study for their whole Programme of Studies, indicating the list of elective modules and in which semester each of them will be taken.

The University reserves the right not to offer a given elective module if the critical number of students is not attained and/or for reasons of resource constraints.

11. Important Note

The rules as stipulated in this Programme Structure and Outline Syllabus will replace all other rules and regulations found in previous Programme Structures.

12. List of Modules

| Code | Module Name | Hrs/Wk L + P | Credits |
|----------------------------|-------------------------------|-------------------------|----------------|
| <u>CORE MODULES</u> | | | |
| PHYSI 6001(7) | Electromagnetic Phenomena | 3 + 0 | 3 |
| PHYSI 6002(7) | Quantum Mechanics II | 3 + 0 | 3 |
| PHYSI 6003(7) | Statistical Mechanics | 3 + 0 | 3 |
| PHYSI 6004(7) | Optics and Photonics | 3 + 0 | 3 |
| PHYSI 6005(7) | Mechanics | 3 + 0 | 3 |
| PHYSI 6006(7) | Physics of Fluids | 3 + 0 | 3 |
| <u>PROJECT</u> | | | |
| PHYSI 6000Y(7) | Research Project | - | 12 |
| <u>ELECTIVES</u> | | | |
| PHYSI 6007(7) | Solid State Physics II | 3 + 0 | 3 |
| PHYSI 6008(7) | Microwaves and Materials | 3 + 0 | 3 |
| PHYSI 6009(7) | Advanced Practicals | 0 + 9 | 3 |
| PHYSI 6010(7) | Dynamical Systems and Chaos | 3 + 0 | 3 |
| PHYSI 6011(7) | Artificial Intelligence Tools | 3 + 0 | 3 |
| PHYSI 6012(7) | Alternative Energy Resources | 3 + 0 | 3 |

And/or other modules approved by the department.

Note: Not all electives may be on offer. The list of modules is not exhaustive.

13. Programme Plan - MSc Physics

Full-Time

| | | YEAR 1 | |
|-------------------------|-------------------------------|-----------------------|----------------|
| Code | Module Name | Hrs/Wk L+P | Credits |
| <u>CORE</u> | | | |
| PHYSI 6000Y(7) | Research Project | - | - |
| PHYSI 6001(7) | Electromagnetic Phenomena | 3 + 0 | 3 |
| PHYSI 6002(7) | Quantum Mechanics II | 3 + 0 | 3 |
| PHYSI 6003(7) | Statistical Mechanics | 3 + 0 | 3 |
| PHYSI 6004(7) | Optics and Photonics | 3 + 0 | 3 |
| PHYSI 6005(7) | Mechanics | 3 + 0 | 3 |
| PHYSI 6006(7) | Physics of Fluids | 3 + 0 | 3 |
| <u>ELECTIVES</u> | | | |
| PHYSI 6007(7) | Solid State Physics II | 3 + 0 | 3 |
| PHYSI 6008(7) | Microwaves and Materials | 3 + 0 | 3 |
| PHYSI 6009(7) | Advanced Practicals | 0 + 9 | 3 |
| PHYSI 6010(7) | Dynamical Systems and Chaos | 3 + 0 | 3 |
| PHYSI 6011(7) | Artificial Intelligence Tools | 3 + 0 | 3 |
| PHYSI 6012(7) | Alternative Energy Resources | 3 + 0 | 3 |

And/or other modules approved by the department.

Note: Not all electives may be on offer. The list of modules is not exhaustive.

Part-Time

YEAR 1

| Code | Module Name | Hrs/Wk L+P | Credits |
|---------------|---------------------------|---------------|---------|
| CORE | | | |
| PHYSI 6001(7) | Electromagnetic Phenomena | 3 + 0 | 3 |
| PHYSI 6002(7) | Quantum Mechanics II | 3 + 0 | 3 |
| PHYSI 6003(7) | Statistical Mechanics | 3 + 0 | 3 |
| PHYSI 6004(7) | Optics and Photonics | 3 + 0 | 3 |
| PHYSI 6005(7) | Mechanics | 3 + 0 | 3 |
| PHYSI 6006(7) | Physics of Fluids | 3 + 0 | 3 |

YEAR 2

| Code | Module Name | Hrs/Wk L+P | Credits |
|------------------|-------------------------------|---------------|---------|
| CORE | | | |
| PHYSI 6000Y(7) | Research Project | - | - |
| ELECTIVES | | | |
| PHYSI 6007(7) | Solid State Physics II | 3 + 0 | 3 |
| PHYSI 6008(7) | Microwaves and Materials | 3 + 0 | 3 |
| PHYSI 6009(7) | Advanced Practicals | 0 + 9 | 3 |
| PHYSI 6010(7) | Dynamical Systems and Chaos | 3 + 0 | 3 |
| PHYSI 6011(7) | Artificial Intelligence Tools | 3 + 0 | 3 |
| PHYSI 6012(7) | Alternative Energy Resources | 3 + 0 | 3 |

And/or other modules approved by the department.

