

BIOLOGICAL SCIENCES

www.bio.waikato.ac.nz

Biological Sciences is for those who love life. Whether you want to stand in a metre of mud, on top of a tree, under the sea or on a kilometre of Antarctic ice, biology is for you. Our students have many opportunities; they can be ecologists with interests in ecosystems, physiologists aiming to understand how organisms function, or geneticists using DNA as the key to identifying diseases of organisms. With biology as a great start to their career, our graduates have secured positions around the world, testimony to the international standing of our degrees.

Biological Sciences covers a wide range of specialist areas including animal behaviour, biochemistry, botany, ecology, marine biology, microbiology, physiology and zoology.

Waikato was rated the top university in New Zealand for its research in molecular, cellular and whole organism biology, and ecology, evolution and behaviour, in the Tertiary Education Commission's 2006 assessment of tertiary research.

CONTACTS FOR THE DEPARTMENT OF BIOLOGICAL SCIENCES

Departmental Administrator
Gloria Edwards

Room: E2.20
Phone: 07 838 4022
Email: biology@waikato.ac.nz

First Year Mentor
Dr Alison Campbell

Room: F1.08
Phone: 07 838 4582
Email: a.campbell@waikato.ac.nz

Degrees

Biological Sciences is available as a major subject for the Bachelor of Science or Bachelor of Science (Technology) degrees. The Department of Biological Sciences offers papers, programmes and degrees that cover the full breadth of the natural living world. Papers are offered at all levels of study, from pre-degree and undergraduate degrees, through to postgraduate and doctoral studies.

Biological Sciences Major

General Structure of a Biological Sciences Major for the BSc and BSc(Tech) degrees

100 LEVEL	BIOL101 15 points	BIOL102 15 points	<p>100 Level – Prerequisites: BIOL101 Cellular and Molecular Biology and BIOL102 The Biology of Organisms.</p> <p>200 Level – At least 60 points at 200 Level Biological Sciences.</p> <p>300 Level – At least 60 points at 300 Level Biological Sciences.</p>
	BIOL2XX 20 points	BIOL2XX 20 Points	
300 LEVEL	BIOL3XX 20 points	BIOL3XX 20 points	BIOL3XX 20 points

Specialisations

Students may undertake the following specialisations for the BSc and BSc(Tech) major in Biological Sciences.

» Agribusiness	*
» 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 Programmes

Students may undertake the following general programmes for the BSc and BSc(Tech) major in Biological Sciences. Detailed information can be found in the back of this section.

» Animal Physiology	page 41
» Behavioural Ecology and Conservation	page 43
» Biochemistry	page 44
» Biomedical Sciences	page 45
» Botany	page 46
» Ecology	page 47
» Freshwater Biology	page 48
» Genetics	page 49
» Microbiology	page 50
» Plant Physiology	page 51
» Zoology	page 52

Choosing Papers

Entry into Biological Sciences Papers

Satisfactory completion of secondary study at Level 3 or higher on the NZQA framework in a relevant area is acceptable for admission to Biological Sciences papers. Students who do not have credits in NCEA Level 3 Biology are advised to discuss their options with the first-year student mentor. The bridging biology classes provide the prior knowledge required for studying first-year papers in Biology. Information on bridging options may be found in the Bridging Programme section.

In some cases, we are able to relax the rules relating to prerequisites. If you would particularly like to take a paper for which you have not satisfied a specified requirement, talk to the paper co-ordinator.

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Biological Sciences Major

To complete a major in Biological Sciences, students must complete 120 points above 100 Level, including 60 points at 300 Level from Biological Sciences papers.

100 Level – Papers are worth 15 points.

Students wishing to major in Biological Sciences or a related field should take the two core papers:

Prerequisites

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms

You should also refer to the specialisations and general programmes that have been designed to allow Biological Sciences majors to develop themes in particular areas.

200 Level – Papers are worth 20 points unless specified.

Students intending to major in Biological Sciences are required to take at least 60 points from 200 Level Biological Sciences papers. Again, the specialisations and general programmes provide a good guide for students interested in particular areas.

300 Level – Papers are worth 20 points unless specified.

Students intending to major in Biological Sciences must also gain at least 60 points at 300 Level from the Biological Sciences papers offered. Please note that BIOL307 – Special Topic may not be counted toward a major at 300 Level.

The other papers needed to complete the degree requirements of the BSc and BSc(Tech) may come from further optional papers in Biological Sciences, other science subjects, or may even include a few papers from other faculties/schools of study.

Students not intending to major in Biological Sciences

If you are not a Biological Sciences major, please feel free to sample from our wide variety of paper offerings. Generally, it will be easiest for you to pick up Biological Sciences papers at 100 and 200 Levels, as these papers will be less-affected by prerequisites.

Timetable Clashes

Your selection of papers may depend on your timetable. You will not usually be permitted to take papers which have lecture clashes. Laboratory clashes can usually be resolved. You should contact the paper co-ordinator if you have a laboratory clash.

Biological Sciences Papers

100 Level Papers

BIOL101-12B (HAM) & 12B (SEC) – Cellular and Molecular Biology

15 Points

This first year paper deals with the ultrastructure and function of both prokaryotic and eukaryotic cells, including a discussion of the energy flow in photosynthesis, respiration and metabolism. An introduction to microbiology emphasises the structure, metabolic and taxonomic diversity of microorganisms and viruses, and the immune response. Molecular genetics focuses on the use of DNA information to control cellular activities and includes an introduction to recombinant DNA technologies, while Mendelian and population genetics focuses on the generation of genetic diversity and the principles of evolution.

