Welcome from the Head of School

The School of Electrical Engineering and Telecommunications is one of the highest ranked Schools in the University of New South Wales and has a well-regarded reputation across Australia and around the world. It is the largest Electrical Engineering School in Australia and is recognised for its research excellence and the high quality of its learning and teaching and a well-rounded student experience. The School’s international standing consistently attracts high calibre students from Australia and overseas.

We offer undergraduate and postgraduate programs with electives from all branches of the profession of Electrical Engineering and Telecommunications and there is a strong design component across all years of our undergraduate curriculum. We have a focus on flexible teaching delivery modes, such as open online lectures, with the use of educational technology developed at the School.

The 5 year BE ME in Electrical Engineering is a flagship program offered by the School, which has an integrated minor, and is the first program of its kind to be offered in Australia. Introduced in 2011, this program now offers 10 minors, and promises to produce high-calibre, and entrepreneurial electrical engineering graduates for the Australian market.

The School also has great depth in its research activities that makes it one of the largest postgraduate Schools in the country and a world leader in a number of key research areas. The School comprises five research disciplines namely Power Engineering, Telecommunications (including Photonics), Systems and Control, Microsystems and Signal Processing. Our academic, professional and technical staff are experts in these fields and share research interests and teaching commitments across all five disciplines.

The School continues to offer a world-class, challenging and well balanced learning environment that has produced talented engineering graduates over the years. With a team that is recognised for its teaching excellence and innovative research, the School of Electrical Engineering & Telecommunications is producing the next generation of engineers who will be equipped with the skills and knowledge to make a positive impact on industry and society.

Professor Eliathamby Ambikairajah
Head of School of Electrical Engineering & Telecommunications
May 2015
Electrical Engineering and telecommunications (EE&T) is arguably the origin of most high technology as we know it today. Based on fundamental principles from mathematics and physics, engineering concepts are progressively introduced until students are equipped to tackle professional electives spanning microelectronics, systems and control, signal processing, energy systems, telecommunications, photonics embedded systems design, instrumentation and real time computing, video, image and speech processing and data networks.

The majority of courses have a significant laboratory component, providing a critical link between theory and practice in a hands-on environment. Professional electives and core courses in management and entrepreneurship form the basis for a career path towards technology management. The industrial training component of the program provides the link between university lab and project work with the life of a graduate engineer.

UNSW EE&T graduates find themselves in constant demand everywhere, whether they are building electric motors for hybrid cars, designing new brain-computer interfaces, programming control systems for autonomous aircraft, pioneering quantum electronic circuits, doing financial modelling for a bank, developing gigahertz switching technology using microelectromechanical systems, or planning the next generation of wireless networks. UNSW electrical engineering degrees are accredited by Engineers Australia (EA), which also gives our graduates international recognition for their qualifications under the Washington Accord. Our graduates work in more than 90 countries around the world. A UNSW Electrical Engineering degree will always have high value in the job market.

SINGLE DEGREE PROGRAMS
BE Honours (Electrical Engineering)
BE Honours (Telecommunications)

INTEGRATED DEGREE PROGRAM (5 years)
BE (Hons) ME in Electrical Engineering with broadening discipline

DUAL DEGREE PROGRAMS
BE BA (Electrical, Telecommunications)
BE BSc (Electrical, Telecommunications)
BE BCom (Electrical, Telecommunications)
BE MBiomedE (Electrical, Telecommunications)
Other dual degrees are also available such as BE LLB, BSci (Adv Science)/BE, BSci (Adv Maths)/BE, BMus/BE.

Details available via: www.eet.unsw.edu.au
Why choose Electrical Engineering at UNSW?

No 1 Engineering in Australia
Source: The 2014 ARWU/SHJT Rankings

$3,000,000 in engineering scholarships for students provided each year

More technology entrepreneurs than any other university in Australia.
(Crunchbase Report 2013)

18% of the Top 100 most influential engineers in Australia are UNSW Graduates*
*Engineers Australia Top 100 list in 2014.

Globally recognised engineering degrees with Engineers Australia

28 degrees

100+ degree combinations

>$500,000 on average per year spent on equipment and laboratory components
Bachelor of Engineering (Honours)  
(Electrical Engineering)

Electrical Engineering is a broad and creative profession concerned with the design, development, planning and management of systems and devices which underpin modern economics and contribute to the quality of life.

