

ENGINEERING

www.eng.waikato.ac.nz

New Zealand needs more engineers. Currently, New Zealand has less than 1,000 fourth-year engineering graduates. Similar countries to New Zealand graduate double this number. Increasing the number of engineers is essential for our country's growth in technology-related enterprises. New Zealand's industry needs engineering graduates who can not only run large-scale enterprises, but who can also create and run small-scale enterprises. To meet this need, graduates of Waikato's engineering degrees have the skills that are especially appropriate for solving problems in smaller-scale manufacturing industries. These industries make up the majority of New Zealand's enterprises.

The Waikato engineering degrees will put you at the cutting edge of engineering. This is reflected in the programmes offered: Chemical & Biological Engineering, Electronic Engineering, Materials & Process Engineering, Mechanical Engineering and Software Engineering. All programmes available in the Bachelor of Engineering have full accreditation from the Institute of Professional Engineers New Zealand (IPENZ), making Waikato's Engineering qualifications professionally recognised in 14 countries and regions, including Australia, the UK and the USA. All programmes are designed to prepare students for careers in the new economy and build on the expertise found in the major teaching departments involved with Science and Engineering at the University.

The professional application of engineering and design skills, including the requirements of professional practice means you will be prepared for roles as engineers and able to create, design and realise sophisticated engineering technologies. Our papers combine high-end design skills with the ability to develop, run and manage companies whatever their size, allowing you to develop your own potential. Our Cooperative Education Unit arranges and oversees the industrial work placement component of your degree, which will ensure the quality of your work placement.

CONTACTS FOR THE SCHOOL OF ENGINEERING

The School of Engineering administers the specified programmes in the BE and BE(Hons) degrees, and also the majors in Biotechnology, Electronics, Materials & Processing and Physics for the BSc and BSc(Tech) degrees.

School Administrators
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Associate Dean (Engineering)
Professor Janis Swan

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Degrees

The Bachelor of Engineering and Bachelor of Engineering (Honours) degrees are offered by the School of Engineering. Papers in engineering are offered at all levels of study from undergraduate degrees through to postgraduate and doctoral studies.

Admission to Honours Programme – BE(Hons)

Admission to the BE(Hons) programme is based on grades in the first three years of the BE degree. You should maintain at least a 'B-' average to be invited into the honours programme. Honours students enrol in a design and research paper in their fourth year that is more academically challenging than the non-honours design paper. You must also fulfil the individual programme requirements for each engineering programme.

Specified Programmes

The following programmes are available for the Bachelor of Engineering degree. Details of programme requirements are listed under the individual subjects.

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

Engineering Papers

Engineering is not available as a major for a Bachelor of Science or a Bachelor of Science (Technology) degree.

100 Level Papers

ENGG180-12A (HAM) – Foundations of Engineering

15 Points

Introduction to engineering analysis, engineering design, and the engineering profession. It includes: skills of a successful engineer, the nature of design and the design process; fundamental laws for engineering analysis, and accounting principles applied to mass, energy, and money. Students undertake a design-build-test experience to practice design skills.

Co-ordinator(s): Dr Rob Torrens

Equivalent: ENMP101

Required book(s): Holtzapple et al *Foundations of Engineering* (McGraw Hill) 2000

Assessment: Internal assessment/examination ratio: 1 : 1

ENGINEERING

200 Level Papers

ENGG279-12B (HAM) – Preparation for the Professional Workplace

0 Points

For details refer to Work Placements ENGG279.

ENGG282-12B (HAM) – Engineering Design

10 Points

This core paper for BE students introduces the design process as a problem-solving activity. This is reinforced by a group design project. Students also learn how to use and apply CAD design software and produce engineering drawings.

Co-ordinator(s): Dr Mike Duke

Recommended book(s): Cross *Engineering Design Methods 3rd ed* (Wiley) 2008

Assessment: Internal assessment/examination ratio: 1 : 1

ENGG283-12A (HAM) – Linear Algebra for Engineers

10 Points

This paper develops the fundamental ideas and techniques of linear algebra, with an emphasis on the practical engineering aspects of the subject. Topics will be selected from: basis and dimension of a vector space, geometric effect of a matrix transformation, determinant, subspaces of vector spaces, linear independence, change of basis, range and kernel, eigenvectors and eigenvalues, diagonalisation of matrices, the inner product, orthonormal bases, the Gram-Schmidt process, orthogonal diagonalisation of symmetric matrices, complex Euclidean spaces, Hermitian matrices and their diagonalisation.

Co-ordinator(s): Dr Nick Cavenagh

Prerequisite(s): MATH102

Restriction(s): MATH253

Required book(s): Anton *Elementary Linear Algebra 8th or 9th ed* (Wiley) 2000

Assessment: Internal assessment/examination ratio: 1 : 1 or 0 : 1

ENGG284-12B (HAM) – Differential Equations for Engineers*10 Points*

Ordinary and partial differential equations with applications to engineering problems. First-order equations, systems of equations and higher-order equations, phase-plane diagrams and geometrical methods. Solution to the wave equation, heat diffusion equation and Laplace's equation using separation of variables and Fourier series techniques.

