PAPERS

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Note(s): *This section gives a brief description of the papers needed to complete a Bachelor of Engineering (Honours) (page 9), Bachelor of Science (page 25) or Bachelor of Science (Technology) (page 27). For more information on a paper, please contact the paper convenor/co-ordinator/lecturer listed for that paper.*

UNDERSTANDING PAPER CODES

The code of each paper contains information regarding the subject, the level, the year, and the period and location of teaching.

Example: BIOL102-15A (HAM) – The Biology of Organisms

BIOL	1	02	-15	A	(HAM)
Subject code	Level	Paper	Year	Period	Location

Subject Codes

Descriptions of papers with the following subject codes are listed in this handbook.

- BIOL Biological Sciences
- CHEM Chemistry
- ENEL Electronics
- ENGG Engineering
- ENME Mechanical Engineering (see Materials and Processing)
- ENMP Materials and Processing
- ENVS Environmental Sciences
- ERTH Earth Sciences
- PHYS Physics
- PSYC Psychology
- SCIE Science & Engineering (Work Placements)

This handbook refers to, but does not provide descriptions of papers with the following subject codes:

- ANTH Anthropology
- COMP Computer Science
- ECON Economics
- ENVP Environmental Planning
- FREN French
- GEOG Geography
- GERM German
- JAPA Japanese
- MAOR Te Reo Māori
- MATH Mathematics
- MSYS Management Systems
- PHIL Philosophy
- POLS Political Science
- SPAN Spanish
- STAT Statistics
- TIKA Tikanga Māori
- TOMG Tourism Management

Period Indicators

- A A Semester: March – June
- B B Semester: July – November
- C An atypical teaching period
- S Summer School: January – February
- T Summer School 2: November – December
- Y Full year: March – November

Location Indicators

- HAM Papers taught in Hamilton
- TGA Papers taught in Tauranga
- NET Online course
- SEC Papers taught at a secondary school

100 LEVEL SCIENCE PAPERS

The following is a list of all of the 100 Level papers available in Science subjects at the University of Waikato.

Biological Sciences
- BIOL101B – Cellular and Molecular Biology
- BIOL102A – The Biology of Organisms

Chemistry
- CHEM100A – Chemistry in Context
- CHEM106 – Chemical Hazards, Safety and Legislation†
- CHEM111A – Structure and Spectroscopy
- CHEM112B – Chemical Reactivity

Computer Science
- COMP103A/B/C – Introduction to Computer Science 1
- COMP104B/S/C – Introduction to Computer Science 2
- COMP123A/B/S – The Computing Experience
- COMP124 – He Tomokanga ki te Ao Rorohiko†
- COMP125A – Visual Computing
- COMP126B – Computing Media

Earth Sciences
- ERTH103B – Discovering Planet Earth
- ERTH104A – Earth and Ocean Environments

Electronics
- ENEL111A – Introduction to Electronics

Engineering
- ENGG180A – Foundations of Engineering

Environmental Science
- ENVS101B – Environmental Science*

Materials and Process Engineering
- ENMP102B – Introduction to Materials Science and Engineering

Mathematics
- MATH101A/B/S – Introduction to Calculus
- MATH102A/B – Introduction to Algebra
- MATH165A/B – General Mathematics
- MATH168A/B – Preparatory Mathematics**

Philosophy
- PHIL102B – Introduction to Logic

Physics
- PHYS100A – Exploring Physics
- PHYS103B – Physics for Scientists and Engineers 1

Psychology
- PSYC102B – Social and Developmental Psychology
- PSYC103A – General and Experimental Psychology

Statistics
- STAT111B – Statistics for Science
- STAT121A/S – Introduction to Statistical Methods

† Not offered in 2015.
** Interdisciplinary paper with contributions from Biological Sciences, Chemistry and Earth Sciences.*
*** Cannot be included in the requirement of 105 points at 100 Level across four science subjects for the BSc and BSc(Tech) degrees.*

BIOLOGICAL SCIENCES PAPERS

100 Level Papers

BIOL101-15B (HAM) & 14B (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 Alison Campbell, Dr Ryan Martinus and Associate Professor Ian McDonald*
Senior Tutor:	*Brydget Tulloch*
Required book(s):	*Reece et al. **Campbell Biology** 9th ed (Benjamin Cummings)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

BIOL102-15A (HAM) & 14A (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 To be advised*
Senior Tutor:	*Brydget Tulloch*
Required book(s):	*Reece et al. **Campbell Biology** 9th ed (Benjamin Cummings)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENVS101-15B (HAM) – Environmental Science
15 Points
For details see Environmental Sciences ENVS101.

200 Level Papers

BIOL201-15A (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 Michael Clearwater, Dr Chrissen Gemmill, Associate Professor Carolyn King and Dr Ian Duggan*
Prerequisite(s):	*BIOL101 or BIOL102*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

BIOLOGICAL SCIENCES PAPERS

BIOL210-15B (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: 1 : 1*

BIOL212-15A (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, Professor Brendan Hicks, Associate Professor Conrad Pilditch and Professor David Hamilton*
Prerequisite(s): *BIOL102, (ENVS101 is strongly recommended)*
Assessment: *Internal assessment/examination ratio: 1 : 1*

BIOL223-15B (HAM) – Plant Biology and Ecology
20 Points
An introduction to the structure and adaptation of plants, 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*

BIOL226-15T (HAM) – 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.

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 2015.

BIOL234-15A (HAM) (TGA) – 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, including selected topics in ecophysiology. Topics covered include the physiology of nerve and muscle, chemical communication and senses, animal locomotion, respiration, circulation, osmoregulation and thermoregulation. An introduction to animal behaviour will include lectures on orientation and navigation, visual and auditory communication, mating systems and other aspects of social behaviour.

Lecturer(s): *Associate Professor Nick Ling and Professor Joe Waas*
Prerequisite(s): *BIOL102*
Assessment: *Internal assessment/examination ratio: 2 : 3*

BIOL235-15B (HAM) – Biomedical and Molecular Physiology
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): *Dr Pawel Olszewski and Dr Steve Bird*
Prerequisite(s): *BIOL102; (BIOL101 is recommended)*
Assessment: *Internal assessment/examination ratio: 2 : 3*

BIOL241-15A (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): *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*

BIOLOGICAL SCIENCES PAPERS

BIOL251-15A (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): *Dr Ryan Martinus and Professor Vic Arcus*
Prerequisite(s): *BIOL101 and 15 points at Level 100 Chemistry*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP222 – Biotechnology: Food and Bioresources
20 Points
This paper will not be offered in 2015.

300 Level Papers

BIOL307-15A/B/C/Y (HAM) & 14B (TGA) – 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): *Professor Joe Waas*
Assessment: *Internal assessment/examination ratio: 1 : 0*

BIOL310-15A (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 Professor Vic Arcus*
Prerequisite(s): *BIOL210*
Assessment: *Internal assessment/examination ratio: 1 : 1*

BIOL312-15A (HAM) (TGA) – 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.