An electrical engineer may be responsible for the research, design, development, manufacturing and management of complex hardware and software systems and reliable, cost effective devices, many involving the use of new information and computer intensive technologies. These include:

- Computer systems, data and telecommunication networks including the Internet
- Mobile telecommunications and wireless networks
- Optical and microwave communications
- Integrated electronic systems
- Advanced robotics and intelligent machines
- Video and image processing systems
- Quantum devices and quantum computing
- Generation and transmission of electrical power
- Renewable energy systems and solar energy conversion
- Biomedical instruments and applications, such as medical imaging scanners, the cochlear implant (bionic ear), pacemakers and hearing aids

Career Opportunities
Potential employers include service industries such as Energy Australia, Eraring Energy or Waubra Wind Farm; large private industrial groups, such as Alstom, BHP, Boeing Australia, Downer EDI, Honeywell, Google, Canon, Transfield and Alcatel; and small innovative private firms specialising in the application of new technologies to new products and services, for example Cochlear.
## Electrical Engineering Program

### YEAR 1

<table>
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<tr>
<th>SESSION 1</th>
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<tbody>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A*</td>
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<tr>
<td>PHYS1131</td>
<td>Higher Physics 1A*</td>
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<tr>
<td>COMP1911</td>
<td>Computing 1A*</td>
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<tr>
<td>ENGG1000</td>
<td>Introduction to Engineering Design and Innovation</td>
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<th>SESSION 2</th>
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<td>MATH1231</td>
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<td>PHYS1231</td>
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<tr>
<td>Electives L1 (Two)</td>
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**Recommended L1 Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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<tbody>
<tr>
<td>ELEC1111</td>
<td>Electrical and Telecommunications Engineering</td>
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<tr>
<td>COMP1921</td>
<td>Computing 1B*</td>
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*Different versions and schedules of theses courses may be possible.

### YEAR 2

<table>
<thead>
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<tbody>
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<td>MATH2069</td>
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<tr>
<td>ELEC2141</td>
<td>Digital Circuit Design</td>
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<tr>
<td>ELEC2134</td>
<td>Circuits and Signals</td>
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<tr>
<td>GENXXXXX</td>
<td>General Education</td>
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<tr>
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<tbody>
<tr>
<td>MATH2099</td>
<td>Mathematics 2B</td>
</tr>
<tr>
<td>ELEC2142</td>
<td>Embedded System Design</td>
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<tr>
<td>ELEC2133</td>
<td>Analogue Electronics</td>
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<tr>
<td>GENXXXXX</td>
<td>General Education</td>
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### YEAR 3

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<tr>
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<tbody>
<tr>
<td>ELEC3115</td>
<td>Electromagnetic Engineering</td>
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<tr>
<td>ELEC3106</td>
<td>Electronics</td>
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<tr>
<td>ELEC3104</td>
<td>Digital Signal Processing</td>
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<tr>
<td>Elective L3</td>
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<tr>
<td>ELEC3105</td>
<td>Electrical Energy</td>
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<tr>
<td>ELEC3114</td>
<td>Control Systems</td>
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<tr>
<td>ELEC3117</td>
<td>Electrical Engineering Design</td>
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<td>Elective L3</td>
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### YEAR 4

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<tbody>
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<td>ELEC4120</td>
<td>Thesis A</td>
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<tr>
<td>ELEC4123</td>
<td>Design Proficiency</td>
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<tr>
<td>Electives L4 (Two)</td>
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<tr>
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<tbody>
<tr>
<td>ELEC4121</td>
<td>Thesis B</td>
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<tr>
<td>ELEC4122</td>
<td>Strategic Leadership and Ethics</td>
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<tr>
<td>Electives L4 (Two)</td>
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</tbody>
</table>

For more information about courses, schedules and a complete list of L1 electives, please see [http://www.engineering.unsw.edu.au/electrical-engineering/electrical-engineering/electrical-engineering-degree](http://www.engineering.unsw.edu.au/electrical-engineering/electrical-engineering/electrical-engineering-degree)
Telecommunications engineering is concerned with communicating information at a distance. It is strongly associated with data communications, largely because of the need to encode, compress and encrypt all information, and because of the growing importance of digital and wireless (e.g., mobile telephony) networks. Telecommunications engineering will appeal to those who are interested in the following fields:

- Satellite communications
- Signal and image processing
- Optical fibres and photonics
- Mobile satellite communications
- Data networks
- Software systems including e-commerce
- Microelectronic devices and systems
- Data coding, compression, encryption and transmission
- Real-time embedded systems
- Quantum telecommunications

**Career Opportunities**

Telecommunications engineering is developing rapidly and the demand for graduates in telecommunications is evolving as the technology advances and broadens its scope of applications.

You could work for telecommunications service providers such as iiNet or Skype, major equipment and device manufacturers such as Cisco, Apple or Huawei; and a wide range of start-up companies such as Airhop Communications, Cloudscaling, Devicescape or UNSW’s own Zedelef. Demand for telecommunications engineers is boosted by huge infrastructure projects like the National Broadband Network.
**Telecommunications Program**

### YEAR 1

**SESSION 1**
- MATH1131 Mathematics 1A*
- PHYS1131 Higher Physics 1A*
- COMP1911 Computing 1A*
- ENGG1000 Introduction to Engineering Design and Innovation

**SESSION 2**
- MATH1321 Mathematics 1B*
- PHYS1231 Higher Physics 1B*
- Electives L1 (Two)

**Recommended L1 Electives**
- ELEC1111 Electrical and Telecommunications Engineering
- COMP1921 Computing 1B*

*Different versions and schedules of theses courses may be possible.