Co-ordinator(s): Associate Professor Sean Oughton

Prerequisite(s): MATH101 and MATH102

Restriction(s): MATH255

*Required book(s): Boyce and Di Prima **Elementary Differential Equations and Boundary Value Problems** 7th or 8th ed (Wiley) 2003*

Assessment: Internal assessment/examination ratio: 1 : 1 or 0 : 1

ENGG285-12A (HAM) – Multivariable Calculus for Engineers*10 Points*

Differentiation of functions of n-variables and vector functions; applications including tangent planes, normals and optimisation; integration in n-dimensions; applications including curve length, surface areas and volumes. Further applications will be selected from: centre of mass co-ordinates and moments of inertia; gradient, divergence and curl operators; curvilinear co-ordinate systems; and integral theorems with applications to engineering problems.

Co-ordinator(s): Dr Ian Craig

Prerequisite(s): MATH101 and MATH102

Restriction(s): MATH251

*Recommended book(s): Finney et al **Thomas' Calculus** 10th or 11th ed (Addison-Wesley) 2003*

Assessment: Internal assessment/examination ratio: 1 : 1 or 0 : 1

ENGG287-12A (HAM) – Engineering Applications*10 Points*

Computer programming as a tool for engineering, using computer languages and systems to solve engineering problems.

Co-ordinator(s): Associate Professor Alistair Steyn-Ross

Prerequisite(s): PHYS103 and one of COMP103 or COMP106 or COMP153

Restriction(s): ENGG181

Assessment: Internal assessment/examination ratio: 1 : 1

ENGINEERING

300 Level Papers

ENGG301-12A/B/C/Y (HAM) – Special Topic in Engineering

20 Points

An independent theoretical, literature or experimental investigation of an engineering topic, supervised by a member of staff. Progress is discussed in group seminars and assessment is based on activities such as a seminar, poster presentations and a full report.

Co-ordinator(s): *Professor Janis Swan*

Assessment: *Internal assessment/examination ratio: 1 : 0*

ENGG302-12A (HAM) – Engineering of Technology

20 Points

Engineering fundamentals and the design process; the relationships of engineering to technology. Includes a design-build-test experience and links to pedagogical teaching processes. This paper is only available for GradDip(Eng)(Technology Teaching).

Convenor(s): *Professor Janis Swan, Dr Beverley Cooper*

Prerequisite(s): *Chair's discretion*

Restriction(s): *ENGG180*

Assessment: *Internal assessment/examination ratio: 3 : 2*

ENGG381-12A (HAM) – Engineering Statistics

20 Points

This paper is aimed specifically at engineering students. It covers statistical models, experimentation for quality designing and control, process measurement and improvement, statistical process control and capability, and reliability.

Lecturer(s): *Dr Ray Littler*

Prerequisite(s): *MATH101 and MATH102*

Assessment: *Internal assessment/examination ratio: 1 : 1*

Engineering Work Placement Papers

For details refer to Work Placements.

400 Level Papers

ENGG401 – Systems Control Theory

This paper will not be offered in 2012.

ENME440-12A (HAM) – Computer Aided Engineering

20 Points

For details refer to Materials and Processing ENME440.

ENGG482-12A/B/C/Y (HAM) – Engineering Design and Management Project

60 Points

A practical project in the design philosophy, requirements of the market, specifications, project planning and management, materials selection, prototype development, documentation and patents.

This paper is taken for the BE; students invited to the BE(Hons) should enrol in ENGG492.

Co-ordinator(s): Professor Janis Swan

Programme Convenors: Dr Giridhar Nair (Biological & Chemical Engineering), Professor Jonathan Scott (Electronic Engineering), Dr Johan Verbeek (Materials & Process Engineering), Dr Mike Duke (Mechanical Engineering) and Professor Steve Reeves (Software Engineering)

Assessment: Internal assessment/examination ratio: 1 : 0

ENGG492-12A/B/C/Y (HAM) – Honours Research and Management Project

60 Points

Practical projects including design philosophy; market requirements; specifications; project planning and research; management components and material selection; basic design and analysis; computer aided design; prototype development; reliability; quality; safety; failure analysis and protection, regulations; standards and codes; documentation and patents. There is a substantial research component. This paper can only be taken for the BE(Hons).

Co-ordinator(s): Professor Janis Swan

Programme Convenors: Dr Giridhar Nair (Biological & Chemical Engineering), Professor Jonathan Scott (Electronic Engineering), Dr Johan Verbeek (Materials & Process Engineering), Dr Mike Duke (Mechanical Engineering) and Professor Steve Reeves (Software Engineering)

Prerequisite(s): All 100, 200, 300 Level BE papers of the student's chosen programme.

Assessment: Internal assessment/examination ratio: 1 : 0