This paper is one of the two core papers for all students majoring in Biological Sciences or intending to do at least some biology papers at the second and third year level.

Lecturer(s): Dr Ryan Martinus, Associate Professor Ian McDonald and Dr Alison Campbell
Required book(s): Campbell and Reece **Biology** 9th ed (Benjamin Cummings)
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL102-12A (HAM) & 12A (SEC) – The Biology of Organisms

15 Points

This paper is concerned with the distinctive features of the various groups of plants and animals, and how they have overcome various basic problems such as the acquisition of nutrients, gaseous exchange, regulation and transport of body fluids, reproduction, and development. Aspects of animal behaviour, and the principles of ecology are also covered.

Like its counterpart BIOL101, this paper is a foundation paper for all students majoring in Biological Sciences or intending to do at least some biology papers at second and third year levels.

Lecturer(s): Dr Alison Campbell and Associate Professor Nick Ling
Required book(s): Campbell and Reece **Biology** 9th ed (Benjamin Cummings)
Assessment: Internal assessment/examination ratio: 1 : 1

ENVS101-12B (HAM) – Environmental Science

15 Points

For details refer to Environmental Sciences ENVS101.

200 Level Papers

BIOL201-12A (HAM) – Evolution and Diversity of Life

20 Points

An examination of the evolutionary history of life, beginning with an introduction to the history and philosophy of evolutionary thinking. Other topics include present-day evidence of evolution in plant, animal, and bacterial taxa, modern methods for obtaining and analysing this evidence, and discussion of the mechanisms of evolution. This paper should be regarded as essential by all students of biology.

Lecturer(s): Dr Carolyn King, Dr Chrissen Gemmill, Dr Ian Duggan and Dr Michael Clearwater
Prerequisite(s): BIOL101 or BIOL102
Assessment: Internal assessment/examination ratio: 1 : 1

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BIOL210-12B (HAM) – Introduction to Genetics

20 Points

This paper deals with genetics in the widest sense, from the molecular and cellular to the applied and evolutionary. Both prokaryote and eukaryote genetics are discussed with respect to DNA replication, gene expression and control, and the role of mutations at both the DNA and chromosomal levels. Applications of molecular genetics such as cloning, DNA sequencing, genetic engineering, DNA fingerprinting and antibody technologies are introduced. An in-depth treatment of Mendelian genetics and an introduction to quantitative genetics complete the paper.

The paper is seen as being of major importance to students of biology, irrespective of whether their interests are in metabolic and cellular processes, plant/animal genetic improvement, or ecological and evolutionary.

Lecturer(s): Dr Ray Cursons, Dr Linda Peters and Dr Steve Bird

Prerequisite(s): BIOL101

Assessment: Internal assessment/examination ratio: 2 : 3

BIOL212-12A (HAM) – Ecology

20 Points

This paper covers the principles of ecology, including adaptation to environment, species interactions, population dynamics, biogeography, and conservation ecology. Weekend field trips and computer laboratory work are essential elements of this paper.

Lecturer(s): Dr Ian Duggan, Associate Professor Brendan Hicks, Dr Carolyn King, Dr Conrad Pilditch and Professor David Hamilton

Prerequisite(s): BIOL102, (ENVS101 is strongly recommended)

Required book(s): Smith and Smith **Ecology and Field Biology 2008 7th ed** (Benjamin Cummings)

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL223-12B (HAM) – Plant Biology and Ecology

20 Points

An introduction to the structure and adaptation of plants, diversity, ecology, reproduction, evolution and systematics. Laboratory work emphasises practical handling of plants. The paper provides a foundation for advanced plant papers, and complements BIOL226 Flora of Aotearoa.

Lecturer(s): Dr Chrissen Gemmill, Dr Michael Clearwater and Dr Daniel Laughlin

Prerequisite(s): BIOL102

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL224-12B (TGA) Aquaculture Reproduction and Early Life Stages

20 Points

Students will study the underlying reproductive physiology and developmental biology of early life cycle strategies used by aquatic animal species. This knowledge will be examined for its use in the husbandry, breeding and production of species in aquaculture. This paper is only available to Tauranga students.

Prerequisite(s): Aquaculture 1, Aquaculture 2, Diploma in Marine Studies
Bay of Plenty Polytechnic

Assessment: Internal assessment/examination ratio: 3:2

BIOL226-12C (BLK) – Flora of Aotearoa/New Zealand

20 Points

A paper for students interested in New Zealand's native and naturalised flora, with emphasis on identification of plants and plant systematics. A three-day field trip will be held as part of this paper.

At the end of this paper students will be familiar with all the major elements of the New Zealand flora, and will be able to work with any modern flora to key out and identify plants from the scientific literature. The paper will normally be taught entirely over two weeks in February, followed by work on an independent research project. **For entry contact Dr Chrissen Gemmill, c.gemmill@waikato.ac.nz**

Lecturer(s): Dr Chrissen Gemmill, Professor Bruce Clarkson, Dr Michael Clearwater and Dr Daniel Laughlin

Assessment: Internal assessment/examination ratio: 1 : 0

BIOL227 – Flora of the Pacific

20 Points

*This paper will not be offered in 2012.***BIOL234-12A (HAM) – Functional Animal Biology**

20 Points

This paper is an integrated theoretical and experimental study of the principles of animal physiology. Comparative aspects will be emphasised in how animals adapt to their environment. Topics covered include the physiology of nerve and muscle, senses, reflexes, endocrinology, respiration, circulation, osmoregulation-excretion and thermoregulation. An introduction to animal behaviour may include sensory abilities, orientation and navigation and selected aspects of social behaviour.

