



THE UNIVERSITY  
OF AUCKLAND

FACULTY OF SCIENCE

2015

## Faculty of Science Biomedical Science Handbook



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## Further Information

**For further Information regarding the Biomedical Science programme contact the Faculty of Science Student Centre email [scifac@auckland.ac.nz](mailto:scifac@auckland.ac.nz) in the first instance.**

**Professor Larry Chamley, Biomedical Sciences Programme Director**

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### **Disclaimer**

*Although every reasonable effort is made to ensure accuracy, the information in this document is provided as a general guide only for students and is subject to alteration. All students enrolling at the University of Auckland must consult its official document, the Calendar of the University of Auckland, to ensure that they are aware of and comply with all regulations, requirements and policies.*

# Biomedical Science programme



This major within the Bachelor of Science is designed for very academically able students with an interest in emerging areas of medical science.

The Biomedical Science programme provides an understanding of the scientific basis of health and disease in humans and animals. During the first three years, the programme will deliver rigorous scientific training in a range of disciplines and students will gain a unique insight into this important area of modern biological research.

This research-led field is currently the most rapidly developing area in basic biological science and is therefore associated with a high level of public awareness and approval. The University of Auckland is acknowledged as a centre of excellence in Biomedical research and the options within the programme at Year Three reflect our particular strengths. Biomedical Science is jointly taught by the Faculties of Science and Medical and Health Sciences, with lectures split between the City and Grafton campuses.

**PROFESSOR LARRY CHAMLEY**  
**Biomedical Sciences Programme Director**

# Programme regulations



## A BSc - Biomedical Science must include:

- 90 points: BIOSCI 101, 106, 107, CHEM 110, PHYSICS 160, MEDSCI 142
- 60 points: BIOSCI 201-203, MEDSCI 205
- at least 45 points from MEDSCI 201, 203, 204, 206, (BIOSCI 204 or MEDSCI 202), PSYCH 202
- at least 15 points from STATS 101, 108, BIOSCI 209
- at least 30 points from BIOSCI 347-358
- at least 30 points from MEDSCI 301-317
- at least 15 points at Stage III from BIOSCI, MEDSCI, CHEM 390, 392 or PSYCH 305
- at least a further 45 points from the Schedule for the Bachelor of Science
- 30 points from General Education courses approved for this degree

## Year One (Science Common Year)

BIOSCI 101	Essential Biology: From Genomes to Organisms
BIOSCI 106	Foundations of Biochemistry
BIOSCI 107	Biology for Biomedical Science: Cellular Processes and Development
CHEM 110	Chemistry of the Living World
MEDSCI 142	Biology for Biomedical Science: Organ Systems
PHYSICS 160	Physics for the Life Sciences
Elective (any course but if applying for Medicine it must be POPLHLTH 111)	
General Education or other	

## Year Two

BIOSCI 201	Cellular and Molecular Biology
BIOSCI 202	Genetics
BIOSCI 203	Biochemistry
MEDSCI 205	The Physiology of Human Organ Systems
At least 3 courses from:	
<ul style="list-style-type: none"> <li>• MEDSCI 201 Human Structure and Function</li> <li>• MEDSCI 203 Mechanisms of Disease</li> <li>• MEDSCI 204 Introduction to Pharmacology and Toxicology</li> <li>• MEDSCI 206 Introduction to Neuroscience</li> <li>• BIOSCI 204 Principles of Microbiology OR MEDSCI 202 Microbiology and Immunology</li> <li>• PSYCH 202 Biopsychology</li> </ul>	
General Education	

