

ENGINEERING

ANU College of
Engineering &
Computer Science



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ANU FAST FACTS

89%

89% of ANU research is rated 'above world standard' or 'well above world standard' by the Australian Government

number 1

ANU has been ranked number one in Australia for producing the 'most employable graduates' (Global Employability University Survey 2013)

18,700

ANU has 18,700 students (2013)

4,842

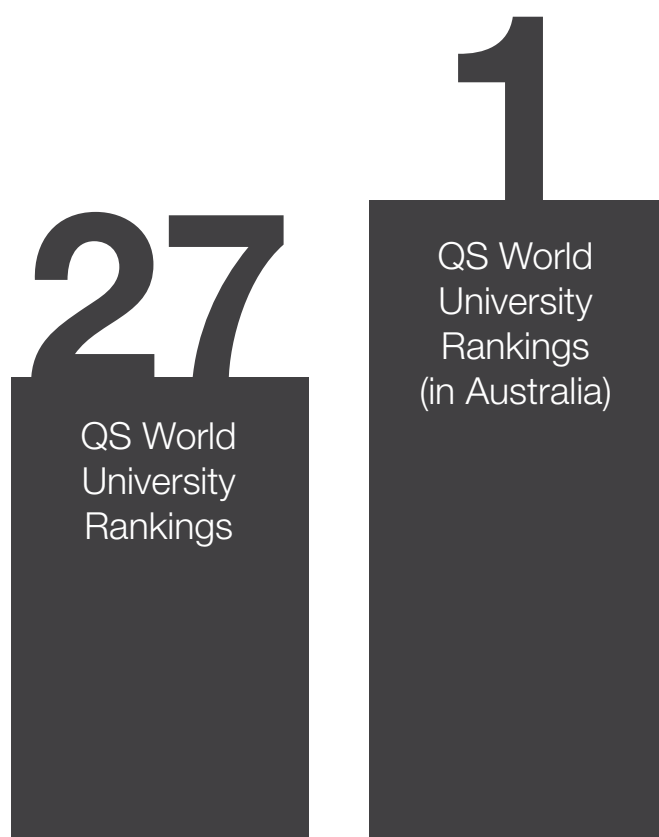
4,842 students lived on campus (2013)

25%

International students make up 25% of the student population (2013)

six

ANU has produced six Nobel Prize winners



ABOUT ANU

The Australian National University (ANU) has a rich history of discovery and a culture of enquiry that offers students an exceptional and unrivalled learning environment.

Established by the Federal government in 1946 to lead the intellectual development of Australia through research and education of the highest international standards, ANU has evolved into one of the world's leading centres of research and scholarship.

As Australia's national university, ANU sets the standard in research, teaching and community engagement on issues of national and international significance. Our students learn and study alongside distinguished academics – individual thinkers who are at the forefront of their respective fields and who lead and shape debate at the global level, making vital breakthroughs and extending knowledge in new and profound directions.

A national asset, ANU has strong relationships with important decision makers and remains a significant contributor to the advancement of Australia and its role in the world. ANU is closely aligned with other Australian national institutions, research organisations, foreign ministries, government offices and Parliament.

The University stands alongside other world-leading research and educational institutions as a member of the International Alliance of Research Universities – a partnership based on a shared global vision, research-led teaching and a commitment to educating future leaders.

The main ANU campus is located on 145 hectares of beautifully-maintained parkland in the centre of the nation's capital, Canberra. Facilities include a range of on-campus accommodation residences, modern laboratories and lecture theatres, two million volumes on the shelves of five main libraries and access to a wealth of e-resources. The landscaped campus offers all the convenience of a small town, including medical services, a gym, cafés, restaurants, art galleries, sporting fields and bookshops.

With its legacy of intellectual leadership, position of national prominence and global reach, ANU provides a memorable, rewarding and valuable experience for each and every student.

ANU facts & figures

ANU is consistently ranked amongst the best universities in Australia and the world¹.

- > ANU has earned a distinguished reputation for excellence in research and teaching, including six Nobel Prize winners and more Royal Society members (world's oldest scientific academy) and Federation Fellows (fellowships awarded by the Australian Research Council) than any other Australian university.
- > The University is made up of seven Colleges, employing over 1,600 academic staff, of whom 83 per cent hold a PhD. The vibrant campus community includes 10,000 undergraduate students and 6,600 graduate students. Just over 25 per cent are international students, from more than 100 countries, and 5,100 students live on-campus in a range of accommodation styles.
- > The 75,000-strong ANU alumni network includes former Prime Ministers Kevin Rudd and Bob Hawke.

The International Alliance of Research Universities

The International Alliance of Research Universities (IARU) is a collaboration of ten of the world's leading research-intensive universities that share a similar vision and have a commitment to educating future leaders. Member universities are:

- > The Australian National University
- > ETH Zurich
- > National University of Singapore
- > Peking University
- > University of California, Berkeley
- > University of Cambridge
- > University of Copenhagen
- > University of Oxford
- > The University of Tokyo
- > Yale University.

¹Ranked first in Australia and 27th in the world 2013 QS Top World 200 Ranking Times; ranked 66th in the world 2013 Jiao Tong Academic Ranking of World Universities; ranked 48th in the world 2014 Times Higher Education Supplement World University Rankings.

ANU COLLEGE OF ENGINEERING & COMPUTER SCIENCE

Dedication to Research & Education

The ANU College of Engineering and Computer Science contributes to the tradition of excellence in research and research-led education at The Australian National University.

It is recognised as a leader in the areas of algorithms and data, applied signal processing, artificial intelligence, computer vision and robotics, logic and computation materials and manufacturing, software intensive systems engineering, sustainable energy and systems and control.

The College comprises the:

- > **Research School of Engineering**
- > **Research School of Computer Science.**

It conducts research and teaching that aims to deliver solutions to some of the most pressing technological and environmental challenges that the world faces.

The College recruits and nurtures students and academics that will lead the way in finding solutions to these challenges, some of which haven't been thought of yet.

This highly regarded College is committed to improving the world we live in by advancing and transferring knowledge through research and teaching; providing students with the best educational and research training experience to ensure they are equipped with a broad knowledge and understanding of other disciplines, communication and leadership skills; and raising community awareness of the important role of engineers and computer scientists in driving critical thinking that helps to form public policy and decision-making.

The academic staff members within the College are of a world class standard undertaking high quality research, research student training and teaching in coursework programs. With relatively small classes led by world renowned experts, students in this College benefit from being part of a dynamic and intellectual research environment.

The College has an extensive network of international collaboration with research institutions and industries in Europe, the Asia Pacific and the USA, as well as locally.



Examples include partnerships with research institutions in China; with companies in Germany on researching and developing new solar cell technologies; with US companies like IBM, Texas Instruments and Intel, on creating new high performance computer systems and hardware, with Boeing on repair of composite materials used in aircraft wings; and closer to home with companies like Endless Solar on solar cooling, and Defence on robotics, autonomous unmanned vehicles and lightweight flexible solar cells.

Members of the College provide specialist advice to business, the Federal Government and its agencies, and play an active role in appropriate professional bodies.

The results of this College's research, knowledge exchange and transfer, and the commercialisation or adoption of new technologies is what helps to drive the world economy, and contributes to a safer global society.



Dr Paul Compston

Associate Dean (Education)

Dr Paul Compston is an Associate Professor, and the Associate Dean (Education) in the College of Engineering and Computer Science.

In 2000, Dr Compston completed his PhD in materials engineering at ANU. His research has taken him across the world, to Norway as a Visiting Fellow at the University of Agder, as a Visiting Researcher at Kyushu University in Japan and as a Research Fellow at Liverpool University in the UK.

Between 2001 and 2003 Dr Compston worked with Australian Composites Pty to develop a UV curing material, which has now become a commercial product.

Dr Compston is an Australian Research Council Postdoctoral Research Fellow (Industry).

In 2009 he received a Dean's Award for Excellence in Teaching for his work developing a new internship concept for engineering students.



RESEARCH SCHOOL OF ENGINEERING

The Research School of Engineering at The Australian National University is a creative mix of staff and students that embrace the breadth of engineering professions from materials and manufacturing, to robotics, telecommunications and systems, and control of massively complex networks.

Our undergraduate students study what is known as 'Systems Engineering'. This interdisciplinary approach to engineering is unique in Australia. Students learn the theory and practice of engineering in a very holistic way through a wide variety of courses. Graduate coursework and graduate research students are offered subjects and training for their future research and industry careers.

Our research covers a broad range of areas in engineering including: biomedical, computer vision, materials and manufacturing, robotics, semiconductor, photovoltaic, solar thermal energy and solar cell technologies, systems and control, and telecommunications and signal processing.

The School has a strong working relationship with the Canberra Research Laboratory of National ICT Australia (NICTA), as well as research partnerships with industries like TransGrid, Chromasun in US, and Trina Solar in China.

We collaborate with research institutions like CSIRO and MIT. Our research and teaching staff have numerous contacts with other leading researchers around the world and this helps to nurture the deep knowledge base that characterises our research and teaching.

Research groups

Our research covers a broad range of areas within engineering. We are able to encourage and support a dynamic research environment in which we incubate new areas of research until they reach their full potential and become established research groups.

We have built up an extensive network of international collaboration with research institutions and industries in Europe, the Asia Pacific and the USA, for research and teaching activities.

Please read further into our research groups to find out more about the people and projects in them, and how we are making the possible more probable.

- > **Applied Signal Processing**
- > **Centre for Sustainable Energy Systems**
- > **Computer Vision and Robotics**
- > **Materials and Manufacturing**
- > **Semiconductor and Solar Cells**
- > **Solar Thermal Group**
- > **Systems and Control**



Professor Rob Mahony

Director, Research School of Engineering*

Professor Rob Mahony has received a Bachelor of Science in applied mathematics and geology and a PhD in systems engineering from ANU.

During his time studying, he worked as a Research Fellow in the Cooperative Research Centre for Robust and Adaptive Systems.

Professor Mahony has worked as a marine seismic geophysicist and an industrial research scientist before completing a post-doctoral fellowship for Heuristics Diagnostics and Complex Systems (Heudiasyc) at the Compiegne University of Technology in France. He also held a Logan Fellowship in the Department of Engineering and Computer Science at Monash University in Melbourne.

He has held many positions at ANU including the Chair of the CECS Advisory Board, Group Leader of the Computer Vision and Robotics research group and Coordinator of the Mechatronics stream. He has recently been appointed Director of the Research School of Engineering, commencing October 2014.

His research interests are in non-linear control theory with applications in robotics, mechanical systems and motion systems. He is also interested in mathematical systems theory and geometric optimisation techniques with applications in linear algebra, computer vision, digital signal processing and machine learning.

* from October 2014



Applied Signal Processing Group

In Applied Signal Processing the focus is on developing signal processing methods to address physically inspired or physically motivated problems arising in real applications, primarily in wireless communications and audio. Although the group uses advanced mathematical methods and modeling, the development of such mathematical tools only plays a secondary role.

The group's research ranges from the development of fundamental limits, to implementation issues and experimental investigations.

The Applied Signal Processing Group conducts research in the following application areas:

- > acoustic and audio signal processing
- > applied information theory
- > bio-signal processing
- > broadband and nearfield sensor arrays, and beamforming
- > space-time signal processing
- > telecommunications, including wireless and mobile communications.



