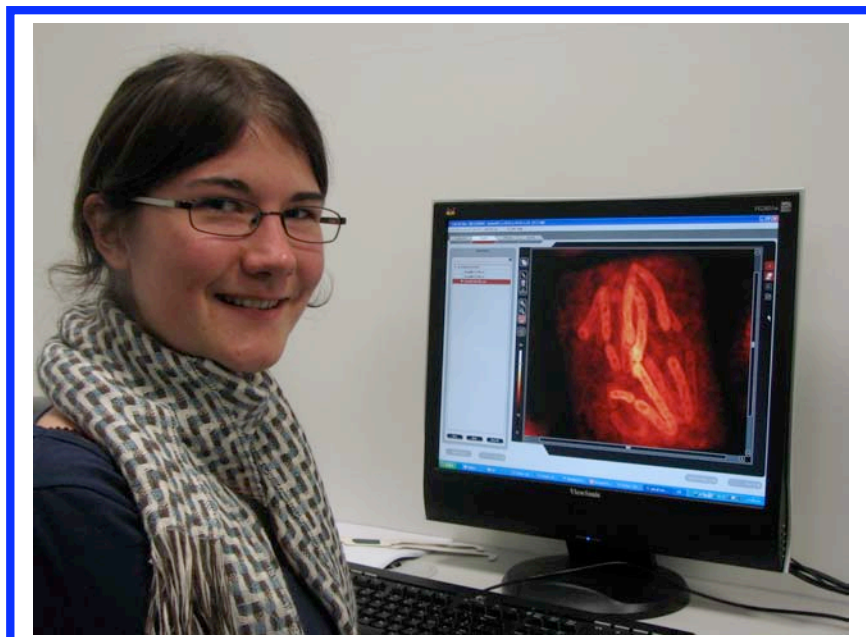




Bachelor of Science Genetics

Undergraduate Handbook 2010



Contents

Welcome	3
Introduction.....	4
Teaching approach.....	4
Bachelor of Science degree	4
Biological Sciences Major - Overview	5
Contact Details.....	6
Year ONE papers	
162.101 Biology of Cells.....	7
123.101 Chemistry and Living Systems	8
122.101 Biochemistry of Cells	9
123.102 Chemistry and the Material World.....	10
Year TWO papers	
122.231 Genes and Gene Expression	11
162.211 Biology and Genetics of Microorganisms	12
203.303 Human Genetics.....	13
122.232 Protein Biochemistry.....	14
122.233 Metabolic Biochemistry	15
196.207 Biological Evolution.....	16
203.202 Genetic Analysis	17
Year THREE papers	
120.304 Plant Biotechnology	18
203.300 DNA Technology.....	19
203.307 Advanced Cell Biology.....	20
117.345 Genetics for Livestock Improvement.....	21
120.302 Plant Development	22
203.203 Gene Regulation.....	23
162.312 Molecular Microbiology	24
203.305 Advanced Practical Genetics.....	25
Starter package - Recommended papers.....	26
Research	27
General Information	28
Maps - Palmerston North Campus - Overview.....	29
Bsc Programme Information	30

WELCOME

COLLEGE OF SCIENCES

Genetics 2010

To all prospective students,

If the 1930s was the great age of chemistry then without doubt this is the age of genetics. The development of DNA manipulation and high throughput DNA sequencing technologies have enabled researchers to determine the complete genome sequence for hundreds of organisms. We are only beginning to understand the complexity of genomes. However, geneticists now have at their disposal a powerful mix of research tools to study genes. There is much yet to be discovered!

Eric Lander, Professor of Biology at the Massachusetts Institute of Technology (MIT) said:
"That's what I love about genomics. We're learning that there are vast tracts of biology that we have missed. It's as if we suddenly could look at the whole earth and see that there are several continents we hadn't known about."

Genetics studies also include the rapidly emerging field of epigenetics, where an altered phenotype results not from a change in the DNA sequence of a gene but a change in gene expression. Modern epigenetic studies are focused on modifications to the DNA and histone proteins that have a profound impact on chromatin structure and hence gene expression. Epigenetic modifications play an important role in normal development, learning & memory and may be important in some diseases such as cancer.

Massey University has a long tradition of genetics research and education. A wide range of undergraduate and postgraduate papers are available to you at Massey University. These include papers in classical transmission genetics and papers in modern molecular genetics such as DNA Technology and Gene Regulation.

The undergraduate papers offered in the Genetics major are detailed in this booklet. A B.Sc. degree majoring in Genetics will enable you to have a career in basic, biomedical and applied research, biotechnology, agriculture, horticulture, education, forensics or science administration. This degree will also enable you to embark on post-graduate studies in Genetics.

I welcome your interest in Genetics.



A handwritten signature in black ink, appearing to read 'Rosie Bradshaw', with a long, sweeping underline.

Associate Professor Rosie Bradshaw (PhD)
Subject Leader
Institute of Molecular BioSciences

Introduction

This handbook profiles papers that are of special interest to Genetics students, and are taught by the College of Sciences. We have made every attempt to ensure all details are correct. However, all students should note that the 2010 Massey University Calendar is the official source of information on courses and regulations.

The discipline of Genetics at Massey University consists of several academic staff members (p21). In addition, the group is well supported by several technical and administrative staff. Interests range from genomics, epigenetics, genetic control, plant protection and cell biology.

Staff in Genetics provide postgraduate opportunities with, for example, PGDipSc, Honours, Masters and PhD programmes available. Undergraduate students are eligible to apply for summer studentships that may be offered on an annual basis.

Teaching approach

Undergraduate papers are taught via lectures (usually 3 lectures per week at 100 & 200 level and 2 lectures per week at 300 level) and laboratory classes (usually one 3 hour class per week). Optional tutorials are offered at set times. Students are expected to spend some time in addition to the scheduled learning time, in reading and preparing for lectures and practical classes. Many papers are web supported. A comprehensive paper outline will be made available to enrolled students at the start of each paper.

The Bachelor of Science degree

Students have to pass 24 papers (each of 15 credits) in total to qualify for a BSc degree. Typically, eight papers have to be passed each year from papers listed in the BSc schedule in the Calendar. Students should ensure that the essential required papers for each major are included in their programme.

In planning your total degree, you can consult the 'Enrolment Science 2010' Handbook, the 2010 Massey University Calendar, or contact Associate Professor Rosie Bradshaw (contact details p. 6).

