



Specialisation

Quantum Engineering

ELECCH

168 Units of Credit

Faculty[Faculty of Engineering](#)**School**[School of Electrical Engineering & Telecommunications](#)**Study Level**

Undergraduate

Minimum Units of Credit

168

Specialisation Type

Honours

Overview

The progress of nanotechnology allows the fabrication of devices whose physical dimensions approach the atomic scale. For over 100 years, it has been known that the behaviour of physical systems at the atomic scale does not obey the familiar laws of classical physics. Atomic-size systems behave according to quantum mechanics, which allows them to exhibit rather spectacular properties and dynamics. This stream trains students to design and operate devices that behave according to quantum mechanics, opening the possibility to exploit the peculiar laws of quantum physics to perform otherwise cumbersome or impossible tasks, such as the efficient solution of computationally hard problems, or the secure teleportation of information. Graduates from this stream will have

valuable skills that position them ideally for the burgeoning quantum engineering industry, as well as broad skills across most key electrical engineering disciplines.

Learning Outcomes

1. Show proficiency of knowledge in the fundamental enabling sciences of quantum mechanics, mathematics, computer science and electromagnetics that underpins Quantum Engineering, and relate the physical laws of quantum mechanics to the fundamental principles of engineering.

Scholars

2. Identify, select and proficiently apply specialist technical knowledge and mathematical and computational tools to analyse engineered quantum and electrical systems and networks.

Scholars

3. Critically evaluate quantum and electrical devices and systems to solve complex open-ended problems and recognize their relevance to the future development of the discipline.

Scholars

4. Demonstrate a broad understanding of design and operation principles for engineered quantum systems and networks, and articulate future directions for the development of enhanced quantum devices and their application to problems of practical relevance in the fields of computing, communications, and sensing.

Scholars

5. Design, assemble and utilise classical electrical engineering devices, for example electronic and microwave devices and computational tools, needed to interface with and operate quantum systems.

Professionals

Scholars

Global Citizens

6. Lead and manage quantum engineering projects, individually or as part of an interdisciplinary team, in a systematic and professional manner.

Professionals

Scholars

Global Citizens

7. Synthesize engineering practices with norms and regulations of relevance to the safe and ethical application of engineered quantum systems.

Professionals

Scholars

Global Citizens

8. Demonstrate proficiency in the effective communication of systematic engineering synthesis, design processes, critical evaluation, and implications of results to all audiences, in particular as they apply to quantum engineered systems.

Graduate Capabilities

Available in Program(s)

Single degree program(s) in which this specialisation is available:

Bachelor of Engineering (Honours) - BE (Hons)

3707 - Engineering (Honours)

Faculty: Faculty of Engineering

Campus Sydney

Units of Credit: 192

Typical duration: 4 Year(s)

Read More 

Specialisation Structure

Students must complete 168 UOC.

Level 1 Core Courses

42 Units of Credit:

Students must take 42 UOC of the following courses.

Level 1 Core Courses

→ COMP1511

Programming Fundamentals

6 UOC

→ ELEC1111

Electrical Circuit Fundamentals

6 UOC

→ DESN1000

6 UOC

Introduction to Engineering Design and Innovation

→ PHYS1231

6 UOC

Higher Physics 1B

One of the following:

→ MATH1131

6 UOC

Mathematics 1A

OR

→ MATH1141

6 UOC

Higher Mathematics 1A

One of the following:

→ PHYS1121

6 UOC

Physics 1A

OR

→ PHYS1131

6 UOC

Higher Physics 1A

One of the following:

→ MATH1231

6 UOC

Mathematics 1B

OR

→ MATH1241

6 UOC

Higher Mathematics 1B

Level 2 Core Courses

36 Units of Credit:

Students must take 36 UOC of the following courses.