Lecturer(s): Associate Professor Nick Ling and Professor Joe Waas

Prerequisite(s): BIOL102

Assessment: Internal assessment/examination ratio: 2 : 3

BIOL235-12B (HAM) – Humans and Other Mammals: Structure and Function

20 Points

An introduction to human and mammalian biology. Topics covered include the tissues and organs of the body; the structure and functioning of the nervous system and the endocrine system; digestion, respiration, circulation; the immune system; reproduction and development. Health and social issues will be considered.

This paper provides a base for the third-year paper BIOL335.

Lecturer(s): Associate Professor Nick Ling, Dr Pawel Olszewski and Dr Steve Bird

Prerequisite(s): BIOL102; (BIOL101 is recommended)

Assessment: Internal assessment/examination ratio: 2 : 3

BIOL241-12A (HAM) – Microbiology: Form, Function and Metabolism

20 Points

This paper deals almost wholly with bacteria. Its aim is to provide insight into their structure, how they are classified, how they grow and some account of their very diverse physiologies. Structure and physiology are discussed in relation to the role of bacteria in nature and how various methods (such as the use of antibiotics) may be used to control their growth.

The paper is a prerequisite for BIOL341, and can be seen as complementary to the genetics, biochemistry and biotechniques papers.

Lecturer(s): Professor Hugh Morgan and Associate Professor Ian McDonald

Prerequisite(s): BIOL101; (BIOL102 is recommended)

Restriction(s): ENMP325

Required book(s): Madigan et al *Brock's Biology of Microorganisms* 13th ed (Prentice-Hall)

Assessment: Internal assessment/examination ratio: 1 : 2

BIOL251-12A (HAM) – Biochemistry

20 Points

The aim of this introductory paper is to familiarise students with most aspects of biochemistry, including the structure and function of proteins and enzymes, energy-yielding metabolism and the biochemical basis of nutrition and the functioning of hormones. An emphasis is placed on the relevance of biochemistry to understanding what is going on within and around you and the paper is seen as serving the needs of all biologists and of those chemists intending to work in primary production industries. This paper is strongly recommended for all students with an interest in biotechnology, molecular genetics, or plant, animal or microbial physiology.

Lecturer(s): Professor Peter Molan and Dr Ryan Martinus

Prerequisite(s): BIOL101 and CHEM102

Assessment: Internal assessment/examination ratio: 1 : 1

ENMP222-12B – Biotechnology: Food and Bioresources

20 Points

For details refer to Materials and Processing ENMP222.

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300 Level Papers

BIOL307-12A/B/C/Y (HAM) – Special Topic

20 Points

An experimental and/or theoretical paper offered in biological subjects. A chosen topic is conducted with an individual supervisor and is assessed by a final written report and oral presentation. The major topic areas are: animal behaviour; aquatic ecology; biochemistry; genetics; microbiology; plant and animal physiology and ecology.

Admission is at the discretion of the co-ordinator/s for this paper. This paper will not normally be accepted as one of the three papers required for a major in Biological Sciences.

Co-ordinator(s): Associate Professor Ian Hogg and Professor Joe Waas

Assessment: Internal assessment/examination ratio: 1 : 0

BIOL310-12A (HAM) – Advanced Genetics

20 Points

This paper follows on from BIOL210 and deals in greater detail with both the molecular and whole organism aspects of genetics. Throughout the paper there will be an emphasis on the application of genetic knowledge; on the one hand in the direction of genetic engineering and genetic analysis and on the other hand in the study of population genetics.

The paper is recommended to all biologists; it complements papers both in the evolutionary areas of biology as well as those in the metabolic and biotechnological.

Lecturer(s): Dr Ray Cursons, Dr Linda Peters, Dr Steve Bird and Associate Professor Vic Arcus

Prerequisite(s): BIOL210

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL312-12A (HAM) – Applied Terrestrial Ecology

20 Points

A course that explores ecological principles, ecosystem dynamics and functioning, restoration, conservation genetics, conservation ecology, forest ecosystems, pest control and protection of native species, wetland ecosystems, Antarctic ecosystems and modified ecosystems.

Lecturer(s): Dr Daniel Laughlin, Dr Chrissen Gemmill, Dr Carolyn King and Dr Michael Clearwater

Prerequisite(s): BIOL212

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL313-12B (HAM) – Applied Freshwater Ecology

20 Points

This paper is an introduction to the applied ecology of freshwater communities (limnology). It deals both with the physical and chemical environments of lakes and rivers, as well as with the various plant and animal communities found in these habitats. The variety and ways of life of freshwater organisms and the factors governing their populations are examined. Freshwater ecosystems are often affected by human activities and so the paper also deals with the effects of land use, lake management, and management of stream habitats.

Lecturer(s): Associate Professor Ian Hogg, Associate Professor Brendan Hicks, Dr Ian Duggan and Professor David Hamilton

Prerequisite(s): BIOL212

Assessment: Internal assessment/examination ratio: 2 : 3

BIOL314-12A (HAM) – Marine Biology and Monitoring*20 Points*

This paper deals with the ecology of marine organisms, focusing particularly on events at the individual, assemblage and population level. A wide range of habitats is considered, in order to stress the diverse nature of the marine environment. There is also an emphasis on detecting change due to human activities on marine systems, including fisheries. As a consequence, statistics of ecological surveys and experiments are an integral part of the paper. Please note that there is a class limit of 45 for this paper.