Bachelor of Sciences – Major in Genetics

Programme Structure

Year 1	
123.101	Chemistry and Living Systems
162.101	Biology of Cells
119.155 †	Communication in Sciences
122.102	Biochemistry of Cells
161.130 †	Biometrics
PLUS three other approved papers	
* strongly recommended	
123.102*	Chemistry and the Material World
159.101 or	Programming Fundamentals
159.102	Computer Science Fundamentals

Year 2	
203.202	Genetic Analysis
203.203	Human Genetics
122.231	Genes and Gene Expression
162.211	Biology and Genetics of Microorganisms
PLUS four other approved papers.	
* strongly recommended	
196.207*	Biological Evolution
122.232*	Protein Biochemistry
122.233*	Metabolic Biochemistry
For a list of approved other papers, see p30	

Year 3	
203.300	DNA Technology
203.307	Advanced Cell Biology
203.303	Gene Regulation
203.305	Advanced Practical Genetics
PLUS four other approved papers.	
Papers with a significant genetic content include:	
117.345 Genetics for Livestock Improvement	
120.302 Plant Development	
120.304 Plant Biotechnology	
162.312 Molecular Microbiology	
For a list of approved other papers, see p30	

† or approved alternatives (See BSc regulations)

Contact details:

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Major Leader Genetics
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NEW ZEALAND

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Email: R.E.Bradshaw@massey.ac.nz

More Information

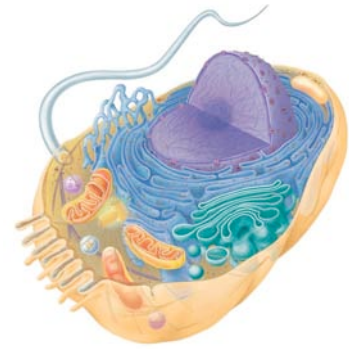
Students who intend to take papers offered in Genetics and who may wish for more information, should consult the major leader of Genetics, Associate Professor Rosie Bradshaw. Assoc Professor Kathy Kitson is the Programme Director for the College of Sciences at the Manawatu Campus and can also provide information of a more general nature.

YEAR ONE - Semester 1

162.101 **Biology of Cells**

Paper Co-ordinator: Assoc Professor Rosie Bradshaw

Objective: To give a general understanding of the structure and function, at a cellular level, of both eukaryotic and prokaryotic cells, and a broad introduction to genetics and molecular biology.



Outline: An introduction to eukaryotic and prokaryotic cell structure and function, and to the flow of information within cells. The transmission of genetic information to progeny in cell division. A description of cellular mechanisms for creating genetic diversity, leading to a discussion of biological evolution. An introduction to molecular biotechnologies for modifying the genetic information of cells.

Pre- requisites: Students will be assumed to have studied at least 20 credits from NCEA Level 3 Biology and achieved at least 14, or passed Bursary Biology or 162.103 or an acceptable alternative.

Extramural: Available extramurally in 2010.

Assessment:

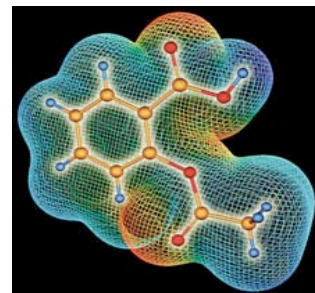
Online Assignments	4%
Laboratory Test	18%
Semester Test	16%
5 lab-based quizzes	7%
Final Examination	55%

Textbook: Campbell NA & Reece JB. Biology. 8thEdition (2009) with Interactive Study Partner CD-ROM (ISBN 0-8053-6844-2). The 7th edition can also be used in 2009

Lecturers: Assoc Prof Rosie Bradshaw, Institute of Molecular BioSciences
Dr Rose Motion, Institute of Molecular BioSciences
Prof David Penny, Institute of Molecular BioSciences

YEAR ONE -Semester 1

123.101 Chemistry and Living Systems



Paper Coordinator: Associate Professor Trevor Kitson

Objective: To give an understanding of the molecular basis of the world in which we live and be able to apply organic and physical principles to a range of biological and non-biological processes.

Outline: This paper takes a wide range of examples from everyday life to illustrate concepts of organic and biological chemistry. The structure, properties and reactions of organic compounds, identification of organic compounds using spectroscopy, and the mechanisms of organic reactions are covered. It also introduces the concepts of chemical equilibrium, particularly as they are applied to acids and base, and chemical kinetics.

Pre-requisites: Students will be assumed to have studied at least 20 credits from NCEA Level 3 Chemistry and achieved at least 14, or passed Bursary Chemistry or 123.103 or an acceptable alternative.

Extramural: Available extramurally in 2009

Assessment:

Practical work	20%
Mastery Tests	10%
Semester Test	20%
Final Examination	50%

Textbook: No prescribed textbook. Recommended reading Blackman et al, Chemistry, Wiley 2008

Lecturers: Associate Professor Trevor Kitson, Institute of Fundamental Sciences
Dr. Gareth Rowlands, Institute of Fundamental Sciences
Dr Vyacheslav Filichev, Institute of Fundamental Sciences

YEAR ONE - Semester 2

122.102 **Biochemistry of Cells**

Paper Co-ordinator: Dr Rose Motion

Objective: To understand at a molecular level of how organisms grow, move, store energy, reproduce, and achieve highly specialized functions such as photosynthesis and muscle contraction.



Outline: The study of cellular processes at a molecular level, applicable to plant, animal and microbial systems: proteins, including enzymes; major processes of carbohydrate metabolism; the importance of ATP and proton gradients in metabolism. Applications of Biochemistry in Medicine and Biotechnology are included.

Pre-requisites: 123.101 (or 123.111) and 162.101.

Extramural: Not available extramurally

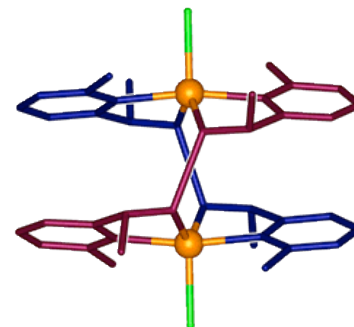
Assessment: Laboratory tests 20%
Semester test 20%
Final examination 60%

Textbook: Elliott, W.H. and Elliott, D.C. Biochemistry and Molecular Biology, 3rd edition (2005), , Oxford University Press, Oxford

Lecturers: Dr Gill Norris, Institute of Molecular BioSciences
Assoc Prof Kathy Kitson, Institute of Food Nutrition and Human Health
Dr Rose Motion, Institute of Molecular BioSciences

YEAR ONE - Semester 2

123.102 **Chemistry and the Material World**



Paper Co-ordinator: Dr Mark Waterland

Objective: To understand the structure and chemical properties of compounds and materials.

