

Engineering



The largest wind tunnel in the Southern Hemisphere is used to refine the design of vehicles, buildings and bridges. In a search for efficiency elite cyclist Cadel Evans used the Monash wind tunnel to test equipment ahead of the 2008 Tour de France.

What makes Engineering at Monash special?

- **World-class faculty:** With outstanding facilities, Monash Engineering is a leader in both traditional and emerging fields in engineering.
- **Freedom to choose:** The common first year allows students enrolled in the Bachelor of Engineering the time to settle into university and get a feel for engineering before they choose which discipline to study.
- **Double degrees:** Students can combine their engineering degree with studies in other disciplines including art and design, arts, biomedical science, commerce, law, pharmaceutical science and science, giving them a wide variety of career paths.
- **Enrichment opportunities:** MERIT (Monash Engineering Research and Industry Training) offers students programs to enhance and complement their studies. These include the prestigious Leadership in a Technological Environment program, designed to prepare the engineering leaders of the future, and the Undergraduate Research Opportunities Program (UROP), where students get the chance to be involved in cutting-edge research.
- **Access to scholarships and bursaries:** Students have access to a range of lucrative scholarships and bursaries offered by the faculty and the university.

Research tools

- The largest wind tunnel in the southern hemisphere
- Access to Australia's \$206 million synchrotron
- 80 metre wave tank
- Microscopy and microanalysis equipment worth more than \$8 million
- State-of-the-art computer laboratories, specifically geared towards the needs of the engineer-in-the-making
- A library and resource centre, specially designed for engineering studies
- Specialist laboratories dedicated to structural testing, biomedical research, robotics and communications
- Specialist research centres and laboratories including the MicroNanophysics Research Laboratory, Institute for Sustainable Water Resources and the Intelligent Robotics Research Centre

Professional recognition

- Engineers Australia
- The Australian Computer Society
- The Institute of Chemical Engineers (UK)
- Engineering Accreditation Council of Malaysia (for Malaysian engineering degrees only)

Australia is a signatory to the Washington Accord, which allows engineers trained in Australia to work in other countries that have also signed the agreement. See www.washingtonaccord.org

Contact

For further information, talk to one of our advisers:

Faculty of Engineering

Domestic student enquiries: +61 3 9905 3404

Email: eng.info@eng.monash.edu.au

International student enquiries: +61 3 9627 4852

Email: study@monash.edu.au

Fax: +61 3 9905 3409

www.eng.monash.edu

Make an informed choice – the common first year

Engineers are involved in cutting-edge research, have well-rewarded, challenging careers, and help to build our future. Opportunities are abundant in engineering but how do students choose which discipline to study?

The Bachelor of Engineering includes the common first year that allows students to build the foundations of engineering while getting a taste for the range of engineering disciplines available. In the common first year students learn to:

- apply developing maths and science knowledge to real-life problems
- understand the interaction between engineering and society
- develop a range of common skills for the workplace such as communication and report writing, teamwork, business enterprise, and quality and community consultation.

The common first year gives students time and experience before they have to choose their engineering discipline. It means a change of heart does not have to mean a change of program.



World-class opportunities

With a national and international reputation for excellence, Monash engineering graduates are transforming the world. Monash researchers are at the front line in developing the technologies of the future in:

- nano-structuring and nano-manufacturing
- bioengineering technology
- aerospace technology
- geotechnical engineering
- intelligent robotics
- sustainable transport
- railway engineering
- power electronics
- sustainable water

At the same time Monash continues to work closely with industry on cutting-edge issues utilising existing technologies, such as polymer engineering, clean energy technologies, cast metals and manufacturing.



Student profile

Alison Slater

Bachelor of Biomedical Science and a Bachelor of Engineering (Chemical).

Alison is studying one of the many double degree combinations on offer at Monash.

Alison says that the opportunities at Monash are fantastic.

"Being accepted for a really interesting research project has been a highlight for me. It involves studying enzymes which could eventually be applied to the healing of spinal injuries – it's challenging and so exciting!"

Getting involved and making a difference is important to Alison.

"I am currently the president of Engineers Without Borders at Monash. We do all sorts of community activities including assisting in the production of a biodiesel plant on campus, helping to fix computers to give to underprivileged students and sending engineering textbooks to students in Afghanistan."