### YEAR 2

**SESSION 1**
- MATH2069 Mathematics 2A
- ELEC2141 Digital Circuit Design
- ELEC2134 Circuits and Signals
- GENXXXX General Education

**SESSION 2**
- MATH2099 Mathematics 2B
- ELEC2142 Embedded System Design
- ELEC2133 Analogue Electronics
- GENXXXX General Education

### YEAR 3

**SESSION 1**
- ELEC3115 Electromagnetic Engineering
- ELEC3106 Electronics
- ELEC3104 Digital Signal Processing
- TELE3118 Network Technologies

**SESSION 2**
- ELEC3114 Control Systems
- TELE3117 Electrical Engineering Design
- TELE3113 Analogue and Digital Communications
- TELE3119 Trusted Networks

### YEAR 4

**SESSION 1**
- ELEC4120 Thesis A
- TELE4123 Design Proficiency
- Electives L4 (Two)

**SESSION 2**
- ELEC4121 Thesis B
- ELEC4122 Strategic Leadership and Ethics
- Electives L4 (Two)

For more information about courses, schedules and a complete list of L1 electives, please see [http://www.engineering.unsw.edu.au/electrical-engineering/electrical-engineering/telecommunications-engineering](http://www.engineering.unsw.edu.au/electrical-engineering/electrical-engineering/telecommunications-engineering)
Electives for BE(Elec) & BE(Tele)

SYSTEMS & CONTROL
Real-Time Instrumentation (L3)
Continuous-Time control System Design (L4)
Computer Control Systems (L4)
Real Time Engineering (L4)

DATA & MOBILE COMMUNICATIONS
Network Technologies (L3)
Trusted Networks (L3)
Analogue and Digital Communications (L3)
Digital Modulation and Coding (L4)
Mobile and Satellite Communications (L4)
Network Performance (L4)
Wireless Communication Technologies (L4)

ENERGY SYSTEMS
Distributed Energy Generation (L3)
Power System Protection (L4)
Electrical Energy (L3)
Electrical Drive Systems (L4)
Power Systems Equipment (L4)
Power Systems Analysis (L4)
Power Electronics (L4)

MICROELECTRONICS
Solid-State Electronics (L4)
Microelectronic Design and Technology (L4)
Digital and Embedded Systems (L4)
RF Electronics (L4)

PHOTONICS
Applied Photovoltaics (L3)
Optical Circuits and Fibres (L4)
Photonic Networks (L4)

SIGNAL PROCESSING
Engineering Modelling and Simulation (L2)
Advanced Digital Signal Processing (L4)
Multimedia Signal Processing (L4)

COMPUTER SYSTEMS
Software Engineering (L3)
Operating Systems (L3)
Computer Architecture (L3)
Database Systems (L3)

BUSINESS ADMINISTRATION
Entrepreneurial Engineering (L4)

MATHEMATICS
Information, Codes and Ciphers (L3)
Dynamical Systems and Chaos (L3)
Optimisation (L3)

Key:  L2: Level 2 elective
      L3: Level 3 elective
      L4: Level 4 elective
Photonics is about generating, manipulating (processing) and detecting light (photons), and specifically light that is carrying useful information, be it voice telephony, image data files, measurement signals, or performing some other useful purpose, such as remote illumination. Photonic engineers unlock the enormous bandwidth of optical fibres and waveguides, they deliver the huge storage capacity of DVDs, their expertise provides the images making keyhole-surgery possible, and they implement all-optical control networks which enhance safety in industrial environments where electrical signals present fire hazards.

Soon photonic engineers will develop processors with speeds thousands of times faster than anything currently available as well as laser instrumentation for new medical procedures. Today, photonics is an area of great excitement and possibilities; it will become as important, fundamental and generic as electronics was in the twentieth century.

Photonic engineering will appeal to those interested in the following fields:
- Optical fibres
- Optical signal processing
- Optical and quantum communications
- Optical devices

Career opportunities

Photonics is at the core of the National Broadband Network, Australia’s largest ever infrastructure project. Australia’s photonics industry has an established reputation as one of the most successful and innovative in the world and exports to every continent.

Potential employers include major international photonic device companies (e.g. Alcatel, JDS U nickage, Lucent, Nortel) that have operations based in Australia; telecommunication carriers (Telstra, Optus, Powertel) and other operations (electricity utilities, railways) that use large-scale photonic technologies.

Currently there is no direct entry into BE (Phot) - The program can be taken by transferring from BE (Elec).

Image courtesy of Nicholas Ritchie, BE(Phot) summer industrial training at a major industrial automation company.
5-Year Integrated Bachelor of Engineering (Hons) Master of Engineering (BE ME) in Electrical Engineering with Broadening Discipline

**Improved flexibility:**
- Choose a broadening discipline (similar to a minor) in many interest areas - computer science, music, mechatronics, photovoltaics, maths, physics and more, either at UNSW or overseas... it’s up to you.
- Significant elective choice from year 2 onwards, including choice of more than 20 postgraduate electives not normally accessible to 4-year BE program students.

**Better specialisation:**
- Maximise your learning in the Electrical Engineering disciplines of your choice.
- Work right at the cutting edge on your fourth and fifth year project.

**More design:**
- Coursework thread in engineering design from year 1 to year 4.

**Easier integration with international exchange:**
- Four to six courses can be arranged overseas as a part of the broadening discipline.