Lecturer(s): *Dr Daniel Laughlin and Associate Professor Carolyn King*
Prerequisite(s): *BIOL212*
Assessment: *Internal assessment/examination ratio: 3 : 2*

BIOL313-15B (HAM) (TGA) – Applied Freshwater Ecology
20 Points
This paper is an introduction to the applied ecology of freshwater communities (limnology). It deals with both 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, Professor Brendan Hicks, Dr Ian Duggan and Professor David Hamilton*
Prerequisite(s):	*BIOL212*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

BIOL314-15A (HAM) (TGA) – 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):	*Associate Professor Conrad Pilditch, Professor Brendan Hicks and Professor Chris Battershill*
Prerequisite(s):	*BIOL212; (BIOL201 is recommended)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

BIOL324-15B (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.**

Lecturer(s):	*Professor Chris Battershill (University of Waikato) and Dr Simon Moncaster (Bay of Plenty Polytechnic)*
Prerequisite(s):	*Aquaculture 1, Aquaculture 2, Diploma in Marine Studies Bay of Plenty Polytechnic or BIOL234 University of Waikato*
Assessment:	*Internal assessment/examination ratio: 3 : 2*

BIOL325-15A (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*
Prerequisite(s):	*BIOL223*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

BIOL326 – Advanced Topics in Plant Biology
20 Points
This paper will not be offered in 2015.

BIOLOGICAL SCIENCES PAPERS

BIOL333-15B (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, Associate Professor Nick Ling, Dr Pawel Olszewski and contributors from Landcare, the Department of Conservation and AgResearch*
Prerequisite(s): *BIOL234*
Assessment: *Internal assessment/examination ratio: 1 : 1*

BIOL335-15A (HAM) – Mammalian Physiology
20 Points
This paper is an integrated theoretical and experimental study of selected aspects of the physiology of mammals. 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 applied research in mammalian physiology and including neurophysiology and the physiology of behaviour, immunology, muscle growth and development, reproduction and lactation.

Lecturer(s): *Associate Professor Nick Ling and Dr Pawel Olszewski*
Prerequisite(s): *BIOL234 or BIOL235; (BIOL251 is recommended)*
Assessment: *Internal assessment/examination ratio: 2 : 3*

BIOL338-15B (HAM) – Advanced Zoology
20 Points
This paper looks at selected topics in evolutionary zoology, with particular emphasis on the dominant invertebrate and vertebrate groups.

This paper is complementary to BIOL335 and BIOL333.

Lecturer(s): *Associate Professor Carolyn King and Associate Professor Ian Hogg*
Prerequisite(s): *BIOL201 or BIOL234*
Assessment: *Internal assessment/examination ratio: 1 : 1*

BIOL341-15B (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 archaebacteria 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): *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*

BIOL351-15B (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 Vic Arcus*
Prerequisite(s): *BIOL251*
Assessment: *Internal assessment/examination ratio: 1 : 1*

BIOL362-15C (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, biochemistry or biomedical research.

Lecturer(s): *Dr Ray Cursons, Dr Linda Peters, Professor Vic Arcus and Dr Steven Bird*
Prerequisite(s): *BIOL210*
Assessment: *Internal assessment/examination ratio: 2 : 3*

ENMP322-15B (HAM) – Biotechnology
20 Points
For details see Materials and Processing ENMP322.

CHEMISTRY PAPERS

100 Level Papers

CHEM100-15A (HAM) (TGA) – Chemistry in Context
15 Points
An introductory course assuming minimal chemistry background for students who are non-chemistry majors. Students with 16 or more credits in NCEA Level 3 Chemistry are encouraged to take CHEM111 instead. An emphasis is made to place the chemical concepts taught in the course within the broader context of the world around us.

Lecturer(s): *Dr Joseph Lane*
Restriction(s): *CHEM101, CHEM102, CHEM111, CHEM112*
Recommended book(s): *CHEM 2: Chemistry in Your World 2nd ed (Cengage)*
Assessment: *Internal assessment/examination ratio: 60 : 40*

CHEM106 – Chemical Hazards: Safety and Legislations
15 Points
This paper will not be offered in 2015.

CHEM111-15A (HAM) – Structure and Spectroscopy
15 Points
A theoretical and practical course covering aspects of analytical and inorganic chemistry. This course is required for the Chemistry major.

Lecturer(s): *Professor Bill Henderson, Associate Professor Merilyn Manley-Harris and Associate Professor Graham Saunders*
Prerequisite(s): *16 credits at Level 3 NCEA Chemistry or equivalent*
Required book(s): *Brown et al **Chemistry the Central Science** (Prentice Hall)*
Assessment: *Internal assessment/examination ratio: 45 : 55*

CHEM111-15T (HAM) – Structure and Spectroscopy
15 Points
A theoretical and practical course covering aspects of analytical and inorganic chemistry.
This occurrence of the paper is offered to students who achieved an A in CHEM100 and want to enrol in CHEM211- CHEM214, which are required for the Chemistry major.

Required book(s): *Brown et al **Chemistry the Central Science** (Prentice Hall)*
Assessment: *Internal assessment/examination ratio: 45 : 55*

CHEM112-15B (HAM) – Chemical Reactivity
15 Points
A theoretical and practical course covering aspects of physical and organic chemistry. This course is required for the Chemistry major.

Lecturer(s): *Dr Michael Mucalo and Associate Professor Merilyn Manley-Harris*
Prerequisite(s): *16 credits at Level 3 NCEA Chemistry or equivalent or A grade or above in CHEM100*
Recommended book(s): *Brown et al **Chemistry the Central Science** (Prentice Hall)*
Assessment: *Internal assessment/examination ratio: 45 : 55*

ENVS101-15B (HAM) – Environmental Science
15 Points
For details see Environmental Sciences ENVS101.

200 Level Papers

CHEM200-15B (HAM) – Analytical Tools for the Life and Environmental Sciences
20 Points
A largely practical paper for students in the life and environmental sciences who require an understanding of the abilities and limitations of chemical analysis in their fields of study.

Lecturer(s): *To be advised*
Prerequisite(s): *CHEM100*
Restrictions(s): *CHEM111 and CHEM204*
Assessment: *Internal assessment/examination ratio: 1 : 0*

CHEM211-15A (HAM) – Analytical and Inorganic Chemistry 1
20 Points
A theoretical paper covering aspects of analytical and inorganic chemistry.

Lecturer(s): *Professor Bill Henderson, Associate Professor Graham Saunders, Associate Professor Merilyn Manley-Harris and Dr Michéle Prinsep*
Prerequisite(s): *CHEM111*
Assessment: *Internal assessment/examination ratio: 1 : 1*

CHEM212-15B (HAM) – Organic and Physical Chemistry 1
20 Points
A theoretical paper covering aspects of organic and physical chemistry.

Lecturer(s): *Dr Michael Mucalo, Associate Professor Merilyn Manley-Harris, and Dr Michéle Prinsep*
Prerequisite(s): *CHEM112*
Assessment: *Internal assessment/examination ratio: 1 : 1*

CHEM213-15A (HAM) – Analytical and Inorganic Chemistry Laboratory 1
10 Points
A laboratory based paper covering aspects of analytical and inorganic chemistry.

Lecturer(s): *Professor Bill Henderson, Associate Professor Graham Saunders, Associate Professor Merilyn Manley-Harris, and Dr Michéle Prinsep*
Corequisite(s): *CHEM211*
Assessment: *Internal assessment/examination ratio: 1 : 0*

CHEM214-15B (HAM) – Organic and Physical Chemistry Laboratory 1
10 Points
A laboratory based paper covering aspects of organic and physical chemistry.

Lecturer(s): *Dr Michael Mucalo, Associate Professor Merilyn Manley-Harris, and Dr Michéle Prinsep*
Corequisite(s): *CHEM212*
Assessment: *Internal assessment/examination ratio: 1 : 0*

CHEMISTRY PAPERS

CHEM261-15B (HAM) – Environmental Chemistry and Geochemistry
20 Points
This paper is designed to give students in chemistry, Earth sciences and biological sciences an understanding of the chemistry of our environment. The composition of the earth, particularly its atmosphere and hydrosphere, and its derivation from the solar system, will be examined. Concepts of residence times, fluxes and geochemical cycles will be introduced. The features that make the Earth unique among the known planets, and habitable, especially the importance of oxygen, carbon dioxide, photosynthesis and respiration form an important part of this paper. Atmospheric processes to be examined include carbon dioxide and the greenhouse effect, acid rain and the sulphur cycle, and photochemistry.

