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# *Information for Australian universities seeking to have a qualification accredited by the Australian Institute of Physics 2013-2016*

Physics is the study of matter and energy and their interaction. Physical laws are universal and international in their application. A graduate physicist should be able to mathematically model a wide range of physical processes by:

- making appropriate assumptions and limitations,
- estimating the magnitudes of effects of inputs and outputs,
- making measurements to test and refine models of physical processes,
- connecting models and their impact on the wider community in meaningful ways, and
- communicating models and their outputs to both expert and non-expert audiences.

The Institute encourages universities to offer degree programs that will provide its graduates with automatic eligibility for admission to the grade of Member of the Australian Institute of Physics ("the Institute"). The accreditation of qualifications is overseen by the Australian Institute of Physics (AIP) Accreditation Manager, who reports to the Executive of the Institute.

## (1) Assessment guidelines for Membership of the Institute

It is expected that accredited qualifications will satisfy one of the following three categories:

**(a) A Bachelor degree with a major in Physics or Applied Physics or with major studies involving substantial applications of Physics:**

As a minimum requirement, 1 year equivalent of the total degree program should be classifiable as physics, with a half year equivalent of "core principles of Physics" (as specified below) beyond the introductory degree program level, or such alternative arrangements as satisfy the Institute. Accreditation panels will expect to see evidence of sequential development of physics and mathematics knowledge and skills.

The inclusion of substantial experimental experience is mandatory. Some laboratory components should be included at higher levels. While simulations may have a role in experimental work, they should not dominate the laboratory experience.

The mathematics components should reflect the importance of mathematics to physics and should require students to understand material beyond an introductory level. As a guide, a three year degree program should include appropriate problem solving skills in Pure and/or Applied Mathematics including Differential Equations, Vector Analysis, Linear Algebra and Complex Analysis.

Degree programs must include a clear development sequence of physics computation skills either studied as discrete subject(s)/unit(s) or embedded within physics subjects/units. Computational skill development should cover more than one area of physics computation, e.g. algorithm development, high level data processing, and algebraic computing.

**(b) A Bachelor degree with Honours in Physics or Applied Physics:**

It is assumed that the requirements for such a degree program will be comparable, but not necessarily identical to the requirements in (a) above. Please note that if the three-year bachelor degree satisfies the requirements of the AIP there is no need to provide information regarding a separate honours program.

**(c) Other qualifications**:

Other qualifications which are demonstrably at least the equivalent of any of the above may be deemed sufficient grounds for admission to Graduate Membership of the Institute, as determined by the Accreditation Panel.

***Notes:***

- "Core principles of Physics" is taken to include a balance of topics such as: Classical Mechanics, Electromagnetism, Quantum Physics, Nuclear and Particle Physics, Thermal Physics, Optics, Condensed Matter Physics, Waves and Sound and Relativity.

- It is recognised that this core material may in some cases also be embedded in topics such as Geophysics, Photonics, Optoelectronics, Laser Science, Medical Physics, Biomechanics, Biophysics, Space Science, Materials Science, Nanoscience, Nanotechnology, Plasma Physics, Astrophysics, Crystallography, Surface Physics, Electronic Device Physics or Atmospheric Physics. Accreditation Panels will assess degree programs on the breadth and level of the physics and mathematics understanding and computational skills demonstrated by students rather than just on the description of the content.

## (2) Issues considered in the accreditation process

In examining a degree program for accreditation purposes, the Accreditation Panel will consider the following input factors:

- the general academic practices and standards of the university;
- the objectives of the degree program and the methods adopted to achieve these objectives;
- the requirements for and standards of admission to the degree program;
- the duration of the degree program;
- the breadth, depth and balance in the subjects/units involved and the intellectual effort and demands of the degree program;
- the methods of assessment of student progress;
- the arrangements for practical training and experience as part of the degree program;
- the teaching staff conducting the degree program, their numbers, professional qualifications and experience and their educational expertise;
- the accommodation and facilities available including equipment, libraries, experimental and computing laboratories, workshops, etc.
- the extent, quality and level of student feedback provided through program and subject/unit evaluation processes.

The primary output factor of concern to the Accreditation Panel is the quality of the student experience. This will be assessed through interviews with students and consideration of student assessments. However, the university may wish to provide further submissions to the Panel on:

- pass, withdrawal rates for the program and core subjects/units of the program;
- marks/grade distribution profiles of core subjects/units of the program;
- the general quality of student work (laboratory/project reporting, assignments and examinations);
- Graduate employment/study destinations;

Each university requesting accreditation of a degree program or degree programs will be required initially to provide the information listed below in a clear and concise form and subsequently to host a visit of up to one day's duration by an Accreditation Panel.

## (3) Documentation required from a university to support accreditation

(It is anticipated that much of the documentation required could be extracted by the university from existing handbooks, the university web site and similar publications.)