Note: Not all electives may be on offer. The list of modules is not exhaustive.

14. **Outline Syllabus**

This outline syllabus is not prescriptive and is intended to serve as a guide only.

CORE MODULES

PHYSI 6000Y(7) - RESEARCH PROJECT

The student must undertake a research project work on a topic approved by the department.

PHYSI 6001(7) - ELECTROMAGNETIC PHENOMENA

Electromagnetic wave equation. Electromagnetic wave propagation. Generation (and sources) of electromagnetic waves. Polarisation. Interference. Diffraction. Electromagnetic wave scattering. Electromagnetic fields. Electromagnetic radiation.

PHYSI 6002(7) - QUANTUM MECHANICS II

Introduction: concepts of quantum mechanics and conservation laws in quantum mechanics. Perturbation theory: time independent and time dependent. Spin. Identity of particles. Radiation from atoms. Some selected topics.

PHYSI 6003(7) - STATISTICAL MECHANICS

Thermodynamics. Statistical methods. Systems & particles. Statistical thermodynamics. Ensembles. Quantum statistics. Fluctuations. Phase transitions. Applications.

PHYSI 6004(7) - OPTICS AND PHOTONICS

Review of basic concepts. Geometrical optics. Coherence theory. Fourier optics. Optical systems. Lasers. Imaging. Holography. Guided optics and optical devices.

PHYSI 6005(7) - MECHANICS

A brief survey of the basic principles. Variational principles and Lagrange's equations. Central conservative forces. Kinematics of rigid bodies. Dynamics of a rigid body. Hamilton's equations of motion. Canonical transformations. Hamilton-Jacobi equation. Relativistic mechanics.

PHYSI 6006(7) - PHYSICS OF FLUIDS

Fluid statics. Fluid motion. Boundary layer flow. Flow in open channels. Flow in pipes and ducts. Incompressible & compressible flows. Turbulence. Non-Newtonian fluids. Hydraulic machines. Applications.

ELECTIVE MODULES**PHYSI 6007(7) - SOLID STATE PHYSICS II**

Review: The free electron model and its failures. Electrons in periodic potentials. Band model. Approximate methods of band structure calculations. Lattice dynamics. Accurate methods of band structure calculations. Beyond the independent electron approximation. Many-body theory (an introduction). Magnetism in solids. Advanced theories of dielectric solids. Elementary excitations. Superconductivity. Quantum Hall effect.

PHYSI 6008(7) - MICROWAVES AND MATERIALS

Dielectrics. Polarisation in dielectrics. Dielectric losses. Relaxation models. Permittivity tensor. Magnetic permeability. Magnetic losses. Ferrites. Permeability tensor. Faraday rotation. Transmission lines. Propagation constant and attenuation constant. Characteristic impedance. Smith chart. Field analysis of waveguides. Propagation modes. Rectangular circular and coaxial guides. Waveguide discontinuities. Scattering matrix theory. Passive components.

PHYSI 6009(7) - ADVANCED PRACTICALS

This module aims at developing and enhancing experimental expertise. The practicals will be based on the various fields of physics.

PHYSI 6010(7) - DYNAMICAL SYSTEMS AND CHAOS

Phase space description of dynamical systems. Critical points in phase space. Non-linear deterministic systems. Chaos. Routes to chaos. Strange attractors. Poincaré maps. Characterisation of strange attractors. Applications to physical systems.

PHYSI 6011(7) - ARTIFICIAL INTELLIGENCE TOOLS

Fuzzy set: Theory and applications. Fuzzy systems. Neural network. Supervised and unsupervised learning architectures. Genetic algorithm and evolutionary computing.

PHYSI 6012(7) - ALTERNATIVE ENERGY RESOURCES

Brief review of the different sources of renewable energy and types of collectors. Solar energy. Wind energy. Tidal energy. Wave energy. Geo-thermal energy. Brief review of some other sources. Applications.

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