Index

Bachelor of Engineering page 70

Bachelor of Aerospace Engineering page 73

Bachelor of Environmental Engineering page 74

Bachelor of Engineering

Engineers are leaders in innovation and research who have the power to change the world around them.

Their work is evident everywhere – in health, built and natural environments, foods, medicine and aerospace – in everything from smart buildings to videophones, from the internet to digital television.

Course Outline

Monash offers a common first year in the Bachelor of Engineering, giving students the time to experience a range of engineering disciplines before choosing a specialisation.

Level 1 – Common first year

Core units

Computing for engineers – Mathematics for engineering

Select at least four units of:

Process systems analysis – Engineering structures – Electrical systems – Engineering dynamics – Engineering materials

Foundation Units

Students who have not completed VCE units 3 and 4 of Chemistry or Physics and/or Specialist Mathematics are required to select one or two appropriate foundation units from:

Foundation chemistry – Foundation physics – Foundation mathematics

Elective Units

Students select none, one or two units from the following to make up 48 credit points (8 units):
Engineering profession – Chemistry for engineering – Physics for engineering – Biological engineering I

At the end of the first year students choose from one of the following engineering disciplines:

Chemical engineering* – Civil engineering* – Electrical and computer systems engineering – Materials engineering* – Mechanical engineering – Mechatronics engineering+

*Not available at Sunway campus (Malaysia).

+Available at Sunway campus (Malaysia) only. The Bachelor of Mechatronics Engineering is available as a separate entry degree at Clayton campus. See page 75.

Career Outlook

Engineering is among the highest paid graduate sectors. Refer to entries for individual engineering disciplines for further details on career prospects.

Course Details

Four years full-time, eight years part-time
Clayton and Sunway (Malaysia) campuses

2009 clearly-in ENTER: Clayton 91.15

Sunway 85.00

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6496

2009 Tuition fee (Sunway): RM 36,080

2009 IB score: Clayton 33

Sunway 28

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Engineering – Chemical Engineering

Many everyday things we take for granted, such as toothpaste, mobile phones, paint, plastic, petrol, paper, instant coffee and clean power involve chemical engineering at some stage of their manufacture.

Based in chemistry, physics and mathematics, chemical engineering involves the economic and safe design, operation and management of chemical and physical processes that convert, with minimal environmental impact, raw materials into useful and valuable products.

The Bachelor of Engineering in the field of chemical engineering can be combined with arts, biomedical science, commerce, law, pharmaceutical science or science to form a double degree.

Course Outline

Level One

Students study the common Bachelor of Engineering first year

Level Two

Fluid mechanics – Material and energy balances – Heat and mass transfer – Thermodynamics – Bio-nano engineering – Chemistry: Principles and practice – Advanced engineering mathematics

Level Three

Chemistry and chemical thermodynamics – Process control – Sustainable processing – Reaction engineering – Separation processes – Process design – Minor in biotechnology, nanotechnology or sustainable processing

Level Four

Engineers in society – Particle technology – Transport phenomena and numerical methods – Minor in biotechnology, nanotechnology or sustainable processing. Students also complete a substantial design project and a substantial chemical engineering project

Each year, a small number of students may be selected to spend the first six months of their final year working in industry as part of the Integrated Industrial Training unit.

Career Outlook

Graduates can work across a range of fields from classical fields such as the petrochemical and mining industry to biomanufacturing, biotechnology and the development of “smart” products. Chemical engineers are also working toward the development of environmentally clean technologies for product manufacturing and power generation.

Course Details

See main reference for Bachelor of Engineering

Bachelor of Engineering – Civil Engineering

Civil engineers design, build, maintain, manage and operate infrastructure for the benefit of society. Various types of infrastructure within the civil engineering discipline include highways and railways, buildings and structures, foundations, tunnels, airports, road systems, harbour facilities space stations, power generation facilities and water and wastewater treatment plants and distribution systems.

The Bachelor of Engineering in the field of civil engineering can be combined with arts, biomedical science, commerce, law or science to form a double degree.

Course Outline

Level One

Students study the common Bachelor of Engineering first year

Level Two

Mechanics of solids – Computing and water systems – Design of steel and timber structures – Design of concrete and masonry structures – Introductory geoengineering – Water systems – Transport and traffic engineering – Advanced engineering mathematics

Level Three

Engineering investigation – Project management for civil engineers – Building structures and technology – Bridge design and assessment – Geoengineering – Groundwater and environmental geoengineering – Urban water and wastewater systems – Road engineering

Level Four

Civil engineering practice, a thesis project and a number of elective subjects specialising in one or more civil engineering disciplines

Career Outlook

Local and international opportunities are found in private industry, government, construction and mining, marine and resort developments, property/land developments and consulting firms. Students might even start their own company.