Professor Rodney Kennedy

Applied Signal Processing Group

Professor Rodney Kennedy has spent over 12 years as a Professor in the Research School of Engineering.

He is an electrical engineer with research specialisation in wireless communications, signal processing and audio signal processing.

Professor Kennedy has received 29 external grants and industry contracts/university consultancies, including 14 Australian Research Council (ARC) grants.

With regards to major research centres, Professor Kennedy is a leading participant in the Cooperative Research Centre for Robust and Adaptive Systems (CRASys), National ICT Australia (NICTA) and the ARC Communications Research Network (ACoRN).

Professor Kennedy is an IEEE Fellow and has published close to 320 journal papers, conference papers and patents, and has supervised 45 PhD students.



Centre for Sustainable Energy Systems

The Centre for Sustainable Energy Systems (CSES), was founded in 1991, and is one of the largest and longest established solar energy research groups in Australia. Work in CSES spans the range from basic research and development through to technology commercialisation. The group works with the Government and private companies, and several substantial commercialisation projects are also in progress.

Research activities undertaken by the group include:

- > defect detection and surface passivation in silicon wafers
- > high performance silicon solar cells, including SLIVER® solar cells
- > plasmons and nano PV technology, PV modules, hybrid PV/thermal parabolic trough concentrator systems
- > solar cooling.

CSES research is supported by a state-of-the-art fabrication and characterisation laboratory. The group collaborates extensively with industry and research institutes, and conducts a vigorous outreach program.



Professor Andrew Blakers

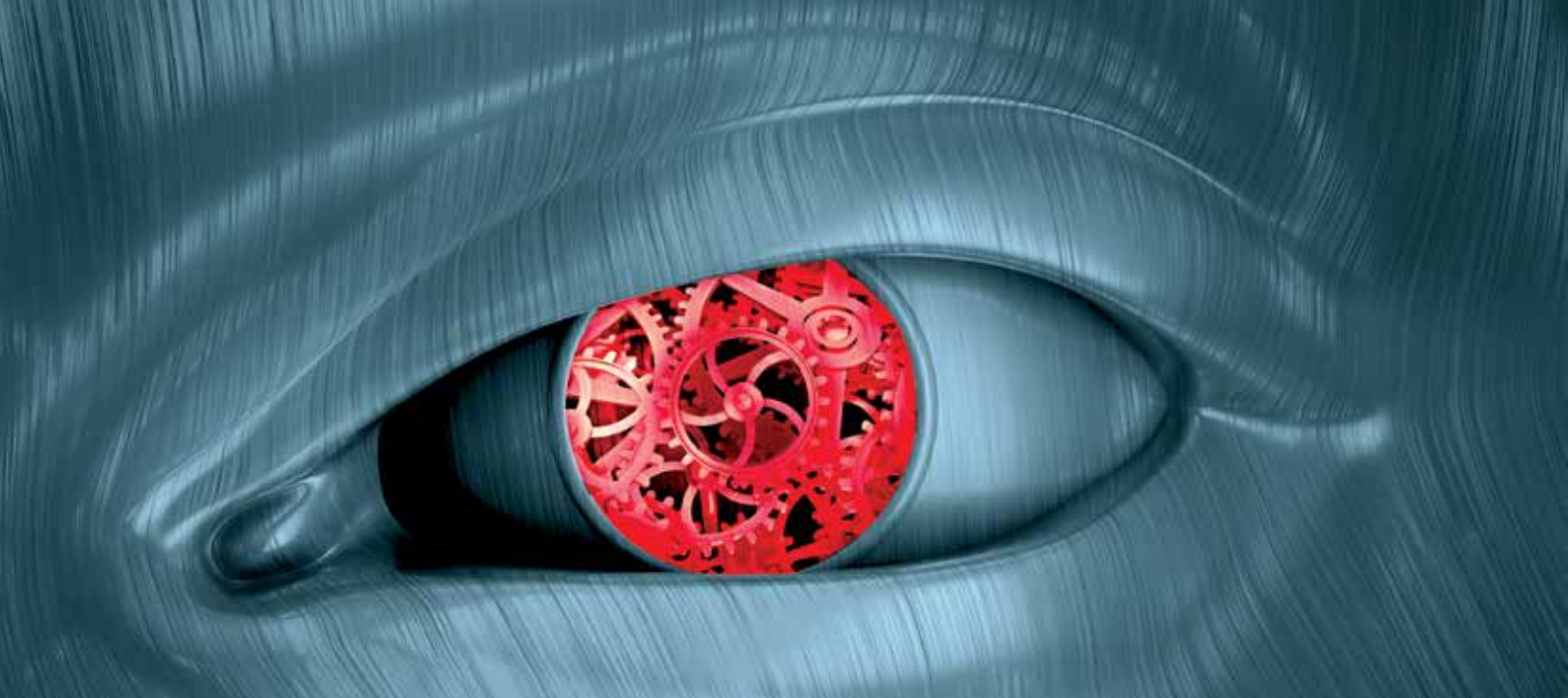
Centre for Sustainable Energy Systems

Professor Andrew Blakers is the Foundation Director of the Centre for Sustainable Energy Systems at ANU, and Director of the Australian Research Council Centre for Solar Energy Systems.

His current research interest include SLIVER solar cells – efficient, lightweight, flexible and transparent solar cells that require only a fraction of silicon compared to conventional cells.

Another research interest is Microconcentrators – concentrator photovoltaic systems where sunlight is focused on the photovoltaic cells using optics such as mirrors and lenses to increase the amount of sunlight the cells receive.

Professor Blakers is the recipient of many awards including the Engineering Excellence Award for SLIVER technology from Engineers Australia, the Weeks Award for Achievement Through Action from the International Solar Energy Society and the ACT Sustainable Cities Environmental Innovation Award in 2006.



Computer Vision & Robotics Group

Robotics is the multi-disciplinary science of moving artifacts in real-world environments. The difficult task of achieving predictability and robustness in observable behaviors under these conditions is one of our central research goals. Robotics research at ANU covers areas as diverse as advanced mathematical theory through to the practical engineering applications of robots.

In partnership with industry and other research institutions, the group is researching aspects of computer vision such as:

- > multiple view geometry motion (eg model building and graphics applications)
- > medical image analysis (eg ophthalmological diagnostic imaging, brain imaging and ultrasound simulation)
- > hyperspectral imagery (eg biosecurity applications)
- > surveillance.



Professor Richard Hartley

Computer Vision and Robotics Group

Professor Hartley is also the Program Leader for the Autonomous Systems and Sensor Technology Program and a Distinguished Researcher of National ICTA Australia (NICTA).

From 1985 to 2001 Professor Hartley worked with the General Electric (GE) Research and Development Centre, and in 1991 he was awarded GE's Dushman Award for his work in creating a very successful design system called Parsifal Silicon Compiler.

He was a project leader at GE for a share-vision project with Lockheed-Martin, which involved design and implementation of algorithms for an AFIS (fingerprint analysis) system that was developed with the FBI.

Professor Hartley has completed research in areas of Image Understanding and Scene Reconstruction while working with GE's Simulation and Control Systems Division. This division was responsible for building large scale flight simulators and involved research in camera modelling, stereo matching and scene reconstruction.



Materials & Manufacturing Group

This group focuses on research with relevance and applicability to a range of industries. The group has strong collaborations with industry and some of the research is partially undertaken within company premises. The group is part of the STAMP Centre for Manufacturing with the Ford Motor company, and Automotive Technology CRC.

Current research spans across manufacturing, mechanics and advanced materials.

Manufacturing:

- > Material processing and transformation
- > Organisational management
- > Forming processes for new materials
- > Manufacturing processes for knowledge based applications
- > Geometric characterisation and modelling

Mechanics:

- > Finite and boundary element method
- > Smart materials and structures
- > Biomechanics
- > Fracture and damage mechanics

Advanced Materials:

- > Fibre reinforced polymer composites
- > Biomaterials
- > Electronic and novel non-linear optical materials
- > Nanomaterials
- > Multifunctional smart materials



Professor Qinghua Qin

Materials and Manufacturing Group

Professor Qinghua Qin has received a Master of Science and a PhD in Applied Mechanics from Huazhong University of Science and Technology (HUST), China.

After lecturing at HUST for ten years he was awarded a DAAD/K.C. Wong Research Fellowship that enabled him to work for nine months at the University of Stuttgart, Germany.

Professor Qin was awarded a postdoctoral research fellowship in 1994 at Tsinghua University, China, where he remained until 1997.

He was awarded a Queen Elizabeth II fellowship in 1997 and a professorial fellowship at the University of Sydney in 2002.

Professor Qin has published over 200 journal papers and five monographs.



Semiconductor & Solar Cells Group

The group's research spans the fields of semiconductor technology, silicon solar cells and photovoltaic solar energy. It aims to achieve a balance between basic science and applied engineering, with a focus on crystalline and multicrystalline silicon materials, and their application to solar cells.

The research is particularly focused on understanding the role of imperfections and impurities in silicon solar cells and coatings that reduce losses at the surface of the silicon wafers. These improvements are then incorporated into new solar cell designs and manufacturing technologies with the ultimate aim of reducing the cost of solar electricity.



Professor Andres Cuevas

Semiconductor and Solar Cells Group

Professor Andres Cuevas has received a PhD and a Master of Engineering (Telecommunications) from the Polytechnic University of Madrid.

Professor Cuevas is a Fulbright Scholar at Stanford University and a visiting researcher at the universities of Florida and Catalunya, the CNR-Istituto LAMEL in Bologna and the Fraunhofer ISE in Freiburg.

He has held academic positions at the Polytechnic University of Madrid from 1980 to 1992, and at The Australian National University since 1993.

Professor Cuevas has published more than 260 scientific publications, including several patents and book chapters in the field of silicon solar cells and photovoltaic solar energy.

His research interests include semiconductor physics and technology, novel characterisation techniques for electronic materials and devices, the study of fundamental properties of silicon, the passivation of its surface by means of silicon nitride, and the advancement of multicrystalline silicon solar cells.



Solar Thermal Group

The Solar Thermal Group develops technologies that allow solar radiation to drive thermal processes such as steam turbine power cycles, production of carbon-neutral liquid fuels, and air-conditioning systems.

In the area of high-temperature concentrating solar power (CSP), the group works on CSP optics, heat transfer, structural design, and optimisation and control, to develop more efficient plants with a lower energy cost.

The group operates a 500 m² paraboloidal CSP dish, the world's largest, as its major experimental facility.

Thermochemical energy storage is a major interest for the group, to allow CSP to provide electricity when other renewables are offline; the group also works on processes that will use CSP for conversion of biomass into liquid transport fuels.

In the low-temperature area, the group works on solar-thermal heat pumps and phase-change energy storage. Hybrid solar heat pumps are being developed by the group, which incorporate ejector-based compression and either a mechanical compressor or phase-change cold storage as backup; the aim is to make solar air-conditioning cost effective and to reduce peak grid electricity demand.

This project is supported by experimental and computational work on variable-geometry ejectors, and development of new gas hydrate phase change materials for cold storage.