More detail: see [http://www.engineering.unsw.edu.au/electrical-engineering/be-me](http://www.engineering.unsw.edu.au/electrical-engineering/be-me)

Take advantage of this leading new program from UNSW Engineering, the largest faculty of engineering in Australia, recognised for excellence throughout Asia.

**Contact:**
A/Prof Julien Epps, Director of Academic Studies
j.epps@unsw.edu.au, Ph: 02 9385 4000
Bachelor of Engineering (Hons) Master of Engineering (BE ME) Program

Year 1 (48 UoC core)
MATH1131 Mathematics 1A or MATH1141 Higher Mathematics 1A
MATH1231 Mathematics 1B or MATH1241 Higher Mathematics 1B
PHYS1131 Physics 1A
PHYS1231 Physics 1B
COMP1917 Higher Computing 1
ENGG1000 Introduction to Engineering Design & Innovation
ELEC1112 Electrical Circuits
ELEC2141 Digital Circuit Design

Year 2 (36 UoC core)
ELEC2133 Analogue Electronics
ELEC2134 Circuits & Signals
ELEC2142 Embedded Systems Design
ELEC2117 Electrical System Design
MATH2069 Mathematics 2A
MATH2099 Mathematics 2B
6 UoC Free elective
6 UoC of Broadening Discipline in chosen area (see p12)

Year 3 (30 UoC core)
ELEC3115 Electromagnetic Engineering
ELEC3104 Digital Signal Processing
ELEC3105 Electrical Energy
ELEC3114 Control Systems
ELEC3117 Electrical Engineering Design
6 UoC of Broadening Discipline in chosen area
6 UoC of General Education
6 UoC L3 elective (see p7)

Year 4 (24 UoC core)
ELEC4122 Strategic Leadership & Ethics
ELEC4123 Electrical Design Proficiency
ELEC4120 Thesis A
ELEC4121 Thesis B
6 UoC of Broadening Discipline in chosen area (see p12)
18 UoC L4 electives (see p7)

Year 5 (12 UoC core)
ELEC9120 Project Report A
ELEC9121 Project Report B
6 UoC Engineering and Technical Management Course
6 UoC of Broadening Discipline in chosen area (see p12)
24 UoC L5 electives (see p13)

Note: Program structure/schedule may have to be adjusted depending on the broadening discipline chosen.
## MUSIC

**Year 2**
- MUSC1101 Music reinvented

**Year 3/4/5**
- Select two courses in Musicianship
- Select one from the following:
  - Electronic Music
  - Film Music
  - Popular Music
  - Music history
  - Psychology of Music
  - Music analysis
  - Ethnomusicology
  - Musicianship C

## PHOTOVOLTAICS

**Year 2**
- SOLA2540 Applied Photovoltaics

**Year 3/4/5**
- Select three from the following:
  - SOLA2020 Photovoltaic Techn & Manufacturing
  - SOLA3507 Solar Cells & Systems
  - SOLA5509 Photovoltaics Materials Processing Technology
  - SOLA5508 High Efficiency Silicon Solar Cells
  - OR
  - SOLA4012 Grid-Connected Photovoltaics
  - SOLA5054 PV Stand-Alone Sys. Des.& Inst
  - SOLA5057 Managing Energy Efficiency
  - SOLA5053 Wind Energy
  - SOLA3010 Low Energy Building and Photovoltaics

## LANGUAGE

**Year 2/3/4/5**
- Select six language courses; available in different languages

## COMMERCE: SUB-DISCIPLINES AVAILABLE:

**Year 2/3/4/5**
- Accounting
- Finance
- Business Economics
- Business Strategy
- International Business
- Management
- Human Resource Management
- Marketing

## GEOSPATIAL

**Year 2/3/4/5**
- Select four from the following:
  - GEOS9016 Principles of Geographic Information Systems
  - GMAT4900 Introduction to GPS Positioning
  - GMAT4910 GeoIT & Infomobility Applications
  - GMAT9201 GPS Receivers & How They Work
  - GMAT9300 Aerial & Satellite Imaging Systems
  - GMAT9600 Principles of Remote Sensing

## PSYCHOLOGY

**Year 2/3/4/5**
- PSCY1001 - Psychology 1A
- PSCY1011 - Psychology 1B
- PSYC2061 - Social and Developmental Psychology
- PSYC2071 - Perception and Cognition
- PSYC2081 - Learning and Physiological Psychology
- PSYC2101 - Assessment, Personality and Psychopathology

## MECHATRONICS

**Year 3/4/5**
- MTRN3020 Modelling and Control of Mechatronic Systems
- MTRN3100 Robot Design
- MTRN4230 Robotics
- MTRN4010 Advanced Autonomous Systems

## COMPUTING

**Year 2**
- Select two from the following courses:
  - COMP1927: Computing 2
  - COMP2911: Engineering Design in Computing
  - COMP3231: Operating Systems
  - COMP3211: Computer Architecture
  - COMP4601: Configurable Systems and Logic Design

