Physics at UNSW

The School of Physics at UNSW is prominent in both teaching and research, and we are also one of the largest Schools of Physics in all Australian universities. We host the Australian Centre of Excellence for Quantum Computation and Communication Technology.

The School of Physics is equipped with exceptional student computing facilities, teaching laboratories and also has its own astronomical observatory. The School of Physics is active in research in many different fields. These include astrophysics, biophysics, music acoustics, theoretical physics, optoelectronics, nanotechnology and quantum physics - students are taught by experts in these fields and may also have the opportunity to conduct their own research projects with individual lecturers.

Projects which students are currently involved in include searching for space-time variations in the fundamental constants of nature, searching for exo-solar planets, developing the world’s first scalable “quantum computer”, and studying the acoustics of musical instruments such as flutes and guitars.

What is Physics?

Physics is the search for the laws that govern the behaviour of the universe, from the very smallest scales of subatomic particles to the very largest in cosmology. The application of these laws to the resolution of practical problems often leads to the development of new technologies like the generation and distribution of electrical power, radio and television, and the internet. Physicists need a broad range of problem solving skills in order to undertake this work.

A physicist might examine whether the laws of physics have changed over time, or use the laws at the smallest scales to derive the behaviour of a large system. They may apply them to design new experiments to test our understanding of these laws, or to develop new technologies for manipulating matter on the atomic scale.

Real World Applications of Physics

A physicist may be a numerical modeler developing sophisticated computer algorithms to calculate how climate will change. They could also be an experimentalist developing new techniques to measure properties of nature or combining those theories and techniques into new technologies.

Physics is an increasingly interdisciplinary field, as physicists work with mathematicians, chemists, biologists and engineers in order to understand and solve a wide range of problems confronting society.

Qualified physicists can expect to undertake governmental, university and industrial research, but their skills can also be applied to secondary science teaching, the world of finance, business and management as well as computing. A good physicist is trained in solving problems, a skill that finds wide application throughout society.
Undergraduate degrees in Physics

Bachelor of Science
UNSW code: 3970
3 years full-time

Students in the 3-year Bachelor of Science can study Physics by completing a major in Physical Science. This degree is extremely flexible and the wide variety of courses available to choose from allows you to tailor your degree to fit your interests and career aspirations. You may decide to combine physics studies with courses from another science discipline or courses from other faculties of the university. Students who have performed well have the option to add a fourth Honours year to this degree.

Bachelor of Science (Advanced Science)
UNSW code: 3972
4 years full-time

The Advanced Science degree is a four year degree, designed for particularly talented students. The degree includes a fourth Honours year. The School of Physics offers a major in Physics within the Advanced Science degree. You can choose to study electives in areas of interest such as Astrophysics; Theoretical Physics and Mathematics; or Computer Science; as well as core Physics subjects.

Bachelor of Science and Business
UNSW Code: 3925
3 years full-time

The Bachelor of Science and Business is designed to prepare you to work in the scientific industry but also have an understanding of commercial environments. You complete a major in Physical Science, and a range of business courses. You can choose to add a fourth, Honours year in Physics.

Bachelor of Science (International)
UNSW Code: 3987
4 years full-time

The Bachelor of Science (International) prepares you for an increasingly global work environment. You complete a Physical Science major, a number of language and cultural based electives, and spend a year on exchange studying at an overseas university. You can choose to add an extra Honours year in Physics.

Dual Degrees

Dual degrees allow you to complete two degrees simultaneously. Some, such as Science/Education or Engineering/Science allow you to combine studies in physics while obtaining a professional qualification. Others, such as Science/Arts, give you greater flexibility to study a wider range of courses than you may in a single degree.
Graduate Diplomas and Masters Degrees

The Graduate Diploma in Physics offers an advanced training program for graduates from overseas universities who wish to obtain specialised training in physics.

The Graduate Diploma in Physics Research Techniques offers an advanced training program for graduates who wish to obtain specialised training in research techniques in physics.

In the Master of Philosophy degree students complete an eighteen month long research project. They also study postgraduate courses in areas such as theoretical physics, astrophysics or solid state physics.

