



Medical Physics

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Course Website: http://sydney.edu.au/science/medical_physics/program/delivery.shtml

Faculty Handbook: <http://sydney.edu.au/handbooks/science/>

Course Codes:

LF034 Graduate Diploma in Medical Physics

LC046 Master of Medical Physics

Course Requirements

- (1) The units of study that may be taken for these awards are set out in the Medical Physics postgraduate coursework degrees table.
- (2) To qualify for the Graduate Diploma in Medical Physics a candidate must complete 48 credit points of core units of study.
- (3) To qualify for the Master of Medical Physics a candidate must complete 72 credit points of core units of study

Example study plans:

Example Study plan for Master of Medical Physics (full time student)			
FIRST YEAR, SEMESTER 1			
PHYS5002 (6cp) Anatomy and Biology Essentials for Physicists	PHYS5011 (6cp) Nuclear Physics	PHYS5012 (6cp) Radiation Physics and Dosimetry	PHYS5029 (6cp) Nuclear Medicine Physics
FIRST YEAR, SEMESTER 2			
PHYS5005 (6cp) Radiotherapy Physics	PHYS5006 (6cp) Medical Imaging Physics	PHYS5018 (6cp) Radiation Protection and Health Physics	PHYS5020 (6cp) Computation and Image Processing
SECOND YEAR, SEMESTER 1			
PHYS5019 (24cp) Research Project and Methodology			

Example Study plan for Graduate Diploma in Medical Physics (full time student)			
SEMESTER 1			
PHYS5002 (6cp) Anatomy and Biology Essentials for Physicists	PHYS5011 (6cp) Nuclear Physics	PHYS5012 (6cp) Radiation Physics and Dosimetry	PHYS5029 (6cp) Nuclear Medicine Physics
SEMESTER 2			
PHYS5005 (6cp) Radiotherapy Physics	PHYS5006 (6cp) Medical Imaging Physics	PHYS5018 (6cp) Radiation Protection and Health Physics	PHYS5020 (6cp) Computation and Image Processing

Units of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
All Degrees: Core Units			
PHYS5002 Anatomy & Biol Essentials for Physicists	6		Semester 1
PHYS5029 Nuclear Medicine Physics	6		Semester 1
PHYS5011 Nuclear Physics	6		Semester 1
PHYS5012 Radiation Physics and Dosimetry	6		Semester 1
PHYS5005 Radiotherapy Physics	6		Semester 2
PHYS5006 Medical Imaging Physics	6		Semester 2
PHYS5018 Health Physics and Radiation Protection	6		Semester 2
PHYS5020 Computation and Image Processing	6		Semester 2
Masters: Additional Core Unit			
PHYS5019 Research Methodology and Project	24	<p>P Successful completion of the eight coursework units of the postgraduate coursework Masters degree for which the student is enrolled, equivalent to completion of the requirements for award of the Graduate Diploma.</p> <p><i>Note: Department permission required for enrolment</i></p>	Semester 1 Semester 2

Unit of study descriptions 2014

PHYS5002 Anatomy & Biol Essentials for Physicists

Credit points: 6 **Session:** Semester 1 **Classes:** One 3-hour lab class per week. **Assessment:** Mid-semester and final exams (100%).

In this unit normally undertaken as part of the Masters of Medical Physics degree or the Graduate Diploma in Medical Physics, introduces the concepts and nomenclature of the structure of the human cell, tissues, anatomical structure and physiology. The organisation and function of major organ systems that constitute the human body are covered. Examples of pathology of diseases commonly encountered in the practice of medical physics such as cancer will be included. Basic principles of cell and molecular biology and molecular imaging will also be introduced. The course has been designed specifically for physics students with no prior knowledge of the field.

PHYS5029 Nuclear Medicine Physics

Credit points: 6 **Session:** Semester 1 **Classes:** 2-hour lecture and 1-hour practical per week. **Assessment:** Assignments and written exam (100%).