**Year 3/4/5**
- Select two from many breadth and depth courses available

## SATELLITE SYSTEMS

**Year 3**
- AERO9500 Space Systems Architectures and Orbits

**Year 4/5**
- AERO9610 The Space Segment
- ELEC9762 Space Mission Development
- ELEC9764 The Ground Segment and Space Operations

## NUCLEAR ENGINEERING

**Year 3**
- ENGG9741 Introduction to Nuclear Eng

**Year 4/5**
- ENGG9742 Reactor Physics for Engineers
- ENGG9743 Fuel Cycle, Waste & Life Cycle
- ENGG9744 Nuclear Safety, Security & Safety
Microelectronics
ELEC9701 Mixed Signal Microelectronics Design
ELEC9702 RF IC design
ELEC9703 Microsystem Design & Technology
ELEC9704 VLSI Technology
ELEC9705 Quantum Devices

Energy Systems
ELEC9711 Advanced Power Electronics for Renewable Generation
ELEC9712 High Voltage Systems
ELEC9713 Industrial & Commercial Power Systems
ELEC9714 Electricity Industry Plan & Economics
ELEC9715 Electricity Industry Operation & Control
ELEC9716 Electrical Safety

Signal Processing
ELEC9721 Digital Signal Processing & Applications
ELEC9722 Digital Image Processing Systems
ELEC9723 Speech Processing
ELEC9725 GPS Receivers and How They Work

Control Systems
ELEC9731 Robust & Linear Control Systems
ELEC9732 Analysis & Design of Non-Linear Control
ELEC9733 Real Time Computing & Control

Data and Mobile Communications
TELE9751 Switching Systems Architecture
TELE9752 Network Operations & Control
TELE9753 Advanced Wireless Network
TELE9754 Coding & Information Theory
TELE9755 Microwave Circuits, Theory and Techniques
TELE9756 Advanced Networks
TELE9757 Quantum Communications
GSOE9758 Network Systems Architecture

Spatial Information Systems
GMAT9200 Principles of GPS Positioning
GMAT9202 Satellite Navigation: Receivers & Systems
GMAT9210 Geopositioning Technologies and Infomobility Applications

Engineering and Technical Management Electives
GSOE9420 Project Management in Eng & Research
GSOE9747 Innovation & Commercialisation for Engineers
GSOE9820 Engineering Project Management
GSOE9820 Engineering Decision Structures
GSOE9810 Process and Product Quality in Engineering
Comparison between the BE (Hons) & BE ME

Additional Information:

Broadening Disciplines consist of a minimum of 4 courses and a maximum of 6 courses, mutually agreed upon by the School of Electrical Engineering & Telecommunications and the School providing the broadening disciplines.

Broadening Disciplines taken within the Faculty of Engineering must consist of a maximum of 4 courses as 2 general education courses must be taken outside the Faculty.

It is possible that the degree can be completed in 4.5 years if students complete two summer sessions.
To further increase study flexibility, the School of Electrical Engineering and Telecommunications offers a suite of courses run in block-mode over summer, catering for the different needs, e.g.: mid-year entry or students wishing to accelerate their program to finish in quicker time (e.g. completion of a BE in 3.5 years may be possible), or students wishing to “underload” during the normal semester time in their final year, when the thesis is taken. The following courses will run in the summer semester:

- ELEC1112 Electrical Circuits (Year 1)
- ELEC2134 Circuits and Signals (Year 2)
- TELE3118 Network Technologies (Year 3)
- ELEC9716 Electrical Safety
- GSOE9742 Energy Efficient Lightning

The summer courses run over an 8-week period straddling the Christmas break, so students still have 2 weeks vacation time over summer. Pre-recorded lectures together with blackboard/Moodle classroom teaching and support allow great flexibility during summer study.

---

**Taste of Research Summer**

The Taste of Research Scholarships give 3rd year students the chance to do a 12 week project with an existing research team within the Faculty, and receive a tax exempt allowance of about $500 per week. UNSW Bachelor of Engineering students may use their Taste of Research Summer as a contribution towards their Industrial training requirements.

**Current Projects:**

- Advanced Photonics
- Data and Mobile Networks
- Energy System Modelling and Economics
- Multimedia Signal Processing
- Quantum Computing and Microelectronics
- Satellite Systems
- Smart Grid and Energy Systems
- Systems & Control and Biomedical Systems

For more information about projects and an example topic list visit:

https://www2.eng.unsw.edu.au/scholarships/tr1516/projects/school.cfm?id=5
Since 2013, the University of New South Wales has been offering a world class Masters level program in satellite systems engineering developed in collaboration with the international space industry and global leaders in space education. As Australia’s first comprehensive postgraduate program of its type - and one of only a handful of similar programs worldwide - the new Satellite Systems Engineering program is designed to produce “industry ready” graduates for the Australian, regional and international satellite and space industries.

NEW: Study Satellite Systems as an undergraduate student, via a BE ME broadening discipline

In January 2015, the BLUEsat team, mentored by Dr Elias Aboutanios, successfully launched a stratospheric balloon from Muswellbrook and safely recovered its payload, consisting of a control computer, tracking equipment and two GoPro cameras. The balloon rose to a height of 25,000m, and was tracked the balloon using a Spot GPS and an APRS tracker, both through the APRS network and through our own receiving station with software developed by the BLUEsat team. The BLUEsat team comprised 6 undergraduate MME students and 2 EE&T undergraduate students.

