

# DEGREES



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# ENTRY REQUIREMENTS

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## Guaranteed Admission

You are guaranteed a place in the Faculty of Science & Engineering if you:

- » Apply online or submit an Application to Enrol form by **1 December 2011**, and
- » Meet the requirements for the University Entrance standard (or equivalent), and
- » Meet any additional requirements for the qualification you have selected, and
- » Achieve the NCEA Level 3 Certificate (or equivalent), and
- » Accept a place by completing your enrolment (full payment of fees through student loan or other payment method), or by paying a non-refundable acceptance deposit of \$100, no later than two weeks after the firm offer of place is issued or by 27 January 2012 (whichever is later).

## Bachelor of Science and Bachelor of Science (Technology) (BSc and BSc(Tech))

Many of the subjects offered at Waikato have prerequisites on their core papers. If you have not achieved the specified prerequisites through your study at Level 2 and Level 3 NCEA, you may be required to take additional papers or foundation courses in order to satisfy these prerequisites. Applicants in this situation are advised that not all papers undertaken may count toward the completion of the degree and that the programme of study may take an additional period of time. Other applications will be treated on a case by case basis.

## Bachelor of Engineering (BE)

If you do not meet the Guaranteed Admission requirements for the BE specified programmes as set out below, but your University Entrance includes the required subjects (ie physics and mathematics), we strongly recommend that you contact the Faculty Office to discuss a programme of study.

### Electronic Engineering Programme

You must gain University Entrance, including a minimum of 16 credits in NCEA at Level 3 in Mathematics with Calculus, and 14 credits in Physics at Level 3.

### Chemical & Biological Engineering, Materials & Process Engineering and Mechanical Engineering Programmes

You must gain University Entrance, including a minimum of 16 credits in NCEA at Level 3 in Mathematics with Calculus, at least 14 credits in both Chemistry and Physics at Level 3.

### Software Engineering Programme

You must gain University Entrance, including a minimum of 16 credits in NCEA at Level 3 in Mathematics with Calculus.

## Discretionary Entrance (entry from NCEA)

Applicants will normally be granted Discretionary Entrance if they have gained a total of at least 80 credits in four subjects at Level 2 NCEA with a minimum grade of merit in at least half of the achievement standards for each subject. Applicants must also have satisfied the numeracy and literacy requirements for University Entrance. Applications must be supported by the applicant's school principal or the University's student recruitment officers.

## Special Admission

Students over the age of 20 are eligible to apply for admission to all of the Faculty's programmes. Most first year science papers assume some prior knowledge and some students may be required to complete bridging study such as Science Foundation or the Certificate of University Preparation (see page 21).

## Admission with Credit for Previous Study

You can apply for credit for degree level study completed at another tertiary institution. Any credit awarded depends on the type of qualification studied and the level, content and number of papers passed. Details are also available on the Tertiary Education Alliance website at [www.tea.ac.nz](http://www.tea.ac.nz)

To apply for credit, tick the relevant box on the Application to Enrol form and supply an official academic record of your previous study. If you have any further questions about credit, the Faculty Office or the Student Information Centre in the Library can help.

## BACHELOR OF ENGINEERING BE

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*Engineers seek to build useful products and services using the understanding of the laws governing natural processes. The BE is a four-year, full-time degree designed to prepare you to apply advanced scientific knowledge in a constructive and effective way. There are five specified programmes: Chemical & Biological Engineering, Electronic Engineering, Materials & Process Engineering, Mechanical Engineering and Software Engineering. Our Cooperative Education Unit will help you seek the work experience to complete 800 hours of paid industrial workplace experience to prepare you for professional registration.*

### Degree Length

The BE requires four years of full-time study or the equivalent in part-time study. Students must also complete at least 800 hours of work experience.

### Requirements

- » 480 points at 100, 200, 300 and 400 Levels in papers outlined by the chosen specified programme (equivalent to four years full-time study),
- » No more than 120 points at 100 Level,
- » Complete the requirements of one of the specified engineering programmes, and
- » 800 hours of work experience.

### Specified Programmes

Further information on the programmes is in the subject and papers section.