Students will greatly benefit by taking this second semester paper in combination with CHEM200 Analytical Tools for the Life and Environmental Sciences. Students undertake one day of field-work and five three-hour laboratory sessions.

Lecturer(s):	*Dr Adam Hartland, Associate Professor Merilyn Manley-Harris and Professor Bill Henderson*
Prerequisite(s):	*15 points at Level 1 Chemistry and 15 points at Level 1 Earth Sciences*
Required book(s):	*VanLoon, G.W., Duffy, S.J.* ***Environmental Chemistry: A Global Perspective*** *(Oxford University Press), White, W.M.* ***Geochemistry*** *(Wiley-Blackwell)*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

300 Level Papers

CHEM301-15A (HAM) – Advanced Organic Chemistry
20 Points
This paper looks at mass spectrometry and advanced NMR spectroscopy. It explores biosynthesis of natural products and advanced carbohydrate chemistry, as well as stereoelectronic effects, and enolates and enamines in synthesis and biosynthesis.

Lecturer(s):	*Dr Michéle Prinsep and Associate Professor Merilyn Manley-Harris*
Prerequisite(s):	*CHEM201*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

CHEM302-15A (HAM) – Advanced Physical Chemistry
20 Points
This paper covers topics selected from thermodynamics of real systems, surface chemistry, nanotechnology, reaction kinetics and mechanisms, metal corrosion, dynamic electrochemistry, and atomic and molecular structure as revealed by quantum chemistry.

Lecturer(s):	*Dr Michael Mucalo*
Prerequisite(s):	*CHEM202*
Required book(s):	*Engel and Reid* ***Physical Chemistry*** *(Pearson)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

CHEM303-15B (HAM) – Advanced Inorganic Chemistry
20 Points
Topics dealt with in this paper include the chemistry of the heavier transition elements, and of the lanthanides and actinides. The important topics of bioinorganic chemistry and organometallic chemistry are also presented in some detail. Other aspects of inorganic chemistry that are explored include metal-hydride chemistry, electron-deficient compounds, and complex oxides and oxyanions. For the practical component of the paper, students spend 36 hours in the laboratory working on individual projects from inorganic chemistry. These usually combine quite demanding preparative chemistry with a research component.

Lecturer(s):	*Professor Bill Henderson and Associate Professor Graham Saunders*
Prerequisite(s):	*CHEM203*
Required book(s):	*Henderson et al **Introduction to Modern Inorganic Chemistry** 6th ed (Nelson Thornes) For intending MSc candidates: Either Cotton et al **Advanced Inorganic Chemistry** 6th ed (Wiley-Interscience); or Earnshaw et al **Chemistry of the Elements** (Pergamon)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

CHEM304-15A/B/C/S/Y (HAM) – Special Topics in Chemistry
20 Points
Each student is assigned an independent or small team research project, which can be laboratory and/or literature-survey based. Students are expected to complete at least 100 hours of laboratory work on their project. Some informal seminars covering project/design and report writing are held, and students present their work to other class members at seminars.

Assessment is based mainly on the detailed reports that are submitted at the end of the paper. This paper provides a useful introduction to research for students who intend to progress to more serious research as part of a MSc programme, and is also a useful way for a student to gain familiarity with an instrumental technique (or techniques) in appropriate cases.

Co-ordinator(s):	*Dr Michéle Prinsep*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

CHEM305-15B (HAM) – Environmental, Forensic, Toxicological and Medicinal Chemistry
20 Points
A paper with a selection of topics from heavy metals and organic compounds in the environment; arson, explosives and fingerprint investigations in forensic casework; toxicological effects in humans, drugs (particularly anti-cancer drugs) and other topics. An organic chemistry/biochemistry background is an advantage for this section of the paper.

The combination of CHEM305 and CHEM306 (built on the foundation of CHEM204) is highly recommended for students wishing to specialise in analytical chemistry.

Lecturer(s):	*Professor Bill Henderson, Associate Professor Graham Saunders and Dr Michéle Prinsep*
Prerequisite(s):	*CHEM201, CHEM209, or both CHEM112 and BIOL251*
Assessment:	*Internal assessment/examination ratio: 2 : 3*

CHEMISTRY PAPERS

CHEM306-15B (HAM) – Advanced Analytical Chemistry
20 Points
Chemical analysis is an essential part of scientific research across the range of disciplines, and these days is usually carried out using specialised part-mechanical and part-electronic devices referred to as instruments. A sound understanding of analytical chemistry and the various instrumental methods of analysis is not only extremely useful to graduate research in biology, earth sciences and/or chemistry, but is also the skill most sought-after by New Zealand employers of chemistry graduates. In this paper, the aim is to further develop such an understanding.

Topics covered are as follows:

- Sampling, sample preparation, trace analysis, data interpretation
- Use of High Pressure Liquid Chromatography (HPLC)
- Interfacing computers and instruments
- Inductively-Coupled Plasma Optical Emission Spectroscopy (ICP-OES)
- Chromatography with emphasis on Gas Chromatography-Mass Spectrometry (GC-MS)
- Emphasis in the laboratory course is on gaining practical working experience of the concepts and instruments discussed in lectures.

Lecturer(s):	*Associate Professor Merilyn Manley-Harris, Dr Adam Hartland and Associate Professor Graham Saunders*
Prerequisite(s):	*CHEM204*
Required book(s):	*Kellner et al **Analytical Chemistry** (Wiley-VCH) (Same book as CHEM211)*
Assessment:	*Internal assessment/examination ratio: 3 : 2*

CHEM361-15A (HAM) – Applied Environmental Geochemistry
20 points
This course is designed to give students the necessary skills and understanding to tackle the analysis of chemical datasets from natural and polluted waters. The course advances understanding of environmental chemical principals developed in CHEM261 to focus on aqueous geochemistry, combining team-based fieldwork, chemical and computer labs, taught lectures and individual study. Students investigate the processes which determine the chemical composition of natural and polluted waters using the geochemical modelling codes PHREEQC and visual MINTEQ, providing the student with industry-relevant geochemical modelling skills. Students carry out a practical research project involving field and laboratory work and geochemical modelling, finally writing a coherent report including reference to relevant literature. In addition, students will deliver an oral presentation and a poster presentation about the project. Thus, the outcome of this course is to develop students professionally, preparing them for a career in environmental science and management.

Co-ordinator(s):	*Dr Adam Hartland*
Prerequisite(s):	*CHEM261*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

EARTH SCIENCES PAPERS

100 Level Papers

ENVS101-15B (HAM) – Environmental Science
15 Points
For details see ENVS101 Environmental Sciences.

ERTH103-15B (HAM) – Discovering Planet Earth
15 Points
A lecture and laboratory paper that explores the Earth's interior and its dynamic interaction with the crust. Topics covered include the major rocks and minerals and their economic importance; interpreting the rock record and geologic maps; the geological time scale and fossils; rock deformation; plate tectonics; volcanism; earthquakes; the New Zealand geological environment. A one-day field trip will be run introducing students to aspects of Earth sciences.