Dr Wojciech Lipinski

Solar Thermal Group

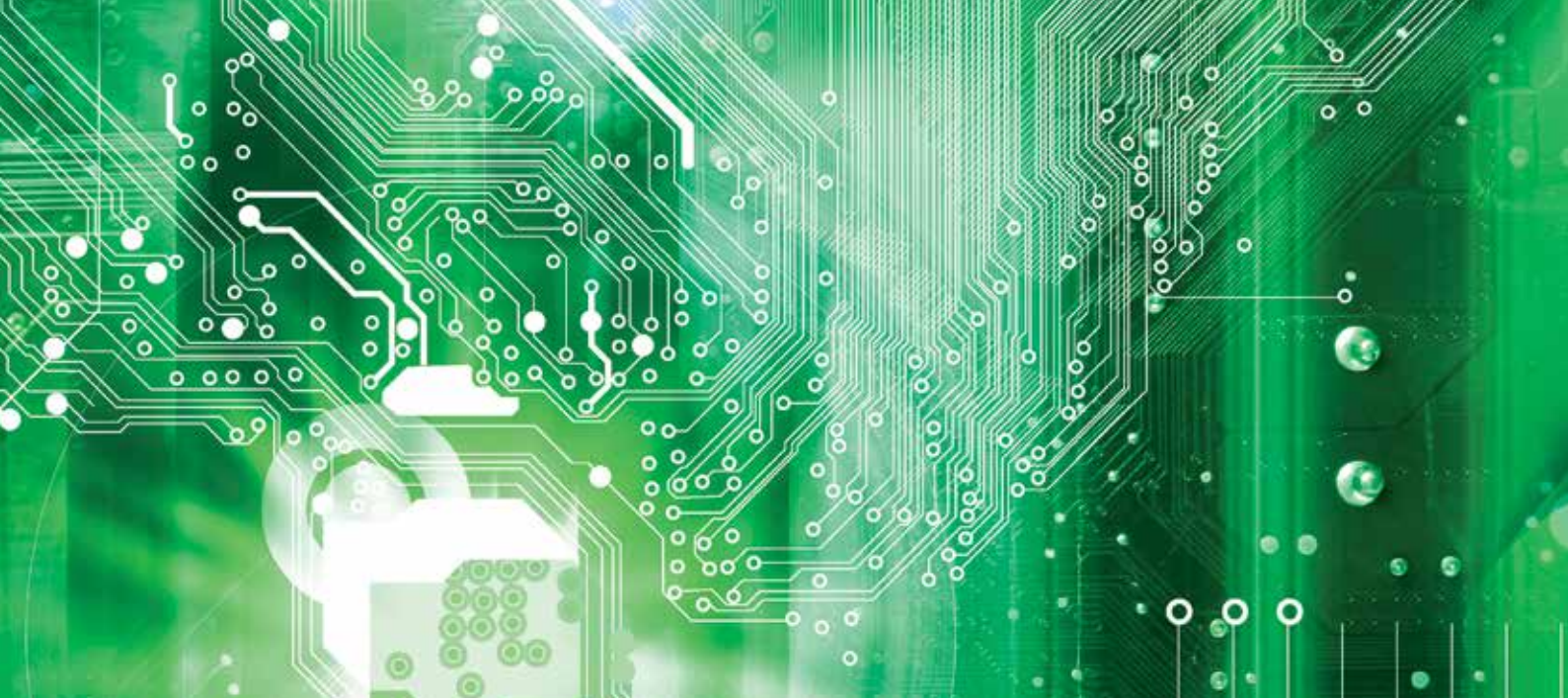
Wojciech Lipinski received his Doctor of Technical Sciences degree in Mechanical and Process Engineering from ETH Zurich in 2004 and his Habilitation in Energy Technology from ETH Zurich in 2009.

Before joining ANU Dr Lipinski was Assistant Professor in the Department of Mechanical Engineering at University of Minnesota.

Wojciech is a scientific committee member for several conferences and workshops in the field of solar energy, a referee for several scientific journals and an Associate Editor of the Journal of Solar Energy Engineering.

His research interests are in the area of thermal and thermo-chemical sciences applied to novel energy conversion technologies, with a focus on renewable and clean energy.

More recent research projects include the development of high-temperature processes that utilise concentrated solar radiation for renewable fuel production and power generation. He uses numerical and experimental techniques to study heat mass transfer phenomena in heterogeneous reacting flows, in particular radiative heat transfer.



Systems & Control Group

The Systems and Control group is a multidisciplinary group focusing on the broad areas of automatic control and systems theory. Their particular research areas cover a diverse range of topics in three major areas:

Swarms and Multiagent Systems

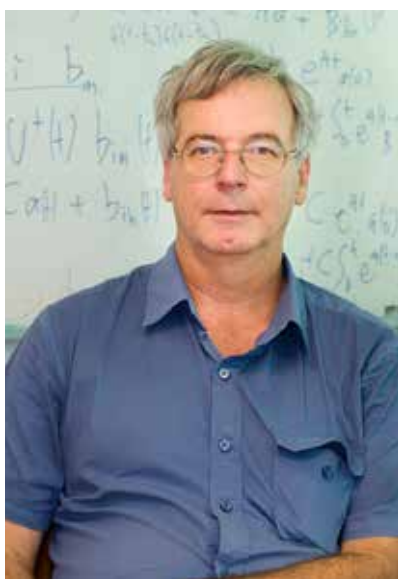
It is becoming increasingly important for airborne and ground vehicles to maintain rigid or semi-rigid formations when executing a mission. In a squadron of unmanned airborne vehicles (UAVs) for example, which talks to which? Which needs to measure what? How can the whole formation stay together if one of the communication links breaks down?

Complex and Dynamical Networks

As the world becomes ever more connected we see the necessity of understanding how to analyse and control large networks. Detecting and isolating faults in complex networks, for example in an electricity grid, can help to minimise economic and social disruption to consumers and business.

Quantum Control

Science and technology are rapidly developing at the nano scale, where physical features have dimensions on the order of tens of nanometers or below. This calls for a new control engineering that is suited to quantum technologies, and in particular, that takes into account the quantum models that are needed in this frontier domain.



Professor Matt James

Systems and Control Group

Professor Matt James received his Bachelor of Science in Mathematics and his Bachelor of Engineering (Honours) from the University of New South Wales, and in 1988 received a PhD in Applied Mathematics from University of Maryland in the USA.

In 1991 Professor James joined ANU and served as Head of the Department of Engineering from 2001 to 2002.

Matt has worked as a visiting Assistant Professor at both Brown University and at the University of Kentucky in the USA. He has also worked with the University of California, Imperial College and University of Cambridge.

He is a co-recipient of the SIAM Journal on Control and Optimization Best Paper Prize for 2007. Matt is currently serving as Associate Editor for IEEE Transactions on Automatic Control, and has previously served SIAM Journal on Control and Optimization, Automatica, and Mathematics of Control, Signals and Systems.

His research interests include quantum, nonlinear and stochastic control systems.

PROFESSOR BRIAN ANDERSON

Distinguished Professor



Professor Brian Anderson has a PhD in Electrical Engineering from Stanford University and completed his undergraduate degrees in mathematics and electrical engineering from Sydney University.

In 1967 he commenced as a professor at the University of Newcastle, where he remained until 1981.

He was a professor, and head of the department of Systems Engineering, previously the Research School of Information Sciences and Engineering (RSISE) at ANU from 1994 to 2002.

From 2002 to 2003 Professor Anderson was CEO of the newly formed National ICT Australia (NICTA) and from 2003 to 2006 was Chief Scientist of NICTA.

He has held visiting appointments in the United States, Europe and Asia, including at the University of California, Berkeley, Stanford University, Yale University, Swiss Federal Institute of Technology and Tokyo Institute of Technology.

Professor Anderson has served as a member of a number of government bodies, including the Australian Science and Technology Council and the Prime Minister's Science, Engineering and Innovation Council.

From 1995 to 2005 he was a member of the Board of Cochlear Limited, the world's major supplier of cochlear implants.

He is a Fellow of the Australian Academy of Science and Academy of Technological Sciences and Engineering, the Institute of Electrical and Electronic Engineers, and an Honorary Fellow of the Institute of Engineers, Australia.

In 1989 he became a Fellow of the Royal Society, London, and in 2012 a Foreign Associate of the US National Academy of Engineering.

Professor Anderson holds honorary doctorates of the Catholic University of Louvain in Belgium, the Swiss Federal Institute of Technology, and the Universities of Sydney, Melbourne, New South Wales and Newcastle.

He was appointed an Officer of the Order of Australia in 1993 and received the Japanese Order of the Rising Sun with Neck Ribbon and Gold Rays in 2007.

Professor Anderson's research interests have included many contributions in the area of circuits, signal processing and control, and currently his work focuses on distributed control of multiagent systems, sensor network localization, and econometric modelling.

ENGINEERING FAST FACTS

ranked **2nd**

Electronic engineering at ANU is ranked second in Australia and 29 in the world by the QS World University Rankings by Subject 2014.

**small
classes**

We choose to have a smaller cohort of students so you get smaller classes and closer engagement with professors and lecturers.

22%

Engineering graduates achieve on average a 22% salary increase within 3 years of completing their postgraduate qualification – taking their median salaries to approximately \$95,000 *

* Graduate Employment Stats from Beyond Graduation Survey conducted by Graduate Careers Australia Ltd, 2012.

Systems

ANU is the only Australian university to offer an undergraduate Systems Engineering degree.



research grants



research intensity



staff qualifications



student to staff ratio



success in getting a job*



graduate starting salary*



positive graduate outcomes*

The 2013 Good Universities Guide

* Domestic undergraduate

40% increase

Engineering graduates achieve on average a 40% salary increase within 3 years of completing their bachelor degree – taking their median salaries to approximately \$76,000*

* Graduate Employment Stats from Beyond Graduation Survey conducted by Graduate Careers Australia Ltd in 2012.

satisfaction

The ANU student satisfaction rate is highest amongst the top universities in Australia (Group of Eight)

world's largest

We own the world's largest paraboloidal dish solar concentrator, which is 500m² in size

“ If you're looking for the best university in Australia, lots of amazing friends and opportunities to do amazing research then this is the place.

”

Caroline Skinner
Bachelor of Engineering (Honours)/
Bachelor of Arts

employment

ABB Switzerland
Norman Disney &
Young
National Australia Bank
Lockheed Martin
BHP Billiton
Cognizant
Accenture

Bloomberg
Suncorp
Dolby
Thales
Citigroup
Toyota
Google
Ford

PHD & MPhil

The PhD (Doctor of Philosophy) and MPhil (Master of Philosophy) are research degrees, awarded based on the submission and subsequent independent assessment of a thesis that describes original research undertaken by the author while enrolled as a student in a relevant degree program at ANU. In both programs the student is expected to acquire specialised knowledge. They will be exposed to a network of research contacts and will also gain skills in bibliographic search and problem solving.

The main differences between the two programs are the depth of the knowledge acquired, and the expectation that a PhD student will gain skills in problem formulation.

To guide students towards the successful submission of their thesis the College has a variety of innovative study programs, that are at the forefront of Australian best practice. For example, students have the opportunity to access a broad range of specialist courses, attend seminars, conferences and summer schools, and to contribute to the various undergraduate teaching activities.

In short, the PhD and MPhil study programs provide students with comprehensive research training that will equip them, should they decide to pursue a research career.

A wide range of pure and applied research is undertaken within the College. There are close ties to the NICTA centre of excellence, government bodies such as CSIRO, and several industrial organisations. Many of our students work on collaborative projects involving a number of partners, and often spend extended periods of time in the relevant partner organisations.