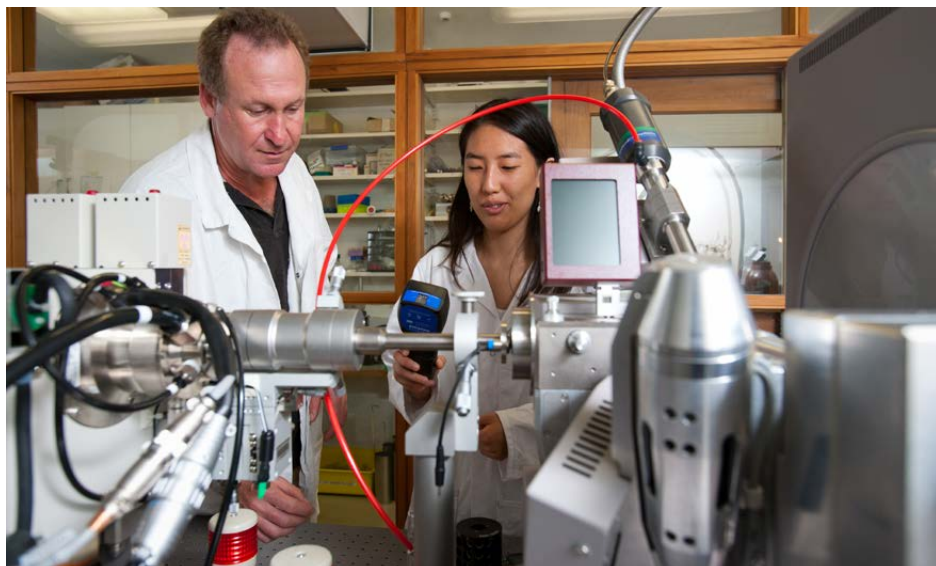
For course descriptions go to [www.science.auckland.ac.nz/biomed](http://www.science.auckland.ac.nz/biomed)

## Year Three suggested options and recommended preparation

We strongly recommend you focus your studies on a recognised area of research as you move into your second and third years. There are eight strands of research supported by academic groups at the University of Auckland and a range of courses you can take to gain experience in these fields.

You should complete 30 points from BIOSCI 347-358, 30 points from MEDSCI 301-317 and a further 15 points at Stage III from BIOSCI, MEDSCI, CHEM 392 or PSYCH 305. Students wishing to take Honours must include a total of 90 points (6 courses) at Stage III. Subject to timetabling limitations, we recommend you choose one of the following combinations to structure the third year of your degree.

Research area	Part 3 courses	Part 2 courses
	Recommended core courses Recommended complementary courses	Recommended preparation Desirable courses
Cancer Biology and Therapeutics	MEDSCI 301-303	BIOSCI 201-203, MEDSCI 203-205
	BIOSCI 351, 353, 354, 356, 358, CHEM 390, 392, MEDSCI 306, 314	
Cardiovascular Biology	MEDSCI 309, 311, 316	BIOSCI 201-203, MEDSCI 205, 206
	BIOSCI 350, 351, 353, 354, MEDSCI 301, 305, 317	MEDSCI 201
Cellular and Molecular Biomedicine	BIOSCI 350, 351, 353	BIOSCI 201-203, MEDSCI 205
	MEDSCI 301, 303-305, 309, 316	MEDSCI 203, 204, 206
Genetics and Development	BIOSCI 351, 354, 356	BIOSCI 201-203, MEDSCI 205
	BIOSCI 350, 353, MEDSCI 301, 312	MEDSCI 203
Microbiology and Immunology	BIOSCI 349 MEDSCI 301, 314	BIOSCI 201-203, (BIOSCI 204 or MEDSCI 202), MEDSCI 203, 205
	BIOSCI 347, 348, 350-353	
Neurobiology	MEDSCI 304, 307, 316, 317	BIOSCI 201-203, MEDSCI 204-206
	BIOSCI 350, 351, 353, 354, MEDSCI 309, 312, PSYCH 305	MEDSCI 201 or PSYCH 202
Nutrition	BIOSCI 358, MEDSCI 312, 315	BIOSCI 201-203, MEDSCI 205
	BIOSCI 348, 351, 353, FOODSCI 301, MEDSCI 301, 306, 307, 314, 316	MEDSCI 203, 204, 206 (MEDSCI 202 or BIOSCI 204)
Reproduction, Growth and Metabolism	BIOSCI 351, MEDSCI 312, 313	BIOSCI 201-203, MEDSCI 205
	BIOSCI 350, 353, 354, 356, 358, MEDSCI 301, 314	MEDSCI 201, 203



## Year Three

### At least 2 courses from:

- BIOSCI 347 Environmental Microbiology and Biotechnology
- BIOSCI 348 Food and Industrial Microbiology
- BIOSCI 349 Biomedical Microbiology
- BIOSCI 350 Protein Structure and Function
- BIOSCI 351 Molecular Genetics
- BIOSCI 353 Molecular and Cellular Regulation
- BIOSCI 354 Gene Expression and Gene Transfer
- BIOSCI 356 Developmental Biology and Cancer
- BIOSCI 358 Nutritional Science