Lecturer(s):	*Dr Adrian Pittari, Dr Shaun Barker and Dr Beth Fox*
Tutor(s):	*Dr Hazel Needham*
Required book(s):	*Marshak **Earth: Portrait of a Planet 4th ed** (Norton)*
Recommended book(s):	*I. J. Graham (Chief ed.) **A Continent on the Move: New Zealand Geoscience into the 21st Century** (Geological Society of New Zealand).*
Required reading:	*ERTH103 Study Guide*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ERTH104-15A (HAM) – Earth and Ocean Environments
15 Points
A lecture and laboratory paper that explores the processes operating in the terrestrial and ocean environments, and the resulting deposits and landforms. Topics covered include oceanography; coastal hazards and climate change; the hydrological cycle; rivers and groundwater; glaciers; weathering; erosion and mass movement; and soil formation. A one-day field trip will be run introducing students to the physical environment of the Waikato-Raglan district.

Lecturer(s):	*Dr Megan Balks, Dr David Campbell and Dr Willem de Lange*
Tutor(s):	*Dr Hazel Needham*
Required book(s):	*ERTH104 Study Guide*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

EARTH SCIENCES PAPERS

200 Level Papers

ERTH221-15B (HAM) – Earth Materials and Processes
20 Points
In this paper the nature and significance of Earth materials are studied, and particularly the processes and products of volcanism and sedimentation. Students learn the methods of describing and identifying the common minerals and rocks of the Earth's crust. There is an emphasis on laboratory work which covers introductory crystallography, optical mineralogy using petrographic microscopes, igneous, metamorphic, and sedimentary petrography, grain-size analysis, and detrital mineralogy.

It is strongly advised that this paper is taken in conjunction with ERTH222. A background in first-year chemistry is advisable, but is not essential.

Note(s): *This paper has an enrolment limit of 65 students due to a limited number of petrographic microscopes.*

Lecturer(s):	*Dr Adrian Pittari, Dr Shaun Barker, Dr Beth Fox and Professor Peter Kamp*
Prerequisite(s):	*ERTH103 and one of ERTH104, ENVS101, GEOG103*
Recommended book(s):	*Francis and Oppelnheimer **Volcanoes** (Oxford);* *Winter **Principles of Igneous and Metamorphic Petrology** (Prentice Hall);* *Boggs Jr **Principles of Sedimentology and Stratigraphy** (Merrill);* *Prothero and Schwat **Sedimentary Geology: an Introduction to Sedimentary Rocks and Stratigraphy** (W.H.Freeman)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ERTH222-15A (HAM) – Stratigraphy, Structure and Field Methods
20 Points
This paper teaches students field methods in Earth Sciences related to the description, mapping and structural interpretation of rock sequences underlying land surfaces. It is the principal paper at second-year level that gives students experience in fieldwork. Topics covered are stratigraphic procedures; field mapping and map interpretation; introduction to analysis of geological structures; report writing; and computer graphics for Earth science applications. The paper includes a compulsory field camp at Port Waikato, where students undertake section descriptions and mapping exercises. This is followed by training in, and the completion of, a compulsory report on the fieldwork.

Note(s): *This paper has an enrolment limit of 50 students, due to field trip accommodation availability.*

Lecturer(s):	*Dr Shaun Barker, Dr Beth Fox and Professor Peter Kamp*
Prerequisite(s):	*ERTH103 and one of ERTH104, ENVS101 or GEOG103*
Recommended book(s):	*Boggs Jr **Principles of Sedimentology and Stratigraphy** (Merrill);* *Prothero et al **Sedimentary Geology – An Introduction to Sedimentary Rocks and Stratigraphy** (Freeman)*
Assessment:	*Internal assessment/examination ratio: 3 : 2*

ERTH233-15A (HAM) – Soils in the Landscape
10 Points
Soils are New Zealand's most important natural resource: they sustain life, sequester carbon, and provide many essential 'services' and functions. ERTH233 is an introductory paper on the nature and formation of soils and their place in the landscape, their classification, distribution pattern and use as a finite resource in New Zealand. Two fieldtrips (half day, one day) examining the properties and origins of soils in the Waikato region are undertaken. The paper is a partner to ERTH234.

Lecturer(s): *Professor David Lowe*
Prerequisite(s): *Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Restriction(s): *ERTH231*
Required book(s): *Clayden and Hewitt **Horizon Notation for New Zealand Soils** (Manaaki Whenua Press)*
Recommended book(s): *Molloy **Soils in the New Zealand Landscape 2nd ed** (NZ Society of Soil Science)*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ERTH234-15A (HAM) – Soil Properties and their Management
10 Points
This paper is an introduction to the physical, chemical, mineralogical, and biological properties of soils including analysis and interpretation using laboratory methods, and issues of soil quality, land degradation and sustainable management. The paper is a partner to ERTH233.

Lecturer(s): *Professor Louis Schipper*
Prerequisite(s): *Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Restriction(s): *ERTH231*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ERTH242-15B (HAM) – Oceanography
20 Points
New Zealand has the fourth largest Exclusive Economic Zone in the world, which creates a demand for graduates with good understanding of oceanography. The paper is largely an introduction to physical oceanography and examines the nature and origin of the oceans; the currents, waves, and circulation patterns found in the oceans; and ocean/climate interactions such as ENSO events. Additional topics include paleoceanography; oceanographic instrumentation and technology; marine resources and management; productivity, energetics and fisheries; and oceanography of the New Zealand Exclusive Economic Zone.

This paper is suitable for all students with an interest in some aspect of marine sciences, and should provide a basic grounding in oceanography which is not normally available elsewhere in a single course until masters-level papers.

Lecturer(s): *Dr Julia Mullarney, Dr Willem de Lange and Associate Professor Karin Bryan*
Prerequisite(s): *Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Recommended book(s): *Garrison **Oceanography** 6th ed. (Tomson, Brooks & Pole); Goff et al **The New Zealand Coast: Te Tai O Aotearoa** (Dunmore Press)*
Assessment: *Internal assessment/examination ratio: 1 : 1*

EARTH SCIENCES PAPERS

ERTH245-15A (HAM) – Weather and Climate
10 Points
An introduction to atmospheric processes, including meteorology of the New Zealand region, precipitation processes, energy exchanges within the hydrosphere, and microclimatology, with emphasis on the role of water in climate processes.

Lecturer(s):	*Dr David Campbell*
Prerequisite(s):	*Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Required book(s):	*ERTH245 Study Guide*
Restriction(s):	*ERTH241*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ERTH246-15B (HAM) – Introduction to Hydrology
10 Points
An introduction to the land component of the hydrological cycle and associated human modifications. Topics include introduction to groundwater, fluvial processes and landforms, catchment hydrology and hydro power evaluation.

Lecturer(s):	*Associate Professor Earl Bardsley*
Prerequisite(s):	*Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Restriction(s):	*ERTH241*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ERTH251-15B (HAM) – Engineering Geomorphology
10 Points
An introduction to the study of mass wasting processes on hillslopes: classification of mass wasting; processes of rock and soil slope failure and their recognition based on geomorphic evidence; nature and geomorphology of debris flows and debris avalanches; hazard assessment for slope failure. Field and laboratory work concentrates on basic mapping and surveying techniques, air photo interpretation and geomorphic map presentation, collection and description of soil profile logs.

Lecturer(s):	*Dr Vicki Moon*
Prerequisite(s):	*Any two of ERTH103, ERTH104, ENVS101 or GEOG103*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ERTH284-15B (HAM) – Introduction to Environmental Monitoring
10 Points
This paper introduces students to aspects of environmental monitoring within the New Zealand resources management framework and includes principles of environmental monitoring as applied to a range of environments in the Waikato Region; sampling strategies; and data interpretation. Practical exercises concentrate on specific skills in the acquisition and interpretation of environmental data, including undertaking field surveys; sampling of earth materials; sample management and analysis; report presentation and communication of results.

