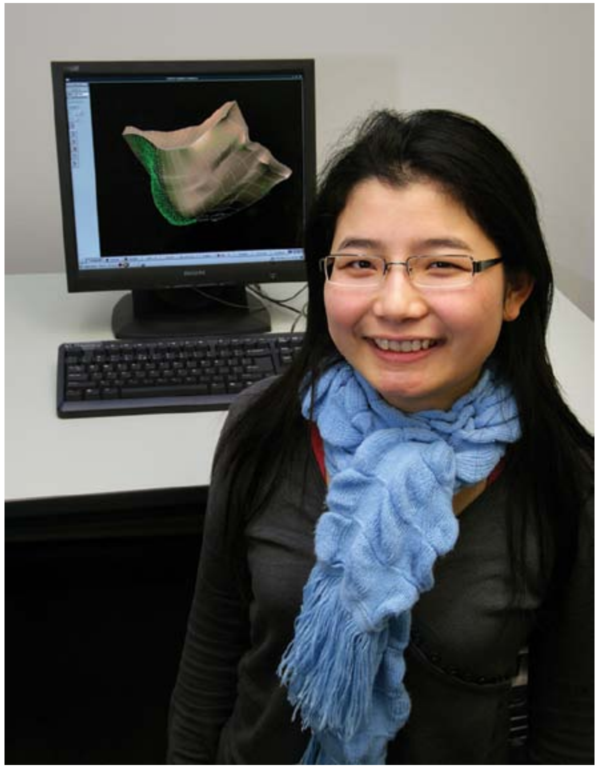
Biomedical Engineering

Biomedical Engineering bridges the gap between engineering, medicine, and biology.

Biomedical engineers use engineering, mathematical, and computational tools to model the human body. The aim is to obtain a deeper understanding of how the body functions to enable better clinical outcomes based on that understanding.

Biomedical engineers also develop new instrumentation to obtain useful information about living bodies, to improve fundamental knowledge of healthy individuals and diagnosis of pathologies.

This specialisation is relatively new and is rapidly expanding. There is an increasing demand for biomedical engineers as computational and mathematical modelling play a greater role in medicine.



Angela Lee, with an image from her Part IV Project on modelling the breast

Career outlook

Graduates of this degree will possess a wide range of skills. Biomedical engineers are employed in industry, in hospitals, in research facilities, and in government regulatory agencies.

They often serve in a coordinating or interfacing function, using their background in both the engineering and medical fields. In industry, they may create designs where an in-depth understanding of living systems and of technology is essential.

Much of the Biomedical Engineering landscape remains uncharted. Many areas exist that are open for exploration and innovation. Many BME graduates go on to do postgraduate research in the Auckland Bioengineering Institute, or at overseas universities. Postgraduate study can pave the way for careers working on the cutting edge of Biomedical Engineering research.

Jean (BE/BSc, 2005) is a design engineer at Fisher & Paykel Healthcare, working in a team that designs devices for laparoscopic surgery. Her role involves all aspects of the product lifecycle including product design, prototyping, testing, clinical trials and designing production equipment.

Laith (BE, 2005) went on to work at HortResearch as a Research Associate in the Human Health and Performance Group. The group's main focus is to develop technologies and products for monitoring and improving sports performance in athletes.

NOTE:
Full profiles of Jean, Laith, Sarah, Kim and Matthew can be found on the department website.

The image on the front cover represents work from a wide variety of people, many of whom were graduates of the Department of Engineering Science.

