

# Physics, Astronomy & Astrophysics, Optical Technology, Physics Teaching

**Department of Physics, Division of Information and Communication Sciences, Macquarie University**

**Home to 4 programs of study:**

**Bachelor of Science in Physics**  
**Bachelor of Science in Astronomy and Astrophysics**  
**Bachelor of Optical Technology**  
**BSc DipEd (in Physics)**

The Department of Physics at Macquarie University is the home of two majors of the BSc degree: Physics; and Astronomy & Astrophysics; the BOptTech degree; and the BScDipEd with major in physics. All are accredited Physics degrees, (most recent review completed by the Australian Institute of Physics in 2002, <http://www.aip.org.au>). Units of study from the other departments within the Division of ICS (Mathematics, Computing and Electronic Engineering) and from departments in other Divisions of the University are included in these, to a greater or lesser extent, depending on the program/degree. This document provides information on these programs of study. It should be used in conjunction with other resource materials which address the research, teaching, and outreach activities of the Department of Physics; and the career options and employers of graduates; to assist students to decide on their future program-of-study.

Programs of study at Macquarie University are either defined by a coherent study (BSc, see below) or an undergraduate study pattern (BSc major in Astronomy and Astrophysics, BOptTech, BScDipEd (major in physics)). These are found in the Undergraduate Handbook (in print copy, and at <http://www.handbook.mq.edu.au/>). A program of study is made up of a number of units of study ("units"), each worth a fixed number of credit points (CP) – typically 3. A unit of study is usually completed in one semester of instruction, involving lectures, assignments, practical sessions and tutorials.

**Bachelor of Science (in Physics)**  
 UAC code 300517 CSP\*, 310517 DFEE\*

Undergraduate Coherent Study PHY03 - Physics (also PH04, Mathematical Physics and PH01, PH02 BA equivalents)

Physics is fundamental to all the natural sciences and plays a central role in the development of new technologies. Physics is a core discipline for all science and technology students. It challenges students to explore the underlying principles of all physical phenomena as well as to develop problem-solving skills, good laboratory techniques, and skills in numerical analysis, technical writing and oral communication. The flexibility of the BSc degree allows students to complete a major in physics but include units of

study in other sciences, some humanities or interdisciplinary areas. The BSc requires 68 credit points (CP). A specific program of study satisfying the degree rules for a BSc majoring in physics is outlined below. Also the coherent study PHY03 is reproduced. The programs of study (PHY01, PHY02, PHY03, PHY04), and details of the units of study can be found in the Undergraduate Handbook. PHYS 140 is one 3 CP unit of study. Its entry from the handbook is reproduced overleaf.

HSC Mathematics Band 4, (or HSC Mathematics Extension 1 Band E2) is a prerequisite for PHYS 140 and MATH 135. Students without this study MATH 130 before progressing.

## **Year 1**

*1st half-year:* PHYS140, MATH135 or MATH 132

*2nd half-year:* PHYS143, MATH136 or MATH 133.

*1st or 2nd half-year:* ELEC166 and 6 to 9 additional credit points, normally selected from CBMS101, CBMS103 or COMP115 or COMP155, COMP125 or COMP165.

## **Year 2**

*1st half-year:* PHYS201, MATH136 if not yet completed or else MATH235, and 6 or 7 additional credit points, possibly including PHYS220 and/or PHYS242 and/or PHYS270. OPTO221 is recommended.

*2nd half-year:* PHYS202, ELEC280 or PHYS278, and 6 or 7 additional credit points; MATH235 is essential if not yet completed, or else MATH236 is strongly recommended.

Some students may include PHYS246 in the second half-year.

## **Year 3**

*1st half-year:* PHYS301, PHYS303 and 6 or 7 additional credit points; MATH335 is recommended. (Consider OPTO321, PHYS377, ELEC376 as possible options.)

*2nd half-year:* PHYS304, PHYS306 or PHYS378 and 6 or 7 additional credit points, which should include MATH236 (strongly recommended) or ELEC280 (if not already completed).