### And at least 2 courses from:

- MEDSCI 301 Molecular Basis of Disease
- MEDSCI 302 Cancer Biology
- MEDSCI 303 Principles of Pharmacology
- MEDSCI 304 Molecular Pharmacology
- MEDSCI 305 Systematic Pharmacology
- MEDSCI 306 Principles of Toxicology
- MEDSCI 307 Neuroscience: Neuropharmacology
- MEDSCI 309 Biophysics of Nerve and Muscle
- MEDSCI 311 Cardiovascular Biology
- MEDSCI 312 Endocrinology of Growth and Metabolism
- MEDSCI 313 Reproductive Biology
- MEDSCI 314 Immunology
- MEDSCI 315 Nutrition, Diet and Gene Interactions
- MEDSCI 316 Sensory Neuroscience
- MEDSCI 317 Integrative Neuroscience

At least 15 points from Stage III BIOSCI, Stage III MEDSCI or CHEM 390 Medicinal Chemistry, CHEM 392 Issues in Drug Design and Development, PSYCH 305 Human Neuroscience

45 points from the Science schedule including STATS 101 or 108

For the full Science schedule go to [www.calendar.auckland.ac.nz/regulations/BSc.html](http://www.calendar.auckland.ac.nz/regulations/BSc.html)

# Year Three Options

## Cancer Biology and Therapeutics

The control and cure of cancer still remains a substantial challenge. Considerable innovative research is undertaken by a wide network of cancer researchers throughout the University. This includes the internationally renowned Auckland Cancer Society Research Centre (ACRSC) in the Faculty of Medical and Health Sciences, which has successfully developed numerous anti-cancer drugs. The multi-disciplinary cancer research within the network ranges from understanding the genetic, molecular and cellular basis of the disease, the design and development of new drugs and novel therapeutic strategies, as well as strong translational links to the Oncology clinics. The background provided by the courses in this theme provides students with a wide range of knowledge applicable to the multi-disciplinary nature of this research field.

### Associate Professor Nuala Helsby (Option Adviser)

School of Medical Sciences

**Phone:** 373 7599 ext 89831

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## Cardiovascular Biology

Cardiovascular disease kills 50% of the population and is a major area of health and research expenditure worldwide. Cardiac muscle cells and other cells form the heart; this organ's rhythm and function is regulated by the central nervous system, which gives rise to blood pressure and blood vessel tone. There is huge scope for research in all of these areas at the University of Auckland, where the largest and most respected grouping of cardiovascular researchers in New Zealand is located. Students choosing this option will have a vast range of research laboratories to choose from including molecular and cellular issues relating to cardiac muscle cells and blood vessels, to heart structure

and function, to control of blood pressure and even human cardiovascular studies.

### Professor Laura Bennet (Option Adviser)

School of Medical Sciences

**Phone:** 373 7599 ext 84890

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## Cellular and Molecular Biomedicine

This option offers students a chance to focus their study at a fundamental level and apply it to the widest possible range of biomedical research themes. The emphasis is on how basic studies in molecular and cellular biology contribute to the development of knowledge in a variety of biomedical fields. Students will gain first-hand experience in the application of state-of-the-art technologies including genomics and proteomics, biomolecular structure analysis, cellular imaging and electrophysiology. Research interests of affiliated staff cover gene structure and expression, molecular cell biology and the structure and function of biomolecules as applied to molecular neuroendocrinology, metabolic regulation, diabetes and insulin resistance, molecular virology, membrane transport, cellular physiology and drug development.

### Dr Judy O'Brien (Option Adviser)

School of Biological Sciences

**Phone:** 373 7599 ext 88764

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## Genetics and Development

Developmental biology is concerned with how multicellular organisms and their complex structures, such as different organs and tissues, arise from a single cell. Much of the excitement in developmental biology today arises from our growing understanding of how genes direct these developmental processes. Reference will be made to many model organisms in this option and you will learn how genes influence development by focussing on specific organs and tissues. We will also consider how problems in development underpin many diseases of the human body. Research in all areas of biomedicine requires an appreciation of the temporal and spatial patterns of gene expression and developmental programmes, and it is these areas that are highlighted here.