Course Details

See main reference for Bachelor of Engineering

Bachelor of Engineering – Electrical and Computer Systems Engineering

Electrical and computer systems engineers investigate, plan, design, develop, construct, test and maintain a wide range of products and systems, from broadcasting and telecommunications to blood analysers and from power generation to robotics.

This branch of engineering is extremely diverse, taking in electronics, computer systems, telecommunications, bioengineering, control, robotics and electrical power engineering.

The Bachelor of Engineering in the field of electrical and computer systems engineering can be combined with arts, biomedical science, commerce, law or science to form a double degree.

Course Outline

Level One

Students study the common Bachelor of Engineering first year

Level Two

Signal processing – Electromagnetism – Telecommunications – Analogue electronics – Circuits and control – Computer organisation and programming – Digital systems – Advanced engineering mathematics

Level Three

Wireless and guided EM or electrical power engineering – Electronic systems and control or Computer systems – Engineering design – Systems engineering and reliability analysis – Optimisation estimation and numerical methods – Three electives

Level Four

Wireless and guided EM or Electrical power engineering – Electronic systems and control or Computer systems – Professional practice

Students also complete a thesis project and three electives

Career Outlook

Graduates work locally and overseas in power generation, industrial and power electronics, automation systems, computer programming, robotics, health care, water and energy industries.

Course Details

See main reference for Bachelor of Engineering

Bachelor of Engineering – Materials Engineering

Materials engineers control and change the properties or behaviour (or both) of materials to make them more useful.

They make a unique contribution to the design of a new device, product or component, and make existing ones work better, whether it's thermal protection on a space shuttle, high-tech artificial hip implants, titanium golf clubs or battery systems for electric cars, artificial hearts or laptop computers.

The Bachelor of Engineering in the field of materials engineering can be combined with arts, biomedical science, commerce, law or science to form a double degree.

Course Outline

Level One

Students study the common Bachelor of Engineering first year

Level Two

Advanced engineering mathematics – Nanostructure of materials – Microstructural development – Functional materials – Polymers and ceramics – Structure-property relationships in materials – Biomaterials

Level Three

Materials durability – Microstructural design in structural materials – Microstructure to applications: the mechanics of materials – Management and practice in materials engineering – Functional materials and devices – Polymers and ceramics – Materials characterisation and modelling

Level Four

Materials engineering design and practice – Polymer and composite processing and engineering – Processing and engineering of metals and ceramics

Students also undertake a thesis project

Career Outlook

The expertise of materials engineers is required in many fields including the development of new biomaterials for clinical application, producing improved lightweight metal alloys for the automotive industry, optimising polymer processing to produce superior articles, and developing materials such as fuel cells for energy storage.

Course Details

See main reference for Bachelor of Engineering

Bachelor of Engineering – Mechanical Engineering

Mechanical engineers play a pivotal role in solving some of the most challenging problems currently facing the globe. This is achieved by employing multi-disciplinary skills to design and develop unique solutions to complex problems.

The discipline covers the generation, conversion, transmission and use of mechanical and thermal energy, and includes the design, construction and operation of devices and systems. It also involves studying the behaviour of solids, liquids and gases when forces are applied and when heated and cooled.

This degree equips students with the skills to pursue careers in fields as diverse as mining, renewable energy generation, oil and gas exploration, construction, nano and micro-scale technology, and automotive design, among many others.

The Bachelor of Engineering in the field of mechanical engineering can be combined with arts, biomedical science, commerce, industrial design, law or science to form a double degree.

Course Outline

Level One

Students study the common Bachelor of Engineering first year

Level Two

Advanced engineering mathematics – Dynamics – Engineering design – Mechanics of materials – Fluid mechanics – Thermodynamics – Electromechanics

Level Three

Fluid mechanics – Design – Dynamics – Thermodynamics and heat transfer – Solid mechanics – Engineering computational analysis – Systems and control – Experimental project

Level Four

Professional practice

Students also complete a full year independent project in their area of interest

A choice of one Commerce and four engineering electives is also available at level four.