## **PHY03 - Physics (Undergraduate Coherent Study) Requirements**

Obtain an aggregate of at least 68 credit points, including at least 38 credit points in units at 200 level or above, and at least 34 credit points in units at 200 level or above in designated as science units, and at least 18 credit points in units at 300 level or above designated as science units, which include the following approved coherent study: 12 credit points which must include PHYS301 and which may include at most two of ELEC376, OPTO300, OPTO301, PHYS306, with the remainder chosen from other units of study, in the range PHYS300-PHYS389.

**(Note BSc (in physics) graduates with a GPA of 2.5 or better meet the requirements for subsequent entry to BSc honours in physics)**

**Bachelor of Science (in Astronomy and Astrophysics) UAC code 300529 CSP, 310529 DFEE**

Undergraduate Study pattern ASTR01 – Astronomy and Astrophysics

The program of studies leads to the award of a BSc. The program is an accredited physics degree with a strong emphasis on astronomy and astrophysics. Students admitted to this program may enrol in the unit, PHYS270 Astronomy, in their first year of study. The BSc requires 68 credit points (CP) made up from 3 CP units of study. The program of study is outlined below. PHYS 140 is one 3 CP unit of study. Detailed descriptions of the program of study (ASTR01) and of the units of study can be found in the Handbook of Undergraduate Studies or on the University Web Site – <http://www.handbook.mq.edu.au>

HSC Mathematics Band 4, (or HSC Mathematics Extension 1 Band E2) is a prerequisite for PHYS 140 and MATH 135. Students without this study MATH 130 before progressing.

## **Year 1**

*1st half-year:* PHYS140, MATH135 or MATH132, COMP115 or COMP155, and a 100-level Science unit (with prefix BIOL, CHEM, GEOS or STAT).

*2nd half-year:* PHYS143, MATH136 or MATH133, ELEC166, COMP125 or COMP165.

## **Year 2**

*1st half-year:* PHYS270, PHYS201, MATH235, PHYS220 or COMP225.

*2nd half-year:* PHYS278, PHYS202, MATH236, ELEC280 or COMP226.

## **Year 3**

*1st half-year:* PHYS377, PHYS301, MATH335, PHYS303 or OPTO300.

*2nd half-year:* PHYS378, PHYS306, MATH336, PHYS304 or OPTO301.

Other units considered suitable for inclusion in the program are MATH132, MATH133, MATH232, COMP226, ELEC260, GEOS309 (Astrobiology)

**(Note graduates with a GPA of 2.5 or better meet the requirements for subsequent entry to BSc honours in physics.** Research projects in astronomy and astrophysics and appropriate coursework are included in this honours program).



# Physics, Astronomy & Astrophysics, Optical Technology, Physics Teaching

## Bachelor of Optical Technology

UAC code 300660 CSP, 310660 DFEF

Undergraduate study pattern OPTL02 – Optical Technology

Optical Technology is the basis for a range of new products such as DVDs, digital cameras and flat panel displays, laser scanners, biomedical instrumentation and communication systems. Optics is at the heart of many emerging technologies being developed for medicine, environmental monitoring, advanced computers, machine vision and manufacturing.

The Bachelor of Optical Technology program combines studies in physics, optics, materials science and electronics in a professionally-oriented degree, and includes technologies such as lasers, nanophotonics, biophotonics, optical fibres and communications. In this degree you will develop industry-relevant skills including technical writing and communication skills, technology management and practical skills using modern instrumentation. In a highlight of the degree program, our students are placed in local companies in an industry-based project. The program requires 72 credit points made up from 24 units of study (each 3 credit points) with 24 credit points each year. A typical program of study is outlined below. Detailed descriptions of the program of study and the units of study can be found in the Handbook of Undergraduate Studies, or on the website - <http://www.handbook.mq.edu.au>

HSC Mathematics Band 4 (or HSC Mathematics Extension 1 Band E2) is a prerequisite for PHYS140 and MATH135. Students without this study MATH130 before progressing.

### Year 1

*1st half-year:* PHYS140, MATH135 or MATH 132, COMP115 or COMP 155, ELEC 141.

*2nd half-year:* PHYS143, MATH136 or MATH 133, ELEC166, COMP125 or COMP 165 or CBMS101 or STAT170 or STAT171.