Lecturer(s): Dr Conrad Pilditch and Associate Professor Brendan Hicks
and Dr Ian Duggan

Prerequisite(s): BIOL212; (BIOL201 is recommended)

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL325-12A (HAM) – Plant Function*20 Points*

This paper provides an introduction to the discipline of plant physiological ecology. Participants will gain an understanding of how plants interact with their environment as they grow and reproduce, using examples from both natural vegetation and managed agricultural environments. Practical work will emphasise laboratory and field techniques for measuring plant performance, including measurements of microclimate, photosynthesis and water use.

Lecturer(s): Dr Michael Clearwater and Dr Daniel Laughlin

Prerequisite(s): BIOL223

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL326-12B (HAM) – Advanced Topics in Plant Biology*20 Points*

This paper is delivered in modules and will cover advanced aspects of three areas of topical interest such as restoration ecology, modern approaches to plant systematics, and ecophysiological responses of plants. This paper is essential to those interested in pursuing a masters degree in all areas of plant science.

Lecturer(s): Dr Chrissen Gemmill, Dr Michael Clearwater, Dr Chris Lusk
and Dr Daniel Laughlin

Prerequisite(s): BIOL223 and either BIOL226 or BIOL312

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL333-12B (HAM) – Advanced Animal Behaviour*20 Points*

This paper provides an up-to-date review of issues in the field of animal behaviour. We examine the development, causation, function and evolutionary history of vertebrate and invertebrate behaviour.

Lecturer(s): Professor Joe Waas, Dr Carolyn King, Associate Professor Nick Ling
and contributors from Landcare, the Department of Conservation and
AgResearch scientists

Prerequisite(s): BIOL234

Assessment: Internal assessment/examination ratio: 2 : 3

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BIOL335-12A (HAM) – Mammalian Physiology

20 Points

This paper is an integrated theoretical and experimental study of selected aspects of physiology. The paper follows on from Functional Animal Biology (BIOL234) and Humans and Other Mammals (BIOL235) and deals with topics not covered in these papers as well as some of the same topics in more depth. The paper is concerned with mammalian physiology, in particular covering areas of research at Ruakura and including gastro-intestinal physiology, muscle, reproduction and the mammary gland.

Lecturer(s): Associate Professor Nick Ling, Dr Pawel Olszewski and contributors from AgResearch

Prerequisite(s): BIOL234 or BIOL235; (BIOL251 is recommended)

Assessment: Internal assessment/examination ratio: 2 : 3

BIOL338-12B (HAM) – Advanced Zoology

20 Points

This paper looks at selected topics in evolutionary zoology, with particular emphasis on the dominant invertebrate and vertebrate groups. Also examined are adaptations to extreme environments and vertebrate origins and lifestyles.

This paper is complementary to BIOL335 and BIOL333.

Lecturer(s): Dr Carolyn King, Associate Professor Ian Hogg and Associate Professor Nick Ling

Prerequisite(s): BIOL201 or BIOL234

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL341-12B (HAM) – Microbial Physiology and Ecology

20 Points

This paper looks at the great metabolic diversity of bacteria and their ability to respond to fluctuating and extreme environments. Emphasis will be placed on the unifying principles and the relationship of bacterial physiology to the taxonomy and ecology of archaeobacteria and eubacteria. The role of adhesion will be discussed leading to the importance of bacterial biofilms and the metabolic interactions that occur within these consortia. Bacterial phylogeny will be used to introduce new methods of molecular ecology.

Lecturer(s): Professor Hugh Morgan and Associate Professor Ian McDonald

Prerequisite(s): BIOL241

Required book(s): Madigan et al *Brock's Biology of Microorganisms* 13th ed (Prentice-Hall)

Assessment: Internal assessment/examination ratio: 1 : 2

BIOL351-12A (HAM) – Advanced Biochemistry*20 Points*

This paper is targeted at students interested in biochemistry, plant and animal physiology, biotechnology, genetics, microbiology and chemistry. We will build upon the principles of biochemistry introduced in BIOL251 to:

1. Examine the molecular mechanisms underlying cellular communication and trafficking of proteins between organelles, cellular stress responses and cell death.
2. Consider metabolic regulation in relation to the control of enzyme stability and activity as well as human diseases (eg diabetes).
3. Specific topics illustrating a variety of other aspects of biochemistry such as mammalian vision, toxicology and inflammation will also be presented. Students will also be required to evaluate and present recent findings in biochemistry and molecular cell biology as part of the directed study section of the course.

Lecturer(s): Dr Ryan Martinus and Professor Peter Molan

Prerequisite(s): BIOL251

Assessment: Internal assessment/examination ratio: 1 : 1

BIOL362-12C (BLK) (HAM) – Molecular Biology and Biotechniques*20 Points*

This online course will examine the molecular biological technologies used to analyse and manipulate DNA, RNA and proteins. It includes coverage of the major recombinant DNA techniques.

This paper is strongly recommended to students doing BIOL351 or BIOL310, or intending to work in the fields of molecular genetics or biochemistry.

Lecturer(s): Dr Ray Cursons, Dr Linda Peters, Associate Professor Vic Arcus and Dr Charles Lee

Prerequisite(s): BIOL210

Assessment: Internal assessment/examination ratio: 2 : 3

ENMP322-12B (HAM) – Biotechnology*20 Points*

This paper is jointly taught by the Department of Biological Sciences and the School of Engineering.

For details refer to Materials & Processing ENMP322.

BSc(Tech) Work Placement Papers

For details refer to Work Placements.

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Biological Sciences Specialisations

Restoration Ecology

Restoration ecology is the study of restoring degraded, damaged or destroyed ecosystems through active human intervention. This specialisation is for students who wish to develop a career focussed on ecological restoration or conservation biology. With some 3,000 community-based restoration projects currently being undertaken in New Zealand, there is strong demand for graduates able to address key issues of this field.