Career Outlook

Graduates work in the petrochemical, manufacturing, transportation, automotive, aerospace, electronic, mining and robotics industries. They are also in high demand in growth sectors such as banking, communications, public utilities, consulting practices and even the entertainment industry.

Course Details

See main reference for Bachelor of Engineering

Bachelor of Engineering/ Bachelor of Arts

As the modern world becomes more complex and traditional career paths change direction, an engineering and arts double degree offers diversity, additional job options and flexibility. Communication skills acquired in an arts degree complement the vocational skills gained in engineering.

Course Outline

Students complete a modified Bachelor of Engineering common first year and two level 1 arts units.

At the end of first level students choose an engineering discipline from Civil, Chemical, Electrical and Computer Systems, Materials or Mechanical engineering.

See individual entries for details on the engineering specialisations.

For a full list of areas of study within the Bachelor of Arts see page 41.

Career Outlook

As students complete two degrees, they have options in both fields on graduation. By combining engineering and arts students gain complementary skills in technology and communications.

Course Details

Five years full-time, ten years part-time
Clayton campus

2009 clearly-in ENTER: 94.00

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6250

2009 IB score: 35

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Engineering/ Bachelor of Design (Industrial Design)

This double degree integrates creative skills in mechanical engineering (inventiveness and project management) and industrial design (aesthetics, manufacturing technologies and graphics), with a focus on hi-tech consumer product design. The combination of these disciplines creates a professional who is often called a product design engineer.

Course Outline

Students undertake the mechanical engineering component on Clayton campus and the industrial design component is taught at Caulfield campus.

Level One

Design studio – Drawing – Engineering structures – Electrical systems – Engineering dynamics – Computing for engineers – Mathematics for engineering – Occupational health and safety

Level Two

Advanced engineering mathematics – Industrial design studio – Model making and workshop practice – Product drawing – Dynamics – Engineering design – Mechanics of materials

Level Three

Digital processes for art and design – Industrial design studio – Ergonomics – Fluid mechanics – Thermodynamics – Electromechanics – Introduction to design history and theory

Level Four

Industrial design studio – Fluid mechanics – Dynamics – Solid mechanics – Systems and control – Critical issues in design

Level Five

Industrial design studio – Materials and manufacturing – Full year project – Electives

Career Outlook

Opportunities are found in vehicle design, production engineering, packaging design and ergonomics, display design and consumer product design in industries as diverse as the petrochemical, transportation, automotive, aerospace, robotics, communications and entertainment industries.

Course Details

Five years full-time, ten years part-time
Clayton and Caulfield campuses

2009 clearly-in ENTER: Range of criteria

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6023

2009 IB score: Range of criteria

IB prerequisites: English, Mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Engineering/ Bachelor of Pharmaceutical Science

This double degree leads to a range of exciting careers in the development and manufacture of sophisticated pharmaceutical products, such as improved drugs and vaccines targeting chronic diseases like avian flu, malaria, HIV, diabetes, glaucoma and asthma.

Changes in the pharmaceutical industry have produced a demand for pharmaceutical scientists with the industrial expertise to take new products from the design and formulation stage right through to manufacturing.

Course Outline

Level One – Parkville

Students study a common Bachelor of Pharmaceutical Science first level program

Level Two – Clayton

Material and energy balances – Heat and mass transfer – Process systems analysis – Engineering thermodynamics I – Materials chemistry: biomaterials, macromolecules and smart materials – Engineering computing – Mathematics for engineering – Advanced engineering mathematics A

Level Three – Parkville

Pharmaceutical biochemistry – Analytical methods – Pharmacology – Formulation chemistry I and II – Molecular cell biology – Product development I – Biopharmaceutics

Level Four – Clayton

Fluid mechanics – Chemistry and chemical thermodynamics – Process control – Sustainable processing case studies – Reaction engineering – Separation processes – Process design – Bioprocess technology

Level Five – Clayton

Engineers in society – Particle technology – Biochemical engineering – Transport phenomena and numerical methods.

Students also complete a substantial design project and a substantial chemical engineering project.

Career Outlook

This program produces highly skilled graduates who can work across the spectrum of the pharmaceutical product design and development process.

Course Details

Five years full-time, ten years part-time
Clayton and Parkville campuses

2009 clearly-in ENTER: 92.20

VCE prerequisites: Units 3 and 4 – a study score of at least 35 in English (ESL) or 30 in any other English, and a study score of at least 30 in each of mathematical methods (either), chemistry and one of biology, physics or specialist mathematics.

