

# SCIENCE



## SCIENCE

The Science Faculty at UOW is distinguished by its strong integration of teaching and research. Leading researchers teach in both undergraduate and postgraduate programs, so you will learn from them from the beginning of your studies.

Teaching grows out of the world-class research conducted by our staff and students. The Faculty is renowned nationally and internationally for its research activities and has strong links with universities and other research organisations both in Australia and around the world. Programs range across the full spectrum of biological, chemical, earth and environmental sciences. Innovative, multi-disciplinary programs provide technical skills for specialist careers in science and develop analytical and research skills that can be applied to a wide array of career choices. The Faculty offers both three-year general degrees and specialist degrees in each of the core Science disciplines. Advanced degrees for high-achieving students and a range of double degrees, combining science with studies in another faculty, are also available.

As all Science degrees include practical laboratory and/or fieldwork, students take advantage of the superb local marine life, coastal landscapes, nearby rainforest escarpment and freshwater and terrestrial ecosystems. Collaborations with industry and government researchers provide students with real world experience in manufacturing and in the mining, medical and nuclear industries. As a Science student at UOW, you will learn skills valuable to employers, including logical and critical thinking, creative problem-solving, practical research skills, organisational abilities, numeracy, statistical literacy, and strong communication skills. You will also develop personal qualities, such as the ability to work and think independently, interpersonal and teamwork skills. You will be surprised just where a Science education can take you!

### GRADUATE DESTINATIONS

- Agricultural Adviser/Researcher
- Biochemist
- Biotechnologist
- Cartographer
- Catchment and River Management Officer
- Coastal/Estuarine Management Officer
- Computer Bioinformatician
- Conservationist
- Demographer
- Ecologist
- Eco-tourism Manager/Operator

- Environmental Consultant/Officer
- Exploration/Mining Geologist
- Food Chemist
- Forensic Scientist
- Geochemist
- Geological Surveyor
- Health Service Officer
- Hospital Scientist
- Industrial/Pharmaceutical/Medicinal Chemist
- Laboratory Assistant
- Land Use/Urban Services Planner
- Marine Biologist
- Materials Scientist
- Medical Researcher
- Microbiologist
- Museum Curator
- National Park Ranger
- Oceanographer
- Patent Assessor
- Product Developer
- Rehabilitation Officer
- Re-vegetation Specialist
- Science Teacher
- Technician
- Technical Inspector
- Technical Sales Adviser
- Veterinary Researcher

Full details of courses offered can be found at: [www.uow.edu.au/handbook/current](http://www.uow.edu.au/handbook/current)

**DEGREES AT A GLANCE**

DEGREE	APPROX. UAI	FULL-TIME DURATION	ASSUMED KNOWLEDGE	RECOMMENDED STUDIES/ ADDITIONAL REQUIREMENTS	LOCATION
Bachelor of Science (Biological Sciences)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Biotechnology)	75	3 years	4 units of Science or 4 units comprising Science and Mathematics	4 units of Science (incl. Biology) and Mathematics	Wollongong
Bachelor of Science (Chemistry)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Ecology)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Environment)	75	3 years	Mathematics plus Biology or Chemistry or Geography or Earth & Environmental Science	4 units of Science (incl. Biology) and Mathematics	Wollongong
Bachelor of Science (Geology)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Geosciences)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Human Geography)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Land & Heritage Management)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Medicinal Chemistry)	75	3 years	Chemistry and Mathematics	At least 4 units of Science (incl. Chemistry)	Wollongong
Bachelor of Science (Nanotechnology)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Bachelor of Science (Physical Geography)	75	3 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
Physics	For all Physics degrees please refer to Faculty of Engineering <i>Degrees at a Glance</i> table on page 63.				

**SPECIALIST DEGREES**

Bachelor of Biotechnology	85	4 years	4 units of Science or 4 units comprising Science and Mathematics	4 units of Science (incl. Biology or Chemistry) and Mathematics	Wollongong
Bachelor of Environmental Science	85	4 years	Mathematics plus Biology or Chemistry or Geography or Earth & Environmental Science	4 units of Science (incl. Biology) and Mathematics	Wollongong
Bachelor of Marine Science	85	3 years	4 units of Science (incl. Biology or Chemistry) or 4 units comprising Science & Mathematics	Biology or Chemistry, and Mathematics	Wollongong
Bachelor of Medicinal Chemistry	85	4 years	Chemistry and Mathematics	At least 4 units of Science (incl. Chemistry)	Wollongong
Bachelor of Nanotechnology	85	4 years	Chemistry, Physics and Mathematics	HSC Mathematics Extension 1 plus Chemistry and Physics	Wollongong