*Note that MATH132 and MATH133 are advanced alternatives to MATH135 and MATH136 for a student with a strong mathematical background; similarly COMP155 and COMP165 are advanced alternatives to COMP115 and COMP125.*

### Year 2

*1st half-year:* PHYS201, MATH235, ELEC290 or PHYS220, OPTO221.

*2nd half-year:* PHYS202, MATH236 or ELEC241, OPTO222.

### Year 3

*1st half-year:* PHYS301, PHYS303, OPTO321, MPCE360.

*2nd half-year:* PHYS306, OPTO322, OPTO310, ELEC321 or ELEC280.

**(Note graduates with a GPA of 2.5 or better meet the requirements for subsequent entry to BOptTech Honours in optoelectronics.)**

## Bachelor of Science with Diploma in Education BSc DipEd

UAC code 300537 CSP, 310537 DFEF

Undergraduate study pattern TESC04

In the BSc with DipEd the professional teaching component is taken concurrently with a science degree. Minimum time for completion is four years. In the case of the study pattern TESC04 it is a BSc majoring in physics, with DipEd which will qualify graduates to teach physics and science. Recent graduates of this degree have had offers of more than one teaching position before completion. Graduates also work in adult education and training sectors relating directly to science. It is also possible to follow any of BSc in Physics, BSc in Astronomy and Astrophysics, or BOptTech with a one year Grad DipEd, an alternate route to qualifying for secondary teaching. The plan listed below is an example that satisfies the study pattern TESC04. Some of the BIOS, GEOS and TEP units can be varied. Also there is some choice in 18 CPs of 300 level science units, which must include PHYS 301 and a minimum of 12CPs of 300 level PHYS/OPTO units to satisfy the requirements for a physics major. The BScDipEd requires a minimum of 92 CPs which satisfy the TESC04 study pattern.

### Year 1

*1st half-year:* PHYS140, MATH135 or MATH132, EDUC105, CBMS101

*2nd half-year:* PHYS143, MATH136 or MATH 133, EDUC106, CBMS103.

### Year 2

*1st half-year:* PHYS201, PHYS 270, MATH235, EDUC264.

*2nd half-year:* PHYS202, MATH236, BIOL115, EDUC258.

### Year 3

*1st half-year:* PHYS301, OPTO321, PHYS 303, TEP295

*2nd half-year:* PHYS306, GEOS309, TEP246, PHYS 278

### Year 4

*1st half-year:* TEP414, TEP433, PHYS 377, GEOS268

*2nd half-year:* TEP416, TEP434, ENV200, EDUC370

### Unit of Study: PHYS140: Physics IA

PHYS140 and PHYS143 give an overview of physics to discover and understand the fundamental laws of nature using them to explain and exploit the phenomena that occur in the universe. Students will be introduced to the central topics of classical physics, the physics that describes what we observe in day-to-day life, namely the mechanical, electrical and magnetic behaviour of matter. The subjects covered include measurement and vectors, Newton's laws of motion, momentum and energy, gravitation, electric charge, electric field and potential, capacitance, simple direct-current circuits, the origin of magnetic fields, and electromagnetic induction.

The language of physics is mathematics but much of what physics has to say can be described using straightforward algebra and a

little calculus from the HSC Mathematics course. This approach gives a distinct advantage: a quantitative and usefully different perspective to topics that may be encountered in units of study in biology, chemistry or earth sciences.

Regular guided laboratory work enables students to investigate the phenomena discussed in the lectures, using modern techniques in a well-equipped laboratory

## Another degree of interest offered by the Division of Law: Bachelor of Science with the degree of Bachelor of Laws

UAC Code 300305 CSP 310305 DFEF

Undergraduate Coherent Study LAW14

Graduates who complete this degree with a major in physics are sought as patent and trademark attorneys. Requires 116 credit points and minimum time for completion is 5 years.

### Further Information

<http://www.physics.mq.edu.au>

<http://www.ics.mq.edu.au>

<http://www.reg.mq.edu.au/undergrad/current/scholarship/index.htm>

### Glossary of Terms:

<http://www.handbook.mq.edu.au/PDFs/2007/ug-glossary-of-terms.pdf>

### How to Use the Undergraduate Handbook

<http://www.handbook.mq.edu.au/PDFs/2007/ug-howtouse.pdf>

### Contacts and Enquiries

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