### **Professor Phil Crosier** (Option Adviser)

School of Medical Sciences

**Phone:** 373 7599 ext 86279

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## Microbiology and Immunology

The course of infectious disease in humans is determined by the replication and spread of microbial pathogens on the one hand and the

ability of the host immune system to recognise and eliminate these invaders on the other. This option integrates two of the most active areas of biomedical research: the molecular microbiology of bacteria, viruses and microbial eukaryotes together with the nature and complexity of the immune response triggered by their infection of animal hosts. The overall objective is to give students an insight into the interactions between pathogens and host at the molecular level and to provide a view of the human immune system as both an effective barrier to disease and the major driving force behind microbial evolution, with research groups active in the Faculty of Medical and Health Sciences and the School of Biological Sciences.

### **Associate Professor Roger Booth** (Option Adviser)

School of Medical Sciences

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## Neurobiology

One of the fastest growing areas of modern biomedical science, research in this field deals with structures and mechanisms that underlie the function of the brain and nervous system in health and disease. Neurobiology is an area in which the University of Auckland is particularly strong with numerous research groups acknowledged as world leaders in their fields. Multi-disciplinary teams in the School of Medical and Health Science are working on the development of the nervous system, the cellular basis of learning and behaviour, mechanisms of hearing and vision, control of breathing and circulation by the central nervous system, regulation of feeding behavior and body weight and the molecular and cellular basis of neuro-degenerative brain disorders.

### **Associate Professor Johanna Montgomery** (Option Adviser)

Department of Physiology

**Phone:** 373 7599 ext 89828

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## Nutrition

While nutrients were traditionally considered necessary for preventing deficiency diseases, it is increasingly clear that inappropriate diet may be responsible for almost half of the global burden of Non Communicable Diseases, as well as significantly enhancing susceptibility to Communicable Diseases. There is a considerable nutrition-related skill base across the University of Auckland, both in the Faculty of Medical and Health Sciences and in the School of Biological Sciences, which also directs the Human Nutrition Trial Unit in Mt Eden. Several groups are focused on research areas ranging from molecular nutrition through to population-based studies, and include clinically related examples.

### Professor Lynn Ferguson (Option Adviser)

School of Medical Sciences

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**Email:** l.ferguson@auckland.ac.nz

## Reproduction, Growth and Metabolism

For one in six couples, infertility, miscarriages and other diseases of pregnancy prevent them from giving birth to and raising a healthy child. Further to this, one in five children resulting from successful pregnancies will develop obesity, diabetes and health-related complications as they grow through puberty into adulthood. In this option you will learn about all aspects of reproduction in humans and animals. The University of Auckland has a long tradition of excellence in reproductive science, growth and metabolism that continues today. Research groups are located in the Department of Obstetrics and Gynaecology, the Liggins Institute, the Department of Physiology, Molecular Medicine and Pathology and the Department of Medicine.

### Dr Lynsey Cree (Option Adviser)

School of Medical Sciences

**Phone:** 373 7599 ext 81695

**Email:** l.cree@auckland.ac.nz

## Postgraduate study in Biomedical Science

Students may proceed to postgraduate study in Biomedical Science by selection for BSc(Hons) - Biomedical Science, or through entry to PGDipSci and MSc in Biomedical Science.

### BSc(Hons) Biomedical Science requirement:

- 90 points BIOMED 791 Research Portfolio
- 30 points from BIOINF 701, BIOSCI 736, 737, 741, 755-759, HLTHPSYC 716, MEDSCI 701-723, 725-734, 737-739

A major research portfolio will be prepared on a topic associated with the work of one of the biomedical research teams within the University. Advice on the research portfolio and how to choose a project will be given during Semester 2 of Year 3.

### PGDipSci (Biomedical Science) requirement:

- At least 90 points from MEDSCI 703-723, 725-739, BIOINF 701, BIOSCI 728, 729, 733, 736, 737, 738, 741, 755-761, HLTHPSYC 716
- Up to 30 points from other 600 or 700 level courses as approved by the Board of Studies (Biomedical Science)

### MSc (120 points):

- Prerequisite: A BSc(Hons) or a PGDipSci in Biomedical Science, or an equivalent qualification as approved by the Board of Studies (Biomedical Science)

### Requirement for Research Masters:

- 120 points: BIOMED 796 MSc Thesis in Biomedical Science

In exceptional circumstances a 240 point MSc may be available.

# Helpful information

Applications for Admission close on 8 December 2014 – Biomedical Science has limited places so it is advisable to apply early. The last day to enrol for the programme is 14 February 2015.

## Entry requirements for BSc – Biomedical Science

Recommended subjects to take in Years 12 and 13 are Biology, Chemistry, Physics, Maths and English or another subject which develops literacy and communication skills.