Lecturer(s):	*Dr Vicki Moon, Dr Megan Balks and guest lecturers from Waikato Regional Council*
Prerequisite(s):	*Any two of ENVS101, ERTH103, ERTH104 or GEOG103*
Restriction(s):	*ENVP308*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

300 Level Papers

ERTH311-15A/B/C (HAM) – Special Topics in Earth Sciences
20 Points
Students are assigned a research project on which they are expected to spend at least 100 hours and to write a report. This paper is not normally part of an Earth Sciences major and is intended for top academic achievers. Admission is at the discretion of the relevant Paper Convenor/Co-ordinator, and will depend on the availability of a supervisor.

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

ERTH312-15A/B/C (HAM) – Special Topics in Earth Sciences
10 Points
Students are assigned a research project on which they are expected to spend at least 50 hours and to write a report. This paper is not normally part of an Earth Sciences major. Admission is at the discretion of the relevant Paper Convenor/Coordinator and will depend on the availability of a supervisor.

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

ERTH321-15A (HAM) – Volcanology
20 Points
Volcanism is the fundamental geological process shaping our planet, one that provides abundant resources for society while also posing significant hazards. This paper explores the nature, dynamics and significance of all types of volcanoes and volcanic processes, and examines the magmatic systems that feed volcanoes. Topics covered include properties of magma, lava flows, explosive eruption mechanisms and emplacement processes, volcano monitoring, origin of magmas, crystallisation of rock-forming minerals and phase equilibria, petrology and trace element geochemistry of volcanic rocks, and geothermal and mineral resources.

The paper includes a two-day field trip to Taupo and Tongariro to examine some world-class volcanoes and volcanic deposits.

Lecturer(s): *Dr Adrian Pittari and Dr Shaun Barker*
Prerequisite(s): *ERTH221 (ERTH222 is strongly recommended)*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH322-15B (HAM) – Sedimentary and Petroleum Geology
20 Points
This paper describes various types of sedimentary basins in terms of their plate tectonic setting, and looks at the different controls on sedimentation. It offers an integrated lecture-lab segment on principles and application of sequence stratigraphy which involves the interpretation of oil exploration acquired seismic reflection profiles. The concept of sedimentary facies is emphasised, particularly those criteria used for interpreting the depositional environments of ancient sedimentary rock sequences. New Zealand examples are used throughout the paper. Laboratory work includes facies analysis and mapping, microfossil analysis, thin-section petrography, X-ray diffraction techniques, and there is a compulsory three-day geology field trip to northern Taranaki, based at Awakino, and an associated report.

This paper leads on from ERTH221 and/or ERTH222 and it may be considered a partner to ERTH321.

Lecturer(s): *Professor Peter Kamp, Dr Rochelle Hansen and Dr Beth Fox*
Prerequisite(s): *ERTH221 or ERTH222*
Recommended book(s): *Boggs Jr **Principles of Sedimentology and Stratigraphy** (Merrill); James et al **Facies Models – Response to Sea Level Change** (Geological Association of Canada); Prothero et al **Sedimentary Geology – An Introduction to Sedimentary Rocks and Stratigraphy** (Freeman)*
Assessment: *Internal assessment/examination ratio: 3 : 2*

EARTH SCIENCES PAPERS

ERTH333-15A (HAM) – Pedology and Land Evaluation
10 Points
This paper examines soil genesis and spatial variability, quantitative soil survey and soil-landscape modelling, soil taxonomy, and the interpretation of soil and land data in a form applicable to land-use planning and management. This paper, which follows on from ERTH233, is a partner to ERTH334.

Lecturer(s): *Professor David Lowe*
Prerequisite(s): *ERTH233*
Restriction(s): *ERTH331*
Recommended book(s): *Schaetzl and Anderson **Soils: Genesis and Geomorphology** (Cambridge University Press); Milne et al **Soil Description Handbook** 2nd ed (Manaaki Whenua Press)*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH334-15B (HAM) – Soil and Land Management
10 Points
Analysis and interpretation of soil properties relating to land and environmental management, soil fertility, soil water management, land treatment of wastes, soil degradation and remediation, soil nitrogen and phosphorus cycling. This paper, which follows on from ERTH234, is a partner to ERTH333.

Lecturer(s): *Professor Louis Schipper and Dr Megan Balks*
Prerequisite(s): *ERTH234*
Restriction(s): *ERTH331*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH343-15B (HAM) (TGA) – Coastal Geomorphology and Management
20 Points
The paper focuses on understanding of coastal processes, sediments and evolution of coastal landforms as a basis for coastal management. Topics covered include beach sediments and processes, coastal erosion, and littoral, tidal flats, tidal inlets, estuaries, dunes, rocky shorelines; semiquantitative methods for coastal hazard analysis and tidal inlet stability; coastal planning issues relating to the RMA (1991); sea-level rise impacts, dredging and spoil dispersion, port and marina developments, and methods of coastal protection.

There will be a one-day field trip to examine aspects of coastal geomorphology processes and management.

Lecturer(s): *Dr Willem de Lange and Associate Professor Karin Bryan*
Prerequisite(s): *40 points from 200 Level Earth Sciences or approved Geography papers*
Recommended books: *Komar **Beach Processes and Sedimentation** 2nd ed (Prentice-Hall) 1998; Middleton **Data Analysis in the Earth Sciences Using Matlab** (Prentice-Hall)*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH344-15A (HAM) – Coastal Oceanography and Engineering
20 Points
This paper focuses on physical oceanography of the coastal zone. Topics include methodologies for quantifying processes and coastal responses; evaluation of design conditions for coastal engineering; and application of numerical models for simulating coastal processes. This paper, which follows on from ERTH242, includes a one-day field trip.

Lecturer(s): *Associate Professor Karin Bryan and Dr Julia Mullarney*
Prerequisite(s): *ERTH242 or ERTH245*
Recommended book(s): *Komar **Beach Processes and Sedimentation** 2nd ed (Prentice-Hall) 1998; Middleton **Data Analysis in the Earth Sciences Using Matlab** (Prentice-Hall)*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH345-15A (HAM) – Catchment Hydrology
10 Points
Measurement, analysis and modelling of surface hydrological processes at the catchment scale, emphasizing precipitation, river flow, evaporation, interception loss and hillslope runoff processes. This paper is a partner to ERTH346.

Lecturer(s): *Dr David Campbell*
Prerequisite(s): *ERTH245 or ERTH246*
Restriction(s): *ERTH341*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH346-15B (HAM) – Freshwater Resources and Hazards
10 Points
Overview of freshwater resources and their analysis, with some emphasis on groundwater resources; introduction to hydrological hazards including flood hazard analysis and river contamination modelling. This paper is a partner to ERTH345.

Lecturer(s): *Associate Professor Earl Bardsley*
Prerequisite(s): *ERTH246 or ERTH245*
Restriction(s): *ERTH341*
Recommended book(s): *Wainwright and Mulligan **Environmental Modelling** (Wiley) 2004*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH352-15A (HAM) – Engineering Geology
10 Points
An understanding of the nature and mechanics of soil instability is developed from an examination of slope erosion processes and the physical properties of earth materials. Strategies are discussed for mitigation and avoidance of hazards resulting from slope instability and associated erosion processes.

Lecturer(s): *Dr Vicki Moon*
Prerequisite(s): *ERTH251*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ERTH384-15B (HAM) – Advanced Environmental Monitoring
10 Points
This paper has focus on detecting and quantifying change in the natural environment. A source-to-sea theme is included, with topics incorporating catchment hydrology, soil and land use patterns, sedimentation and nutrient inputs to estuaries. Techniques covered include simple modelling, statistical methods and field survey analysis.