» Chemical & Biological Engineering	page 56
» Electronic Engineering	page 91
» Materials & Process Engineering	page 136
» Mechanical Engineering	page 139
» Software Engineering	page 159

## BACHELOR OF ENGINEERING (HONOURS) BE(Hons)

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*Admission to the BE(Hons) programme is based on the grades obtained in the first three years of the BE degree. Honours students complete a more academically challenging fourth year of their degree. The individual programme requirements for each engineering programme must still be fulfilled.*

# BACHELOR OF ENGINEERING BE / BE(Hons)

General Structure of the BE / BE(Hons) Degrees									
YEAR 1	ENGG180	ENMP102	MATH101	MATH102	COMP103 100 Level	PHYS103 ** 100 Level	SPECIFIED 100 Level	SPECIFIED 100 Level	
YEAR 2	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	ENGG279 *		
YEAR 3	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	SPECIFIED	ENGG379 *		
YEAR 4	SPECIFIED	SPECIFIED	SPECIFIED	DESIGN PROJECT ENGG482 or ENGG492					
Work Placement									
YEAR 2-3	PLACEMENT ENGG371 *	YEAR 3-4	PLACEMENT ENGG372 *						
<input type="checkbox"/> <b>Specified</b> – These papers are specified by the programme and are given in the subjects and papers section of this handbook. <input type="checkbox"/> <b>Design Project</b> – A major design project (60 points) is undertaken in Year 4.									

\*Applies to students who enrol from 2010 onwards. Students enrolled in previous years should refer to the handbook from their year of enrolment.

\*\*PHYS103 is compulsory for all specified programmes, except Software Engineering, where it is one of four electives.

# BACHELOR OF SCIENCE BSc

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*The Bachelor of Science (BSc) is an internationally-recognised general science degree. Graduates are eagerly sought by industry and public bodies in New Zealand and overseas. The BSc allows wide flexibility in the choice of the papers students can take, allowing you to combine papers to suit your strengths and abilities. You can construct a general degree and major in the subject of your choice, or choose to complete a specialisation within that major.*

## Degree Length

The BSc requires three years of full-time study or the equivalent in part-time study.

## Requirements

- » 360 points at 100, 200 and 300 Levels (equivalent to three years full-time study),
- » No more than 120 points at 100 Level,
- » 105 points at 100 Level must be in science, of which 60 points must be across four different Science subjects,
- » 80 points at 300 Level,
- » Satisfy the requirements for a major subject (see next page),
- » A maximum of 80 points may be taken outside Science (unless taking a double major), and
- » At least 40 points at 200 Level or higher outside the major subject.

## Majors

To meet the requirements of a major, you must pass at least 120 points above 100 Level in that subject, including 60 points above 200 Level. The same number of points in a second subject must be passed if you elect to pursue a double major. The major subjects for the degree are:

» Animal Behaviour	page 24
» Biochemistry	page 27
» Biological Sciences	page 30
» Biotechnology	page 53
» Chemistry	page 59
» Earth Sciences	page 68
» Electronics	page 94
» Environmental Planning	page 106
» Environmental Sciences	page 110
» Materials and Processing	page 123
» Physics	page 142
» Psychology	page 148

## Specialisations

Specialisations are areas of interest that can be taken alongside a major. Most specialisations can only be taken alongside a specific major subject. Please refer to the page numbers below for more information on each available specialisation.

» Agribusiness	*
» Environmental Microbiology	page 115
» Environmental Modelling	page 117
» Land and Freshwater Environments	page 119
» Marine Sciences	page 121
» Restoration Ecology	page 40
» Science International	page 157
» Te Pūtaiao me ngā take Māori	page 162

*\*Enrolment in this specialisation should be completed in consultation with both the Faculty of Science & Engineering and the Waikato Management School.*

General Structure of the BSc Degree								
YEAR 1	SCIENCE MAJOR 100 Level	SCIENCE MAJOR 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	ELECTIVE 100 Level
YEAR 2	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE 200 Level	ELECTIVE 200 Level	ELECTIVE 200 Level		
YEAR 3	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE 300 Level	SCIENCE 200 or 300 Level	ELECTIVE 200 or 300 Level		
<input type="checkbox"/> <b>Science Major</b> <input checked="" type="checkbox"/> <b>Science</b> – These papers should be recognised science papers, which are all papers offered by the Faculties of Science & Engineering and Computing & Mathematical Sciences (except MATH168), and selected philosophy and psychology papers. A list of all recognised 100 Level science papers can be found on page 179 of this handbook. <input type="checkbox"/> <b>Elective</b> – These papers may be chosen from science or non-science papers.								