Restoration Ecology may be taken as a specialisation of the Biological Sciences major for the BSc or BSc(Tech) degrees. For further information email restoration@waikato.ac.nz

Structure of the Restoration Ecology Specialisation

100 LEVEL	BIOL101 15 points	BIOL102 15 points	ERTH103 or ERTH104 15 points	ENVS101 15 points	STAT121 or STAT111 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL 201 20 points	BIOL 212 20 points	BIOL 226 20 points	BIOL 223 20 points	ELECTIVE 20 points	ELECTIVE 20 points		
300 LEVEL	BIOL 307 20 points	BIOL 312 20 points	BIOL 326 20 points	BIOL313 or BIOL314 20 points	SCIENCE * 20 points	ELECTIVE * 20 points		

100 Level – Papers are worth 15 points.

Major prerequisites

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms

Restoration ecology specialisation papers

- » ENVS101B – Environmental Science
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

Choose one of:

- » ERTH103A – Discovering Planet Earth
- » ERTH104B – Earth and Ocean Environments

200 Level – Papers are worth 20 points unless specified.

Major papers

- » BIOL201A – Evolution and Diversity of Life
- » BIOL212A – Ecology
- » BIOL226C – Flora of Aotearoa/New Zealand

Restoration ecology specialisation papers

- » BIOL223B – Plant Biology and Ecology

300 Level – Papers are worth 20 points unless specified.

Major papers

- » BIOL307A/B/C/Y – Special Topic
- » BIOL312A – Applied Terrestrial Ecology
- » BIOL326B – Advanced Topics in Plant Biology

Restoration ecology specialisation papers

Choose one of:

- » BIOL313B – Applied Freshwater Ecology
- » BIOL314A – Marine Biology and Monitoring

**May be chosen from 200 or 300 Level papers.*

Note(s): For descriptions of individual papers refer to the following subjects: BIOL Biological Sciences; ENV5 Environmental Sciences; EARTH Earth Sciences. For descriptions of papers with subject codes COMP, MATH or STATS, refer to the **Computing & Mathematical Sciences Handbook**. For papers with other subject codes refer to the **University Calendar**.

Biological Sciences General Programmes

Note(s): For descriptions of individual papers refer to the following subjects: BIOL Biological Sciences; CHEM Chemistry; ENEL Electronics; ENGG Engineering; ENMP Materials & Process Engineering, ENME Materials & Process Engineering; ENV5 Environmental Sciences; EARTH Earth Sciences; PHYS Physics; PSYC Psychology. For papers with other subject codes refer to the **University Calendar**.

Animal Physiology

Animal physiology is the study of the mechanical, physical, and biochemical functions of animals. How does a muscle contract? How does a bat fly? How does a butterfly smell its mate? How does a cow turn grass into milk? And why does your blood pressure rise, your hands become sweaty and your pupils dilate under certain circumstances?

Physiologists record electrical activity in nerves and muscles and the eye, measure digestive secretions and movements, determine blood pressure and respiratory rates, and assess endocrine function. These studies help our understanding of how the body regulates and co-ordinates its activities, responds to stress, and adjusts to varying environments.

The following general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended to provide the widest range of employment opportunities in animal physiology:

Structure of the Animal Physiology Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL210 20 points	BIOL234 20 points	BIOL235 20 points	BIOL251 20 points	*	*		
300 LEVEL	BIOL310 20 points	BIOL333 20 points	BIOL335 20 points	BIOL338 20 points	BIOL351 20 points	**		

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100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds

200 Level – Papers are worth 20 points unless specified.

- » BIOL210B – Introduction to Genetics
- » BIOL234A – Functional Animal Biology
- » BIOL235B – Humans and Other Mammals: Structure and Function
- » BIOL251A – Biochemistry

*Choose 40 points from:

- » BIOL201A – Evolution and Diversity of Life
- » BIOL241A – Microbiology: Form, Function and Metabolism
- » CHEM201B – Organic Chemistry
- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » PSYC206B – Animal Behaviour: Principles and Applications
- » PSYC226A – The Psychology of Perception (10 points)
- » PSYC227A – Physiological Psychology (10 points)

300 Level – Papers are worth 20 points unless specified.

- » BIOL310A – Advanced Genetics
- » BIOL333B – Advanced Animal Behaviour
- » BIOL335A – Mammalian Physiology
- » BIOL338B – Advanced Zoology
- » BIOL351A – Advanced Biochemistry

**Choose 20 points from:

- » BIOL341B – Microbial Physiology and Ecology
- » BIOL362C – Molecular Biology and Biotechniques
- » CHEM301A – Advanced Organic Chemistry
- » CHEM306B – Advanced Analytical Chemistry
- » PSYC314B – Behaviour Analysis

Behavioural Ecology and Conservation

Behavioural Ecology combines ideas from evolution, ecology and behaviour to study how an organism behaves, how this relates to the environment, and how it affects population dynamics. Behavioural ecology can be applied to the conservation and management of wildlife.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended if you are interested in the behavioural ecology of animals including humans:

Structure of the Behavioural Ecology and Conservation Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	COMP123 15 points	ENVS101 15 points	ERTH103 15 points	ERTH104 15 points	STAT111 or STAT121 15 points	ELECTIVE 15 points
200 LEVEL	BIOL201 20 points	BIOL210 20 points	BIOL212 20 points	BIOL234 20 points	BIOL235 20 points	PSYC206 20 points	*	
300 LEVEL	BIOL312 20 points	BIOL333 20 points	BIOL338 20 points	** 20 points	** 20 points			

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » COMP123A/B/S – The Computing Experience
- » ENVS101B – Environmental Science
- » ERTH103A – Discovering Planet Earth
- » ERTH104B – Earth and Ocean Environments
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

200 Level – Papers are worth 20 points unless specified.

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL212A – Ecology
- » BIOL234A – Functional Animal Biology
- » BIOL235B – Humans and Other Mammals: Structure and Function
- » PSYC206B – Animal Behaviour: Principles and Applications

*Recommended:

- » BIOL226C – Flora of Aotearoa/New Zealand (Strongly recommended)
- » BIOL227 – Flora of the Pacific[†]
- » ENVP206B – Principles of Environmental Planning
- » PHIL217S – Environmental Ethics

[†] Not offered in 2012.