Lecturer(s): *Associate Professor Karin Bryan, Associate Professor Earl Bardsley and Dr Megan Balks*
Prerequisite(s): *40 points from 200 Level Earth Sciences or approved Geography papers*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ELECTRONICS PAPERS

Electronics Papers

100 Level Papers

ENEL111-15A (HAM) – Introduction to Electronics
15 Points
This paper covers basic electronic concepts. Topics include circuit theory, Thevenin's theorem, resistors, capacitors, inductors and power sources, diodes, amplifiers, feedback, logic circuits, analog-to-digital and digital-to-analog conversion.

Note(s): *This paper is recommended for all Physics majors.*

Co-ordinator(s):	*Professor Jonathan Scott*
Prerequisite(s):	*14 credits at Level 3 in NCEA Physics*
Corequisite(s):	*Students who intend to continue in Physics or Electronics are also recommended to enrol in MATH101*
Required book(s):	*To be advised*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

200 Level Papers

COMP200-15A (HAM) – Computer Systems
10 Points
For details refer to the ***Faculty of Computing & Mathematical Sciences Handbook****.*

ENEL205-15B (HAM) – Analog Electronics and Circuit Analysis
20 Points
This paper covers design and analysis of analog electronic circuits. Topics include ac circuit analysis, nodal analysis, Laplace Transforms, BJT amplifier circuits and their equivalent circuits, frequency response. Feedback, output stages, oscillators, operational amplifiers and their limitations, active filters, using PSPICE. This paper includes a laboratory component.

Co-ordinator(s):	*Dr Sadhana Talele*
Prerequisite(s):	*ENEL111*
Required Book(s):	*Neamen* ***Microelectronics, Circuit Analyses and Design*** *3rd ed (McGraw Hill) 2007*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENEL212-15A (HAM) – Electronics for Digital Systems
10 points
This paper covers the theory, design and applications of logic circuits and technology related to digital systems.

Co-ordinator(s):	*Dr Michael Cree*
Prerequisite(s):	*COMP104 or ENEL111*
Restriction(s):	*ENEL211*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENEL213-15A (HAM) – Instrumentation
10 points
This paper covers the design of analogue and digital instrumentation to measure electrical parameters and the design and use of sensors.

Co-ordinator(s):	*Nihal Kularatna*
Prerequisite(s):	*ENEL111*
Restriction(s):	*ENEL211*
Assessment:	*Internal assessment / examination ratio: 1:0*

ENEL284-15B (HAM) – Electricity and Magnetism
10 Points
This paper teaches principles of electromagnetism relevant to engineering. It covers fundamental theory of electric and magnetic fields.

Co-ordinator(s):	*Professor Moira Steyn-Ross*
Prerequisite(s):	*PHYS103 and ENEL111*
Corequisiste(s):	*either ENGG285 or MATH251, and either ENGG283 or MATH253, and either ENGG284 or MATH255*
Restriction(s):	*ENEL281, PHYS201 and PHYS304*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

ENEL285-15A (HAM) – Quantum and Solid State Physics
10 Points
This paper teaches principles of modern physics relevant to engineering. It covers introductory quantum mechanics, atomic and semiconductor physics.

Co-ordinator(s):	*Dr Michael Cree*
Prerequisite(s):	*PHYS103 and MATH101*
Restriction(s):	*ENEL281, PHYS202 and PHYS304*
Recommended book(s):	*Krane **Modern Physics** 3rd ed 2012*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

300 Level Papers

COMP311 – Computer Systems Architecture
20 Points
This paper will not be offered in 2015.

ENEL301-15A/B/C/Y (HAM) – Special Topics in Electronics
20 Points
An independent theoretical, literature, or experimental investigation of an electronics topic, supervised by a member of staff. Progress and assessment are negotiated between the student and supervisor, and typically take the form of a poster, paper manuscript and/or report.

Note(s): *Admission is at the discretion of the Head of School.*

Co-ordinator(s):	*Associate Professor Rainer Künnemeyer*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

ENEL312-15A (HAM) – Electromagnetic Waves
20 Points
This paper discusses electromagnetic wave phenomena using classical electromagnetic theory, which is applied to a range of engineering applications such as transmission lines, waveguides, antennas, electromagnetic interference, and microwave circuits.

Note(s): *A minimum mark of 40% is required in the examination to receive a passing grade. Laboratory attendance is compulsory.*

Co-ordinator(s):	*Associate Professor Rainer Künnemeyer*
Prerequisite(s):	*ENEL284 or PHYS201, and ENGG285 or MATH251*
Restriction(s):	*ENEL301-09A*
Equivalent:	*PHYS312*
Required book(s):	*To be advised*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

ELECTRONICS PAPERS

ENEL317-15B (HAM) – Microprocessor Applications and Control
20 Points
This paper provides an introduction to the field of mechatronics. Topics covered include a study of sensors and transducers, signal conditioning electronics, circuit analysis using both the Laplace and Z transforms, and PID control theory. Laboratory exercises in which microprocessors are interfaced to physical systems in order to monitor and/or control real-world processes. This paper includes a compulsory laboratory component.

Note(s): *A minimum mark of 40% in the internal tests is normally required in order to receive a passing grade.*

Co-ordinator(s):	*Associate Professor Howell Round*
Prerequisite(s):	*COMP103 and ENEL205 and one of ENEL211 or ENEL212*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

ENEL321-15B (HAM) – Application Specific Integrated Circuits
20 Points
The design and construction of integrated circuits including silicon and compound semiconductor IC fabrication, design hierarchy, circuit layout, operating reliability and failure, verification and test. Circuits that can only be fabricated in a monolithic environment are studied and built.

Co-ordinator(s):	*Professor Jonathan Scott*
Prerequisite(s):	*COMP103 and ENEL205 and one of ENEL211 or ENEL212*
Recommended book(s):	*Weste and Harris **CMOS VLSI Design** (Addison-Wesley) 2005; Grey and Meyer, **Analysis and Design of Analog Integrated Circuits***
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENEL324-15A (HAM) – Optoelectronics
20 Points
This paper discusses the principles of modern optoelectronic components and systems in particular lasers, semi-conductor devices, optoelectronic devices and optical fibres. Theoretical as well as practical aspects will be covered.

Note(s): *Laboratory attendance is compulsory. A minimum mark of 40% is required in the examination to receive a passing grade.*

Co-ordinator(s):	*Associate Professor Rainer Künnemeyer*
Prerequisite(s):	*MATH101, MATH102 and either ENEL285 or PHYS202*
Required book(s):	*Kasap **Optoelectronics and Photonics: Principles & Practices** 2nd ed (Prentice-Hall) 2013*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

ENEL382-15B (HAM) – High Speed Communications
20 Points
This lecture and laboratory paper introduces communications theory and its application to wireless and fibre-optic communication systems.

Note(s): *A minimum mark of 40% is required in the examination to receive a passing grade.*

Co-ordinator(s):	*Dr Sadhana Talele*
Prerequisite(s):	*One of ENGG283 or MATH253, and one of ENGG285 or MATH251*
Corequisite(s):	*ENEL324*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENEL385-15B (HAM) – Power Electronics
20 Points
This paper covers the theory and practice of power semiconductors, power converters, power management, protection, and variable speed drives.