Application process

Applicants are required to hold the equivalent of an Australian Bachelors degree with Honours 2A level or above in a relevant field. Overseas equivalent requirements may vary depending on grading scales. As a guide, students will normally be in the top five to ten per cent of graduates from well regarded universities. Students will also be required to arrange for referee reports. Applicants who are in doubt about the eligibility of their qualifications are encouraged to contact the College for advice.

Admission is also dependent on the ability of the College to provide adequate supervision for the proposed research. Applicants are therefore strongly encouraged to discuss their proposed research topic with a member of the College prior to submitting their application for admission. Students who have not completed their first degree in English are required to meet the University's English language proficiency criteria.

How to apply





Dr Wen Zhang
Research Fellow at ANU



During my time at ANU I have tackled a wide range of courses from manufacturing and production systems to wireless communication research.

After completing the Master of Engineering I decided to commence a PhD that I finished in 2010.

I received a lot of guidance and support from academic staff and because of their individual research backgrounds, I was provided with a rich study and research environment.



Master of Engineering

- > Digital Systems & Telecommunications**
- > Mechatronics**
- > Photonics**
- > Solar Energy Technologies**

MASTER OF ENGINEERING IN DIGITAL SYSTEMS & TELECOMMUNICATIONS

Academic Plan: 7709XMENG
Duration: 2 years full-time
Minimum: 96 units
CRICOS Code: 077326G
UAC Code: 830815

The aim of this degree is to provide students with an advanced technical specialisation in Digital Systems and Telecommunications within a systems engineering framework.

Students will obtain advanced knowledge in signal processing and information engineering which is at the heart of modern digital systems.

Areas of application include microelectronic systems, communication networks, computer vision, audio and acoustic signal processing.

The program contains a targeted professional development component as well as an opportunity to select electives from other areas of study anywhere in the University.

Individual research project

Students who achieve a minimum of a Distinction average in their first 48 units of study may be granted permission to undertake a 24 unit individual research project in their specialisation. This provides a PhD pathway or the opportunity for students to undertake significant research in an area of interest.

Students awarded credit transfer and who have outstanding qualifications and/or experience may also be granted access to the individual research project.

Entry requirements

A Bachelor degree or international equivalent in a relevant discipline with an average mark of at least 70%. Students with an appropriate combination of work experience and qualification may be considered for admission.

* Credit Exemption/Status

Eligible students may be awarded up to one year (50%) of status (credit). This may include students:

- > who have completed a Masters in engineering
- > who have a High Distinction average (or equivalent) in a Bachelor degree in engineering
- > who have a Distinction average in an ANU Bachelor of Engineering
- > with an appropriate combination of relevant work experience and qualification.

Degree structure

Digital Systems & Telecommunications

Completion of 96 units including:

66 units from the following compulsory courses:

- > Digital Systems & Microprocessors
- > Wireless Communications
- > Discrete-time Signal Processing
- > Introduction to Systems Engineering
- > Systems Modelling
- > Professional Communication 1
- > Professional Communication 2
- > Information Theory
- > Embedded Systems & Real Time Digital Signal Processing
- > Probability & Stochastic Processes in Engineering
- > Advanced Topics in Communications & Signal Processing

6 units from the following:

- > Power Electronics
- > Fibre Optic Communication Systems

12 units from completion of ENGN8170 Group Project

12 units from 6000, 7000 and 8000 level elective courses.

MASTER OF ENGINEERING IN MECHATRONICS

Academic Plan:	7709XMENG
Duration:	2 years full-time
Minimum:	96 units
CRICOS Code:	077326G
UAC Code:	830815

The aim of this two-year program is to provide students with an advanced technical specialisation within a systems engineering framework.

Students will gain advanced technical knowledge in Mechatronics, an area ANU has world-leading research strength in.

Mechatronics graduates are highly sought after because of their combined knowledge and cross-discipline skills in three major engineering areas: mechanical, electrical, and computing. This allows them to participate in and lead multi-disciplinary teams in research and product development, automation and manufacturing, and computing and electronics.

The program contains a targeted professional development component as well as an opportunity to select electives from other areas of study anywhere in the University.

Individual research project

Students who achieve a minimum of a Distinction average in their first 48 units of study may be granted permission to undertake a 24 unit individual research project in their specialisation. This provides a PhD pathway or the opportunity for students to undertake significant research in an area of interest.

Students awarded credit transfer and who have outstanding qualifications and/or experience may also be granted access to the individual research project.

Entry requirements

A Bachelor degree or international equivalent in a relevant discipline with an average mark of at least 70%. Students with an appropriate combination of work experience and qualification may be considered for admission.

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Eligible students may be awarded up to one year (50%) of status (credit). This may include students:

- > who have completed a Masters in engineering
- > who have a High Distinction average (or equivalent) in a Bachelor degree in engineering
- > who have a Distinction average in an ANU Bachelor of Engineering
- > with an appropriate combination of relevant work experience and qualification.

Degree structure

Mechatronics

Completion of 96 units including:

72 units from the following compulsory courses:

- > Introduction to Systems Engineering
- > Systems Modelling
- > Professional Communication 1
- > Professional Communication 2
- > Digital Systems & Microprocessors
- > Robotics
- > Control Systems
- > Computer Vision
- > Embedded System & Real-Time DSP
- > Probability & Stochastic Processes in Engineering
- > Engineering Data Analytics
- > Advanced Topics in Mechatronics Systems

12 units from completion of ENGN8170 Group Project

12 units from 6000, 7000 and 8000-level elective courses.



Sajid Hassan

Chief Information Officer, Lifeline Australia
ANU Graduate



I decided to study at ANU because of its high ranking.

My degree offered many new topics and in today's workplace employers expect you to be able to multi-task in a range of disciplines related to engineering.

The best part about studying at ANU, apart from getting to know world-class academics and students, is the fact that the teaching methodology always focuses on practical examples and implementation.



MASTER OF ENGINEERING IN PHOTONICS

Academic Plan: 7709XMENG
Duration: 2 years full-time
Minimum: 96 units
CRICOS Code: 077326G
UAC Code: 830815

The aim of this two-year program is to provide students with an advanced technical specialisation within a systems engineering framework.

Students will gain in-depth knowledge in Photonics Technologies, an area of world-leading research strength at the ANU.

The global photonics industry is growing rapidly, offering exciting career prospects in research and development, telecommunications industry, sensing and biomedical diagnostics.

The program contains a targeted professional development component as well as an opportunity to select electives from other areas of study anywhere in the University.

Individual research project

Students who achieve a minimum of a Distinction average in their first 48 units of study may be granted permission to undertake a 24 unit individual research project in their specialisation. This provides a PhD pathway or the opportunity for students to undertake significant research in an area of interest.

Students awarded credit transfer and who have outstanding qualifications and/or experience may also be granted access to the individual research project.

Entry requirements

A Bachelor degree or international equivalent in a relevant discipline with an average mark of at least 70%. Students with an appropriate combination of work experience and qualification may be considered for admission.

* Credit Exemption/Status

Eligible students may be awarded up to one year (50%) of status (credit). This may include students:

- > who have completed a Masters in engineering
- > who have a High Distinction average (or equivalent) in a Bachelor degree in engineering
- > who have a Distinction average in an ANU Bachelor of Engineering
- > with an appropriate combination of relevant work experience and qualification.

Degree structure

Photonics

Completion of 96 units including:

66 units from the following compulsory courses:

- > Optical Physics
- > Fibre Optic Communication Systems
- > Optical Waveguide Sensing
- > Introduction to Systems Engineering
- > Systems Modelling
- > Professional Communication 1
- > Professional Communication 2
- > Photonics in Bio & Nano Technology
- > Photonics Laboratory
- > Optics for Solar Energy
- > Advanced Topics in Photonics

6 units from the following:

- > Fourier Systems & Optics
- > Semiconductors
- > Digital Communications
- > Photovoltaic Technologies

12 units from completion of ENGN8170 Group Project

12 units from 6000, 7000 and 8000 level elective courses.

A portrait of Professor Kylie Catchpole, a woman with short brown hair and glasses, wearing a red and white striped t-shirt. She is smiling and standing in front of a blurred background that appears to be an outdoor setting with some structures.

PROFESSOR KYLIE CATCHPOLE

Associate Professor/Future Fellow

Dr. Kylie Catchpole is an Associate Professor and Future Fellow at the Centre for Sustainable Energy Systems at ANU. Her research interests are in nanotechnology for solar cell applications.

“We use tiny antennas and novel materials to make new types of solar cells, with the aim of beating the efficiency limits of conventional cells and making solar better and cheaper.”

Kylie’s pioneering work on solar cells is helping to make sustainable technology more effective and accessible, contributing to minimising the planet’s reliance on fossil fuels.

“We are experimenting with new types of solar cells that can use both blue and red light efficiently. The way we are doing this is to use nanotechnology to trap blue light inside the top solar cell, and let red light through. Using nanotechnology lets us use very cheap materials, which is crucial in designing new types of solar cells.”

Kylie attained an undergraduate degree in physics and a PhD in engineering, both at ANU, she also won the University Medal in 1995.

Her research has been featured in top publications including Science Magazine and The Economist.

In 2010 her work on nanophotonic light trapping was listed as one of MIT Technology Review’s ‘10 most important emerging technologies’. In 2011 she won an episode of the ABC’s ‘New Inventors’ program for her groundbreaking work on using silver to create more efficient solar cells.

She was a Post-doctoral Fellow at the University of New South Wales and the FOM Institute for Atomic and Molecular Physics, Amsterdam. She has authored over 80 publications.

She currently leads the nanostructures for photovoltaics group at the Centre for Sustainable Energy Systems.



MASTER OF ENGINEERING IN SOLAR ENERGY TECHNOLOGIES

Academic Plan:	7709XMENG
Duration:	2 years full-time
Minimum:	96 units
CRICOS Code:	077326G
UAC Code:	830815

The aim of this two-year program is to provide students with an advanced technical specialisation within a systems engineering framework.

Students will gain in-depth advanced technical knowledge in Solar Energy Technologies, an area of world-leading research strength at ANU.

The global renewable energy industry is growing rapidly, offering exciting career prospects in research and development, manufacturing industries and large-scale renewable energy projects.

The program contains a targeted professional development component as well as an opportunity to select electives from other areas of study anywhere in the University.

Individual research project

Students who achieve a minimum of a Distinction average in their first 48 units of study may be granted permission to undertake a 24 unit individual research project in their specialisation. This provides a PhD pathway or the opportunity for students to undertake significant research in an area of interest.

Students awarded credit transfer and who have outstanding qualifications and/or experience may also be granted access to the individual research project.

Entry requirements

A Bachelor degree or international equivalent in a relevant discipline with an average mark of at least 70%. Students with an appropriate combination of work experience and qualification may be considered for admission.

* Credit Exemption/Status

Eligible students may be awarded up to one year (50%) of status (credit). This may include students:

- > who have completed a Masters in engineering
- > who have a High Distinction average (or equivalent) in a Bachelor degree in engineering
- > who have a Distinction average in an ANU Bachelor of Engineering
- > with an appropriate combination of relevant work experience and qualification.

Degree structure

Solar Energy Technologies

Completion of 96 units including:

66 units from the following compulsory courses:

- > Energy Systems Engineering
- > Semiconductors
- > Photovoltaic Technologies
- > Introduction to Systems Engineering
- > Systems Modelling
- > Professional Communication 1
- > Professional Communication 2
- > Fundamentals of Solar Cells
- > Photovoltaic Module Manufacturing
- > Advanced Topics in Solar Energy Technologies

6 units from the following:

- > World Energy Resources and Renewable Technologies
- > Solar Thermal Technologies

12 units from completion of ENGN8170 Group Project

12 units from 6000, 7000 and 8000 level elective courses.