**ADVANCED DEGREES**

Bachelor of Biotechnology – Advanced	90	4 years	4 units of Science or 4 units comprising Science and Mathematics	4 units of Science (incl. Biology or Chemistry) and Mathematics	Wollongong
Bachelor of Environmental Science – Advanced	90	4 years	Mathematics plus Biology or Chemistry or Geography or Earth & Environmental Science	4 units of Science (incl. Biology) and Mathematics	Wollongong
Bachelor of Marine Science – Advanced (Honours)	90	4 years	4 units of Science (incl. Biology or Chemistry) or 4 units comprising Science & Mathematics	Biology or Chemistry, and Mathematics	Wollongong
Bachelor of Medicinal Chemistry – Advanced	90	4 years	Chemistry and Mathematics	At least 4 units of Science (incl. Chemistry)	Wollongong
Bachelor of Nanotechnology – Advanced	90	4 years	Chemistry, Physics and Mathematics	HSC Mathematics Extension 1 plus Chemistry and Physics	Wollongong
Bachelor of Science – Advanced (Honours) (in any of the Bachelor of Science majors or programs listed above)	90	3–4 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong
International Bachelor of Science	93	4 years	Mathematics and any 2 units of Science	Mathematics and 4 units of Science	Wollongong

Bridging Courses and a Special Mathematics subject are available for students who do not have the above 'Assumed Knowledge'. Students whose course includes Chemistry and/or Biology but who have not completed these subjects for the HSC are strongly recommended to enrol in bridging courses offered in February each year. Students without at least Mathematics Band 4 (or equivalent) are required to take a special mathematics subject in their first year. Physics, Materials, Medical & Radiation Physics and Photonics degrees are offered by the Faculty of Engineering. Please see the Faculty of Engineering entry on page 64.

NB: UAIs to be used as a guide only and are based on the previous year's demand.

**GRADUATE PROFILE****MATT CROWE**

**Bachelor of Science Advanced – 2004 (Geology)**

**Senior Exploration Geologist**

**BHP Billiton Iron Ore**

I am currently a Senior Exploration Geologist working for BHP Billiton Iron Ore in the Pilbara region of Western Australia. I am responsible for the management of several exploration licenses which involves tasks such as field mapping, logging RC drill samples and diamond drill core, geophysical and drill hole interpretations, project generation and reporting to several government departments. I am also responsible for regional scale project generation and monitoring competitor companies within certain areas of Western Australia.

My studies at UOW gave me a firm base of geological knowledge and practical experience that was easily built upon when I entered the work force. I believe the wide range of topics offered by UOW was more useful than specialising in one field of geology.

The fieldwork components offered by the geology department were a lot of fun and gave me some valuable hands-on geology experience. The lecturers were all very knowledgeable and passionate about geology which made for a very enjoyable learning experience. The skills I learned and the passion for geology I gained from my time at UOW has helped me along a very successful and rewarding career.





## JACQUIE HUNDT BACHELOR OF MEDICINAL CHEMISTRY ADVANCED

**JACQUIE HUNDT**

**Bachelor of Medicinal Chemistry Advanced**

After I graduate, I would love to do research in drug design and medicine. My course specifically prepares you for a career in research. In my Honours year, I'll even get to do a research project with the CSIRO, and my own project on medicinal research. This course is also a basis for further study in pharmacology, which interests me.

I chose UOW for several reasons: it has superior educational facilities; its environment is very inviting and beautiful; it's local; and it was one of the few units to offer the course I wanted to study.

## GRADUATE PROFILE

MATT CROWE

BACHELOR OF SCIENCE ADVANCED - 2004 (GEOLOGY)

SENIOR EXPLORATION GEOLOGIST

BHP BILLITON IRON ORE



KIRI YAPP

BACHELOR OF SCIENCE  
(HUMAN GEOGRAPHY)  
BACHELOR OF ARTS (SPANISH)

KIRI YAPP

Bachelor of Science/Bachelor of Arts  
Human Geography, Spanish

I was attracted by UOW's awards, but ultimately it was a visit to the beautiful campus that sold me. The Uni's commitment to the whole student experience was obvious, and showed me that UOW was far from being a 'degree factory', as I'd heard some unis called.