2009 CSP fee: \$4558

2009 IB score: 34

IB prerequisites: Standard Level: Minimum mark of 5 in English, chemistry, mathematics and one of biology, physics or further mathematics.

Higher Level: Minimum mark of 4 in English, chemistry, mathematics and one of biology, physics or further mathematics.

Bachelor of Science/Bachelor of Engineering

The first double degree offered by Monash and still one of the most popular.

Engineering is concerned with the application of science, but professional engineers remain fascinated by scientific investigation and endeavour and are eager to heighten their knowledge of the pure sciences.

Course Outline

Students choose to study Civil, Chemical, Electrical and Computer Systems, Materials or Mechanical engineering for the engineering component of their degree. Depending on the engineering stream, students in the double degree must complete two major sequences in different science disciplines, or a double major and a minor sequence in a different science discipline, or a major and three minor sequences.

See individual entries for details on the engineering specialisations.

For information on the areas of study within the Bachelor of Science see page 114.

Career Outlook

The breadth and depth of knowledge gained during an engineering and science double degree leaves graduates with an almost unlimited choice of career paths and fields of further study or research.

Graduates are in demand in a range of engineering and scientific fields and in non-scientific industries including medicine and health, banking and finance, environmental consulting, construction and mining, and more.

Course Details

Five years full-time, ten years part-time
Clayton campus

2009 clearly-in ENTER: 93.35

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5092

2009 IB score: 35

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Aerospace Engineering

The Bachelor of Aerospace Engineering equips students with the skills to analyse, design and construct flight vehicles. It encompasses the science and technology of vehicles operating within the Earth's atmosphere or in space. Optional flight training is available through an agreement with the Australian College of Aviation, Moorabbin Airport. (Please note that flight training is not part of the degree program.)

This course can be combined with arts, commerce, law or science to form a double degree.

Course Outline

Level One

Engineering structures – Electrical systems – Engineering dynamics – Computing for engineers – Mathematics for engineering – Aerospace engineering

Level Two

Advanced engineering mathematics – Engineering materials – Materials durability – Aircraft structures – Thermodynamics and heat transfer – Dynamics – Engineering design – Fluid mechanics

Level Three

Aerodynamics – Aerospace design project – Aerospace computational mechanics – Flight vehicle dynamics – Flight vehicle propulsion – Aerospace materials – Aircraft structures – Aerospace control

Level Four

Aerospace practices – Instrumentation and avionics – Damage tolerance and airworthiness

Students must also undertake a full year aerospace project.

A choice of one commerce and two aerospace electives is also available at level four.

Career Outlook

Opportunities are found throughout the traditional aerospace and defence industries and in a wide range of related industries such as automotive engineering and manufacturing, where leading-edge aerospace technologies are increasingly being used. Graduates are also sought after by other professions, including management consulting and finance.

Course Details

Four years full-time, eight years part-time
Clayton campus

2009 clearly-in ENTER: 94.20

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6489

2009 IB score: 35

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.



Student profile

Aaron Chong

Bachelor of Engineering (Materials) and Bachelor of Commerce

"Materials engineering takes the best of chemistry, physics and mathematics and applies them to engineering in a truly cross-disciplinary branch. It is at the forefront of many new and exciting developments that are relevant to the world today. The course material is dynamic and includes some of the latest advancements in the field."

The highlight of my course so far has been receiving a traineeship through BlueScope Steel. It gives me the opportunity to apply my learning in a vocational context.

After graduating I hope to either find a graduate position in a large engineering or professional services company or continue my studies in engineering. I would also love to work overseas one day."

Bachelor of Civil and Environmental Engineering

This course is designed for those with an interest in both civil engineering and sustainable development. Civil and environmental engineers are involved in planning, designing, building and operating road systems, water supply and wastewater treatment facilities, buildings and recreational facilities in sensitive areas, landfill sites and the restoration of mines.

Students in the program develop skills in computer modelling, site assessments, and laboratory work by investigating real-world problems. They also benefit from strong links with local industries.

This course can be combined with business and commerce to form a double degree.