BACHELOR OF ENGINEERING (R&D) (HONOURS)

Academic Plan:	AENRD
ATAR:	99*
Duration:	4 years full-time
Minimum:	192 units
CRICOS Code:	060542F
UAC Code:	135000

ANU has developed a number of elite degrees for high achieving students. While some of these degrees are called Bachelor of Philosophy or PhBs, the engineering equivalent at ANU is called the Bachelor of Engineering (Research and Development). As a high-achieving student, the Research and Development (R&D) program gives you the opportunity to access an innovative structure that allows you to undertake a number of project-based research courses throughout your degree. You will be exposed to cutting-edge research and development activities that are taking place in engineering science at ANU.

Organisations invest in R&D in order to gain a competitive advantage over others. R&D is at the forefront of new product design and development, and is a wealth and change generator. Innovative solutions to many of the problems in society today will come from those working in R&D. Research and development is carried out in industry, government and in academic organisations, and often in partnerships between all three sectors. The Bachelor of Engineering (Research and Development) is designed for students who want to work in R&D in either a commercial, industrial or academic environment. It also provides students with a pathway to a PhD.

The program combines the unique systems engineering focus of the ANU Bachelor of Engineering with a more project based, research intensive study mode, also unique to ANU. Students undertake a number of research projects in different research groups at ANU or an associated industry partner, in order to obtain a flavour of research in the discipline areas, and develop independent research skills.

*indicative only

Prerequisites

- > Specialist Mathematics (Major/Minor) ACT
- > Mathematics Extension 1 NSW

(Or international equivalent of the above.)

Careers

In addition to career opportunities open to Bachelor of Engineering graduates, R&D degree graduates have access to a wider range of opportunities including working in the R&D departments in defence, transport, energy and power, advanced manufacturing, aeronautical and communications industries.

As students complete an engineering major as well as an R&D major, opportunities to pursue a traditional engineering career are also available.

Majors

Students will undertake a major (eight courses) in one of the following areas alongside an R&D major:

- > **Biomedical Systems**
- > **Electronic & Communication Systems**
- > **Mechanical & Material Systems**
- > **Mechatronic Systems**
- > **Photonic Systems**
- > **Renewable Energy Systems**
- > **Sustainable Systems**

Degree structure

YEAR	SEMESTER 1	SEMESTER 2
1	Discovering Engineering Engineering Sciences Physics 1 Mathematics & Applications 1 (Honours)	Introduction to Mechanics Introduction to Electronics Programming for Scientists Mathematics and Applications 2 (Honours)
2	Engineering Research & Development Project (Methods) Systems Engineering Design Mechanical Systems & Design Electronic Systems & Design	Systems Engineering Analysis R&D Project Engineering Major Elective Course (6 units)
3	Engineering Management Engineering R&D Engineering Major Elective Course (6 units)	Engineering Innovation Engineering R&D Project Engineering Major Elective Course (6 units)
4	Engineering R&D Project Systems Engineering Project Engineering Major Elective Course	Engineering R&D Engineering Major Engineering Major Elective Course (6 units)



Dr David Nisbet

Course Convenor, Bachelor of Engineering (R&D) (Honours)

After obtaining a PhD in Materials Engineering, Dr Nisbet received an Australian Postdoctoral Fellowship to pursue a four year post doctorate in tissue engineering and the fabrication of artificial stem cell microenvironments.

He is a chief investigator on two Australian Research Council discovery projects and two National Health and Medicine Research Council project grants. In 2010 he was also awarded the prestigious Fullbright Scholarship to spend six months studying surface science and biofunctionalisation at the University of California Berkeley. This has allowed him to develop a truly interdisciplinary skill set that encompasses materials engineering, nanotechnology, bioconjugation chemistry, surface science, molecular and stem cell biology and neurosurgery. David currently works in the area of biomedical engineering at ANU.

"I am developing new materials that support the growth of human cells. More specifically, I engineer synthetic environments for stem cells that promote their survival and function. From this we hope to regenerate brain cells and pathways that have become damaged, either through injury or through disease."

BACHELOR OF ENGINEERING (HONOURS)

Academic Plan:	AENGI
ATAR:	87*
Duration:	4 years full-time
Minimum:	192 units
CRICOS Code:	077943E
UAC Code:	135004

As a Bachelor of Engineering student, you graduate with the necessary skills and technical know-how to excel in your chosen field. You will be able to design, analyse and manage complex engineering systems involving many different engineering disciplines and be highly sought after by employers as a result. The ability to manage complex systems is made possible by the 'Systems Engineering' approach that is applied to our engineering program – this is what makes ANU graduates different to other engineering graduates.

The 'Systems Engineering' approach, or 'Interdisciplinary Systems Engineering' as it is known at Harvard University and Cambridge University, means our graduates are taught more than just one engineering area. Modern organisations need engineers who can understand the design and performance of the 'whole' engineering system and not just one individual component. For example, while it is important that a telecommunications engineer be an expert in communications, the systems approach ensures that this engineer also has a sound understanding of materials, electronics, computing and business management. This ensures the best and most efficient product design, performance and production.

Building on a solid foundation of science and engineering fundamentals, the Bachelor of Engineering at ANU ensures you will be well prepared for engineering practice. While the systems approach ensures you are equipped to work across a number of engineering disciplines, professional development courses including finance, law and ethical practices guarantee that as an ANU graduate, you will be a well-rounded engineer.

*indicative only

Prerequisites

- > Mathematical Methods (Major) ACT
- > Mathematics NSW
- > Specialist Mathematics or higher is preferred

(Or international equivalent of the above.)

Honours

Honours grades in the Bachelor of Engineering are awarded by the Research School of Engineering on the basis of a recommendation from the school Director.

The awarding of Honours in engineering is based on meritorious performance over the entire four-year program. The assessment of meritorious performance includes the calculation of an average percentage mark (APM), together with the consideration of the overall academic progress of the student.

Careers

Careers in engineering are diverse, with consistently high demand in Australia and overseas. Engineering students are provided with a set of skills and abilities that are highly sought after in engineering organisations, but also across many other professions and organisations. Engineering graduates often progress to senior management, which is why an engineering degree is often considered a springboard into the wider corporate world. Once you have the skills of a professional qualified engineer, the career opportunities are wide and varied.

ANU engineering graduates work in diverse organisations and in government including: Department of Defence including DMO and DSTO, Qantas, Telstra, Motorola, ActewAGL, Bovis Lend Lease, Energy Australia SMEC, Ford, GHD, Accenture, Northrop Consulting Engineers, Bassett Consulting Engineers, IBM, CEA Technologies, ABB (Switzerland), Thales (France), Toyota, Cochlear Limited and many more.

Internship program

An internship program is also available for selected students. This is an opportunity to spend three or six months in the industry and gain real-life experience as an engineer. It is viewed by the School as an increasingly important part of professional engineering education. A flexible curriculum and assessment scheme has been designed for the internship program so that it can be integrated into the Bachelor of Engineering. This means students can receive full credit for their internship and gain valuable experience without delaying their graduation.

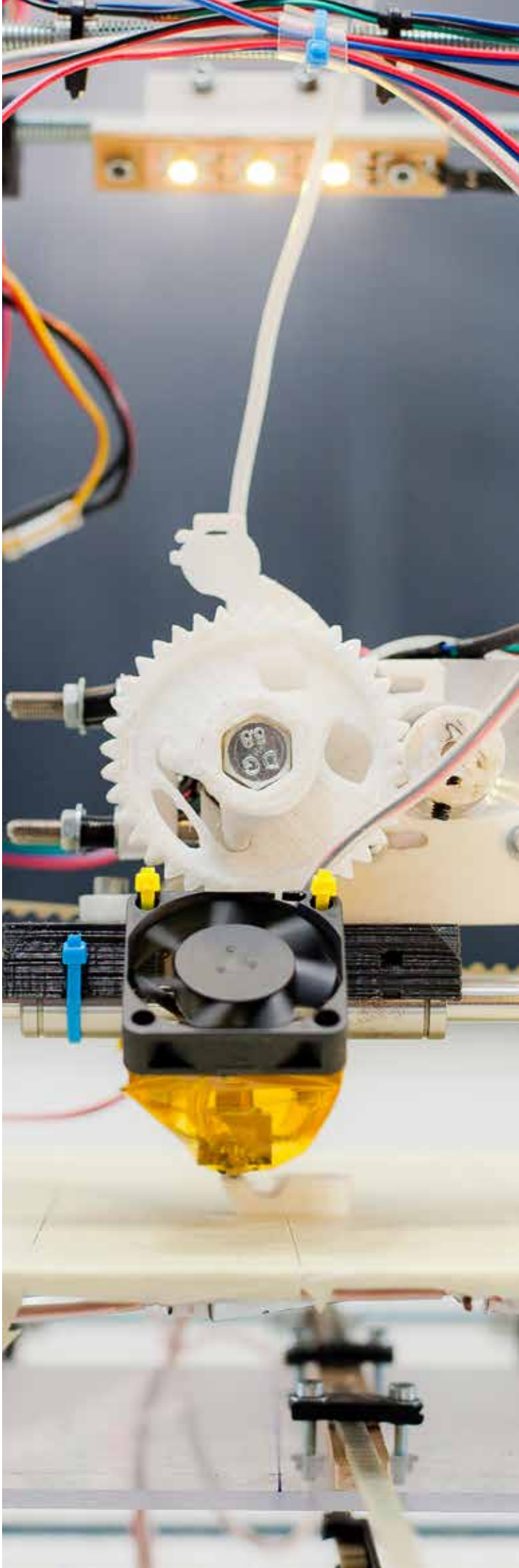
Majors

Students will undertake a major (eight courses) in one of the following areas:

- > **Biomedical Systems**
- > **Electronic & Communication Systems**
- > **Mechanical & Material Systems**
- > **Mechatronic Systems**
- > **Photonic Systems**
- > **Renewable Energy Systems**
- > **Sustainable Systems**