I love the huge range of classes I can take, and the teachers really know what they're talking about. The opportunity to get involved in the wider community through internships and service projects has provided a good balance.

I would like to work for an NGO or maybe DFAT, something that will allow me to have stints overseas while making a difference in the world. I'm going on exchange to Spain next year, and this will give me experience of living in another country, and just through my classes, I'm building confidence and skills to help me out in the working world.

KIRI YAPP  
BACHELOR OF SCIENCE  
(HUMAN GEOGRAPHY)  
BACHELOR OF ARTS  
(SPANISH)

**BACHELOR OF SCIENCE**

The flexible structure of the Bachelor of Science degree allows students to design their study to meet their own particular interests and abilities.

Students who are interested in taking a Specialist or Advanced degree, but who don't initially meet the requirements, may consider starting in one of the Bachelor of Science programs. Subject to satisfactory performance and the approval of the Associate Dean, students may apply to transfer into their chosen degree at the end of first year.

**SPECIALIST DEGREES**

Specialist degrees provide students with the opportunity to undertake a prescribed program of specialist training and include the Bachelor of Biotechnology, Environmental Science, Marine Science, Medicinal Chemistry or Nanotechnology.

**ADVANCED PROGRAMS**

The Advanced Programs are designed for high-achieving HSC students, and offer direct entry into an Honours degree, unlike normal Science degrees, which delay selection for Honours until the completion of third year. They offer flexibility, enrichment activities throughout the program, and the opportunity to undertake individual research projects in second, third and fourth years. Students are required to fulfil all of the normal degree and Honours requirements, and maintain a high standard of academic performance.

**MAJORS****BIOLOGICAL SCIENCES**

**Bachelor of Science (Biological Sciences)**  
**Bachelor of Science Advanced**

Biology is the study of living things, from organic molecules to cells, individual organisms, populations and whole ecosystems.

Studies in biological sciences offer comprehensive training. Field and laboratory studies are built into appropriate subjects at all levels and take advantage of the superb local marine, freshwater and terrestrial environments; field stations on the south coast and inland regions; and modern laboratory facilities.

First and second year subjects provide a broad training in the biological sciences, and students may choose to specialise in one of the following areas towards the end of their degree: Biochemistry; Cell & Molecular Biology; Immunology; Community and Population Ecology (including Terrestrial & Marine); or Comparative Physiology.

**BIOTECHNOLOGY**

**Bachelor of Biotechnology**  
**Bachelor of Biotechnology Advanced**  
**Bachelor of Science (Biotechnology)**

Biotechnology is the use of living organisms (micro-organisms, plants and animals) to make commercial products or research tools. A new generation of pharmaceuticals, vaccines, hormones and anti-inflammatory agents are being developed using these new technologies, which include genetic engineering, monoclonal antibody technology and proteomics.

Biotechnology degrees cover topics including genetics, physiology, infection, immunity and bioinformatics; and are designed to produce graduates who can examine and understand

the application of cellular and molecular biology to industrial, agricultural, environmental and medical fields. Graduates of the Bachelor of Biotechnology qualify to apply for membership of the Australian Institute of Biology, the Australian Society of Microbiology and the Australian Biotechnology Society.

**CHEMISTRY**

**Bachelor of Science (Chemistry)**  
**Bachelor of Science Advanced**

Chemistry is the science of matter, concerned with the structures, properties and reactions of materials at the molecular level. In its central position between biology and medicine on the one hand, and mathematics, physical sciences and geosciences on the other, it has direct links with most other sciences. Chemical ideas and techniques play a vital role across the sciences and are essential to the health of our modern industrial civilisation.

The first year of the Chemistry degree provides a basic foundation in the fundamentals of chemistry, enabling students to identify those parts of chemistry that particularly interest them. In later years, students become familiar with a wide range of modern and sophisticated chemical instrumentation such as nuclear magnetic resonance, mass spectrometers and other recent advances in each of the major areas of Chemistry: analytical, physical, inorganic, organic, biological, environmental and medicinal chemistry.

This degree is accredited by the Royal Australian Chemical Institute.

**ECOLOGY**

**Bachelor of Science (Ecology)**  
**Bachelor of Science Advanced**

This specialisation focuses on the ecology of marine, freshwater and terrestrial systems in both tropical and temperate environments. In addition to studying a range of scientific techniques including remote sensing, molecular genetics and biodiversity assessment; students will also study landscape change, climatology, and organisms including endangered plants, marsupials, marine and arid land birds, and invertebrates.

