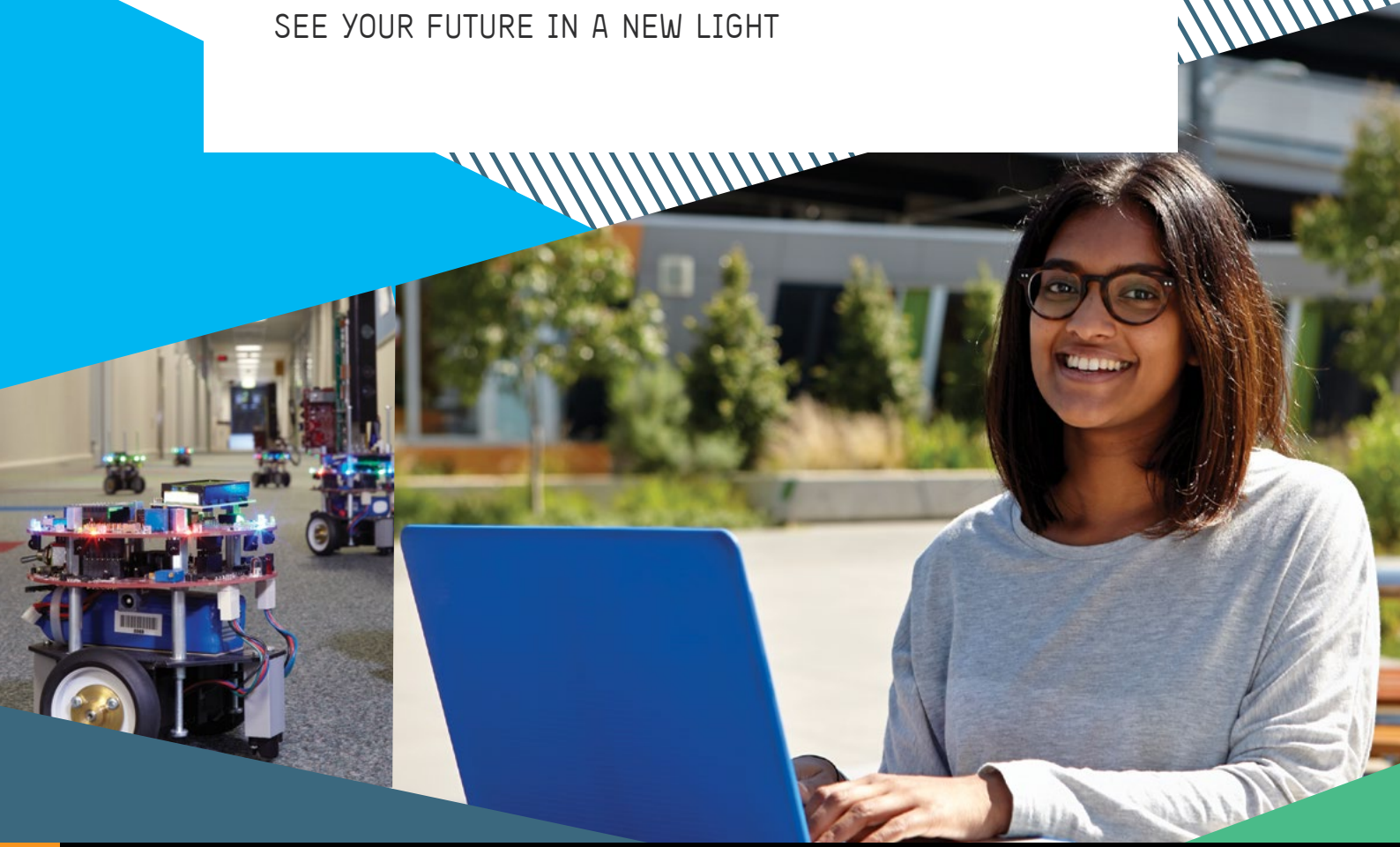
GLOBAL INNOVATION

MONASH University

ELECTRICAL & COMPUTER SYSTEMS ENGINEERING

SEE YOUR FUTURE IN A NEW LIGHT



MONASH University

ELECTRICAL
& COMPUTER
SYSTEMS
ENGINEERING

CHALLENGING. EXCITING. REWARDING.