→ DESN2000

6 UOC

Engineering Design and Professional Practice

→ ELEC2133

6 UOC

Analogue Electronics

→ ELEC2134

6 UOC

Circuits and Signals

→ ELEC2141

6 UOC

Digital Circuit Design

→ MATH2069

6 UOC

Mathematics 2A

→ MATH2099

6 UOC

Mathematics 2B

Level 3 Core Courses

42 Units of Credit:

Students must take 42 UOC of the following courses.

→ ELEC3104

6 UOC

Digital Signal Processing

→ ELEC3106

6 UOC

Electronics

→ ELEC3114	6 UOC
Control Systems	

→ ELEC3115	6 UOC
Electromagnetic Engineering	

→ ELEC3117	6 UOC
Electrical Engineering Design	

→ ELEC3705	6 UOC
Fundamentals of Quantum Engineering	

→ PHYS3118	6 UOC
Quantum Physics of Solids and Devices	

Level 4 Core Courses

36 Units of Credit:

Students must take 36 UOC of the following courses.

→ ELEC4122	6 UOC
Strategic Leadership and Ethics	

→ ELEC4123	6 UOC
Electrical Design Proficiency	

→ ELEC4605	6 UOC
Quantum Devices and Computers	

→ ELEC4951	4 UOC
Research Thesis A	

→ ELEC4952	4 UOC
Research Thesis B	

→ ELEC4953	4 UOC
Research Thesis C	

Breadth Electives

Students can take up to a maximum of 12 UOC of the following courses.

COMP2041

6 UOC

Software Construction: Techniques and Tools

COMP3211

6 UOC

Computer Architecture

COMP3231

6 UOC

Operating Systems

ELEC3145

6 UOC

Real Time Instrumentation

ENGG2600

2 UOC

Engineering Vertically Integrated Project

ENGG3001

6 UOC

Fundamentals of Humanitarian Engineering

ENGG3600

2 UOC

Engineering Vertically Integrated Project

ENGG4600

2 UOC

Engineering Vertically Integrated Project

MATH3101

6 UOC

Computational Mathematics for Science and Engineering

MATH3121

6 UOC

Mathematical Methods and Partial Differential Equations

MATH3161	6 UOC	Optimization
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MATH3201	6 UOC	Dynamical Systems and Chaos
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MATH3411	6 UOC	Information, Codes and Ciphers
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TELE3113	6 UOC	Analogue and Digital Communications
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TELE3118	6 UOC	Network Technologies
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Discipline (Depth) Electives List

Students can take up to 12 UOC of the following courses.

ELEC4445	6 UOC	Entrepreneurial Engineering
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ELEC4601	6 UOC	Digital and Embedded Systems Design
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ELEC4602	6 UOC	Microelectronic Design and Technology
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ELEC4603	6 UOC	Solid State Electronics
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ELEC4621	6 UOC	Advanced Digital Signal Processing
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ELEC4622	6 UOC	Multimedia Signal Processing
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ELEC4631	6 UOC	Continuous - Time Control System Design
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ELEC4632	6 UOC	Computer Control Systems
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ELEC4633	6 UOC	Real-Time Engineering
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PHTN4661	6 UOC	Optical Circuits and Fibres
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PHTN4662	6 UOC	Photonic Networks
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TELE4642	6 UOC	Network Performance
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TELE4651	6 UOC	Wireless Communication Technologies
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TELE4652	6 UOC	Mobile and Satellite Communications Systems
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TELE4653	6 UOC	Digital Modulation and Coding
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Enrolment Disclaimer

Please note that this Handbook is a comprehensive catalogue of our offerings and includes courses that can be taken to satisfy program requirements irrespective as to their availability for a particular year. Availability of courses is best checked using filters on this site or on the [class timetable](#) site.

You are responsible for ensuring that you enrol in courses according to your program requirements and by following the advice of your Program Authority. myUNSW enrolment checks that you have met enrolment requirements such as pre-requisites for individual courses but not that you are enrolling in courses that will count

towards your program requirements.

Pre-2019 Handbook Editions

Access past handbook editions (2018 and prior)

[Pre-2019 Handbook Editions](#) 

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Authorised by Deputy Vice-Chancellor (Academic Quality)

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