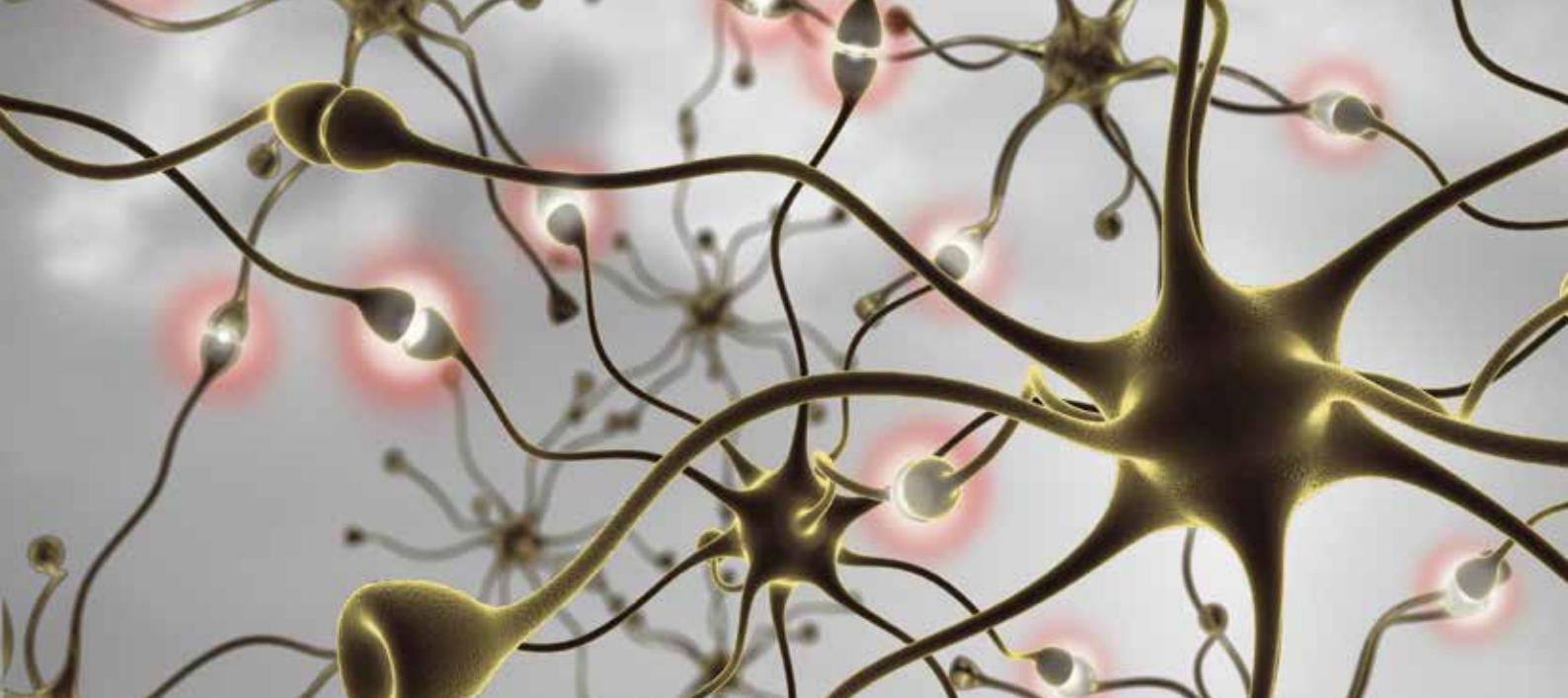
Degree structure

YEAR	SEMESTER 1	SEMESTER 2
1	Discovering Engineering Engineering Sciences Mathematics & Applications 1 Physics 1	Introduction to Mechanics Introduction to Electronics Programming for Scientists Mathematics & Applications 2
2	Systems Engineering Design Mechanical Systems & Design Electronic Systems & Design Computing for Engineering Simulation	Systems Engineering Analysis Engineering Major Elective Course (6 units) Elective Course (6 units)
3	Engineering Management Engineering Major Engineering Major Elective Course (6 units)	Engineering Innovation Engineering Major Engineering Major Elective Course (6 units)
4	Systems Engineering Project Engineering Major Individual Project Elective Course (6 units)	Individual Project Engineering Core Course Engineering Core Course Elective Course (6 units)



Majors

- > Biomedical Systems**
- > Electronic & Communication Systems**
- > Mechanical & Material Systems**
- > Mechatronic Systems**
- > Photonic Systems**
- > Renewable Energy Systems**
- > Sustainable Systems**



Biomedical Systems

Biomedical engineering is an interdisciplinary field that merges biological research with various fields of materials engineering, imaging and sensing, and nanotechnology.

The application of advanced materials, nanotechnology and imaging and sensing techniques provides new tools for modern engineers to alter and measure functional properties of biological cells with unprecedented precision.

This major has a particular emphasis on the emerging field of bio-nanotechnology, which can be exploited to create new materials for advanced medical outcomes, ie. developing new cures for disease and to regenerate diseased or damaged tissue. The field also applies to imaging sensors for medical and security applications, hybrid bio-electronic devices and even nano-machines.

This major requires the completion of eight courses which must include:

- > Biology 2: Molecular and Cell Biology
- > Introduction to Mechanics
- > Mechanical Systems and Design
- > Thermal Energy Systems
- > Biomechanics and Biomaterials
- > Biomedical Imaging
- > Nanotechnology and Applications
- > BioMEMS and BioNEMS.



Francesca Maclean
PhD Student

Francesca graduated from a Bachelor of Engineering (Honours)/Bachelor of Science in 2013 and is now studying a PhD in Biomaterials.



I am currently developing biomaterials in an attempt to regulate the inflammatory response the central nervous system initiates upon injury.

It is a really interesting field because it allows me to combine my experience in materials engineering and chemistry. As it is such innovative work, it has allowed me to collaborate with scientists from other institutions, which has been a very positive learning experience.

What I like most about my experience so far is the interdisciplinary approach to research and exposure to successful early career scientists.





Electronic & Communication Systems

This major brings together the fundamentals of electronics, from analogue and digital electronics to complete electronic systems, which underpin all modern communications systems. Electronic and communications technologies are critical for a wide range of applications such as the internet, mobile phones and smart sensors. Students taking this major will be well prepared for a career in these areas. Courses in this major include Signal Processing, Digital Systems and Microprocessors, Digital and Wireless Communications, and Power Electronics.

This major is aligned with research in applied signal processing, mobile ad hoc networks and high performance computing for medical image analysis, with industry partners that include Microsoft.

This major requires the completion of eight courses which must include:

- > Introduction to Electronics
- > Electronic Systems and Design
- > Signal Processing
- > Digital Systems and Microprocessors
- > Digital Communications
- > Wireless Communications
- > Discrete-Time Signal Processing
- > Power Electronics.



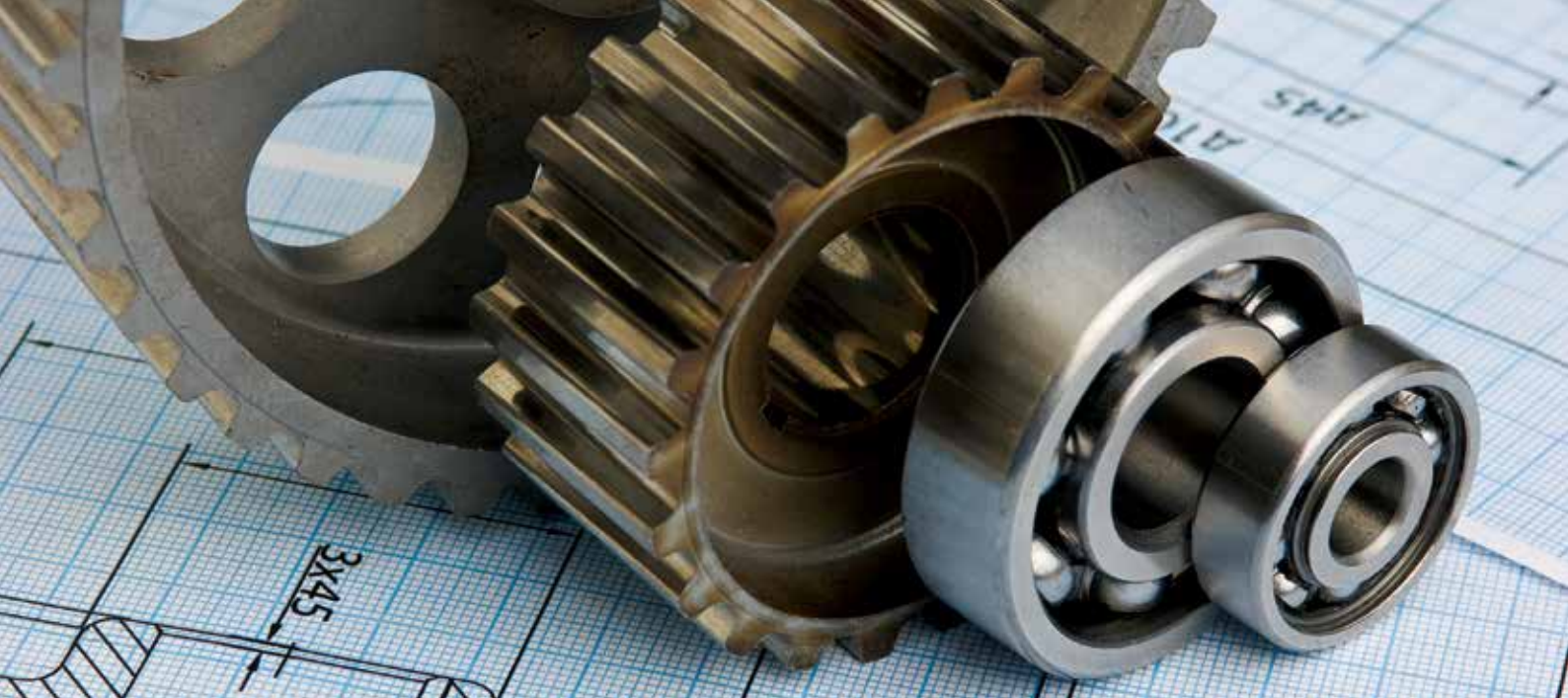
Michaela Gilchrist
Bachelor of Engineering (Honours)

“

I chose to study engineering at ANU because it gave me flexibility and offered a diverse range of courses. The opportunity to try different areas of engineering before choosing a major was great as I did not know what I wanted to study when I finished school.

I have met so many different people throughout my time at ANU and have had the opportunity to be involved in a range of activities around campus. The diversity at ANU and the standard of teaching have given me a fantastic and memorable studying experience.

”



Mechanical & Material Systems

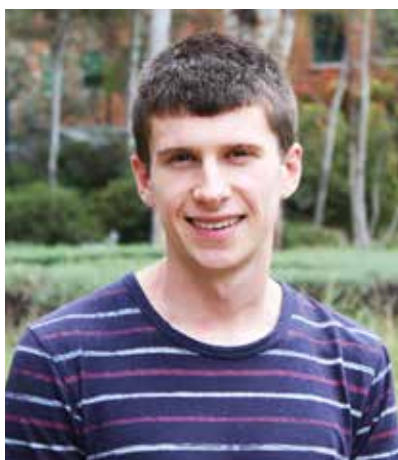
This major has a focus on the relationship between the microstructure of materials, processing, and their mechanical behaviour. Students will study a broad range of materials including, metals, ceramics, polymers and fibre-reinforced composites. These have applications in a range of industries such as energy, automotive, aerospace and transport. There is also an emphasis on the use of advanced modelling techniques to understand and predict material behaviour and structural performance. Courses include Engineering Materials, Composite Materials and Finite Element Analysis.

This major is aligned with research on composite material processing, design of electro-ceramic nano-materials, and the characterisation of novel lightweight materials such as fibremetal laminates and aluminium foam structures.

Industrial research partners include Quickstep Technologies and the Cooperative Research Centre for Advanced Automotive Technologies (AutoCRC).

This major requires the completion of eight courses which must include:

- > Introduction to Mechanics
- > Mechanical Systems and Design
- > Thermal Energy Systems
- > Manufacturing Technologies
- > Engineering Materials
- > Sustainable Product Development
- > Composite Materials
- > Finite Element Analysis.



Conor Horgan

Bachelor of Engineering (R&D)
(Honours)/ Bachelor of Science



Undoubtedly one of the best experiences I've had at ANU is the chance to work with world class leading researchers on different topics.