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300 Level – Papers are worth 20 points unless specified.

- » BIOL312A – Applied Terrestrial Ecology
- » BIOL333B – Advanced Animal Behaviour
- » BIOL338B – Advanced Zoology
- **Choose from:
 - » BIOL307A/B/C/Y – Special Topic
 - » BIOL310A – Advanced Genetics
 - » BIOL313B – Applied Freshwater Ecology
 - » BIOL314A – Marine Biology and Monitoring
 - » BIOL335A – Mammalian Physiology
 - » ECON315B – Environmental and Natural Resource Economics
 - » GEOG306A – Disasters and Development

Biochemistry

Biochemistry is the explanation of life in molecular terms. Biochemists study the structure, physical characteristics and function of biological molecules, including proteins, enzymes, metabolic and nutrition processes.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. This programme is recommended for students who are interested in biochemistry, but would still like the flexibility to pursue other biological science options. Biochemistry is also available as a major subject for the BSc or BSc(Tech) degree (refer to page 27).

Structure of the Biochemistry Programme

100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL210 20 points	BIOL223 20 points	BIOL235 20 points	BIOL241 20 points	BIOL251 20 points	*		
300 LEVEL	BIOL310 20 points	BIOL351 20 points	BIOL362 20 points	ENMP322 20 points	**	**		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds

200 Level – Papers are worth 20 points unless specified.

- » BIOL210B – Introduction to Genetics
- » BIOL223B – Plant Biology and Ecology
- » BIOL235B – Humans and Other Mammals: Structure and Function
- » BIOL241A – Microbiology: Form, Function and Metabolism
- » BIOL251A – Biochemistry

*Choose from:

- » CHEM201B – Organic Chemistry
- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » ENMP211A – Materials 1

300 Level – Papers are worth 20 points unless specified.

- » BIOL310A – Advanced Genetics
- » BIOL351A – Advanced Biochemistry
- » BIOL362C – Molecular Biology and Biotechniques
- » ENMP322B – Biotechnology
- **Choose from:
- » BIOL325A – Plant Function
- » BIOL335A – Mammalian Physiology
- » BIOL341B – Microbial Physiology and Ecology
- » CHEM305B – Environmental, Forensic, Toxicological and Medicinal Chemistry
- » CHEM306B – Advanced Analytical Chemistry

Biomedical Sciences

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended for those interested in laboratory science and research associated with medicine:

Structure of the Biomedical Sciences Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	CHEM106 15 points	COMP123 15 points	PHYS100 15 points	STAT111 OR STAT121 15 points
200 LEVEL	BIOL* 20 points	BIOL* 20 points	BIOL* 20 points	* 20 points	* 20 points	* 20 points		
300 LEVEL	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points	** 20 points	** 20 points	** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds
- » CHEM106B – Chemical Hazards: Safety and Legislation
- » COMP123A/B/S – The Computing Experience
- » PHYS100A – Exploring Physics
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

200 Level – Papers are worth 20 points unless specified.

*Choose 120 points, of which at least 60 points must be from Biological Sciences, from:

- » BIOL210B – Introduction to Genetics
- » BIOL234A – Functional Animal Biology
- » BIOL235B – Humans and Other Mammals: Structure and Function
- » BIOL241A – Microbiology – Form, Function and Metabolism
- » BIOL251A – Biochemistry
- » CHEM201B – Organic Chemistry
- » CHEM204A – Analytical Chemistry and Instrumental Techniques

BIOLOGICAL SCIENCES

300 Level – Papers are worth 20 points unless specified.

**Choose 120 points, of which at least 60 points must be from Biological Sciences, from:

- » BIOL310A – Advanced Genetics
- » BIOL335A – Mammalian Physiology
- » BIOL341B – Microbial Physiology and Ecology
- » BIOL351A – Advanced Biochemistry
- » BIOL362C – Molecular Biology and Biotechniques
- » CHEM305B – Environmental, Forensic, Toxicological and Medicinal Chemistry
- » CHEM306B – Advanced Analytical Chemistry

Botany

Botany is the study of all aspects of plants. Botany encompasses the structure of plants from simple mosses to trees, the evolution and systematics of plants, how they are organised into communities and how they function and reproduce. It includes ecosystem level functioning, and both conservation and exploitation management. Plants are important because they effectively provide the energy supply for all communities on Earth.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. For further information email botany@waikato.ac.nz
To have the widest range of career options in botany, the following papers are recommended:

Structure of the Botany Programme

100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	ERTH103 15 points	ERTH104 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL201 20 points	BIOL210 20 points	BIOL212 20 points	BIOL223 20 points	BIOL226 or BIOL227 20 points	*		
300 LEVEL	BIOL310 20 points	BIOL312 20 points	BIOL325 20 points	BIOL326 20 points	BIOL341 20 points	GEOG328 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds
- » ERTH103A – Discovering Planet Earth
- » ERTH104B – Earth and Ocean Environments

200 Level – Papers are worth 20 points unless specified.

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL212A – Ecology
- » BIOL223B – Plant Biology and Ecology

Choose 20 points from:

- » BIOL226C – Flora of Aotearoa/New Zealand
- » BIOL227 – Flora of the Pacific†

† Not offered in 2012.