- a statement of the objectives of the degree program;
- a statement of the requirements for completion of the degree (or the degree sequence for which accreditation is sought);
- a demonstration that the physics, mathematics and computational physics studied in the degree program meets the AIP requirements (see section 1);
- Outlines of all subjects/units including objectives/outcomes and syllabi, classifiable as physics or mathematics, which could be included in a properly constituted degree program including details of texts, the relevant pre- and co-requisites and details of the methods and types of assessment used and their relative weightings;
- a description of a typical program of study leading to the award of the degree;
- brief (one page) resumes of the continuing and contract physics staff involved in teaching the degree program and a summary list of all physics teaching staff which includes their highest academic qualification, and professional memberships. If this qualification is not in physics then the highest physics qualification should also be given;
- A profile of the experience and qualifications of all staff involved in face to face teaching in the degree program for the current semester; this includes all sessional staff involved in the teaching program and is probably best presented as a matrix.
- A map of the physics and mathematics studied in the degree program and its assessment against the following list of competencies for a graduate physicist:

    1. **Demonstrate knowledge of fundamental physics concepts and principles;**
    2. **Evaluate the role of theoretical models and empirical studies in the past and in the current development of physics knowledge;**
    3. **Apply physics principles to understand the causes of problems, devise strategies to solve them and test the possible solutions.**
    4. **Use a range of measurement and data analysis tools to collect data with appropriate precision and carry out subsequent analysis with due regard to the uncertainties.**
    5. **Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations;**
    6. **Work effectively and ethically in a multi-faceted scientific environment; and**
    7. **Be responsible, critically reflective, self-directed and motivated learners.**

- Evidence of a quality improvement process for the past 5 years. This should include the results of any internal evaluation data of courses/units/subjects/programs relevant to the degree program being accredited, and evidence of action taken in light of these results.
- any other material considered relevant by the university.

If the university is unsure of any of these requirements they should contact the AIP Accreditation Manager.

## (4) Accreditation process

a. The Accreditation Manager appoints Accreditation Panels for all accreditations due the following year. Panels normally consist of three individuals from the Accreditation Committee; typically one member who is also a member of the Membership Committee, one Accreditation Committee member from within the state in which the accreditation is to be carried out, and one member from an adjoining state.

b. The Panel Chair contacts the Chair/Head of the relevant Academic Unit of the university seeking program accreditation and discusses the accreditation process and determines possible timelines.

c. The Panel Chair writes to the Chair/Head of the Academic Unit and formally invites the university to put forward their degree program(s) for accreditation. Enclosed with this invitation is this document.

d. The university responds formally to the Panel Chair's invitation agreeing to the timelines and process.

e. The university makes a **hard copy** submission to the Panel Chair in the manner required by the Institute (section 3). The submission should be provided at least one month before the date of the panel visit. Late submissions may incur an administrative fee (See section 7).

f. The submission is circulated by the Panel Chair to the Accreditation Panel.

g. The one day site visit takes place – see arrangements in section 5, below.

h. The Panel Chair writes the draft report and after obtaining the agreement of the rest of the Panel, sends it to the university for Comment.

i. The Panel Chair attempts as far as possible to get the agreement of the university on the contents of the report. When no further progress seems possible or necessary, the report is presented to the Membership Committee for acceptance. The Panel Chair then submits it to the Executive of the Institute for approval. In the event of a negative report or one lacking the agreement of the university concerned, the Accreditation Manager and Panel Chair will also advise the Executive of these matters and recommend on any relevant action as a consequence of the report.

j. After approval of the Executive, the final report is signed by the AIP President and sent to the University. A covering letter is also sent advising the university of an appeals process in the event that it wishes to challenge any aspect of the report.

k. Appeals will be considered by the AIP Executive after receiving a written submission from the university and written comments on that submission from the Panel Chair, and if required from the Accreditation Manager. The university will have the right to have a member of the staff present its case in person provided that all costs associated with such presentation are met by the university.

## (5) Arrangements for a site visit

During the site visit, the Accreditation Panel will wish to meet the Chair/Head of the Academic Unit or his/her nominee(s) in the first instance, to clarify any queries related to their examination of the documentation provided to the Panel. The panel will also wish to meet a sample of staff involved in teaching the program(s) and students in separate sessions.

The Panel will seek to examine samples of the following, covering a range of academic ability of the students involved:

- previous examination papers and typical student responses;
- examples of students' laboratory notebooks;
- examples of written and other work submitted by students for assessment.

In order to cover the range of student abilities, examples of assessment tasks may need to collected over more than one academic year.

The Panel will tour the physical facilities available to students enrolled in the degree program, including laboratories, computing facilities, lecture theatres, libraries, technical workshops, etc.

## (6) Report

Following the site visit, the Accreditation Panel will produce a report which will be confidential between the Academic Unit of the university involved, the Panel and the Executive of the Institute.

The Panel Chair is expected to produce the first draft for discussion within one month of the site visit and if he/she is unable to do that he/she will ask another panel member to write the draft. The report should be finalised within two months.

Once formally received by the university it is anticipated that the report will be made available to any of the staff within the academic unit involved in the accreditation

## (7) Fees and charges

The fee for an accreditation within Australia is $4,400 plus GST and this includes all travel and accommodation costs incurred by panel members (please note that this is a changed arrangement from previous accreditation visits). Upon application through the Accreditation Manager, the AIP Executive may decide to reduce the fee.

The administration fee applicable for late submissions of documentation is $300 plus GST.

The conditions and fees for accreditation for institutions outside Australia are available through the Accreditation Manager.