Outline: Explain the structure and chemical properties of compounds and materials; Use electronic properties to explain trends in the chemistry of materials from elements and compounds; Explain colour, magnetism and chemical properties; Analyse chemical reactions; Calculate the electrochemical potential of cells; Use phase diagrams;

Pre-requisites: NCEA Level 3 Chemistry, studied 20 credits achieved 14 credits minimum, or Bursary Chemistry, or 123.103.

Extramural: Available extramurally in 2009

Assessment:

Mastery tests	10%
Semester test	20%
Practical test	10%
Lab reports	10%
Final examination	50%

Textbook: Highly Recommended: Chemistry, by Blackman, Bottle, Schmid, Mocerino, Wille

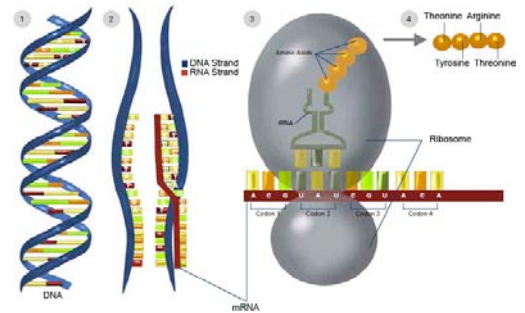
Lecturers: Dr Shane Telfer, Institute of Fundamental Sciences
 Assoc Prof Ashton Partridge, Institute of Fundamental Sciences
 Prof Andrew Brodie, Institute of Fundamental Sciences
 Dr Mark Waterland, Institute of Fundamental Sciences
 Assoc. Prof Simon Hall, Institute of Fundamental Sciences
 Adrian Jull, Institute of Fundamental Sciences

YEAR TWO - Semester 1

122.231 Genes and Gene Expression

Paper Co-ordinator: Assoc Prof Kathryn Stowell

Objective: To understand the *in vivo* functions and *in vitro* molecular manipulation of DNA for the storage and transfer of genetic information.



Outline: Structure of DNA. Replication, DNA repair and transcription. Regulation of prokaryote gene expression. Technologies used in the study of genes and gene expression: plasmids, sequencing, restriction enzymes, libraries, PCR, Southern, northern and western analysis, expression vectors and the production of recombinant proteins. A practical course that illustrates concepts presented in the lectures.

Pre-requisites: 162.101 Biology of Cells

Extramural: Not available extramurally.

Assessment:

Laboratory work	30%
Semester test	10%
Final examination	60%

Textbook: Weaver, R.F. Molecular Biology. 4th edition, (2008), McGraw-Hill, New York

Lecturers: Assoc Professor Kathryn Stowell, Institute of Molecular BioSciences
 Dr Andrew Sutherland-Smith, Institute of Molecular BioSciences
 Professor Barry Scott, Institute of Molecular BioSciences
 Dr Tracy Hale, Institute of Molecular BioSciences

YEAR TWO - Semester 1

162.211 **Biology and Genetics of Microorganisms**

Paper Co-ordinator: Dr Jan Schmid



Objective: To provide students with the core information required for their respective disciplines on (i) the biology of microorganisms and (ii) their manipulation. To provide a basic understanding of immunology.

Outline: Structure and metabolism of bacteria and their relationship to the environment. Bacterial genetics. Eukaryotic microbes – structure, physiology and genetics. Life cycle of viruses. The immune response. Practical training in the manipulation of microorganisms.

Pre-requisites: 162.101

Extramural: Not available extramurally.

Assessment:	Semester test	19%
	Labs	18%
	Career exercise	2%
	Final Examination	61%

Textbook: Biology of Microorganisms by Madigan, Brock, Martinko & Parker, 12th Edition (Earlier editions are adequate for most of the material covered)

Lecturers: Dr Jan Schmid, Institute of Molecular BioSciences
Dr Zoe Jordens, Institute of Molecular BioSciences (Labs only)
Professor Bernd Rehm, Institute of Molecular BioSciences
Dr Larissa Howe, Institute of Veterinary Animal and Biomedical Sciences
Dr Lesley Collins, Institute of Molecular BioSciences

YEAR TWO - Semester 1

203.203 Human Genetics

Paper Co-ordinator: Dr Neville Honey

Objective: Aspects of genetics that are important in human biology, including chromosome abnormalities, genes and genetic disease, immunogenetics, cancer, ageing, complex traits, family studies and populations



Outline: Extends the basic knowledge of genetics learnt at 100-level. Extends the understanding of the role of genetics in human biology and the effects of gene defects on human health. Give an appreciation of the impact of human genetics on society.

Pre-requisites: 162.101

Extramural: Not available extramurally in 2010.

Assessment:	1 st Semester test	15%
	Online test	10%
	Poster	15%
	Final Examination	60%

Textbook: Human Genetics: concepts and applications, 7th edition, R. Lewis (or 8th edition)

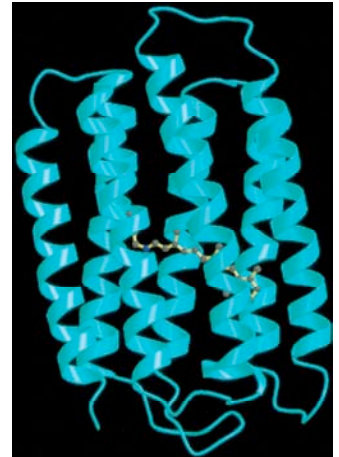
Lecturers: Dr Neville Honey, Institute of Molecular BioSciences

YEAR TWO - Semester 2

122.232 Protein Biochemistry

Paper Co-ordinator: Dr Gill Norris

Objective: Developing an understanding of the importance of the three dimensional conformations of proteins, that play important physiological roles such as catalysis of biochemical reactions, signal transduction, membrane structure, organisation.



Outline: Synthesizing of proteins in cells and directed to carry out their various roles. Topic include protein biogenesis; targeting and post-translational modification; relationship between protein structure and function; enzymes, structural proteins; membranes and membrane proteins.