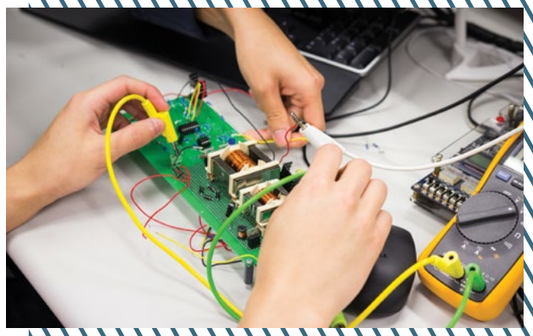
DID YOU KNOW?

The Monash Vision Direct-to-Brain Bionic Eye will use groundbreaking technology to bypass damaged optic nerves and could benefit up to 85% of people who are clinically blind. Human trials will begin from 2016.

The IEEE, Institute of Electrical and Electronic Engineers, the electronic engineering association, is the largest professional association for the advancement of technology.

In 2014/15 smartphone sales worldwide surpassed 1.3 billion units, with global revenue exceeding US$250 billion; android operating systems held 80% market share.

The Chancellor of Monash University, Dr Alan Finkel is a graduate of the Department Electrical and Computer Systems Engineering at Monash.



L to R: Final Year Project Poster Night, electronic testing.

THE WORLD OF ELECTRICAL AND COMPUTER SYSTEMS ENGINEERING IS CHANGING RAPIDLY.

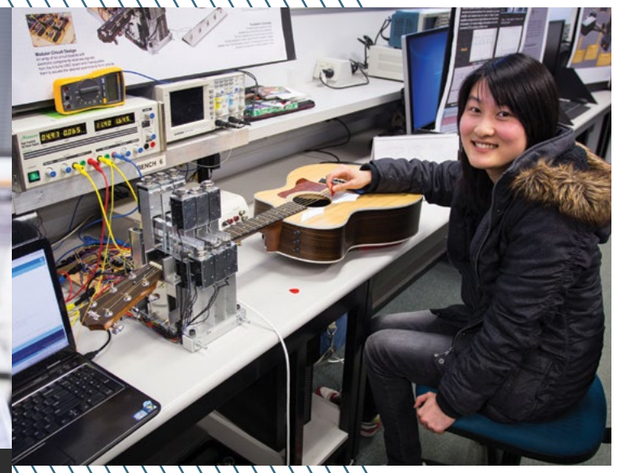
THERE ARE NEW AND EMERGING AREAS FOR EMPLOYMENT AND RESEARCH INFLUENCING A RANGE OF INDUSTRIES AND THE WAY WE LIVE AND OPERATE DAY TO DAY.

THIRD YEAR DESIGN PROJECT

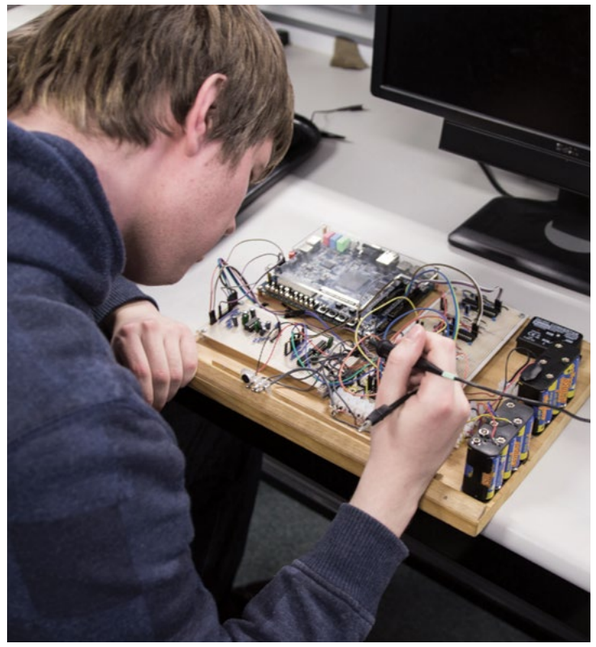
Students use knowledge from electronics, computer systems and communications engineering, to tackle a group project to design a robot.