This successful mission is a great step towards our goal of building reliable stratospheric balloon launch capabilities to take payloads to an altitude of 35-40km and recover them safely. This will serve multiple goals, including (i) serving space research activities within the faculty with a vehicle for testing space systems and space hardware in near-space conditions, and (ii) running high school outreach competitions for students to develop payloads, with the winning team or teams going with us on the launch mission to see their payload go to the stratosphere.

The program includes contribution from UNSW key partners Optus (Australia’s only satellite owner and operator), Thales group (France-based multinational), and Institut supérieur de l’aéronautique et de l’espace (ISAE) (Toulouse-based internationally renowned leader in space education). These ensures that Masters program is informed by, and up to date with, the latest industry developments worldwide.

The program was developed as part of the Warrawal Project (www.warrawal.unsw.edu.au) led by Dr Elias Aboutanios of the School of Electrical Engineering and Telecommunications.
The UNSW High Voltage Laboratory provides a unique facility in Australia for teaching, testing and research activities in High Voltage Power Engineering. In order to enable the laboratory to provide the best and most modern facilities available to sustain its work at the highest level, the Faculty of Engineering and UNSW have recently invested $1.16M to modernise and refurbish the laboratory totally. Major facilities available include 5 screened high voltage test bays equipped with a 400kV/20kJ impulse generator, AC supplies up to 250kV/25kVA, variable frequency and DC supplies, and a wide range of advanced as well as industry-standard test and measurement instruments.

Large-scale electricity generation, transmission, and distribution systems operate at high voltage and thus there is a requirement for facilities for teaching, research and testing of the design and operation of high voltage high power components and apparatus (e.g. transformers, rotating machines, cables, switchgear, etc). The use of electrical insulating materials plays a critical role in preventing breakdowns under severe electrical stress and it is necessary to know design requirements and diagnostic features for such applications of insulation materials.

The key research activity conducted in the UNSW High Voltage Laboratory is focused on developing diagnostic techniques for condition monitoring, and in particular insulation assessment of power system equipment based on partial discharge measurements. The UNSW High Voltage group is recognised internationally and is the leader in Australia in the area of partial discharge research. There has been a long, on-going, and close interaction between the group and power utilities throughout Australia. We will continue to partner with power utility companies in our research activities to expand this industrial focus.
Be part of ELSOC

Founded in 1954, the Electrical Engineering Student Society, ELSOC is one of the largest and most active student societies on campus. They provide all undergraduate UNSW Electrical and Telecommunications Engineers with regular social events, academic mentoring and professional networking opportunities with members of the engineering industry. ELSOC has continued to play an important role in Electrical Engineering and Telecommunications students’ social and academic lives. The staple ELSOC event is their lunchtime BBQs. Students from all years enjoy a free lunch and have a chance to socialise and meet new people.

Some BBQs also coincide with time-honoured traditions, such as the annual 4Pi marathon. Representatives from engineering firms are regular guests at ELSOC BBQs providing assistance to students looking for information on industrial training or graduate programs.

ELSOC also holds annual special events such as the ELSOC Harbour Cruise (where they are joined by a non-engineering student society) and ELSOC Paintball. ELSOC also throws a special First Year Social Night to provide a warm welcome to new students. In 2014, ELSOC and the School of EE&T jointly ran the first Electrical Engineering and Telecommunications Industry Night.

ELSOC also hosted several engineering companies who all sent representatives to meet students and provide insights into professional life, what companies look for in graduating students as well as information for internships and graduate programs.

Industry Night was a huge success with attendance greatly exceeding expectations. The event is sure to be bigger and better in 2015. Academically ELSOC provides a free tutoring service, run by some of our top performing senior students and an extensive textbook borrowing scheme. To find out more, please visit ELSOC at:

www.elsoc.net
www.facebook.com/eeunsw
UNSW Co-op Program Scholarships

For high achieving students, the UNSW Co-op Program offers an ideal combination of challenge and opportunity.

- $15,000 pa for every year of study
- 18 months of relevant industrial training with up to four different companies during your degree
- Network with leading employers and make valuable contacts within your industry

More details: www.coop.unsw.edu.au

NICTA -UNSW Undergraduate Research Scholarship

This new scholarship program offers opportunities for high achieving students to pursue exciting and challenging research during bachelor degree studies. The program is possibly the first of its kind in Australia. If you have a passion for solving problems, a desire to work right at the cutting edge of technology development, and an excellent academic record, applying is a must.


Other Scholarships

Other scholarships are also offered at different levels of study within the school. Please check www.engineering.unsw.edu.au/electrical-engineering/scholarships-3 regularly.

In 2012, ten different types of scholarship were offered.
In the School of Electrical Engineering & Telecommunications, we emphasise electrical engineering design from the start till the end of your undergraduate degree. We believe practical application of the theory learned in the classroom is crucial in developing real world problem solving engineering skills.