Note(s): *A minimum mark of 40% is required in the examination to receive a passing grade.*

Co-ordinator(s):	*Nihal Kularatna*
Prerequisite(s):	*ENEL205*
Restriction(s):	*ENEL485 and ENEL585*
Required book(s):	*Kularatna.* ***DC Power Supplies, Power Management and Surge Protection for Power Electronic Systems*** *(CRC Press) 2012*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

400 Level Papers

ENEL417-15A (HAM) – Mechatronics
20 Points
This paper covers embedded micro-programming, feedback control, interface to electro-mechanical systems involving gears, motors, belt drivers, actuators and sensors: the enabling technologies of robotics. A series of projects require students to integrate software, control, mechanical and electromotive skills to achieve practical goals.

Co-ordinator(s):	*Professor Jonathan Scott*
Prerequisite(s):	*ENEL317*
Restriction(s):	*ENEL517*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

ELECTRONICS PAPERS

ENEL423-15B (HAM) – Electro-Optical Instrumentation
20 Points
Theoretical and practical aspects of advanced electro-optical instrumentation will be discussed and applied in practical sessions. Topics include telemeters, interferometers for velocity or vibration detection, optical gyroscopes, optical fibre sensors, and others.

Note(s): *A minimum mark of 40% in the examination is required to receive a passing grade. Laboratories are compulsory. This paper will only be offered if there are sufficient student numbers.*

Co-ordinator(s):	*Associate Professor Rainer Künnemeyer*
Prerequisite(s):	*ENEL324*
Restriction(s):	*ENEL322 and ENEL522*
Required book(s):	*To be advised*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENEL485-15B (HAM) – Power Electronics
20 Points
This paper covers the theory and practice of power semiconductors, power converters, power management, protection, and variable speed drives.

Note(s): *A minimum mark of 40% in the examination is required to receive a passing grade.*

Co-ordinator(s):	*Nihal Kularatna*
Prerequisite(s):	*ENEL205*
Restriction(s):	*ENEL385 and ENEL585*
Required book(s):	*Kularatna.* ***DC Power Supplies, Power Management and Surge Protection for Power Electronic Systems*** *(CRC Press) 2012*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENGG401-15A (HAM) – Control Theory and Image Processing
20 Points
For details see Engineering ENGG401.

ENGINEERING PAPERS

100 Level Papers

ENGG180-15A (HAM) – Foundations of Engineering
15 Points
Introduction to engineering analysis, engineering design, and the engineering profession. It includes: skills of a successful engineer, the nature of design and the design process; fundamental laws for engineering analysis, and accounting principles applied to mass and energy. Students undertake a design-build-test experience to practice design skills.

Co-ordinator(s): *Dr Rob Torrens*
Restriction(s): *ENGG302*
Equivalent: *ENMP101*
Assessment: *Internal assessment/examination ratio: 1 : 1*

200 Level Papers

ENGG279-15B (HAM) – Preparation for the Professional Workplace
0 Points
For details see Work Placements on page 134.

ENGG282-15B (HAM) – Engineering Design
10 Points
This core paper for BE(Hons) students introduces the design process as a problem-solving activity. This is reinforced by a group design project. Students also learn how to use and apply CAD design software and produce engineering drawings.

Co-ordinator(s): *Associate Professor Mike Duke*
Recommended book(s): *Cross **Engineering Design Methods** 3rd ed (Wiley) 2008*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENGG283-15A (HAM) – Linear Algebra for Engineers
10 Points
This paper develops the fundamental ideas and techniques of linear algebra, with an emphasis on the practical engineering aspects of the subject. Topics will be selected from: basis and dimension of a vector space, geometric effect of a matrix transformation, determinant, subspaces of vector spaces, linear independence, change of basis, range and kernel, eigenvectors and eigenvalues, diagonalisation of matrices, the inner product, orthonormal bases, the Gram-Schmidt process, orthogonal diagonalisation of symmetric matrices, complex Euclidean spaces, Hermitian matrices and their diagonalisation.

Co-ordinator(s): *Dr Nick Cavenagh*
Prerequisite(s): *MATH102*
Restriction(s): *MATH253*
Required book(s): *Anton **Elementary Linear Algebra** 8th or 9th ed (Wiley) 2000*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENGINEERING PAPERS

ENGG284-15B (HAM) – Differential Equations for Engineers
10 Points
This paper includes ordinary and partial differential equations with applications to engineering problems; first-order equations, systems of equations and higher-order equations, phase-plane diagrams and geometrical methods; solution to the wave equation, heat diffusion equation and Laplace's equation using separation of variables and Fourier series techniques.

Co-ordinator(s): *Woei Chet Lim*
Prerequisite(s): *MATH101 and MATH102*
Restriction(s): *MATH255*
Required book(s): *Boyce and Di Prima **Elementary Differential Equations and Boundary Value Problems** 7th or 8th ed (Wiley) 2003*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENGG285-15A (HAM) – Multivariable Calculus for Engineers
10 Points
Differentiation of functions of n-variables and vector functions; applications including tangent planes, normals and optimisation; integration in n-dimensions; and applications including curve length, surface areas and volumes. Further applications will be selected from: centre of mass co-ordinates and moments of inertia; gradient, divergence and curl operators; curvilinear co-ordinate systems; and integral theorems with applications to engineering problems.

Co-ordinator(s): *Yuri Litvinenko*
Prerequisite(s): *MATH101 and MATH102*
Restriction(s): *MATH251*
Recommended book(s): *Finney et al **Thomas' Calculus** 10th or 11th ed (Addison-Wesley) 2003*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENGG287-15A (HAM) – Engineering Applications
10 Points
Computer programming as a tool for engineering, using computer languages and systems to solve engineering problems.

Co-ordinator(s): *Associate Professor Alistair Steyn-Ross*
Prerequisite(s): *PHYS103 and one of COMP103 or COMP106 or COMP153*
Assessment: *Internal assessment/examination ratio: 1 : 1*

300 Level Papers

ENGG301-15A/B/C/Y (HAM) – Special Topic in Engineering
20 Points
An independent theoretical, literature or experimental investigation of an engineering topic, supervised by a member of staff. Progress is discussed in group seminars and assessment is based on activities such as a seminar, poster presentations and a full report.

Co-ordinator(s): *Dr James Carson*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENGG302-15A (HAM) – Engineering for Technology
20 Points
Engineering fundamentals and the design process; the relationships of engineering to technology. Includes a design-build-test experience and links to pedagogical teaching processes. This paper is only available for GradDip(Eng)(Technology Teaching).

Convenor(s): *Dr Rob Torrens*
Prerequisite(s): *At the discretion of the Head of School*
Restriction(s): *ENGG180*
Assessment: *Internal assessment/examination ratio: 3 : 2*

ENGG371-15C (HAM) – Engineering Work Placement 1
0 Points
For details see Work Placements on page135.

ENGG372-15C (HAM) – Engineering Work Placement 2
0 Points
For details see Work Placements on page 135.

ENGINEERING PAPERS

ENGG379-15A (HAM) – Reflection on Professional Workplace Experience
0 Points
For details see Work Placements on page 135.

ENGG381-15A (HAM) – Engineering Statistics
20 Points
This paper is aimed specifically at engineering students. It covers statistical models, experimentation for quality designing and control, process measurement and improvement, statistical process control and capability, and reliability.

Lecturer(s): *Dr Steven Miller*
Prerequisite(s): *MATH101 and MATH102*
Assessment: *Internal assessment/examination ratio: 1 : 1*

400 Level Papers

ENGG401-15A (HAM) – Control Theory and Image Processing
20 points
This paper deals with PID feedback control of linear systems using classical as well as state space methods. It is highly computer and project based.