**ENVIRONMENT**

**Bachelor of Environmental Science**  
**Bachelor of Environmental Science Advanced**  
**Bachelor of Science (Environment)**

Environmental scientists assess, research and manage resources and a wide range of environmental issues. The Environment major in the Bachelor of Science focuses on biological sciences, chemistry and geosciences and is ideal for students wishing to complete a science based environment degree within three years.

The Bachelor of Environmental Science is a specialist degree designed to give students the knowledge and skills required to manage environmental issues confronting Australia and other countries. It combines a broad-based scientific education with a multidisciplinary approach to problem solving, covering all the principal Sciences (biology, chemistry, geography, geology and physics, together with mathematics and statistics) and material from other relevant disciplines including engineering, management, law, science and technology studies, and philosophy. This

equips students to understand the ethical, social, economic and political aspects of environmental issues, and to be able to work alongside engineers, lawyers and other environmental management professionals. In third and fourth years, students elect to specialise in one of four strands: Life Sciences, Land Resources, Earth Sciences or Environmental Chemistry. All students complete a research project for an external organisation in the fourth year. Graduates are eligible for full membership of the Environment Institute of Australia & New Zealand and other relevant professional bodies depending on their disciplinary orientation.

**GEOLOGY**

**Bachelor of Science (Geology)**  
**Bachelor of Science Advanced**

Geology is the study of the earth, the materials it is made of, the processes that act on these materials, the products formed, and the history of the planet and its life forms.

Areas of specialised study include economic geology (coal, petroleum, uranium), geophysics, palaeontology, sedimentology, structural geology, stratigraphy, tectonics, volcanology and geochemistry.

**GEOSCIENCES**

**Bachelor of Science (Geosciences)**  
**Bachelor of Science Advanced**

This program is designed for students who are interested in both Geography and Geology. It provides greater flexibility for students who wish to take a broad range of subjects in these areas.

**HUMAN GEOGRAPHY**

**Bachelor of Science (Human Geography)**  
**Bachelor of Science Advanced**

Human Geography encompasses the study of both people and their environments. Geographers maintain that place matters in examining debates about population, economic development, environmental management, planning and citizenship. They study conflicts and tensions about access to resources and are able to make important contributions in resolving these conflicts.

Human Geography is an immediately relevant discipline with applications in environmental management, urban planning, population studies and the management of social and economic change.

**LAND AND HERITAGE MANAGEMENT**

**Bachelor of Science (Land and Heritage Management)**  
**Bachelor of Science Advanced**

This specialist program combines Physical and Human Geography subjects (including rural and urban spaces, the environmental impact of societies, and environmental and heritage management) with other relevant subjects to provide the skills and knowledge required for employment or research on both cultural and natural heritage issues.

**MARINE SCIENCE****Bachelor of Marine Science****Bachelor of Marine Science Advanced**

The diverse local coastal environment places UOW in an ideal position to offer this multidisciplinary course. The Bachelor of Marine Science provides a broad emphasis on the Marine Sciences, drawing subjects from the biological, earth and environmental sciences. The program includes a flexible range of elective subjects, and students can choose either a single specialisation in Marine Biology or Marine Geosciences, or a combination of the two. In the later years of the degree, students may pursue interests in a range of specialist marine-related areas, including marine biology, ecology, coastal landscapes and management, fisheries and aquaculture, sea-level change or tsunamis. Marine Science is only available as a three-year specialist degree, and not as a major in the Bachelor of Science.

**MEDICINAL CHEMISTRY****Bachelor of Medicinal Chemistry****Bachelor of Medicinal Chemistry Advanced  
Bachelor of Science (Medicinal Chemistry)**

Medicinal Chemists design and synthesise new medicinal and pharmacological agents, develop new dosage forms, monitor guidelines for testing drugs, undertake analyses, assist with drug regulatory affairs and assess patent applications for new drugs.

The Medicinal Chemistry degree aims to provide students with a strong grounding in chemistry, medicinal chemistry, and the biological sciences, as well as knowledge in anatomy, physiology, drug discovery and design, and pharmacology to help students address fundamental questions at the molecular level. Training is provided in physiology, pharmacology and other areas needed to understand the effects of disease on the body and the role of medicinal intervention.