Pre-requisites: 122.102 Biochemistry of Cells

Extramural: Not available extramurally.

Assessment:

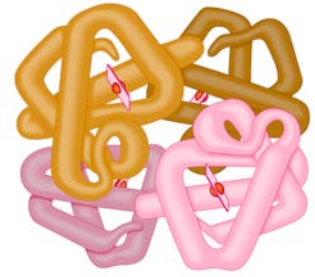
Practical work	22%
Mid Semester Test	18%
Final Examination	60%

Textbook: Recommended – Biochemistry, D. Voet and J.G. Voet (2nd Edition or 3rd Edition)

Lecturers: Dr Gill Norris, Institute of Molecular BioSciences
Dr Mark Patchett, Institute of Molecular BioSciences
Dr Andrew Sutherland-Smith, Institute of Molecular BioSciences

YEAR TWO - Semester 2

122.233 Metabolic Biochemistry



Paper Co-ordinator: Dr Mark Patchett

Objective: Detailed understanding of metabolic biochemistry, integration of pathways and regulation.

Outline: Energy metabolism. Biosynthesis of carbohydrates and the metabolism of polysaccharides. Lipid metabolism. Nitrogen metabolism. integration and regulation of carbohydrate, lipid and amino acid metabolism. Cellular communication systems. The course also includes laboratory experiments and a literature-based research project.

Pre-requisites: 122.102 Biochemistry of Cells

Extramural: Not available extramurally.

Assessment:	Laboratory work	10%
	Literature based project	10%
	Semester Test	20%
	Final Examination	60%

Textbook: Biochemistry and Molecular Biology, 3rd edition (2005), Elliott, W.H. and Elliott, D.C., Oxford University Press, Oxford.

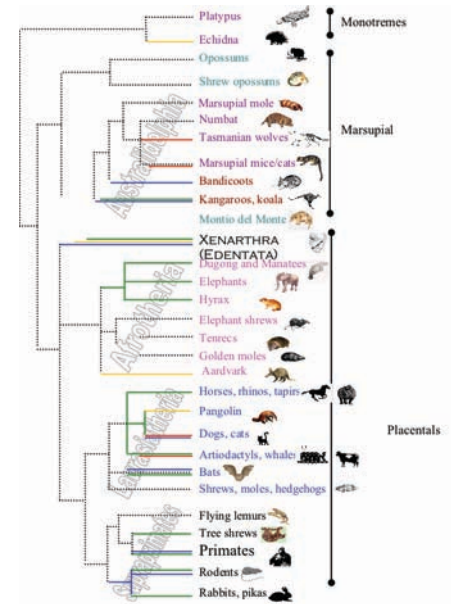
Lecturers: Dr Mark Patchett, Institute of Molecular BioSciences
Dr Jasna Rakonjac, Institute of Molecular BioSciences
Dr Evelyn Sattlegger, Institute of Molecular BioSciences (Albany Campus)
Assoc Prof Kathryn Stowell, Institute of Molecular BioSciences

YEAR TWO - Semester 2

196.207 Biological Evolution

Paper Co-ordinator: Dr Vaughan Symonds

Objective: Examines aspects of classical and emerging evolutionary biology. Review ideas on way populations operate, from genetical perspective. Stability of populations and examine forces that change gene frequencies in these populations. How genes and nucleotide sequences are inherited and evolve. Underlying principles of evolution.



Outline: Genetic and environmental processes that operate in natural populations and among species. Explores history and development of evolutionary thinking, the origins and age of life on earth and prehistoric biodiversity. Also evolutionary changes in DNA, human evolution, origin of life, nature of species and how species arise.

Pre-requisites: A basic understanding of cell biology and genetics (162.101 Biology of Cells)

Extramural: Available extramurally in 2009.

Assessment:

Evolution Report	20%
Laboratory Practicals	20%
Semester Test	20%
Final Examination	40%

Textbook: Evolution. Douglas J. Futuyma. 2005. Sinauer Associates Inc. Sunderland MA., USA. ISBN-10: 0-87893-187-2

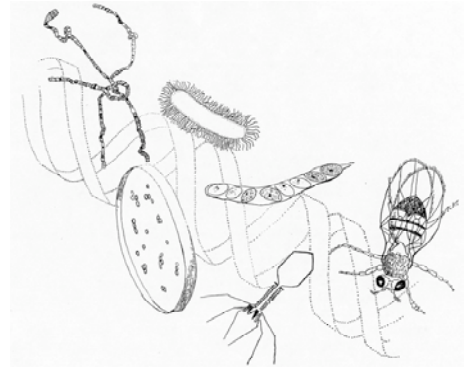
Lecturers: Dr Steve Trewick, Institute of Natural Resources
 Prof David Penny, Institute of Molecular BioSciences
 Dr Lesley Collins, Institute of Molecular BioSciences
 Dr Vaughan Symonds, Institute of Molecular BioSciences

YEAR TWO - Semester 2

203.202 Genetic Analysis

Paper Co-ordinator: Dr Neville Honey

Objective: Methods and applications of genetic analysis. Including genetic variation, cytogenetics, gene characterisation, gene mapping, gene function, developmental genetics, quantitative genetics, population genetics and evolution.



Outline: Learn methods of genetic analysis and gain an appreciation of the power of genetic approaches to the understanding of biological systems.

Pre-requisites: 162.101 Biology of Cells

Extramural: Not available extramurally.

Assessment:	Practical Reports	10%
	Prac Theory test	15%
	Semester Test	15%
	Final Examination	60%

Textbook: An Introduction to Genetic Principles, David Hyde

Lecturers: Dr Neville Honey, Institute of Molecular BioSciences
Assoc Prof Rosie Bradshaw, Institute of Molecular BioSciences

YEAR THREE – Semester 1

120.304 Plant Biotechnology

Paper Co-ordinator: Dr Paul Dijkwel



Objective: Introduce students to some selected topics in plant biotechnology. Emphasis will be placed on the identification of useful traits for plant improvement and current status of plant biotechnology in New Zealand and globally.

Outline: Traditional methods of plant improvement through tissue culture and modern developments in identifying and transferring new traits for plant improvements. Current status and future prospects of genetically modified plants, in addition to the regulatory aspects of genetic modification in New Zealand will be discussed.