Already I've had the chance to develop biomaterials to be injected into the brain, I've worked on quadroter helicopters designing algorithms to help control them. The opportunity to be exposed to this level of knowledge and this level of experience is something that I wouldn't get anywhere else.





Mechatronic Systems

Mechatronics is an emerging engineering discipline based on the integration of mechanical, electrical and computing technology for advanced engineering applications. Engineers with a specialisation in mechatronics are at the forefront of developments in defence, space, medical, transport, mining and manufacturing industries. Courses include System Dynamics, Control Systems, Computer Vision and Robotics.

This major is aligned with research on autonomous systems (aerial, terrestrial and submersible), systems theory and control and computer vision. These have applications in aged care, environmental and infrastructure monitoring and automated driver assistance systems. Industrial partners include Microsoft, Dassault Systemes and the Cooperative Research Centre for Advanced Automotive Technologies (AutoCRC).

This major requires the completion of eight courses which must include:

- > Introduction to Electronics
- > Electronic Systems and Design
- > System Dynamics
- > Digital Systems & Microprocessors
- > Control Systems
- > Computer Vision
- > Robotics
- > Dynamics and Simulation.



Jessica Evers
Bachelor of Engineering (R&D)
(Honours)

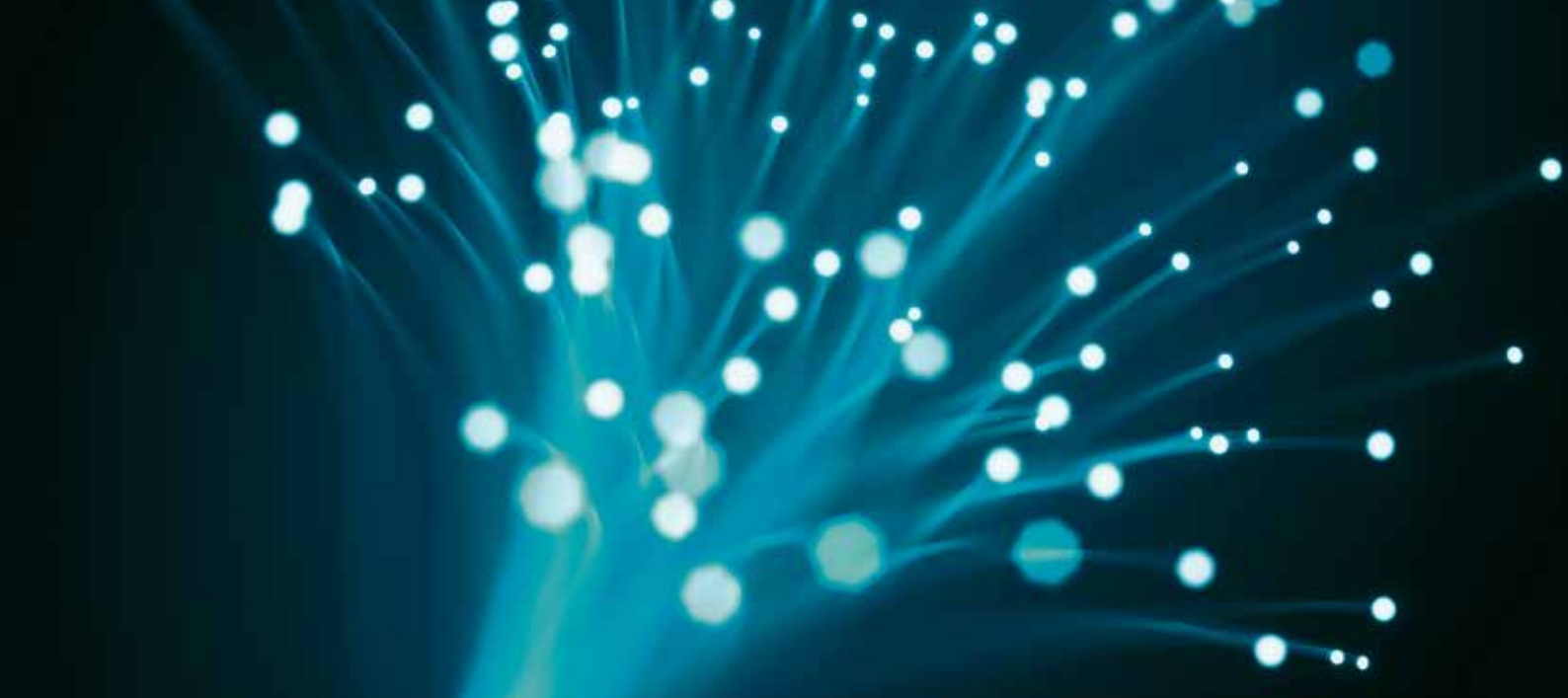
“

I chose ANU because it is one of the best universities in the country. It also has a strong focus on renewable energy, which I was interested in.

Last year I was fortunate to be involved in the Autonomous Ground Vehicle Challenge (AGVC) where myself and two other students created a robot to navigate an obstacle course. We succeeded in winning the Innovation award at this competition.

In 2012 I won the Lisa Brodribb Women in Engineering scholarship which was very exciting. This helped me to maintain the High Distinction average needed for the R&D program as well as allowed me to participate in more student activities.

”



Photonic Systems

Photonics relates to the manipulation, transmission and storage of light data. The main application for many years has been in the development of the world's vast fibre optic telecommunications networks. But there is now increasing use of photonics in a broad range of human endeavours such as sensing, security, architecture, astronomy, transport, medicine, solar energy, nanophotonics and forensic science. As a graduate of this major, you will have a wide range of career opportunities in many organisations. From small Australian photonics start-up companies to major optical communications and network providers. This major also provides a pathway to cutting-edge photonics research in universities, institutes and defence organisations.

The Photonic Systems major is offered in collaboration with the ANU College of Physical and Mathematical Sciences,

and courses include Contemporary Optics, Fibre Optic Communication Systems and Microphotonics, Biophotonics and Nanophotonics.

This major requires the completion of eight courses which must include:

- > Physics 1
- > Physics 2
- > Waves and Optics
- > Semiconductors
- > Optical Physics
- > Fibre Optics Communication Systems
- > Photovoltaic Technologies
- > Micro, Bio and Nanophotonics.



Sam Cheah

Bachelor of Engineering (R&D)
(Honours)

“

ANU gives me a unique opportunity to take part in research projects in an undergraduate degree. My engineering degree equips you with not only a relevant and employable degree, but a really useful skill set and in today's technologically driven world, engineering has a massive impact on the way we live and see the world.

There is such a wide range of things to try out both within and outside your degree. I've had the chance to learn a lot of soft and technical skills, complete some really interesting projects, get involved with many clubs, and travel!

”



Renewable Energy Systems

There is a major global focus on the development of renewable energy technologies due to the effects of fossil fuels on climate change. Students who complete this major will be at the forefront of technological developments that will provide solutions to future energy needs. Demand for graduates with the skills and knowledge gained from this major will be worldwide.

Typical career opportunities may exist in developing and implementing solar energy technologies, designing wind or hydroelectric power systems, developing energy systems to produce electricity using biodegradable materials and researching greenhouse gas emissions. This major is aligned with extensive research into solar photovoltaic and solar thermal energy systems, with industrial partners that include Origin Energy.

This major requires the completion of eight courses which must include:

- > Introduction to Electronics
- > Electronic Systems and Design
- > Thermal Energy Systems
- > Energy Systems Engineering
- > Semiconductors
- > Energy Resources and Renewable Technologies
- > Photovoltaic Technologies
- > Solar Thermal Technologies.



Josiah Khor
Engineer, Lithicon
ANU Graduate

Josiah graduated from a Bachelor of Engineering (R&D) (Hons)/Bachelor of Science in 2013 and was a recipient of the Ian Ross Scholarship.

“

ANU has provided me with a world-class education. With ANU consistently achieving top standings in world university rankings, I'm positive that my degree will be respected wherever I go.

I've learnt a lot about research through my engineering degree at ANU. I also got the chance to play with some cutting-edge technology such as micro-CT X-ray machines, hexacopters, 3D printers, and Vayu (an ANU supercomputer that has now been replaced by Raijin).

”



Sustainable Systems

It is important for engineers to have an awareness of the factors that comprise sustainability as they will add to the complexity of their future practice. There is growing demand from industry for graduates with knowledge and skills in sustainability.

This major has been designed in conjunction with the highly regarded ANU Fenner School of Environment and Society. It includes courses in Human Ecology, Remote Sensing and Geographical Information Systems (GIS), Climate Change Policy and Science, Engineering Sustainable Systems, Solving Complex Environmental Problems, Sustainable Product Development, and Energy Resources and Renewable Technologies.

This major requires the completion of eight courses which must include:

- > Human Ecology
- > GIS and Spatial Analysis
- > Sustainable Systems: Urban OR Climate Change Science and Policy
- > Complex Environmental Problems in Action
- > Energy Systems Engineering
- > Engineering Sustainable Systems
- > Sustainable Product Development
- > Energy Resources and Renewable Technologies.



Susan Dedman
Graduate Engineer, ABB
ANU Graduate

Susan graduated from Bachelor of Engineering (Hons)/Bachelor of Arts in 2013 and was President of the ANU Engineering Student's Association.



As part of my Engineering degree at ANU, I chose to major in Sustainable Energy Systems. This allowed me to specialise in a topic that is becoming increasingly important in today's world, while building a strong multi-disciplinary foundation through a focus on Systems Engineering.

Today I use all of the skills I learned at ANU in the workplace. The many group projects prepared me for working in teams and liaising with others, while my technical knowledge has allowed me to choose a job which matches my interests.



FLEXIBLE DOUBLE DEGREES

Our new flexible double degrees are a pioneering model launched by ANU that gives you more choices for your ATAR. It allows you to build skills for a chosen career without forfeiting your passion.

Flexible double degrees provide access to a range of combinations, and if you are interested in engineering or computing, you can select a double degree from the Engineering or Advanced Computing Group.

How does the model work?

Students who wish to apply for a flexible double degree can follow a three step process:

1

Apply

- > Apply for the group with the degrees in which you are interested.

2

Choose

- > You choose your two degrees from the one group (subject to ATAR) when you accept your offer.
- > You must meet the entry requirements for each of your degree choices.

3

Enrol

- > You select your courses at enrolment time.



Engineering or Advanced Computing Group

Combine one Bachelor of

- Engineering (Honours)*
- Advanced Computing (Honours)*
- Engineering (R&D) (Honours)*
- Advanced Computing (R&D) (Honours)*
- Software Engineering (Honours)*

and

With one Bachelor of

- Actuarial Studies*
- Arts
- Asia-Pacific Security
- Asia-Pacific Studies
- Biotechnology*
- Business Administration
- Commerce
- Economics
- Finance
- Genetics*
- **Information Technology***
- Pacific Studies
- Science
- Science (Forest Sciences)
- Science (Psychology)
- Science (Resource and Environmental Management)
- Statistics*

*Program includes another prerequisite in addition to ATAR.

Please note Information Technology cannot be combined with Software Engineering or Advanced Computing, but can be combined with other degrees as outlined above.