<table>
<thead>
<tr>
<th>Dual Degree</th>
<th>UNSW Codes</th>
<th>Duration</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Commerce/ Bachelor of Science</td>
<td>3529</td>
<td>4 years full time</td>
<td>Ideally suited for careers within technologically based businesses.</td>
</tr>
<tr>
<td>Bachelor of Engineering/ Bachelor of Science</td>
<td>various codes, please enquire</td>
<td>5 years full time</td>
<td>Suitable for engineers who want a strong physics background.</td>
</tr>
<tr>
<td>Bachelor of Laws/ Bachelor of Science</td>
<td>4770</td>
<td>5 years full time</td>
<td>Graduates often choose to specialise in the scientific aspects of law, such as patent or environmental law.</td>
</tr>
<tr>
<td>Bachelor of Science/ Bachelor of Arts</td>
<td>3930</td>
<td>4 years full time</td>
<td>The most flexible dual degree, enabling study from different Faculties.</td>
</tr>
<tr>
<td>Bachelor of Music/ Bachelor of Science</td>
<td>3448</td>
<td>4 years full time</td>
<td>Students may work in specialised areas combining music and scientific skills.</td>
</tr>
<tr>
<td>Bachelor of Science/ Bachelor of Education</td>
<td>4705</td>
<td>4 years full time</td>
<td>There is currently a shortage of secondary science teachers who are able to teach physics.</td>
</tr>
<tr>
<td>Bachelor of Economics/ Bachelor of Science</td>
<td>3563</td>
<td>4 years full time</td>
<td>Graduates develop analytical skills with applications in finance, business and policy.</td>
</tr>
</tbody>
</table>

Honours in Physics

The final year of the Advanced Science degree is an Honours year. In all other degrees, students who have performed well have the option to add an additional Honours year to their degree. The Honours year is essential preparation for those considering a career in research, and is a prerequisite for those wishing to continue on to a PhD. The Honours year also significantly enhances employment prospects. It is different to the previous years of a science degree, with an emphasis on research. Students studying an Honours year complete six courses in areas such as quantum mechanics, solid state physics and astrophysics. They also complete one or two major research projects with academics from the School of Physics. This allows students to undertake their own, original scientific research and this can be in any area of physics in the School.
Research Degrees

After completing an undergraduate degree, you may choose to enrol into a research degree. UNSW offers the Master of Philosophy, Master of Science by Research, and Doctor of Philosophy (PhD) degrees.

Our School offers an extensive range of research projects where students interact directly with an academic expert in the particular research discipline. Interested students should contact the School directly to be put in contact with potential supervisors in their area of interest. A list of current projects can be found on the School web page, www.phys.unsw.edu.au. They include research projects in astrophysics, biophysics, musical acoustics, theoretical physics and condensed matter physics.

Career Opportunities

Physics is a continuously and rapidly expanding field of science. Every year many new discoveries are made. It is the basis of nearly every technology used in the modern world, from mobile phone technology to drug development to the internet. Physics is a challenging and rewarding subject to study. Its study instructs a person in the art of critical thinking, how to pose questions and how to solve problems. In our increasingly technological society, enormous opportunities exist for physics graduates. Many follow careers in research, in universities, government laboratories and industry around the world. Those who want to work in research usually complete an Honours year and then a PhD after their Bachelor of Science.

A vast range of other career options are also available. Some of these include scientific sales and management; teaching in schools, TAFE and universities; or working in the Commonwealth and State Public Services. UNSW physics graduates have also made successful careers in industries such as manufacturing, communications, computing, electronics, finance and biomedical technology. Graduates work for a number of leading, reputable universities including Harvard, the University of California and Cambridge University. Graduates have also worked in a number of observatories, including the European Southern Observatory and the Anglo-Australian Observatory. Other potential employers include the CSIRO, ANSTO, BHP-Billiton, DSTO, the Department of Education in Australia and overseas, the Australian Museum and Qantas, Australia’s national airline.
A Student’s Perspective

Angus Wright
Bachelor of Science (Physics)

As a high school student I always enjoyed Physics, and it was simply because of the way the class was taught. The teacher loved the subject; loved teaching it, reading about it, and working in the field; and it came across in the way the course was taught. I was therefore thrilled when I arrived at UNSW to start my degree, and discovered that every teacher in the entire School of Physics was just as engaging, if not even more so. Here at UNSW, the lecturers are experts in the fields they teach. It means that they don’t just teach you what’s written in the textbook, but they let you in on the cutting edge of research and development in the fields as well. The learning process becomes one where you feel like every step forward takes you into the forefront of the subject, and where a casual discussion with the lecturer can easily cover volumes in understanding (and if that doesn’t help, the physics student society common rooms always have a few know-it-alls to help). It completely changes the way that you learn, making it more in depth, more relevant, and more fun. I highly recommend it!