**ENGG1000 Introduction to Engineering Design and Innovation (Year 1)**

In this course, students will experience first hand one of the major things that engineers do: designing and building creative solutions to problems. They will learn to think the way that engineers think, coming up with good solutions to problems despite being limited by budget, time and resources, the requirement to also meet environmental and social objectives and of course the limitations of the laws of physics.

**ELEC2117 Electrical System Design (Year 2)**

This second year design course complements knowledge gained in first year courses on electronic circuits, programming, and digital circuits, such as those gained from the first year ENGG1000 course. Students will carry out a practical electrical engineering design solving an electrical engineering problem involving computer interfacing of electronic circuits.

**ELEC3117 Electrical Engineering Design (Year 3)**

Design Project Management: Introduction to scheduling, costing, marketing, standards, patents, quality, safety, (electronic) manufacturing methods, engineering innovation, design methodology: systematic design procedures and design documentation.

**ELEC4123 Electrical Design Proficiency (Year 4)**

The course involves 4 competency components in the areas of electronic circuit design, control system design, signal processing design and power system design requires the construction of a working system to solve a specified problem.
Apart from the maths, physics and computing, a highlight for many of our first-year students is the ENGG1000 course. Aiming to teach principles of engineering design and methodology through project-based learning, ENGG1000 is a hands-on course with a lot of scope for creativity, effective team organisation and fun.

“We found that the most effective time for learning was in the laboratories, where we were able to learn things for ourselves, experiment with components and circuits, and observe the results” – Team 1

“These challenges have taught us the value of collective effort in researching and communicating our attained knowledge to each other. With these efforts, we were able to overcome most problems” – Team 7

“More glue isn’t always better, especially when you are gluing something to the wrong side of the car”

“Overall, I enjoyed the project a great deal”

“We never previously had any experience of team work on such a large project” – Team 4
Demand for electricity is on the decline due to the prevalence of energy efficient appliances and exciting new renewable distributed generation technologies. This is challenging the way we traditionally operate our electricity networks. I am investigating methods for electricity network businesses to adjust their business models to embrace this new operating environment in a way that is both environmentally and economically sustainable. - *Ben Hutton*

In my undergraduate thesis I’m investigating electricity load forecasting models from the angle of time series analysis. I’m building layered statistically based models which capture the structure of the univariate time series data, and analyzing the residual diagnostics to assist in parsimonious model development. Forecasting electricity distribution network loads informs decisions regarding the various operational and economical needs of industry entities, which are facing new challenges in maximising the capacity of the existing network infrastructure and actively managing demand. - *Erica Barrett*

My thesis has involved new research and prototyping in the backscatter RF area, a radical change to the way implantable biomedical systems can communicate with ultra low power consumption. A highly practical thesis, my work spanned from using coherent full-duplex software defined radio, to old HAM radio techniques for resonant antenna construction. The support and environment that the university provided has allowed me to learn and achieve the maximum from the experience. - *Cameron Brown*

As a final year student, I chose a thesis project that involved designing an electronic payload for a small satellite (the UNSW-EC0 CubeSat), capable of detecting and correcting radiation-induced bit errors in reconfigurable logic. I found the project to be an exciting, challenging and rewarding experience. - *Thomas Fisk*
Electrical engineering was definitely the right choice for me. Being able to link theory and the real world, as well as working in teams throughout my studies have been the highlights of my degree. I've chosen ResMed Ltd as my future employer as I have always had a passion for the application of electrical engineering in the medical industry.

- Varuni Fernando

Excelling in maths, science and problem solving I was always drawn to the engineering industry, anticipating the challenges that an engineering degree would bring both technically and mentally. Studying EE&T at UNSW enabled me to enhance my technical skills in such a large array of industries (Power, Telecommunications and Control Systems) and has opened up so many wonderful opportunities for my future career. I am currently a graduate at Coca-Cola Amatil, where I am using my engineering skills to build innovative solutions to production issues within our manufacturing facilities.

- Jaclyn Egan

Working in the industry at a company like Dolby has been the ultimate payoff for all the hard work put in at UNSW. The courses in EE&T helped me develop solid engineering design and problem solving experience. It’s these skills that have enabled me to pursue a dream career path in acoustic digital signal processing. UNSW EE&T has a strong practical focus, there will be no shortage of interesting labwork and projects on your plate should you come and join us!

- Christopher Hines

Completing my Bachelor of Electrical Engineering at UNSW has allowed me to begin my career at a first class engineering consultancy. The breadth of courses offered by the School of Electrical Engineering served as the ideal preparation for the diverse workload I now have at Jacobs, whilst completing group projects during electrical labs was a surprisingly great introduction to the project teams that I now work with each day. I’ve made some of my greatest friends at this school and am very proud to count myself as one of its alumni.

- Daniel Floyd

Studying at EE&T has given me an excellent, hands on, education. I have been able to develop practical engineering skills, participating in several of UNSW’s thriving hobby societies. With a confidence to tackle all kinds of complex problems, I have started work at Google Sydney.