This allows them to apply project management skills, and extend their experience of working in groups.

At the end of the semester, all robots are pitted against each other in a nerve wracking competition to find out which team's design and implementation is the best.



Various completed final year projects, far right: student working on debugging



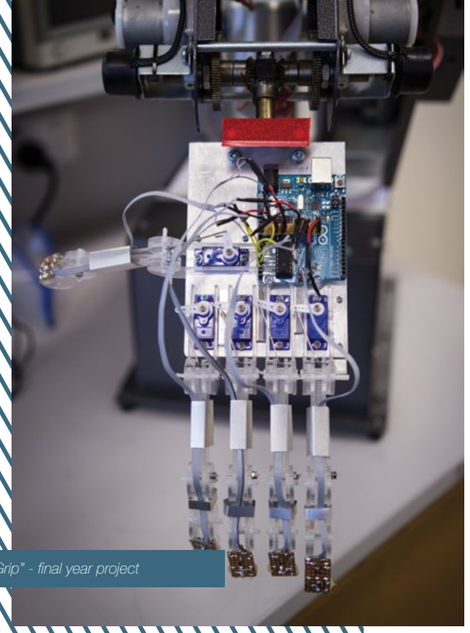
FINAL YEAR PROJECT

During level four, you will undertake an independent full-year project in an area of personal interest. Projects are often related closely to the department's exceptionally strong research and collaborative industry programs within research centres.

One key objective is to give you the experience of tackling a real problem and developing practical solutions.

The final year project often leads to graduate opportunities in that area - employers are very impressed by this practical demonstration of a graduate's abilities and interests.

The final year project builds self-reliance and planning capabilities in both individual and team-based environments.



"Air Grip" - final year project

BROADEN YOUR CAREER OPTIONS

SEE YOUR FUTURE IN A NEW LIGHT!

Third Year Design Competition arena

ANALOG ELECTRONICS

Diodes, transistors, op-amps, linear electronic circuits, feedback, complex impedances, sinusoidal analysis and phasors, frequency response and small signal analysis.

Applications
Amplifiers, telecommunications and sensor / actuator design for cars, aircraft and industrial automation.

DIGITAL ELECTRONICS

Logic gates, flipflops, arithmetic logic units, programmable logic devices, hardware description language (HDL), RAM and ROM and VLSI.

Applications
Telecommunications, computer design (from supercomputers to embedded systems in banking smartcards or myki).

MATHEMATICS

Geometry, vectors, matrices, Eigen values and vectors, calculus, Taylor series, complex variables, differential equations, statistics, finite element analysis and numerical methods.

Applications
Everything!

SIGNAL PROCESSING

Sampling, aliasing, digitising, Fourier series and spectra, filters, wavelets, adaptive and real-time filtering.

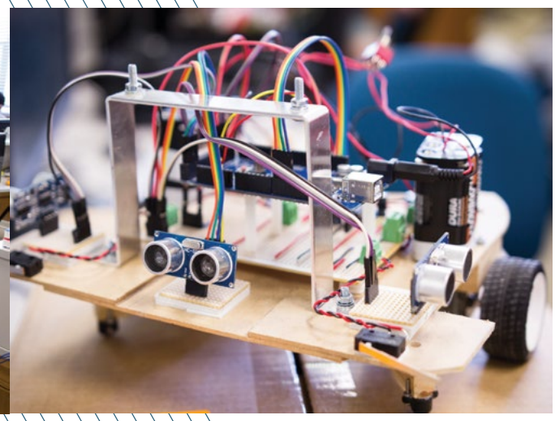
Applications
Information transmission, data compression and processing sensor data.

CONTROL SYSTEMS

Feedback loops, Laplace transforms, Nyquist and Bode diagrams, gain and phase margins, poles and zeros, state spaces, transfer functions, observability and controllability.

Applications
Industrial automation for our water supply, chemical plants, factories, medical equipment and robotics.