School leavers: You will have an NCEA rank score of at least 280 (domestic and international).

For Māori and Pacific Island (MPI) domestic, you will have an NCEA rank score of at least 280.

CIE rank score of at least 310 (domestic and international). For Māori and Pacific Island (MPI) domestic, you will have an CIE rank score of at least 280.

IB score of at least 37 (domestic and international). For Māori and Pacific Island (MPI) domestic, you will have an IB rank score of at least 37.

Rank scores are calculated using the best 80 credits in a maximum of 5 subjects.

If you apply but do not meet the entry requirement, your enrolment will be changed to BSc – Biological Sciences.

University of Auckland returning students must achieve a grade point average of 5.0 to be considered.

## Degree structure

- 3 years – 360 points
- Honours fourth year - 120 points
- Each course is worth 15 points

## General Education

### What courses can I take?

General Education courses are identified by a “G” suffix to their course code (eg, HISTORY 103G).

Courses in the programme are organised into six schedules. The ones that are related to the BSc are the following:

- Open Schedule (O)
- Engineering, Medical and Health Sciences, Science (EMHSS).

*Note: Students taking a BSc in Biomedical Science wishing to apply to the MBChB after their first year must take one General Education course in Year 1. Students admitted to the MBChB will not be able to take a second General Education course.*

## Transferring into Biomedical Science

Students wanting to transfer into Biomedical Science Year 2 from other programmes may be considered if they achieve a GPA of 5.0 or above and there are spaces available.

## Entry into other programmes from Biomedical Science

Biomedical Science Year 1 can be credited in part or whole to other BSc majors, including: Biological Sciences, Bioinformatics, Medicinal Chemistry, Chemistry, Food Science and Nutrition, Pharmacology, Physiology, Psychology, Sport and Exercise Science, as well as the Bachelor of Technology in Biotechnology or MPIT (see web for more details).

**[www.science.auckland.ac.nz/biomed-common-year](http://www.science.auckland.ac.nz/biomed-common-year)**



## Entry to Medicine

Biomedical Science students who gain a B+ average in their first year of study may be eligible for consideration for an interview for entry to Medicine. Students must complete all Biomedical Science Year 1 courses in the same academic year, including the elective POPLHLTH 111 and an approved General Education course. There are no advantages in taking either the BHSc or BSc – Biomedical Science as a pathway into Medicine. Students should choose their programme according to their ability, interest and preference. Go to [www.fmhs.auckland.ac.nz/medicine](http://www.fmhs.auckland.ac.nz/medicine) for more information.

## Entry to Optometry

Students may apply for selection to Optometry at the end of Biomedical Science Year 1. The core passed courses will be credited to Part 1 of this programme. Go to [www.optometry.auckland.ac.nz](http://www.optometry.auckland.ac.nz) for more information.

## Honours

This year is demanding and intended for those who would like to fill leadership roles in research

and development through a PhD. Up to 60 students with a GPA of at least 6.5 are selected at the end of Year 2. These students will complete Year 3 of the undergraduate programme and must maintain at least a B average. Eligible students should then apply online for the BSc (Hons) – Biomedical Science.

## Careers in Biomedical Science

Biomedical science has revolutionised research over the past decade, stimulating growth in a wide range of industries including agriculture, pharmaceuticals, veterinary science and medical research. Graduates of the BSc (Biomedical Science) can expect to find employment within biomedical and biotechnology companies as laboratory technicians and scientific officers, as teachers, or as researchers in universities, Crown Research Institutes, or government agencies, such as the Environmental Risk Management Authority, Ministry of Agriculture and Forestry, Ministry of Business, Innovation and Employment. Employment in biotechnology and pharmaceutical companies is especially buoyant in the United States and Europe, with significant growth expected in New Zealand.



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### **Contact**

Faculty of Science Student Centre  
The University of Auckland  
Private Bag 92019, Auckland 1142  
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Phone: 0800 61 62 63

Web: [www.science.auckland.ac.nz](http://www.science.auckland.ac.nz)

### **The Faculty of Science Student Centre**

8:45am - 5pm Monday to Friday.  
Students wishing to see the Science Advisers regarding programmes or course advice, planning and approval, may make an appointment to visit during consultation hours. To receive general advice or obtain further information, students are free to drop in throughout the day.

### **Physical Location**

Science Student Centre  
Room G016 (Ground Floor)  
Building 303 (Maths/Physics Building)  
38 Princes Street