Course Outline

Level One

Introduction to structural engineering – Introduction to engineering systems – Environmental science and the dynamic environment – Environmental science and resource management issues – Mathematics – Chemistry – Physics

Level Two

Chemistry of the environment – Steel structures – Concrete structures – Water systems – Introduction to geoenvironmental engineering – Waterway engineering – Environmental modelling – Engineering math analysis

Level Three

Project management for engineers – Geoenvironmental engineering – Environmental geoenvironmental engineering – Water and wastewater – Traffic and transport – Global resources and energy management – Environmental management – Geographic information systems (GIS)

Level Four

Civil and environmental engineering practice – Management of water resources – Road engineering – Waste management and remediation
Students also undertake two industry-based thesis projects in a chosen area of interest.

Career Outline

Demand is increasing for engineering graduates with expertise in creating environmentally sensitive infrastructure and systems. Graduates will be well placed for careers with consulting and contracting firms, in various levels of government and in the research and education sectors.

Course Details

Four years full-time, eight years part-time

Gippsland campus

2009 clearly-in ENTER: 74.80

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5914

2009 IB score: 26

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Computer Systems Engineering

Thanks to computer systems engineers we have mobile phones, video games, high-definition TV, virtual-reality systems, smart domestic appliances, the Internet and high performance computers.

This course offers comprehensive training that spans all aspects of computers, from hardware design to software systems. Students analyse, design, develop and manufacture digital products and systems that include both hardware and software.

Course Outline

Level One

Digital systems – Electrical systems – Computing for engineers – Mathematics for engineering – Computer programming – Computer science – Numbers, logic and graphs – Approved elective

Level Two

Signal processing – Electromagnetism – Telecommunications – Analogue electronics – Circuits and control – Computer systems – Advanced engineering mathematics – Approved elective

Level Three

Wireless and guided EM – Electronic systems and control – Engineering design – System engineering and reliability analysis – Advanced computer architecture – One approved and two Bachelor of Computer Systems Engineering electives

Level Four

Embedded and real-time systems – Professional practice – One approved and two Bachelor of Computer Systems Engineering electives. Students also undertake a thesis project.

Students are encouraged, where appropriate, to use approved electives to take international studies, including human languages, and studies through the evolving collaborations with other universities overseas.

Career Outlook

Graduates of the Bachelor of Computer Systems Engineering are well qualified to design and develop modern systems that contain embedded computing, from mobile phones and engine management systems to heart pace-makers and industrial robots.

Course Details

Four years full-time, eight years part-time

Clayton campus

2009 clearly-in ENTER: Consult faculty for further information

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in each of physics, mathematical methods (either) and specialist mathematics.

2009 CSP fee: \$7412

2009 IB score: Consult faculty for further information

IB prerequisites: English, physics and one of mathematics (SL or HL) or further mathematics at a minimum of grade 4 at standard level.

Bachelor of Environmental Engineering

Environmental engineers play a crucial role in solving the environmental problems of the present and seeking to implement sustainable practices for the future. Few other branches of engineering have such a profound impact on our health and quality of life.

Environmental engineering is all about reducing energy and resource use and minimising waste, while at the same time providing communities with development opportunities. This is the heart of sustainability.

Course Outline

Level One

Biodiversity and bioresources – Environmental engineering – Process systems analysis – Engineering structures – Computing for engineers – Mathematics for engineering

Level Two

Conservation biology – Material and energy balances – Thermodynamics – Water systems – Transport and traffic engineering – Materials properties and recycling – Advanced engineering mathematics – Environmental policy and management

Level Three

Groundwater and environmental geoenvironmental engineering – Urban water and wastewater systems – Energy and the environment – The air environment – Environmental impact assessment and management systems

Level Four

Environmental risk assessment – Sustainability and the law – Economics

Students also study units from one of the following streams: Environmental process engineering, Transport and the built environment or Water and land management.

Career Outlook

Environmental engineers' skills and sustainability knowledge are keenly sought by public authorities, research groups and commercial organisations, by a variety of engineering consultants, and by industries involved in building and construction, water, energy, mining and minerals, manufacturing and processing.

Course Details

Four years full-time, eight years part-time

Clayton campus

2009 clearly-in ENTER: 92.70

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5833

2009 IB score: 34

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Mechatronics Engineering

Mechatronics is at the cutting edge of the development of new products and devices. Every day people come in contact with the work of mechatronics engineers: CD and DVD players, cars, microwave ovens, dishwashers, special clothes and washing machines.