Pre-requisites: 120.217 Plant, Cell and Environment

Extramural: Not available extramurally

Assessment:	Research paper analysis	10%
	Laboratory record	20%
	Mid Semester Test	10%
	Final Examination	60%

Textbook: Recommended – Plant Biotechnology – The Genetic Manipulation of Plants, Nigel W. Scott and Mark R. Fowler (2008) 2nd Edition

Lecturers: Dr Paul Dijkwel, Institute of Molecular BioSciences
Professor Michael McManus, Institute of Molecular BioSciences
Professor Barry Scott, Institute of Molecular BioSciences

YEAR THREE – Semester 1

203.300 DNA Technology



Paper Co-ordinator: Dr Jasna Rakonjac

Objective: To provide students with (1) the background of the methodology for DNA manipulations, (2) the necessary skills to plan and carry out DNA technology experiments and (3) to critically evaluate data from experiments using DNA technology.

Outline: DNA structure, topology, replication, repair and recombination. Advanced applications of gene cloning, PCR, micro-arrays and gene targeting. Practical experience will be gained with DNA quantification, restriction mapping, hybridisation, molecular cloning, PCR, DNA sequencing and computer analysis.

Pre-requisites: 122.231 Genes and Gene expression

Extramural: Not available extramurally

Assessment:	Laboratory work	15%
	Laboratory test	15%
	Semester Test	10%
	Final Examination	60%

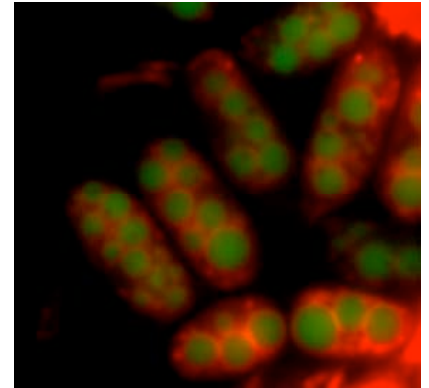
Textbook: Molecular Biology. Weaver. 2nd edition, (2002), McGraw-Hill, New York

Lecturers: Dr Jasna Rakonjac Institute of Molecular BioSciences
Dr Kathryn Stowell, Institute of Molecular BioSciences
Dr Paul Dijkwel, Institute of Molecular BioSciences
Dr Neville Honey, Institute of Molecular BioSciences
Dr Lesley Collins, Institute of Molecular BioSciences

YEAR THREE – Semester 1

203.307

Advanced Cell Biology



Paper Co-ordinator: Dr Tracy Hale

Objective: To provide a description of how cells are organised, communicate, divide and die. To provide practical experience in techniques that are used to study cells.

Outline: Structure and function of the cell and relationship to the whole organism. Cell cycle, signal transduction, cytoskeleton and molecular motors, organelle biogenesis and function, visualising cells, cancer and cell death.

Pre-requisites: 162.101 Biology of Cells, 122.231 Genes and Gene Expression.

Extramural: Not available extramurally.

Assessment:

Laboratory work	25%
Semester Test	20%
Final Examination	55%

Textbook: Lodish et al. (2008) Molecular Cell Biology, 6th edition, W.H.Freeman and Co
Alberts et al (2007) Molecular Biology of the Cell, fifth edition, Garland Publ.

Lecturers: Dr Tracy Hale, Institute of Molecular BioSciences
Prof Barry Scott, Institute of Molecular BioSciences
Dr Sarah Brown, Institute of Molecular BioSciences
Assoc Prof Rosie Bradshaw, Institute of Molecular BioSciences

YEAR THREE – Semester 2

117.345 **Genetics for Livestock Improvement**

Paper Co-ordinator: Rebecca Hickson

Objective: To equip students with knowledge of methods of animal evaluation and how selection decisions impact on genetic gain in animal breeding schemes.



Outline: The relative influence of genetic and environmental factors on quantitative traits. Methods of calculating breeding values or indices to exploit genetic variation in quantitative traits. The use of computers to utilise pedigree and performance records. Selection for disease resistance, the use of new reproductive technologies to enhance genetic gain and the potential importance of molecular genetics in livestock improvement. Maternal influences and methods of selecting for maternal components. Crossbreeding and inbreeding as selection tools.

Pre-requisites: 117.254 Principles of Animal Production or 203.202 Genetic Analysis

Extramural: Available extramurally in 2009

Assessment:

Projects (3)	50%
Final Examination	50%

Textbook: None

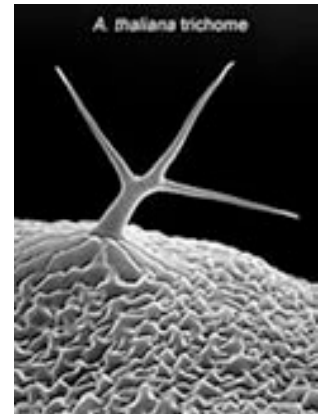
Lecturers: Ms Rebecca Hickson Institute of Veterinary, Animal and Biological Sciences
Professor Hugh Blair, Institute of Veterinary, Animal and Biological Sciences

YEAR THREE – Semester 2

120.302 Plant Development

Paper Co-ordinator: Dr Vaughan Symonds

Objective: Introducing students to the development of the plant from beginning at embryogenesis to the formation of leaves, roots, flowers and seeds. Modern molecular genetic approaches will be integrated with knowledge drawn from the classic literature.



Outline: Introduction to classic literature pertaining to different aspects of plant development and integrates it with more recent molecular genetic studies. The role of plant hormones and other signalling molecules in plant development.

Pre-requisites: 120.101 Plant Biology, plus any two approved papers at 200 level 120.217 is recommended.

Extramural: Not available extramurally.

Assessment:	Lecture and Lab Preparation	5%
	Library Exercise	5%
	Research project-written report	10%
	Research project-oral presentation	5%
	Abstract assignment	5%
	Semester Test	20%
	Final Examination	50%

Textbook:

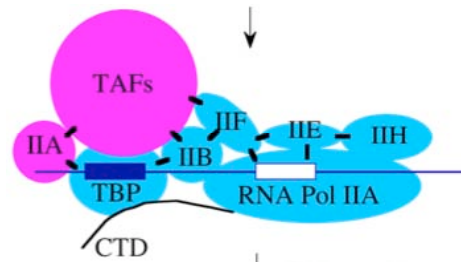
Lecturers: Dr Vaughan Symonds, Institute of Molecular BioSciences
Professor Michael McManus, Institute of Molecular BioSciences
Dr Paul Dijkwel, Institute of Molecular BioSciences

YEAR THREE – Semester 2

203.303 Gene Regulation

Paper Co-ordinator: Assoc Prof Kathryn Stowell

Objective: A student having completed this paper will have an understanding of how genes are regulated in prokaryotes and eukaryotes.