This unit of study will introduce the student to the physics associated with diagnostic and therapeutic applications in Nuclear Medicine. This will cover the use of radionuclides for imaging in single photon (SPECT) and positron emission tomography (PET), radiation and the patient, tomographic image reconstruction and kinetic analysis of imaging data. Internal radionuclide dosimetry will be addressed using standard (MIRD) models as well as by voxel-based estimators.

PHYS5005 Radiotherapy Physics

Credit points: 6 **Session:** Semester 2 **Classes:** One 2-hour lecture and one 1-hour practical per week. **Assessment:** Assignments and written exam (100%).

In this unit normally undertaken as part of the Masters of Medical Physics degree or the Graduate Diploma in Medical Physics, both theoretical and practical aspects of the major topics in radiotherapy physics are covered. These topics include radiation beam production and modification, calibration and characterisation, principles of treatment planning, dose calculation and reporting, and the physics of brachytherapy.

PHYS5006 Medical Imaging Physics

Credit points: 6 **Session:** Semester 2 **Classes:** One 2-hour lecture and one 1-hour practical per week. **Assessment:** Assignments and written exam (100%).

In this unit normally undertaken as part of the Masters of Medical Physics degree or the Graduate Diploma in Medical Physics, the physical principles underlying the physics of imaging in diagnostic radiology, ultrasound, magnetic resonance imaging and functional imaging modalities are covered. Advanced techniques, such as multi-modality imaging, are also introduced.

PHYS5011 Nuclear Physics

Credit points: 6 **Session:** Semester 1 **Classes:** One 3-hour lecture per week. **Assessment:** Assignments and written exam (100%).

This unit is normally undertaken as part of the Master of Medical Physics or the Graduate Diploma in Medical Physics. Nuclear properties, nuclear models, nuclear decays (gamma, beta, alpha and heavy ion decay), natural radioactivity and radioactive decay series, artificial radioactivity, nuclear reactions (including high energy nuclear particle induced spallation reactions), nuclear fission (spontaneous and induced fission) and nuclear fusion are covered.

PHYS5012 Radiation Physics and Dosimetry

Credit points: 6 **Session:** Semester 1 **Classes:** One 2-hour lecture and one 1-hour practical per week. **Assessment:** Assignments and written exam (100%).

This unit is normally undertaken as part of the Master of Medical Physics degree or the Graduate Diploma in Medical Physics. Sources of radiation, interaction of radiation with matter, physical, chemical and biological effects of radiation in human tissue, physical principles of dosimetry, internal and external dosimetry, radiation units and measurement are covered.

PHYS5018 Health Physics and Radiation Protection

Credit points: 6 **Session:** Semester 2 **Classes:** One 2-hour lecture and one 1-hour practical per week.
Assessment: Assignments and written exam (100%).

This unit is normally undertaken as part of the Master of Medical Physics degree or in the Graduate Diploma in Medical Physics. Physical and biological aspects of the safe use of ionising radiation, physical principles and underlying shielding design instrumentation, international and legislative requirements for radiation protection are covered. Factors affecting dose response of tissue are considered along with models describing characteristic behaviour.

PHYS5019 Research Methodology and Project

Credit points: 24 **Session:** Semester 1, Semester 2 **Classes:** Library information session and research work.
Prerequisites: Successful completion of the eight coursework units of the postgraduate coursework Master's degree for which the student is enrolled, equivalent to completion of the requirements for award of the Graduate Diploma. **Assessment:** Report and research seminar (100%).

Note: Department permission required for enrolment

In this unit a research project is undertaken. The topic of the project will be determined in consultation with the course coordinator. In addition, the processes involved in conducting various forms of research, basic data analysis and interpretation, research writing and presentation skills are covered.

PHYS5020 Computation and Image Processing

Credit points: 6 **Session:** Semester 2 **Classes:** One 1-hour lecture and one 2-hour practical per week.
Assessment: Assignments and written exam (100%).

In this unit normally undertaken as part of the Masters of Medical Physics degree or the Graduate Diploma in Medical Physics, Monte Carlo modelling of radiation transport is covered, along with the theory of image formation, concepts of computing, numerical methods and image processing, including techniques such as enhancement, registration, fusion and 3D reconstruction.