The Bachelor of Mechatronics Engineering at Monash covers mechanical engineering, computing, electronics, knowledge of management and manufacturing processes and how these elements can be successfully combined.

This course can be combined with arts, commerce or science to form a double degree.

Course Outline

Level One

Engineering structures – Electrical systems – Engineering dynamics – Engineering materials – Computing for engineers – Mathematics for engineering

Level Two

Mechatronics project I – Mechatronic design – Thermo-fluids and power systems – Mechanics – Digital electronics – Computer programming – Electronics

Level Three

Functional materials – Mechatronics project II – Dynamical systems – Microprocessor systems – Sensors and artificial perception – Power electronics and drives – Modelling and control – Mechatronics and manufacturing

Level Four

Mechatronics final year project – Professional practice – Robotics – Digital communications
A choice of three electives from a prescribed list of units, (of which one unit can be taken as an inter-faculty elective) is also available at level four.

Career Outlook

The applications for mechatronics engineering are virtually unlimited. The need for professionals in this rapidly growing discipline is increasing and graduates are in high demand, particularly in South-East Asia.

Research and development opportunities exist in nanotechnology, robotics, bioengineering and other related industries.

Course Details

Four years full-time, eight years part-time

Clayton campus

2009 clearly-in ENTER: 91.30

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6446

2009 IB score: 33

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Aerospace Engineering/ Bachelor of Arts

Combining technical studies in aerospace engineering with the broad and flexible options of an arts degree, this double degree course offers students a near endless range of options.

Students choose from more than 50 areas of study, available under the Bachelor of Arts degree program, to tailor their degree to a number of career options. For example, taking an arts major in languages would aid an international career, while studying communications would complement the expert skills gained in aerospace engineering.

Course Outline

In the first level of study, students take compulsory engineering units and a first level sequence in an arts discipline.

See the individual entry for Aerospace Engineering for details on the engineering component of the degree.

For a full list of areas of study within the Bachelor of Arts see page 41.

Career Outlook

Completing a double degree allows students to develop a broad range of skills and gives them greater flexibility in their career choices. Graduates are sought after in the traditional aerospace and defence industries, but are also well suited to work in a wide range of related industries such as automotive engineering and manufacturing, where leading aerospace technologies are increasingly being used.

Alternatively graduates can use their Arts degree to pursue careers in areas including management, advocacy, politics, marketing and public relations.

Course Details

Five years full-time, ten years part-time

Clayton campus

2009 clearly-in ENTER: Consult faculty for further information

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$6291

2009 IB score: Consult faculty for further information

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.



Student profile

Shanika Ekanayake

Bachelor of Engineering (Civil) and Bachelor of Laws

A highlight for Shanika during her studies has been the Leadership in a Technological Environment Program.

"The program provides a unique experience and teaches life skills that can be applied in both a professional and personal context. The links with industry and the networking opportunities are invaluable.

I really enjoy being able to analyse problems and come up with solutions for real life situations – it's challenging and rewarding and one of the reasons I chose to study engineering.

The engineering computer laboratories are one of the excellent facilities available. Having 24 hour access to the computers and the specialist engineering programs on them has been extremely helpful."

Bachelor of Aerospace Engineering/ Bachelor of Science

Students combine their interest in the dynamic field of aircraft, spacecraft and flight with a thorough grounding in the major disciplines of science.

The science degree covers the areas of earth, life, physical and mathematical sciences, key contributors to new knowledge and opportunities in all engineering fields.

As with all Monash engineering double degrees this course offers diversity, additional job options and flexibility.

Course Outline

In addition to the core units of the Bachelor of Aerospace Engineering, students complete studies in two fields of science usually taken as two major sequences or a double major and a minor sequence.

See the individual entry for Aerospace Engineering for details on the engineering component of the degree.

For information on the areas of study within the Bachelor of Science see page 114.

Career Outlook

Both degrees offer students highly desirable skills and the combination opens up many career areas. Students can work in scientific and non-scientific fields including health science, environmental consulting, wine and food industries and research, or tailor their double degree toward specific careers within the aerospace, defence and mechanical engineering sectors.

Course Details

Five years full-time, ten years part-time
Clayton campus

2009 clearly-in ENTER: 96.30

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5001

2009 IB score: 37

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Mechatronics Engineering/ Bachelor of Arts

More and more employers are seeking engineering graduates who have expertise in related disciplines such as finance, management, sustainable development and professional ethics.