- Mitchell Ward
Matthew Brown

The man behind Polyphonic Music Transcription

“Matthew Brown says he has solved one of music’s greatest conundrums.”

Matthew Brown’s idea came to him when he was music vice-captain at Scots College in Sydney. The then 17-year-old wanted to spend less time tediously transcribing music compositions and more time composing with his orchestra, and stage and jazz bands. He thought: “Wouldn’t it be great if there was a piece of software that could listen to the music and transcribe it for me?”

Fast forward a few years and his unique software, Polyphonic Music Transcription, now exists courtesy of Matt’s love of music and his degree in Electrical Engineering and Telecommunications (EET) at UNSW. It seems the only thing separating Matt and international recognition is the release of his secret, patent-pending algorithm and smartphone app.

Q&A

What exactly is Polyphonic Music Transcription?

It’s the process of analysing a live musical performance and producing its musical notation. Picture an orchestra playing live, recording it using a microphone, and then printing out the exact manuscript of what was just played.

In the past, skilled musicologists faced the difficult and time-consuming task of notating musical performances music by hand. This often required intensive auditory training, especially for polyphonic music – where several instruments are played simultaneously. My motivation was to provide a tool that eased the workload for musicians and composers.

Back then, how long did it take you to transcribe a piece of music you had composed? It used to take hours! A two to three minute piece of music for a 30-piece orchestra could easily take 30 hours to notate by hand and then type into a computer.

Why did you choose Electrical Engineering and Telecommunications at UNSW?

I knew what I wanted to develop but had no idea how I would actually make it, or what I’d need to study to learn how to make it. It wasn’t until I went to UNSW’s open day in 2007 and got talking to Professor Eliathamby Ambikairajah, EET’s Head of School, that I got my first clue. I gave him a brief outline of my idea and he said to me: “You like music? You should look up audio signal processing”. I looked it up, and saw there was a whole area of electrical engineering devoted to the electrical representation of sound. So I enrolled at UNSW and started the degree.

I didn’t have much of a Mathematics or Physics background so I had to study particularly hard for a few years to understand the basics of electrical engineering. By the beginning of my fourth year, I started majoring in digital signal processing. It was around this time I had enough understanding to start to create my own software.

Extraordinary Journeys of Our Alumni

Rami Banna

The inspirational world of Rami Banna

“Rami Banna has the world at his feet.”

How would you describe your career since leaving UNSW?

Exhilarating! Before finishing my degree I’d worked with Telstra and Alcatel-Lucent – thanks to UNSW’s excellent Co-op Program Scholarship. After graduating I worked with Lucent Microelectronics (later Agere Systems) designing the world’s first chips for 3.5G and 5G mobile phones. Chip design and silicon was my first engineering passion. From there I transitioned into medical devices and the wonderful world of product development and last year I started an MBA at London Business School to combine my love of product and technology with commercialisation and start-ups. I now run my own consulting company, working with start-ups all over the world. It’s been a privileged and wonderful career so far.

What have been your major successes?

In product development and technology, success is a product of two things: teams and history. At Cochlear, a medical device company developing groundbreaking implantable hearing aids, I was part of a tremendous international team that built on a 30-year legacy of invention and pioneering to deliver several Red Dot-winning, International Design Award-earning and Engineering Excellence Award-leading products. One of which, the Cochlear Nucleus 5 System, was truly groundbreaking and set the industry benchmark for many years.

Another major success was winning the Medical Design Excellence Award and the Powerhouse Award in 2013. It started in a café with a ‘back-of-napkin’ sketch with a great friend and colleague. This conversation led to a series of revolutionary healthcare products and started a movement to make Cochlear implants accessible to many more people that needed them.

Why did you choose Electrical Engineering and Telecommunications (EET) at UNSW?

I believed then, as I do now, that engineering and technology is the most valuable degree for today and tomorrow. You just have to look at the explosion in the tech sector and its multi-billion dollar companies today to find evidence of that. Every major trend has electrical engineering at its core – internet, smartphones, wearable technology, virtual reality – you name it. It’s the Golden Age of electrical engineering and the demand for engineers is insatiable. Companies fight for great talent the world over. So, I didn’t need convincing that electrical and telecommunications engineering was what I wanted to study. It was just a matter of finding the best place in Australia to do it. That search didn’t take too long.

What’s your favourite/fondest or most striking memory of studying at UNSW?

UNSW meant so many things. It meant being out of high school; it meant starting to pursue my career; it meant living away from home; it meant being in a new city; it meant meeting life-long friends and it meant growing up to take on the world. I lived on campus for the majority of my time at UNSW and my fondest memories are the simple thinks like taking breakfast in hand and strolling into class two minutes before it started; like spending hours on the library lawn sipping coffee and debating with students from every field. I was even fond of the seemingly never-ending construction on campus – as cumbersome as it was, it really symbolised the pace of change, growth and success of UNSW.

I also remember the large contact hours in first year of Electrical Engineering and the countless all-nighters spent on projects and my final year thesis. You don’t forget that mission easily!

See more at: http://www.engineering.unsw.edu.au/emag/qa/inspirational-world-rami-banna#sthash.H4pcDNSs.dpuf