Outline: Methods and experimental strategies for studying gene promoters and associated transcription factors, transcription initiation, transcription activation, role of chromatin structure in gene regulation, RNA processing and cytoplasmic control.

Pre-requisites: 122.231 Genes and Gene expression

Extramural: Not available extramurally.

Assessment:	Problem sheets (2)	7.5% each
	Oral presentation	10%
	Semester Test	15%
	Final Examination	60%

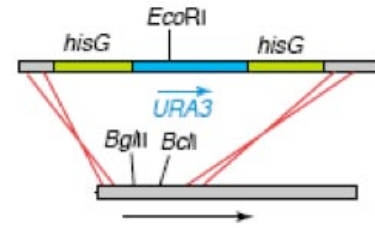
Textbook: Molecular Biology. Weaver. 4th edition, McGraw-Hill, New York

Lecturers: Assoc Prof Kathryn Stowell, Institute of Molecular BioSciences

YEAR THREE – Semester 2

162.312 Molecular Microbiology

Paper Co-ordinator: Dr Jan Schmid



Objective: Answering research questions in microbiology using bacteria, viruses and yeasts as examples. Subject material includes cell structure, surface proteins and adhesins, protein secretion, genetic regulation, bacterial genomics, yeast morphogenesis, and molecular epidemiology. Provide students with an understanding of how molecular techniques have been used productively in these areas.

Outline: Molecular analysis of structure, function and export of bacterial surface proteins. Molecular typing and population dynamics in pathogens. Developmental signals and differentiation in microorganisms. Design, implement and evaluate molecular approaches to a problem in microbiology.

Pre-requisites: 162.211

Extramural: Not available extramurally.

Assessment:

Laboratory Assessment	25%
Semester Test	15%
Final Examination	60%

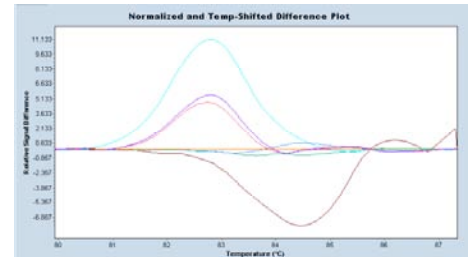
Textbook: Bacterial Pathogenesis: A Molecular approach, Salyers & Whitt (2nd Edition), American Society Microbiology Press 2002

Lecturers: Dr Jan Schmid, IMBS, Massey University
 Dr Jasna Rakonjac, IMBS, Massey University
 Dr Mike Collett, Fonterra Research Centre

YEAR THREE – Semester 2

203.305 **Advanced Practical Genetics**

Paper Co-ordinator: Prof Barry Scott



Objective: An understanding of the application of genetic principles and different experimental designs in genetics. Learn through practical experience genetic techniques. Be able to analyse and interpret data obtained.

Outline: Emphasis on understanding the theory behind the methods used, on data evaluation and on the application of genetic techniques to various questions in biology. Practicals include transposon tagging, reporter gene expression, microarrays, genotype/phenotype correlation using haplotype analysis.

Pre-requisites: 203.202 Genetic Analysis

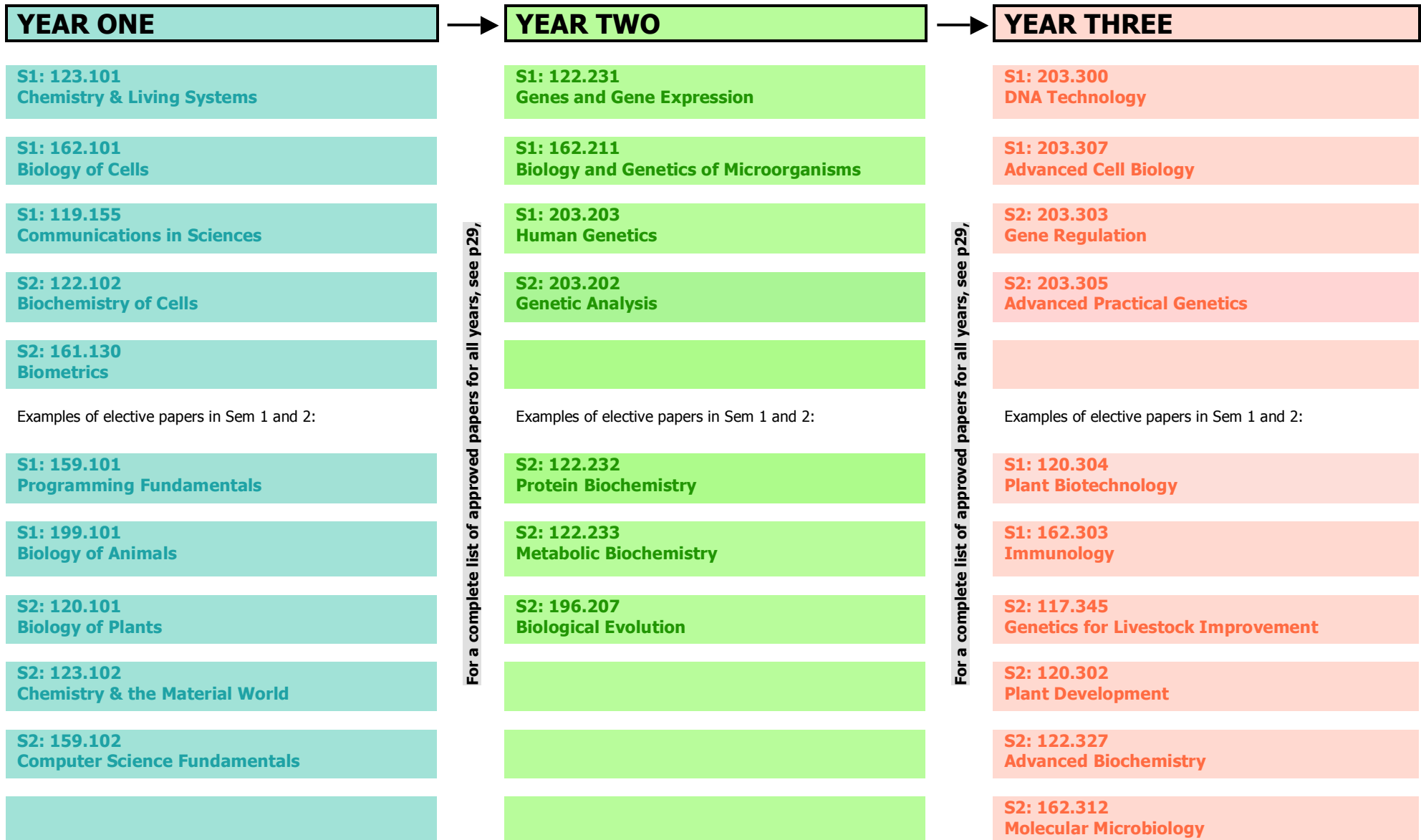
Extramural: Not available extramurally.