The degrees in Medicinal Chemistry are accredited by the Royal Australian Chemical Institute and graduates fulfil the membership requirements as part of their degree.

**NANOTECHNOLOGY****Bachelor of Nanotechnology****Bachelor of Nanotechnology Advanced  
Bachelor of Science (Nanotechnology)**

Nanotechnology is a combination of chemistry and materials science that is set to revolutionise Materials Science and Engineering. It is already impacting on our lives in areas such as health and communications. Students studying this major acquire a firm foundation in materials chemistry and engineering which will enable them to find careers in a wide range of industries and research settings. The degrees target the emerging fields of nano-materials, molecular machines and nano-science, and the focus on the use of nano-scale technologies and molecular architecture will give graduates an edge in the market as more industries implement the advances of the nanotechnology revolution.

Specialist subjects expose students to the possibilities that nano-science has to offer from the first year as they work alongside leading researchers and develop their laboratory skills and understanding of this emerging field. Graduates have career opportunities in the application of advanced materials, including the semi-conductor sector, biomedical materials, telecommunications, manufacturing, defence and the aerospace industries. In addition to the materials chemistry focus, elective streams are available in Physics, Mechatronics and Biology, and students may choose options that enable them to be eligible for accreditation with the Royal Australian Chemical Institute. Students also complete a major research project in the final year.

**PHYSICS**

Physics, as one of the fundamental sciences, provides the basis for making, interpreting and extending observations relating to the behaviour and structure of matter. Physics is fundamental to the study of all sciences and has a key role to play in generating and supporting new technologies. All Science and Engineering graduates will at some time in their careers use equipment and techniques or make judgements which require a basic grounding in physics. Topics covered in Physics include solid-state physics, nuclear physics, astronomy and astrophysics, radiation physics, optics, thermodynamics, and a number of advanced mathematics subjects. For information about Physics, please refer to the Faculty of Engineering section on page 64.

**PHYSICAL GEOGRAPHY****Bachelor of Science (Physical Geography)****Bachelor of Science Advanced**

Physical Geography is the study of patterns and processes in the environment caused by the forces of nature. It examines the environmental and ecological problems facing the world, and provides the skills and knowledge to assist in managing them. Skills in computer techniques, spatial analysis, satellite imagery, landscape change, climatology, and the environmental impact of societies mean that graduates are particularly marketable in those areas requiring expertise across several fields or disciplines.

**INTERNATIONAL BACHELOR OF SCIENCE**

The International Bachelor of Science is an internationally unique four-year degree offered in conjunction with the University of Colorado (Boulder) and Dublin City University. The degree offers a strong discipline-based training in the chosen Science major, integrated with a technological application of science and its social context. Students complete a major research project at Honours level and undertake at least one semester of overseas study at either of the partner universities.

Videoconferencing technology is used to link up students at all three universities in several 'Global Classroom' subjects.

**FURTHER STUDY**

- Honours in Major specialisation
- Graduate Diploma in Education
- Master of Science
- Master of Science – Research
- Doctor of Philosophy

**PREPARING FOR SCIENCE**

The Faculty recommends students planning to enrol in a Science degree take at least two units of science and at least two units of mathematics for the HSC. In addition, students enrolling in degrees which recommend the completion of subjects in Biological Sciences, Chemistry, Physics or Mathematics are strongly advised to study these subjects at HSC level even though they may not be specified prerequisites.

**MATHEMATICS REQUIREMENT**

Students entering a Science degree without at least HSC Mathematics Band 4 (or equivalent) are required to complete a mathematics subject (usually MATH151) as part of their degree.

**BRIDGING COURSES**

Bridging courses in Biology, Chemistry and Physics are held prior to the commencement of the University year, during February. Students who do not meet standard entry levels in these subjects are advised to register on enrolment day. These subjects do not count towards the degree requirements. The current cost of these courses is \$75 for Biology, and \$150 each for Chemistry and Physics.

**MENTORING FOR DISADVANTAGED STUDENTS**

The Faculty offers a free program for first-year students in which senior students mentor disadvantaged students to ensure a smooth transition into university studies. For more information on the program, contact the Faculty of Science office.

**CHEMISTRY HELP DESK**

Extra consultation is available to first-year students who require additional support or assistance in chemistry studies. The aim of this program is to bring all students up to the same knowledge level by the end of the first year of study.