*Choose 20 points from:

- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » ERTH233A – Soils in the Landscape (10 points)
- » ERTH234A – Soil Properties and their Management (10 points)
- » ERTH245A – Weather and Climate (10 points)
- » ERTH246B – Introduction to Hydrology (10 points)
- » GEOG228A – Information Technology and Cartography

300 Level – Papers are worth 20 points unless specified.

- » BIOL307A/B/C/Y – Special Topic
- » BIOL310A – Advanced Genetics
- » BIOL312A – Applied Terrestrial Ecology
- » BIOL325A – Plant Function
- » BIOL326B – Advanced Topics in Botany
- » BIOL341B – Microbial Physiology and Ecology
- » GEOG328B – Geographic Information Systems

Ecology

Ecology focuses on the relationships between living things and the environment. The study of ecosystems includes investigations of their physical and chemical structure, the plant, animal and microbial populations that comprise them, and the interactions among these components.

Ecosystem studies include the conservation and management of resources, as well as the structure and function of the communities. For example, ecologists may document environmental changes, such as deforestation, and observe the consequences for animals that are adapted to forest life and can live nowhere else, such as the native long-tailed bat. Where communities have been damaged, applied ecologists study ways to restore what was lost, such as transferring birds to new, predator-free homes.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended for students interested in general ecology:

Structure of the Ecology Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	ERTH103 15 points	ERTH104 15 points	STAT111 OR STAT121 15 points	SCIENCE 15 points	GEOG103 15 points
200 LEVEL	BIOL212 20 points	BIOL* 20 points	BIOL* 20 points	BIOL* 20 points	BIOL* 20 points	* 20 points		
300 LEVEL	BIOL312 20 points	BIOL313 20 points	BIOL314 20 points	BIOL** 20 points	** 20 points	** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » ERTH103A – Discovering Planet Earth
- » ERTH104B – Earth and Ocean Environments
- » GEOG103A – Resources and Environmental Sustainability
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

BIOLOGICAL SCIENCES

200 Level – Papers are worth 20 points unless specified.

- » BIOL212A – Ecology

*Choose a further 100 points at 200 Level, of which at least 60 points must be from Biological Sciences papers.

300 Level – Papers are worth 20 points unless specified.

- » BIOL312A – Applied Terrestrial Ecology
- » BIOL313B – Applied Freshwater Ecology
- » BIOL314A – Marine Biology and Monitoring

**Choose a further 60 points at 300 Level, of which at least 20 points must be from Biological Sciences papers.

Freshwater Biology

Freshwater ecosystems are the inland waters of the world, including lakes, rivers, streams and wetlands. Freshwater biologists study the animal, plant and other life found in all areas of freshwater. The study of freshwater ecosystems includes investigations of their physical and chemical structure, the plant, animal and microbial populations that comprise them, and the interactions among these components. Freshwater ecosystem studies include the conservation and management of freshwater resources, as well as the structure and function of the communities.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. For a broad background for work in any area of freshwater biology, the following papers are recommended:

Structure of the Freshwater Biology Programme

100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	ENVS101 15 points	ERTH103 15 points	ERTH104 15 points	STAT111 OR STAT121 15 points	ELECTIVE 15 points
200 LEVEL	BIOL212 20 points	BIOL* 20 points	BIOL* 20 points	* 20 points	* 20 points	* 20 points		
300 LEVEL	BIOL313 20 points	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » ENVS101B – Environmental Science
- » ERTH103A – Discovering Planet Earth
- » ERTH104B – Earth and Ocean Environments
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

200 Level – Papers are worth 20 points unless specified.

- » BIOL212A – Ecology
- *Choose a further 100 points, of which at least 40 points must be from Biological Sciences:
- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL223B – Plant Biology and Ecology
- » BIOL234A – Functional Animal Biology
- » BIOL241A – Microbiology: Form, Function and Metabolism
- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » CHEM261B – Geochemistry and Environmental Chemistry
- » EARTH245A – Weather and Climate (10 points)
- » EARTH246B – Introduction to Hydrology (10 points)
- » GEOG228A – Information Technology and Cartography

300 Level – Papers are worth 20 points unless specified.

- » BIOL313B – Applied Freshwater Ecology
- **Choose a further 100 points from 300 Level Biological Sciences papers.

Genetics

Genetics is the science of heredity. Genetics looks at how genes vary and how particular traits are transmitted from one generation to the next. Traditionally geneticists studied mutation, selection and evolution in microbes, plants and animals. These days they also indulge in "genomics" which makes use of computers and large databases of DNA and protein information to research both genes and gene function. Genetic variation can be applied to the study of populations, for conservation, and to reconstructing evolutionary relationships. Geneticists are employed in many fields including agriculture, medicine and crime.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. To obtain the best background for employment opportunities in all areas of genetics, the following papers are recommended:

Structure of the Genetics Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	STAT111 or STAT121 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL 201 20 points	BIOL 210 20 points	BIOL 241 20 points	BIOL 251 20 points	*	*		
300 LEVEL	BIOL 310 20 points	BIOL 362 20 points	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points	BIOL** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds
- » STAT111B – Statistics for Science or
STAT121A/S – Introduction to Statistical Methods

BIOLOGICAL SCIENCES

200 Level – Papers are worth 20 points unless specified.

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL241A – Microbiology: Form, Function and Metabolism
- » BIOL251A – Biochemistry

*Choose 40 points from 200 Level Science papers.