Assessment:	Questions sheets (4)	4%
	Oral presentation	10%
	Lab write-up	10%
	Lab notebook	10%
	Lab interview	10%
	Research proposal-oral	3%
	Research proposal-written	15%
	Final Examination	40%

Textbook: No specified texts for this paper

Lecturers: Prof Barry Scott, Institute of Molecular BioSciences
 Assoc Prof Kathryn Stowell, Institute of Molecular BioSciences
 Prof Peter Lockhart, Institute of Molecular Biosciences
 Dr Tracy Hale, Institute of Molecular BioSciences
 Assoc Prof Rosie Bradshaw, Institute of Molecular BioSciences

BSc Genetics



For a complete list of approved papers for all years, see p29,

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Research

The Institute of Molecular BioSciences at Massey University (Manawatu) in Palmerston North has active research programmes carried out by staff and postgraduate students. Here we list only the main areas of interest of academic staff. Students should be aware that summer studentships are available and will be advertised in October/November each year. Check on the Massey website: http://imbs.massey.ac.nz/Teaching/Summer_Fellowships.htm

Research Interests of Academic Staff in Genetics

Barry Scott	Gene regulation and expression in plant-microbe interactions
Rosie Bradshaw	Fungal molecular genetics and genomics
Kathryn Stowell	Biochemistry, genetics and pathophysiology of human disorders
Peter Lockhart	Molecular Evolution in Plants
Vaughan Symonds	Plant Molecular Genetics
Jennifer Tate	Plant Systematics and Evolution
Neville Honey	Genetics Education
Tracy Hale	Cell Biology
Paul Dijkwel	Regulation of Leaf Senescence

General Information

Student Services

Student Services at Massey University Manawatu provide support to particularly first-year students to successfully integrate into university life and academic study. Check the website to find more out about their role: <http://students.massey.ac.nz/>

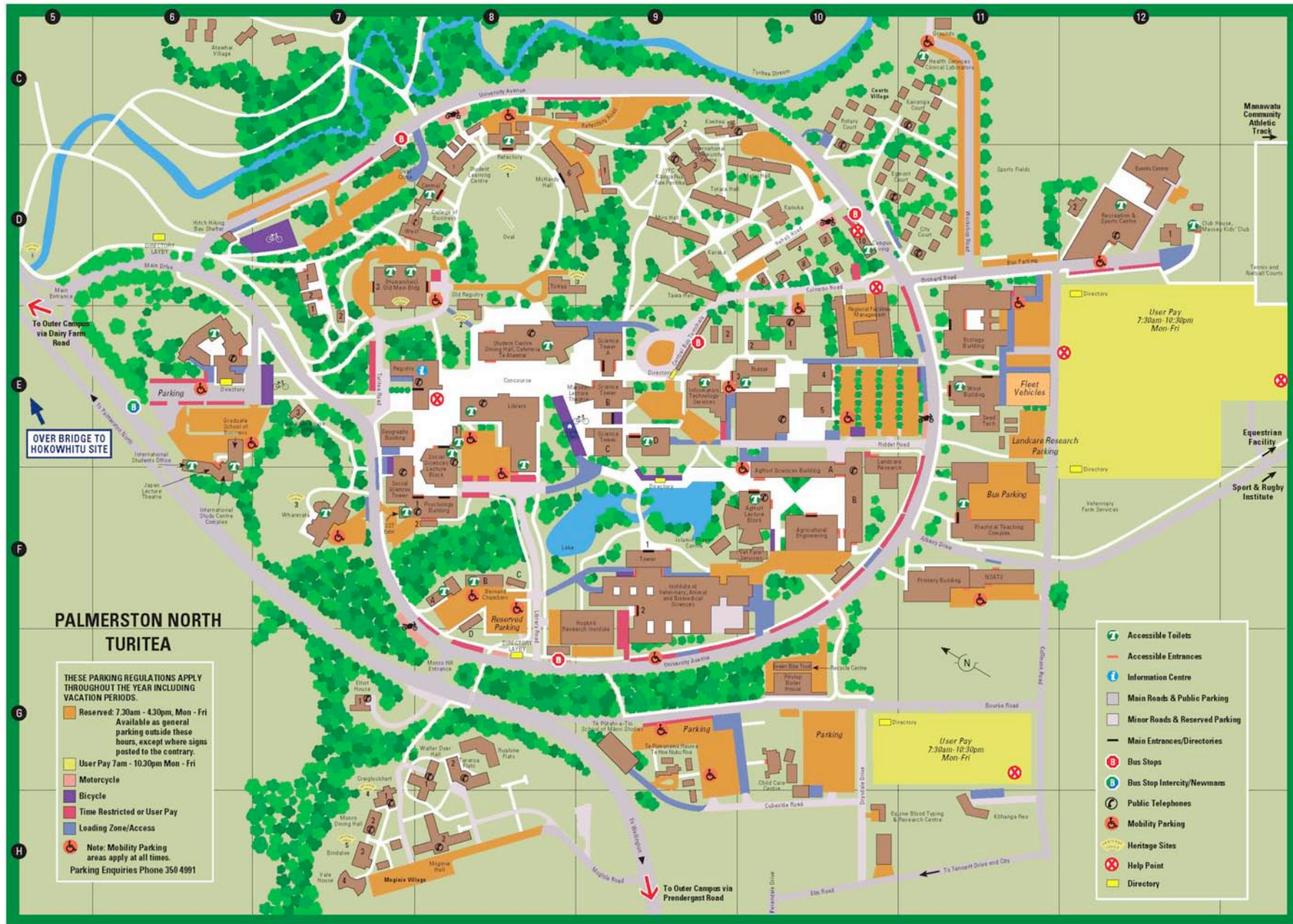
Student Learning Centre

The Student learning Centre offers a whole range of support classes for undergraduate, postgraduate, internal, extramural or international students. For details, please see: <http://learning.massey.ac.nz/>. Students with poor English language skills are advised to include 192.102 (Academic writing for speakers of other languages) in to their degree programme.