## BACHELOR OF SCIENCE (TECHNOLOGY) BSc(Tech)

*A BSc(Tech) puts you on the first step of the career ladder, giving you valuable paid work experience alongside practicing scientists and technologists. Our Cooperative Education Unit arranges and oversees the industrial work placement component of your degree, which will ensure the quality of your work placement. The contacts made and the experience gained means that graduates are very successful in finding jobs within a few months of completing this degree; many in the company where they completed their work experience. Research has shown that BSc(Tech) graduates who had been actively seeking employment have an extremely high success rate of finding paid employment within six months of finishing their degree.*

### Degree Length

The BSc(Tech) requires four years of full-time study or the equivalent in part-time study. The work experience component of the degree is offered in two blocks. The first block occurs at the end of your second year during the summer vacation and consists of three-months of paid work with an associated report. The second block generally occurs at the end of the third year and consists of nine-months (November to July) of work experience, with two reports.

### Requirements

- » 480 points at 100, 200 and 300 Levels (equivalent to four years full-time study),
- » No more than 120 points at 100 Level,
- » 105 points at 100 Level must be in Science, of which 60 points must be across 4 different Science subjects,
- » 80 points at 300 Level (not including placement papers),
- » Satisfy the requirements for a major subject (see page 16),
- » At least 40 points at 200 Level or higher outside the major subject,
- » A minimum of 35 points from Management papers must be completed,
- » 80 points of work placement-related papers, of which 60 points must be at 300 Level, and
- » A maximum of 120 points can be taken outside Science including the Management papers (unless taking a double major).

## Majors

To meet the requirements of a major, you must pass at least 120 points above 100 Level in that subject, including 60 points above 200 Level. The same number of papers in a second subject must be passed if you elect to pursue a double major. The major subjects for the degree are:

» Animal Behaviour	page 24
» Biochemistry	page 27
» Biological Sciences	page 30
» Biotechnology	page 53
» Chemistry	page 59
» Computer Science	*
» Earth Sciences	page 68
» Electronics	page 94
» Environmental Planning	page 106
» Environmental Sciences	page 110
» Materials and Processing	page 123
» Physics	page 142

*\*Enrolment in this major should be completed in consultation with both the Faculty of Science & Engineering and the Faculty of Computing & Mathematical Sciences.*

## Specialisations

Specialisations are areas of interest that can be taken alongside a major. Most specialisations can only be taken alongside a specific major subject. Please refer to the page numbers below for more information on each available specialisation.

» Agribusiness	*
» Environmental Microbiology	page 115
» Environmental Modelling	page 117
» Land and Freshwater Environments	page 119
» Marine Sciences	page 121
» Restoration Ecology	page 40
» Science International	page 157
» Te Pūtaiao me ngā take Māori	page 162

*\*Enrolment in this specialisation should be completed in consultation with both the Faculty of Science & Engineering and the Waikato Management School.*

# BACHELOR OF SCIENCE (TECHNOLOGY) BSc(Tech)

General Structure of the BSc(Tech) Degree								
YEAR 1	SCIENCE MAJOR 100 Level	SCIENCE MAJOR 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	ELECTIVE 100 Level
YEAR 2	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE 200 Level	ELECTIVE 200 Level	MANAGEMENT **		
YEAR 3	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE 300 Level	ELECTIVE 200 or 300 Level	MANAGEMENT ***		
YEAR 4	SCIENCE 200 or 300 Level	ELECTIVE 200 or 300 Level						
Work Placement								
YEAR 2-3	SCIE279 *	PLACEMENT SCIE371 or COMP371 *	SCIE379 *	PLACEMENT SCIE372 COMP372 *	YEAR 4	PLACEMENT SCIE373 COMP373 *		
<input type="checkbox"/>	<b>Science Major</b>							
<input checked="" type="checkbox"/>	<b>Science</b> – These papers should be recognised science papers, which are all papers offered by the Faculties of Science & Engineering and Computing & Mathematical Sciences (except MATH168), and selected philosophy and psychology papers. A list of all recognised 100 Level science papers can be found on page 179 of this handbook.							
<input type="checkbox"/>	<b>Elective</b> – These papers may be chosen from science or non-science papers.							
<input checked="" type="checkbox"/>	<b>Management</b> – Recommended Management papers: **ENMP282 (10 pts) and ENMP283 (10 pts) ***ENMP381 (20 pts)							

*\*Applies to students who enrol from 2010 onwards. Students enrolled in previous years should refer to the handbook from their year of enrolment.*

## CONJOINT DEGREES

*All degrees within the Faculty of Science & Engineering can be combined with any other degree in the University of Waikato as part of a conjoint degree.*

For more information on studying towards a Bachelor of Science, Bachelor of Science (Technology) or Bachelor of Engineering as part of a conjoint degree, please contact the faculty registrar or associate dean (teaching & learning).