Contact:
The Department of Engineering Science
70 Symonds Street, Auckland
Phone: + 64 9 373 7599 ext 88392
Email: info-bme@auckland.ac.nz
Web: www.des.auckland.ac.nz

THE UNIVERSITY OF AUCKLAND
FACULTY OF ENGINEERING
Department of Engineering Science

Biomedical Engineering

a Bachelor of Engineering specialisation

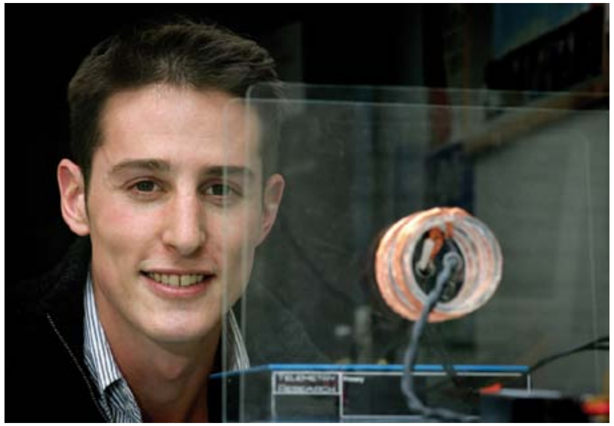
About the degree

The Bachelor of Engineering (Hons) in Biomedical Engineering (BME) is a four year degree with an emphasis on continuum mechanics, mathematical modelling, computational techniques, and instrumentation.

- Part I is common to all Engineering specialisations.
- Parts II and III lay the foundations of engineering and biology with courses in mathematics, mechanics, computation, electronics, and physiology.
- Part IV is more specialised. You will be able to choose a number of courses in areas that interest you most. Using the knowledge and skills you have gained, you will also carry out your own research project based on problems relevant to the biomedical industry or to biomedical research.

As a BME student, you will have access to top facilities and world class expertise from the Faculty of Engineering, the Faculty of Medical and Health Sciences, and the Faculty of Science.

There are opportunities for further study following on from this degree, with postgraduate work both in New Zealand and at universities overseas.



Part IV Project: Inductive power transfer unit for powering an artificial heart

Modelling

Physiological modelling uses mathematics, mechanics, and computational tools to gain a comprehensive and integrated understanding of the function of living organisms. Modelling is used in the analysis of experimental data and in formulating mathematical descriptions of physiological processes.

In research, models are used to design new experiments to refine our knowledge. Living systems have highly regulated feedback control systems which can be examined in this way. Examples include the biochemistry of metabolism and the control of limb movements.

Sarah (BE, 2006) went on to do her Masters of Engineering (ME, 2007) with the Auckland Bioengineering Institute (ABI). She developed an anatomically accurate 3D model of the lower limbs to analyse pressure in the buttocks when sitting for Formway, an award winning ergonomic furniture design company. She now works for the ABI as a Research Fellow.

Kim's academic and sports interests have entwined since school. Maths, physics, and an interest in the workings of the human body took her through her BE (2006), and an ME (2007) for which she modelled the pelvic floor. Hockey took her to China, Australia, Azerbaijan and around New Zealand as a Blackstick, and on to the Bejing Olympics. She played semiprofessionally in the Netherlands, and now works there as a Project Researcher/Coordinator.

Mechanics

Biomechanics is mechanics applied to biological or medical problems. It includes the study of motion, of material deformation, of flow within the body and in devices, and transport of chemical constituents across biological and synthetic media and membranes.

Biomechanics researchers have developed the artifical heart and replacement heart valves, the artifical kidney, the artifical hip, as well as built a better understanding of the function of organs and musculoskeletal systems.

Instrumentation

Bioinstrumentation is the application of electronics and measurement principles and techniques to develop devices to record biological signals for understanding physiological processes and help with the diagnosis and treatment of disease.

Computers are increasingly important in bioinstrumentation, on many levels. Simple microprocessors may be used to do a variety of tasks in a single purpose instrument. Extensive computing power is needed to process the large amount of information generated by a medical imaging system.

Part II students performing an experiment in a bioinstrumentation lab

Matthew (BE, 2005; ME, 2007) is a research engineer at Telemetry Research Limited. Telemetry Research produces an electronic system for wireless measurement of physiological signals, such as blood pressure, in research animals. This technology is sold into research laboratories in over 25 countries worldwide.