Law Group

Combine one Bachelor of

- Law

and

With one Bachelor of

- Actuarial Studies*
- Archaeological Practice
- Art History and Curatorship
- Arts
- Asia-Pacific Security
- Asia-Pacific Studies
- Biotechnology*
- Business Administration
- Classical Studies
- Commerce
- Design Arts*
- Development Studies
- Digital Arts*
- Economics
- Environmental Studies
- European Studies
- Finance
- Genetics*
- **Information Technology***
- International Relations
- Languages
- Latin American Studies
- Medical Science*
- Middle Eastern and Central Asian Studies
- Music*
- Pacific Studies
- Policy Studies
- Politics, Philosophy and Economics
- Science
- Science (Forest Sciences)
- Science (Psychology)
- Science (Resource and Environmental Management)
- Statistics*
- Visual Arts*

Arts, Social Sciences, Business & Science Group

Bachelor of

- Actuarial Studies*
- Archaeological Practice
- Art History and Curatorship
- Arts
- Asia-Pacific Security
- Asia-Pacific Studies
- Biotechnology*
- Business Administration
- Classical Studies
- Commerce
- Design Arts*
- Development Studies
- Digital Arts*
- Economics
- Environmental Studies
- European Studies
- Finance
- Genetics*
- **Information Technology***
- International Relations
- Languages
- Latin American Studies
- Medical Science*
- Middle Eastern and Central Asian Studies
- Music*
- Pacific Studies
- Policy Studies
- Politics, Philosophy and Economics
- Science
- Science (Forest Sciences)
- Science (Psychology)
- Science (Resource and Environmental Management)
- Statistics*
- Visual Arts*

SCHOLARSHIPS

Research degree scholarships

The ANU College of Engineering and Computer Science funds or administers a wide range of scholarships for PhD and Masters by research study.

Scholarships for Australian Citizens/Permanent Residents or New Zealand Citizens

The College of Engineering and Computer Science is committed to offering scholarships to the best students with the best potential projects and will use a broad range of indicators to make such determinations. If you are a domestic student and have a first class honours degree it is extremely likely that you will be offered entry and a scholarship. Domestic students with a second class honours degree and who are able to demonstrate an aptitude and ability for research are also encouraged to apply.

Scholarship packages up to \$A35,000 per annum (tax-free) will be available for successful candidates. The scholarship will be set at the rate of an Australian Postgraduate Award \$A25,392, plus consideration for supplementary funding. Selection is based on academic merit and research potential.

Applicants for research degree scholarships must hold a Bachelors degree with at least an upper second-class Honours. Students with a very good Masters degree with a research component from an Australian or equivalent university may also be considered. In special cases, applicants with other qualifications and/or research experience may be considered.

Scholarships for International Students

There are a small number of scholarships available to outstanding international applicants. These include tuition fee waivers, stipends, supplementary scholarships and intellectual property (IP) assignment scholarships.

Applicants must have an excellent four-year Bachelor degree or a Masters degree from a leading university and should be ranked in the top five per cent of students in their discipline. References from internationally known university Professors are also required. Students with papers that have been accepted at international conferences or in internationally regarded journals will be particularly competitive.

More information

cecs.anu.edu.au/phd

Undergraduate and Postgraduate Coursework scholarships

The College is dedicated to supporting outstanding and talented students. There are a range of scholarships available to undergraduate and postgraduate coursework students.

College scholarships are available for both domestic and international applicants.

Applications are assessed on academic merit.

More information

cecs.anu.edu.au/future_students/scholarships



ACCOMMODATION

On-campus accommodation

What do ANU residences offer?

ANU residences provide you with a safe and supportive environment. We are security conscious — only residents are given entry to rooms, wings, laundries and other facilities. Staff trained in first aid are on duty outside office hours and the ANU campus is regularly patrolled by ANU security services.

Facilities

A variety of accommodation choices are available to ANU students.

There are five ANU owned and operated halls available for undergraduates: Bruce Hall, Burton and Garran Hall, Fenner Hall, Ursula Hall and Toad Hall. Toad Hall is a community of graduate students but will consider mature age undergraduates as capacity permits.

Also available on campus are affiliated residential colleges, Burgmann College and John XXIII College, as well as the Lodges.

Halls and residential colleges offer single fully-furnished rooms in a variety of configurations with shared shower and toilet facilities.

Davey Lodge, Kinloch Lodge, Warrumbul Lodge and Lena Karmel Lodge are owned by ANU and managed by UniLodge, and all offer single and multi-share apartments. All lodges are located on the ANU campus.

All residential rooms have their own telephone with free internal calls and voicemail. Residences offer facilities such as computer labs, libraries, television rooms, common rooms and fully-equipped laundries. Music rooms are also available in some of the residences.

Costs

In 2014 the self-catered accommodation cost is \$189.65 per week in the halls and catered accommodation costs start from \$339.50 per week. Electricity, water, heating and internet costs are included in the weekly rent, with external phone usage being charged separately. Residences also charge varying fees for registration, deposits and resident association fees.

The rates for the Lodges vary from \$202.10 per week depending on the style of apartment with service charges of \$29 per week.

It is also important to budget for transport, textbooks and entertainment expenses.

Accommodation agreements of 41, 48 and 52 weeks are available, however the length on your agreement is dependent on the location offered. These prices are subject to change and for up-to-date prices and detailed information please visit our website.

Support

All residences provide a range of pastoral care services. Halls, Colleges and Lodges also offer academic assistance programs to help you in your studies, including assignment and exam preparation. Senior residents and staff also assist you with adjusting to life on campus.

Community

All residents are welcome to become involved in the inter hall sports competition at ANU. Teams contribute points towards the annual sports shield, with sports including hockey, tennis, basketball, cricket, inward bound, rugby league, netball, softball, volleyball, soccer, Australian rules football, table tennis, swimming and the Daley Road Relay.

Other cultural activities include theatre, sports, chess, debates, public speaking, trivia competition, the annual art exhibition, musical recitals, talent night, poetry and short story writing.

Residential and Campus Communities
Building 77, Brian Lewis Crescent
Canberra ACT 0200

T 02 6125 1100
F 02 6125 0737
E uni.accom@anu.edu.au
W rcc.anu.edu.au

Accommodation guarantee

If you are from outside the ACT region and you haven't studied at ANU before, you will be offered a place in ANU approved accommodation.

To be eligible you must:

- > enrol in a full-time undergraduate degree at ANU
- > complete an online accommodation application form before the accommodation guarantee deadline for your intake
- > live outside the local ACT area.

Some accommodation places are available for local students, refer to our website for more information.

More information

rcc.anu.edu.au

ABOUT CANBERRA, THE NATION'S CAPITAL



Canberra is a modern and vibrant capital – a cosmopolitan city that offers an exciting blend of urban living and nature. Nestled within the leafy surrounds you will find stylish restaurants, bars, cafés and nightclubs, boutique shopping and markets, galleries and museums, nature corridors, cycle paths and walking trails, and open architecture that complements and enhances the local environment.

ANU is within walking distance to Canberra city centre and it is not the only national institution in the Australian Capital Territory. As the seat of Australian Government, the city is home to national museums, galleries, memorials, collections, research institutions and attractions that hold the shared stories and knowledge of the nation.

Canberra also boasts a busy calendar of events, festivals, exhibitions and tours as well as regular social, sporting and recreational activities. As the Australian capital, Canberra is also home to diplomats and visitors from all over the world – adding greatly to the multicultural flavour and diversity of the city.

Situated on the ancient lands of the indigenous Ngunnawal people, Canberra's name is thought to mean 'meeting place'.

The Australian Capital Territory is close to the sparkling waters of the South Coast, the rural greenery of the Southern Highlands and the alpine peaks of the Snowy Mountains. The surrounding region also hosts historic townships, unspoilt wilderness, excellent wineries and gourmet produce. Canberra is located 280 kilometres from Sydney and 660 kilometres from Melbourne.

Canberra facts & figures*

- > Canberra's population of 383,000 people has a median age of 34 years.
- > The people of Canberra earn the highest average weekly salary in Australia.
- > Canberra has consistently had lower levels of unemployment compared to the Australian average.
- > There are around 1,050 ICT firms in Canberra and it had the highest ICT employment intensity in Australia.
- > More than half of the ACT is covered by native forests and woodlands, most of which are within protected conservation areas.
- > Canberra people have the highest participation rate in cultural and leisure activities in the country.

* Figures from Australian Bureau of Statistics and Australian Capital Tourism.

Getting around

Canberra has excellent roads and is a safe place in which to drive, but you don't need to own a car to get around. The Capital has a reliable and regular bus network that covers the length and breadth of the city. There is also a comprehensive network of bicycle paths, which criss-cross the urban areas and surrounding nature reserves. If the ride gets too much for you, most major bus routes now have on-board bike racks fitted. Cyclists using these racks are given a free journey. Many people also take the opportunity to enjoy Canberra's stunning scenery by using one of the many walking paths and trails.

GENERAL INFORMATION

How to apply

Australian and New Zealand Citizens and permanent residents of Australia must apply directly through the University Admissions Centre (UAC).

More information

uac.edu.au

International Students can either apply directly to the University at applyonline.anu.edu.au or through ANU's registered representatives.

Details on ANU registered representative in your country is available on the ANU website.

More information

students.anu.edu.au/contacts/agents.php

Alternative Entry

ANU provides a number of pathways for students who do not meet the ANU entry requirement. In addition, the ANU also recognises technical qualifications in computing disciplines from Canberra Institute of Technology, TAFE Colleges, or overseas equivalents.

More information

students.anu.edu.au/applications/pathways.php

English language requirements (International students)

Applicants who are citizens of Australia, Canada, Fiji, Ireland, Kenya, New Zealand, Papua New Guinea, Singapore, Solomon Islands, South Africa, the United Kingdom, the United States of America, Samoa or Zambia can demonstrate English language capability by evidence of completion of their Bachelor degree where the medium of instruction was English at a recognised, local university in their home country.

Applicants from all other countries and Australian permanent residents will usually be required to supply evidence of English language capability which meet ANU requirements. The ANU English language requirements are:

- > IELTS 6.5 with no band below 6.0
- > TOEFL IBT 80 with no less than 20 in reading and writing, and 18 in speaking and listening.

More information

policies.anu.edu.au

Applicants who have the following minimum English language capability:

- > IELTS 6.0 with no band below 5.0
- > TOEFL IBT 72

may apply for admission to the ANU Access English Program

(CRICOS Code 045067J), a 10-week English and Academic Preparation course offered by ANU College. Successful completion of the program (at 60 per cent) enables students to fulfil the English language requirement for ANU degree programs.

More information

anucollege.com.au

Prospective students will also need to comply with the Australian Government's English Proficiency requirements for a student visa.

Advanced standing, status exemptions and credit

The College considers applications for advance standing (credit) on a case-by-case basis, however there are a number of institutions where formal credit transfer arrangements have already been approved. Some of these institutions include CIT, TAFE and a number of overseas education providers.

More information

cecs.anu.edu.au/future_students/advanced_standing

Fees

Australian citizens and permanent residents

Coursework programs are subject to Graduate Tuition Fees, which are reviewed on an annual basis.

More information

students.anu.edu.au/fees

Australian citizens enrolled in a fee-paying postgraduate non-research program may be eligible for FEE-HELP. This scheme provides a loan for students up to the limit of their course fees.

More information

studyassist.gov.au

International students

All coursework and research programs are subject to International Student Fees. For a current listing of postgraduate fees for international students please visit our website.

More information

students.anu.edu.au/fees

CONTACT US

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ANU online handbook

programsandcourses.anu.edu.au

ANU CRICOS Provider Number #00120C