### Faculty Registrar

To be advised

Room: F1.06A

Phone: 07 838 4290

Email: [science@waikato.ac.nz](mailto:science@waikato.ac.nz)

### Associate Dean (Teaching & Learning)

Dr Alison Campbell

Room: F1.08

Phone: 07 838 4582

Email: [a.campbell@waikato.ac.nz](mailto:a.campbell@waikato.ac.nz)

### BSc Component of a Conjoint Degree

100 LEVEL	SCIENCE MAJOR 100 Level	SCIENCE MAJOR 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level	SCIENCE 100 Level
200 LEVEL	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE MAJOR 200 Level	SCIENCE 200 Level	SCIENCE 200 Level	
300 LEVEL	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE MAJOR 300 Level	SCIENCE 200 or 300 Level		

The above outlines an example of the BSc component of a conjoint degree. The BSc(Tech) and BE can also be taken as part of a conjoint degree. Please contact the Faculty Office for more information.

For information regarding papers required for other degree components please contact the relevant school or faculty.

## OTHER PROGRAMMES

### Intermediates

Intermediate first year programmes are offered by the Faculty of Science & Engineering for entrance into professional degrees offered at other universities. You must consult the specialist school you intend to transfer to before enrolling in an intermediate programme at the University of Waikato. Even if you are taking the papers specified below, you should ensure your proposed programme is approved by the other university. For more information, please contact the faculty registrar on 0800 438 254.

### Engineering (Canterbury)

#### Option 1: Computer, Electrical, and Electronic Engineering

**100 Level – Papers are worth 15 points unless specified.**

- » COMP103A/B – Introduction to Computer Science 1
- » COMP134B – Software Engineering 1
- » ENEL111A – Introduction to Electronics
- » ENGG180A – Foundations of Engineering
- » MATH101A/B/C/D – Introduction to Calculus
- » MATH102A/B/C/D – Introduction to Algebra
- » PHYS103B – Physics for Scientists and Engineers 1

Plus a further 15 points from 100 Level papers.

#### Option 2: Mechatronics, Mechanical, Civil, Natural Resources, and Forestry Engineering

**100 Level – Papers are worth 15 points unless specified.**

- » CHEM101A – Chemical Concepts
- » COMP103A/B – Introduction to Computer Science 1
- » ENGG180A – Foundations of Engineering
- » ENMP102B – Introduction to Materials Science and Engineering
- » MATH101A/B/C/D – Introduction to Calculus
- » MATH102A/B/C/D – Introduction to Algebra
- » PHYS103B – Physics for Scientists and Engineers 1

Plus a further 15 points from 100 Level papers.

#### Option 3: Mechanical, Civil, Natural Resources, Forestry, and Chemical and Process Engineering

**100 Level – Papers are worth 15 points unless specified.**

- » CHEM101A – Chemical Concepts
- » COMP103A/B – Introduction to Computer Science 1
- » ENGG180A – Foundations of Engineering
- » ENMP102B – Introduction to Materials Science and Engineering
- » MATH101A/B/C/D – Introduction to Calculus
- » MATH102A/B/C/D – Introduction to Algebra
- » PHYS103B – Physics for Scientists and Engineers 1

Plus a further 15 points from 100 Level papers.

If you do not gain entry to a required paper on the basis of your NCEA results, you will be contacted as part of the enrolment process. The engineering intermediate can be taken over two years.

## Forestry (Canterbury)

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » STAT121A/S – Introduction to Statistical Methods\*
- » FORE102 – Taught extramurally through the University of Canterbury

And one of:

- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds

And a further 15 points at 100 Level from Economics, Mathematics, Physics or Geography.

Recommended:

- » ECON100A/B/S – Business Economics and the New Zealand Economy

\*This requirement may be waived for students who achieve high marks in a NCEA Level 3 Mathematics subject.

## Surveying (Otago)

100 Level – Papers are worth 15 points.

- » ALED100A/B – Writing for University Purposes
- » COMP103A/B/C/D – Introduction to Computer Science 1
- » MATH101A/B/C/D – Introduction to Calculus
- » MATH102A/B/C/D – Introduction to Algebra
- » STAT121A/S – Introduction to Statistical Methods
- » SURX101 – Introductory Surveying (via distance learning at Otago)

And a further 15 points at 100 Level.

Students must attend the SURX101 Introductory Surveying one-week field course, which is held at Otago.