This course offers students the opportunity to combine expert studies in mechatronics engineering with the broad and flexible options of an arts degree. Communication skills acquired in an arts degree complement the vocational skills gained in engineering.

Course Outline

In the first level of study, students take level 1 engineering units worth 36 points and a 12 point first level sequence in an arts discipline.

See the individual entry for Mechatronics Engineering for details on the engineering component of the degree.

For a full list of areas of study within the Bachelor of Arts see page 41.

Career Outlook

Graduates are highly sought after because of the breadth of knowledge they also bring from their arts degree.

Skills with microcontrollers, programmable logic controllers, industrial sensors, hydraulic, pneumatic and electric drives make mechatronics engineers highly sought after in the design of intelligent products.

Course Details

Five years full-time, ten years part-time
Clayton campus

2009 clearly-in ENTER: Consult faculty for further information

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5953

2009 IB score: Consult faculty for further information

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Mechatronics Engineering/ Bachelor of Science

Mechatronics engineers are highly skilled professionals, involved in the design, construction and running of factory production lines and processes.

This double degree allows students to complement their engineering qualifications with major studies in astrophysics, mathematics, physics or computer science.

Course Outline

Students in the double degree must complete either two major sequences in different science disciplines or a double major and a minor sequence in a different science discipline.

See the individual entry for Mechatronics Engineering for details on the engineering component of the degree.

For information on the areas of study within the Bachelor of Science see page 114.

Career Outlook

Combining mechatronics engineering with science prepares graduates for work in the development of new devices, processes and products, and upgrading the performance of older technologies.

Course Details

Five years full-time, ten years part-time
Clayton campus

2009 clearly-in ENTER: Consult faculty for further information

VCE prerequisites: Units 3 and 4 – a study score of at least 30 in English (ESL) or 25 in any other English, and a study score of at least 20 in mathematical methods (either) and in one of chemistry or physics.

2009 CSP fee: \$5419

2009 IB score: Consult faculty for further information

IB prerequisites: English, mathematics (SL or HL) or further mathematics and one of chemistry or physics at a minimum of grade 4 at standard level.

Bachelor of Technology (Infrastructure – Design, Construction and Management)

Infrastructure technologists build, manage and design the detailed facilities that serve society and business, such as bridges, schools, airports, railways, freeways, dams, housing developments and manufacturing plants.

This course offers a flexible path to university study. Students complete level 1 of the Diploma of Building and Construction (Building) at Holmesglen Institute of TAFE or equivalent for entry into level 2 of the degree program at Monash University.

Course Outline

The first level of the course is completed at an approved TAFE institute. Students are awarded 48 points of credit towards level 1 of the bachelor degree on the successful completion of all units taken at the approved TAFE institute. Students intending to continue the study at Monash after finishing level 1 must satisfy a predetermined level of performance and are subject to a quota for entry.

Level Two

Mechanics of solids – Computing and water systems – Design of steel and timber structures – Design of concrete and masonry structures – Introductory geoengineering – Water systems – Transport and traffic engineering – Mathematics

Level Three

Civil engineering construction – Project management for civil engineers – Building structures and technology – Road engineering – Environmental impact assessment and management systems

Career Outlook

Graduates work in construction, asset management, quantity surveying, energy audits, structural-building design, pollution assessment and control, sustainable development impact studies and risk assessment.

Course Details

Three and a half years full-time, six years part-time
Clayton campus

2009 clearly-in ENTER: Consult faculty for further information

VCE prerequisites: Units 1 and 2 – General mathematics or equivalent, and the successful completion of an Australian Year 12.

2009 CSP fee: \$7195

2009 IB score: Consult faculty for further information

IB prerequisites: English and mathematics (any) at a minimum of grade four at standard level.

Other courses to consider

Bachelor of Biomedical Science/
Bachelor of Engineering – p101

Bachelor of Commerce/
Bachelor of Engineering – p52

Bachelor of Engineering/
Bachelor of Laws – p90

Bachelor of Aerospace Engineering/
Bachelor of Laws – p90

Bachelor of Civil and Environmental
Engineering/ Bachelor of Business
and Commerce – p55

Bachelor of Commerce/Bachelor
of Aerospace Engineering – p50

Bachelor of Commerce/Bachelor
of Mechatronics Engineering – p52