Extramural Study

At present it is not possible for students to complete an extramural BSc with a major in Biological Sciences. However, some papers of relevance to Biological Sciences students are offered from time to time. For details, check the 'Enrolment Science 2010' Handbook.

Notes



**PALMERSTON NORTH
TURITEA**

THESE PARKING REGULATIONS APPLY THROUGHOUT THE YEAR INCLUDING VACATION PERIODS.

- Reserved: 7.30am - 4.30pm, Mon - Fri
Available as general parking outside these hours, except where signs posted to the contrary.
- User Pay 7am - 10.30pm Mon - Fri
- Motorcycle
- Bicycle
- Time Restricted or User Pay
- Loading Zone/Access
- Note: Mobility Parking areas apply at all times.
Parking Enquiries Phone 350 4991

- ♿ Accessible Toilets
- Accessible Entrances
- i Information Centre
- Main Roads & Public Parking
- Minor Roads & Reserved Parking
- Main Entrances/Directories
- B Bus Stops
- B Bus Stop Intercity/Newmans
- ☎ Public Telephones
- ♿ Mobility Parking
- 🏡 Heritage Sites
- ⊗ Help Point
- Directory

To find information about the BSc programme, majoring requirements for Genetics and papers offered, the following information is provided on the Massey University website:



Bachelor of Science (BSc)

Bachelor of Science (Genetics)

Entry Requirements

All students must have a university entrance qualification. Students beginning their study of Genetics should have a sound background in Chemistry and Biology at NCEA Level 3.

However, if you do not have a background of chemistry at the Year 13 level then you can take 123.103 Introductory Chemistry extramurally through Massey University over the summer before your first year of full-time study. This paper will introduce you to basic chemical vocabulary and provides training in the important chemical principles. You do need to already have a university entrance qualification or to expect to obtain one by sitting NCEA Level 3 at the end of this year. If you are interested in this suggestion get in touch with one of the College of Sciences [contact people](#). Similarly, if you have not done NCEA Level 3 Biology you can take 162.103 Introductory Biology over the summer.

In their first year, students intending to major in Genetics should take 123.101 and 162.101 in Semester One and 122.102 in Semester Two. In addition they are strongly recommended to take Biometrics (161.130), and a second paper in Chemistry (123.102) in Semester Two.

For general Massey University entry requirements see Am I Eligible to Study at Massey?

Bachelor of Science (Genetics) Structure

The Genetics programme at Massey University is the most comprehensive on offer at a New Zealand university, covering molecular, developmental, population, quantitative and evolutionary genetics. Graduates in Genetics will have a working knowledge of all these aspects of Genetics yet have the opportunity to specialise in an area of particular interest such as molecular genetics, cytogenetics or genomics. Massey University graduates will also be familiar with the bioethical issues that confront genetics and have a working knowledge of the regulations and codes of practice under which research in genetics is carried out. They are expected to have acquired good analytical skills and to be good communicators of their subject. In a rapidly moving field such as genetics the emphasis is on preparation for the future rather than skills for the present.

Majoring Requirements

123.101 Chemistry and Living Systems,
122.102 Biochemistry of Cells,
162.101 Biology of Cells,
122.231 Genes and Gene Expression,
162.211 Biology and Genetics of Micro-organisms
203.202 Genetic Analysis

203.203 Human Genetics
 203.300 DNA Technology
 203.303 Gene Regulation
 203.305 Advanced Practical Genetics
 203.307 Advanced Cell Biology.

Papers

Manawatu

162.103 Introductory Biology	15	R 162.101 (Note 1)
162.101 Biology of Cells	15	Note 2
123.101 Chemistry and Living Systems	15	Note 3
122.102 Biochemistry of Cells	15	P 123.101 (Note 4), 162.101
162.211 Biology and Genetics of Microorganisms	15	P 162.101, R 162.213
203.202 Genetic Analysis	15	P 162.101
203.203 Human Genetics	15	P 162.101
122.231 Genes and Gene Expression	15	P 162.101
122.232 Protein Biochemistry	15	P 122.102, R 122.342
196.207 Biological Evolution	15	P 162.101
203.300 DNA Technology	15	P 122.231
203.303 Gene Regulation	15	P 203.300
203.305 Advanced Practical Genetics	15	P 203.202, 203.300
203.307 Advanced Cell Biology	15	P 162.101, 122.231 (Note 5)
122.322 Protein Structure and Function	15	P 122.232, R 122.342
117.345 Genetics for Livestock Improvement	15	P 203.202 or 117.254
120.302 Plant Development	15	P 120.101 (Note 6)
120.304 Plant Biotechnology	15	P 120.101, 122.231 R 120.216 (Note7)
162.312 Molecular Microbiology	15	P 162.211
247.300 Research in Molecular BioSciences	15	Note 8

Notes

1. [162.103](#) may not be taken after [162.101](#) has been passed.
2. Students will be assumed to have studied at least 20 credits from NCEA Level 3 Biology and achieved at least 14, or passed Bursary Biology or [162.103](#) or an acceptable alternative.
3. Students **must** normally have studied at least 20 credits from NCEA Level 3 Chemistry and achieved at least 14, or have achieved an equivalently acceptable level in an alternative assessment system to NCEA, or passed Bursary Chemistry or [123.103](#) or an acceptable alternative.
4. Students are strongly advised to take [123.102](#) in addition to [123.101](#).
5. Students are recommended to take [122.232](#) and [122.233](#) before [203.307](#).
6. Plus any two approved papers at 200-level from [120.2xx](#), [122.2xx](#), [162.2xx](#) and [203.2xx](#).
102.217 is strongly recommended.
7. Prerequisite may be waived at the discretion of the Major Leader.
8. Permission from Programme Director. Enrolment in the paper is by application only. Students may apply for specific projects that are available in a given semester. Acceptance will be based on the availability of projects and the academic qualifications and background of applicants.