L to R: Working on Third Year Design team project, constructing a robot



POWER ELECTRONICS

DC machines, induction motors, motor control, three-phase AC networks, transformers, transmission line modelling, power system control, generation and supply, power converters and high voltage engineering.

Applications
Understanding power generation and distribution systems, generation from renewables, developing smart grid technologies and motor driven systems such as electric/hybrid vehicles.

COMPUTER VISION

2D image processing, detection of edges and corners in images, matching between views, inferring 3D structure from 2D images, visual tracking.

Applications
Robotics, medical Imaging and intelligent user interfaces such as mobile phone augmented reality applications.

BIOMEDICAL ENGINEERING

Instrumentation, optics, biomechanics, muscles as motors and brakes, medical imaging, computational methods, medical technology innovation (from concept to market).

Applications
Developing hospital equipment, prosthetics (from artificial limbs to bionic eyes), diagnostic tools and assistive technologies.

TELECOMMUNICATIONS

Transmitters, receivers, OFDM, modulation, digital communication, internet, LAN protocols, packet switching, TCP/IP, routing and congestion algorithms, noise and bit error rates, source and error coding, network security, MIMO and QoS.

Applications
Wired, optical fibre and wireless networks, including the national broadband network, smart meters, mobile phones and satellite communications.

COMPUTING

Programming in Matlab and C, data types, program statements, functions, parameters, data types, numerical methods such as Gaussian elimination, solution of nonlinear equations and numerical calculus, object-oriented programming, interfacing with hardware, CPUs, data paths, concurrency and memory structures.

Applications
Computer design, video games, user interface design and digital control systems such as automotive management systems.

OUR STUDENTS MAKING A DIFFERENCE

DR ALAN FINKEL

Chancellor of Monash University

1. Why did you choose ECSE?
In my day, it was simply called Electrical Engineering. I'd always thought that I would choose medicine but in Year 12, just as I was filling in the forms I realised that my interest in medicine was more about the science and mechanisms of the body than patient health, and that my real interests were in physics and electronics. I chose engineering with a view to doing electrical engineering because it seemed like it offered more practical options than a degree majoring in physics.

2. What did you like most about the course?
Electronics. Anything to do with semiconductors and circuit design filled me with the promise of doing new things. Like software, circuit design allows you to be extremely creative and enjoy seeing reasonably rapid results from prototyping.

3. Where has ECSE taken you?
It set me on a career path I could never have imagined when I started. In retrospect, I am not surprised because engineering of any kind teaches one skills about identification of problems, analysis, design of solutions and delivery of outcomes that are applicable in business and many walks of life. I migrated from electrical engineering into neuroscience (studying electrical activity in brain cells) during my PhD. I did a couple of years postdoctoral research in neuroscience then decided I was a better engineer than researcher. Ultimately, I started a company that made sophisticated instruments for neuroscientists, geneticists and pharmaceutical scientists. After 25 years, I sold that and applied those same engineering skills in publishing, electric car charging, and ultimately in governance as Chancellor of Monash University.

4. How has it helped you obtain a job?
I started my own company. Electrical Engineering gave me the skills and logical approach that I need in order to be successfully self-employed.

5. In a nutshell, why would you recommend ECSE?
I often recommend various types of engineering to young people because of the general skills mentioned above. In particular, the reason that I would recommend ECSE is because of the opportunity to be extremely creative and see the fruits of that creativity emerge rather quickly in prototype form prior to being incorporated into a wide variety of commercially significant products.

ELIZABETH ANDERSON

Maintenance and Reliability Engineer, Esso Australia

1. Why did you choose ECSE?
I chose ECSE because I thought it looked very interesting. I thought electricity seemed like magic, and found myself very curious to find out how it all worked!

2. What did you like most about the course?
The great thing about ECSE was that there were a lot of practical projects, enabling you to apply the learning straight away and see the outcome of your work.

3. Where is ECSE going to take you?
I have accepted an offer for graduate work with Esso Australia, whose parent company is ExxonMobil. I will be working as a Maintenance and Reliability Engineer.