300 Level – Papers are worth 20 points unless specified.

- » BIOL310A – Advanced Genetics
- » BIOL362C – Molecular Biology and Biotechniques

**Choose a further 80 points from 300 Level Biological Sciences papers.

Microbiology

Microbiology is the study of microorganisms, including bacteria, protozoa, fungi and viruses. How we can identify and culture them, how they live, how some infect and cause disease in plants and animals and how we can make use of their activities. Micro-organisms are crucial to ecosystem functioning. Microbiology is an important component in biotechnology.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended for the most useful background and widest career options in microbiology:

Structure of the Microbiology Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	CHEM101 15 points	CHEM102 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL241 20 points	BIOL* 20 points	BIOL* 20 points	* 20 points	* 20 points	* 20 points		
300 LEVEL	BIOL341 20 points	BIOL** 20 points	BIOL** 20 points	** 20 points	** 20 points	** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » CHEM101A – Chemical Concepts
- » CHEM102B – Chemical Change and Organic Compounds

200 Level – Papers are worth 20 points unless specified.

- » BIOL241A – Microbiology: Form, Function and Metabolism

*Choose at least 60 points, of which at least 40 points must be from Biological Sciences, from:

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL212A – Ecology
- » BIOL251A – Biochemistry
- » CHEM201B – Organic Chemistry
- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » ENMP222B – Biotechnology: Food and Bioresources

Plus other 200 Level Science papers.

300 Level – Papers are worth 20 points unless specified.

- » BIOL341B – Microbial Physiology and Ecology
- **Choose at least 40 points from:
 - » BIOL310A – Advanced Genetics
 - » BIOL313B – Applied Freshwater Ecology
 - » BIOL351A – Advanced Biochemistry
 - » BIOL362C – Molecular Biology and Biotechniques
- Plus other 300 Level Science papers.

Plant Physiology

Plant physiology is the study of the function, or physiology of plants. Plant physiologists study fundamental processes such as photosynthesis, respiration and transpiration.

This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. For a background suited to the widest range of opportunities for employment as a plant physiologist, the following papers are recommended:

Structure of the Plant Physiology Programme								
100 LEVEL	BIOL101 15 points	BIOL102 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	ELECTIVE 15 points
200 LEVEL	BIOL201 20 points	BIOL210 20 points	BIOL212 20 points	BIOL223 20 points	BIOL251 20 points	*		
300 LEVEL	BIOL310 20 points	BIOL325 20 points	BIOL351 20 points	BIOL312 20 points	CHEM306 20 points	BIOL326 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms

200 Level – Papers are worth 20 points unless specified.

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL212A – Ecology
- » BIOL223B – Plant Biology and Ecology
- » BIOL251A – Biochemistry
- *Choose 20 points from:
 - » CHEM201B – Organic Chemistry
 - » CHEM204A – Analytical Chemistry and Instrumental Techniques
 - » EARTH233A – Soils in the Landscape (10 points)
 - » EARTH234A – Soil Properties and their Management (10 points)

300 Level – Papers are worth 20 points unless specified.

- » BIOL310A – Advanced Genetics
- » BIOL312A – Applied Terrestrial Ecology
- » BIOL325A – Plant Function
- » BIOL326B – Advanced Topics in Plant Biology
- » BIOL351A – Advanced Biochemistry
- » CHEM306B – Advanced Analytical Chemistry
- **Choose 20 points from 200 or 300 Level papers.

BIOLOGICAL SCIENCES

Zoology

Zoology is the study of animals – their taxonomy, structure, physiology, development, behaviour, ecology and evolution. This general programme is for students undertaking a BSc or BSc(Tech) degree with a major in Biological Sciences. The following papers are recommended for the widest range of options for career openings in zoology:

Structure of the Zoology Programme

100 LEVEL	BIOL101 15 points	BIOL102 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	SCIENCE 15 points	PHIL103 15 points
200 LEVEL	BIOL201 20 points	BIOL210 20 points	BIOL212 20 points	BIOL234 20 points	BIOL235 20 points	*		
300 LEVEL	BIOL338 20 points	BIOL333 20 points	BIOL** 20 points	** 20 points	** 20 points	** 20 points		

100 Level – Papers are worth 15 points.

- » BIOL101B – Cellular and Molecular Biology
- » BIOL102A – The Biology of Organisms
- » PHIL103B – Critical Reasoning

200 Level – Papers are worth 20 points unless specified.

- » BIOL201A – Evolution and Diversity of Life
- » BIOL210B – Introduction to Genetics
- » BIOL212A – Ecology
- » BIOL234A – Functional Animal Biology
- » BIOL235B – Humans and Other Mammals: Structure and Function

*Choose 20 points from:

- » CHEM204A – Analytical Chemistry and Instrumental Techniques
- » EARTH245A – Weather and Climate (10 points)
- » EARTH246B – Introduction to Hydrology (10 points)
- » PSYC206B – Animal Behaviour: Principles and Applications

300 Level – Papers are worth 20 points unless specified.

- » BIOL333B – Advanced Animal Behaviour
- » BIOL338B – Advanced Zoology

**Choose a further 100 points, of which at least 40 points must be from Biological Sciences, from:

- » BIOL310A – Advanced Genetics
- » BIOL312A – Applied Terrestrial Ecology
- » BIOL313B – Applied Freshwater Ecology
- » BIOL314A – Marine Biology and Monitoring
- » BIOL335A – Mammalian Physiology
- » GEOG306A – Disasters and Development