## Bridging Programmes

If you are interested in or would you like to extend your knowledge of science, the University offers the Science Foundation and Certificate of University Preparation (CUP) programmes, which are non-credit papers and bridging programmes that are designed to help you start your first academic year with the knowledge, skills and confidence needed to succeed.

We will contact you as part of the enrolment process if we feel that you would benefit from enrolling in one or more of these programmes. All of our bridging programmes cover aspects of the Year 12 and Year 13 curriculum in the relevant areas to prepare you for enrolment in 100 Level papers in Science. The University also offers the Certificate of Attainment in Foundation Studies (CAFS) programme, which is specifically designed to prepare high school graduates from backgrounds where English is an additional language, for degree study.

**Note(s):** Student loan and allowances support is available only to students enrolling in the Certificate of University Preparation.

## Science Foundation

This non-credit programme, offering tutorials in biology, chemistry, physics and mathematics, is held prior to the beginning of the A Semester. This programme is for those who have been accepted for enrolment into science or engineering and would benefit from brushing up on their knowledge.

For more information about the Science Foundation programme, please refer to the Bridging Programmes link on the Waikato Pathways College website at [www.waikato.ac.nz/pathways/](http://www.waikato.ac.nz/pathways/)

## OTHER PROGRAMMES

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### Foundation Studies

The Foundation Studies programme is a two semester, full-time academic programme specifically designed to prepare high school graduates from non-English speaking backgrounds for degree study in New Zealand. For more information about the Foundation Studies programme, please refer to the Waikato Pathways College website at [www.waikato.ac.nz/pathways/](http://www.waikato.ac.nz/pathways/)

#### Compulsory Papers:

- » CAFS001 – English for Foundation Studies 1
- » CAFS002 – English for Foundation Studies 2
- » CAFS003 – Language and Learning Skills for Foundation Studies

#### Optional Papers:

- » CAFS004 – Mathematics with Calculus for Foundation Studies
- » CAFS005 – Mathematics with Statistics for Foundation Studies
- » CAFS006 – Bridging Accounting
- » CAFS007 – Bridging Economics<sup>†</sup>
- » CAFS009 – Bridging Biology
- » CAFS010 – Bridging Chemistry
- » CAFS011 – Bridging Physics
- » CAFS012 – Introduction to the Social Sciences<sup>†</sup>
- » CAFS013 – Comparative Cultures: An Introduction
- » CAFS014 – Bridging Psychology<sup>†</sup>
- » CAFS099 – English for Specific Purposes
- » CUPR008 – Bridging Mathematics with Statistics

<sup>†</sup> Not offered in 2012.

**Note(s):** Students wanting entry into the BE degree must achieve a B grade average, including no less than a B grade for CAFS001 and CAFS002, and no less than a B in physics and calculus, and in some cases chemistry. Students wanting entry into the BSc or BSc(Tech) degrees require no less than a B grade for CAFS001 and CAFS002 and no less than a C grade in all other papers. It is advantageous to select the Foundation science papers.

## Certificate of University Preparation – CUP

The Certificate of University Preparation bridges the gap between high school and first year university study. This qualification is for people who do not gain University Entrance, but who are still committed to degree level study. The CUP covers key components of the Year 12 and 13 curriculum in a number of areas. If you do not gain University Entrance, subject to successful completion of the CUP programme, you can transfer to a degree.

The CUP programme requires one semester of full-time study and is made up of four non-credit papers. For more information, visit [www.waikato.ac.nz/pathways/](http://www.waikato.ac.nz/pathways/)

### Compulsory:

- » CUPR001 – Introduction to Study Skills
- » CUPR002 – Introduction to Critical Thought and Expression

Plus 30 points from two of:

- » CAFS004 – Mathematics with Calculus for Foundation Studies
- » CAFS005 – Bridging Statistics<sup>†</sup>
- » CAFS009 – Bridging Biology
- » CAFS010 – Bridging Chemistry
- » CAFS011 – Bridging Physics
- » CUPR008 – Bridging Mathematics and Statistics
- » CUPR025 – Bridging General Science

<sup>†</sup> Not offered in 2012.

**Note(s):** Students wanting entry into the BSc or BSc(Tech) degrees from a CUP programme must have no less than a C grade in any paper. Students wanting entry into the BE degree (depending on which specified programme you wish to study) must achieve no less than a B grade in two of physics, maths and chemistry, plus no less than C grades in all other papers.

If you have applied to enrol in the Faculty of Science & Engineering and do not get University Entrance, your application will be referred to the staff administering the Certificate of University Preparation. If you have any questions about your eligibility for the CUP, please contact the faculty registrar.