4. How has it helped you obtain a job?
ECSE teaches you to think in a uniquely rational and logical way. This new way of thinking will set you up well for whatever career path you decide to take. The skills I obtained during my four years helped me obtain a graduate position with a global corporation.

5. In a nutshell, why would you recommend ECSE?
I would recommend ECSE because it is immensely rewarding and fulfilling. I found that I was able to complete projects that I thought impossible at the beginning.

SHARANYA YOGANATHAN

Current student. Electrical and Computer Systems Engineering Bachelor of Electrical and Computer Systems Engineering and Bachelor of Commerce

"Engineering is a meaningful and broad career. Electrical and Computer Systems Engineering is fundamental to our modern way of life, and will shape our future. I find it really exciting that as our world rapidly changes and technology develops, Electrical and Computer Systems engineers are at the forefront of shaping this change. I am currently the Schools Manager for Robogals Monash – a student organisation aiming to increase gender diversity in engineering and science fields. Through Robogals I've been able to get some great experience working in teams and build on skills that are necessary in the workforce."

Read more **eng.monash.edu.au/prospective/profiles/profile/sharanya-yoganathan**

DAVID MCKECHNIE

Telecommunications Engineer, Ericsson

1. Why did you choose ECSE?
ECSE was a natural choice for me: I had a strong interest in computers and IT and I felt a Bachelor of Engineering was a flexible degree with a broad scope for graduate employment. I was also searching for a degree in a growth area, and the ECSE course covered a huge range of possibilities: communications infrastructure, power distribution, hi-tech electronics and more.

2. What did you like most about the course?
Lots of contact time, technical resources and space availability! The course has many units with substantial practical components, and flexibility around allowing student work and experimentation with minimal supervision. ECSE practicals can be very engaging: most of the equipment is available within the department, which certainly sets it apart from some other areas of engineering.

3. Where has ECSE taken you?
In 2010 I secured a position in the Ericsson graduate program, working as a Radio Access Network services engineer. My work is centred around the design of next generation large scale communications networks: at the moment, I'm working on LTE / 4G technology trials based in Singapore. Earlier this year I was working on similar projects in Hong Kong and also for Telstra in Australia. Early next year there is an opportunity to begin a 6 month training activity in Sweden working with the product development unit - ECSE has taken me half way around the world!

4. How has it helped you obtain a job?
I never planned to have a career in telecommunications, however, the breadth of the course allowed me to experience a whole range of possibilities Choosing appropriate electives in my final two years allowed me to engage at length during job interviews even though I didn't have a 'telecommunications' degree and my knowledge was well received by prospective employers.

5. In a nutshell, why would you recommend ECSE?
There's something in ECSE to interest anyone with a desire to work or conduct research in hi-tech industries. The ECSE course set me up to deal with the steep learning curves I encounter every day and provided the fundamentals I need to grasp complicated technical topics quickly.

TIM MCCOY

Technical Application Engineer, GE Energy

1. Why did you choose ECSE?
The course matched my personal interests as well as introducing me to areas that were completely new to me. It was a balance between developing areas in which I had some grounding and stretching me into new ones.

2. What did you like most about the course?
The hands on experience that was also extremely relevant once leaving University.

3. Where has ECSE taken you?
Since leaving University 5 years ago, I have been working in the Energy Utility Sector. I initially developed hardware and firmware for Smart Energy devices for the home and utility market, which has now lead to a customer facing role in Smart Grid technology solutions for Asia Pacific.

4. How has it helped in your career?
The Monash University ECSE name was instantly recognized and highly respected when applying for positions. My skills developed during study then stood me in great stead throughout my working career. I have discovered that Engineering prepares you well for management and working in large teams – something that I still do on a daily basis.

5. In a nutshell, why would you recommend ECSE?
It is the well rounded ECSE study and hands on material that has prepared me for industry as well as I could ever have hoped.

CONTACT

Phone + 61 3 9905 1898
Email ros.rimington@monash.edu

www.eng.monash.edu.au/ecse

MONASH University

GROUP OF EIGHT AUSTRALIA

Group of 8 is an alliance of Australia's best universities, recognised for their excellence in teaching and research.