Convenor(s): *Associate Professor Howell Round*
Prerequisite(s): *One of ENEL317 or ENME352*
Restriction(s): *ENGG501*
Required book(s): *Franklin et al. **Feedback Control of Dynamic Systems** 5th ed (Prentice Hall)*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENGG492-15A/B/C/Y (HAM) – Honours Research and Management Project
60 Points
Practical projects including design philosophy; market requirements; specifications; project planning and research; management components and material selection; basic design and analysis; computer aided design; prototype development; reliability; quality; safety; failure analysis and protection, regulations; standards and codes; documentation and patents. There is a substantial research component. This paper can only be taken for the BE(Hons).

Co-ordinator(s): *To be advised*
Programme Convenor(s): *Dr Johan Verbeek (Chemical and Biological Engineering), Professor Jonathan Scott (Electronic Engineering), Associate Professor Michael Walmsley (Materials and Process Engineering), Associate Professor Mike Duke (Mechanical Engineering) and Professor Steve Reeves (Software Engineering)*
Prerequisite(s): *All 100, 200, 300 Level BE(Hons) papers of the student's chosen programme.*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENVIRONMENTAL SCIENCES PAPERS

100 Level Papers

ENVS101-15B (HAM) – Environmental Science
15 Points
An interdisciplinary study of the fundamental concepts in environmental science. The paper includes ecosystems, nutrient cycles, population principles, water, soil and energy resources, wetlands, human food supplies, agrochemicals, heavy metals, the greenhouse effect, photochemical smog, and waste management.

Lecture material is complemented by a practical component that includes six three-hour laboratory sessions and two field trips.

Co-ordinator(s):	*Dr Megan Balks*
Lecturer(s):	*Dr Ian Duggan, Dr Megan Balks, Professor Bill Henderson and Associate Professor Conrad Pilditch*
Tutor(s):	*Tanya O'Neill*
Required reading:	*ENVS101 Study Guide*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

MATERIALS AND PROCESSING PAPERS

100 Level Papers

ENGG180-15A (HAM) – Foundations of Engineering
15 Points
For details see Engineering ENGG180.

ENMP102-15B (HAM) – Introduction to Materials Science and Engineering
15 Points
Engineers in all disciplines encounter and use materials in their various practices. To function effectively, an engineer needs to have some understanding of the properties and behaviour of materials. This is particularly relevant in design and maintenance, when engineers need to make important decisions on the choice of materials to be used in a component. This paper is, therefore, designed to address the introductory materials science requirements for first-year engineering programmes.

Co-ordinator(s): *Dr Rob Torrens*
Recommended book(s): *Callister et al **Materials Science and Engineering – An Introduction** 8th ed (Wiley) 2010*
Assessment: *Internal assessment/examination ratio: 1 : 1*

200 Level Papers

ENGG282-15B (HAM) – Engineering Design
10 Points
For details see Engineering ENGG282.

ENMP211-15A (HAM) – Materials 1
20 Points
Why are some materials as hard as nails, soft as putty, tough as old boots, or as strong as an ox? And how can they be improved? This paper introduces the basic concepts of materials technology and how to apply these concepts to everyday environments. You will be introduced to the uses and limitations of metals (ferrous and non-ferrous), ceramics/fine ceramics (superconductors, ionic conductors etc), cements and concrete, polymers and composite materials (natural, such as wood, and synthetic, such as carbon fibre-reinforced composites).

Co-ordinator(s): *Professor Kim Pickering*
Prerequisite(s): *15 points at Level 100 chemistry or equivalent credit, or ENMP102*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP213-15B (HAM) – Mechanics of Materials 1
20 Points
Students learn the basics of stress analysis used in mechanical engineering design. This course introduces the essential aspects of designing structures subjected to axial, bending and torsional loads. An important outcome is an introduction to the fundamental principles of stress analysis. This paper is taught through lectures, tutorials and a weekly workshop for problem solving.

Co-ordinator(s): *Professor Ilanko*
Prerequisite(s): *MATH101 and PHYS103*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP214-15B (HAM) – Manufacturing Processes
10 Points
This paper gives students an understanding of the fundamental principles and basic relationships underlying selected major manufacturing processes widely used in industry, including machining processes, metal casting, forming processes such as extrusion, welding and joining processes. Knowledge on metrology and non-destructive testing techniques will also be introduced. It is highly recommended that students taking this paper also take ENMP215.

Co-ordinator(s): *To be advised*
Prerequisite(s): *ENMP102*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP215-15B (HAM) – Manufacturing Technology
10 Points
This paper covers the practical aspects of manufacturing processes, and students have the opportunity to increase their practical workshop skills. The major processes covered by the paper include machining, casting, mechanical forming, welding, and printed board manufacturing. It is highly recommended that students taking this paper also take ENMP214.

Co-ordinator(s):	*Dr Chi Kit Au*
Prerequisite(s):	*ENMP102*
Required book(s):	*M. Groover **Automation, Production Systems and Computer Integrated Manufacturing** (Pearson)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENMP221-15A (HAM) – Engineering Thermodynamics
20 Points
This paper teaches fundamental concepts and laws of thermodynamics and thermodynamic properties of engineering materials, with applications to mass and energy analysis of chemical processes, power cycles, and refrigeration cycles. It includes laboratory work.

Co-ordinator(s):	*Dr Johan Verbeek*
Prerequisite(s):	*ENGG180 or ENMP102*
Required book(s):	*Cengel and Boles **Thermodynamics, an Engineering Approach** 6th ed (McGraw Hill)*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENMP222 – Biotechnology: Food and Bioresources
20 Points
This paper will not be offered in 2015.

ENMP223-15B (HAM) – Thermofluids
20 Points
This paper teaches fundamental concepts and laws related to static and dynamic behaviour of fluids, and heat transfer in steady and transient systems. It includes laboratory work.

Co-ordinator(s):	*Associate Professor Michael Walmsley*
Prerequisite(s):	*MATH101, PHYS103 or ENMP221*
Recommended book(s):	*Cengel and Cimbala **Fluid Mechanics - Fundamentals and Applications** 3rd ed (McGraw Hill)2008; Cengel and Ghajar **Heat and Mass Transfer** 4th ed (McGraw Hill)2008*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

ENMP241-15B (HAM) – Environmental Technology 1
20 Points
The Earth's natural environment suffers from the effects of past exploitative development. This paper combines the principles of science and engineering to find technological solutions for existing problems and design processes for future sustainable development. In this introductory paper, processes for maximising the benefit of the material resources taken from the environment (minerals, water, air, fossil fuels and biomass) and minimising waste and negative impacts will be discussed.

Co-ordinator(s):	*Dr Mark Lay*
Prerequisite(s):	*Any 30 points from 100 Level Science and Engineering papers, and 15 points from 100 Level Mathematics or Statistics*
Recommended book(s):	*Nazaroff and Alvarez-Cohen **Environmental Engineering Science** (Wiley) 2001*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

MATERIALS AND PROCESSING PAPERS

ENMP282-15A (HAM) – Science and Engineering Management A
10 Points
A study of the management function and activities relating to the needs of scientists and engineers. Topics include technology and innovation, communication and financial management.

This paper will not normally be available for a major in Materials and Processing.

Co-ordinator(s): *Dr James Carson*
Restriction(s): *ENGG280 and ENMP281*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP283-15B (HAM) – Science and Engineering Management B
10 Points
This core management paper for the BSc(Tech) is normally taken before the first industry placement. It is also a useful paper for other science students who want to be familiar with management terms and concepts. This paper provides a broad introduction to the essential aspects of management functions and activities. Topics include marketing, total quality management and ethics.

This paper will not normally be available for a major in Materials and Processing.

Co-ordinator(s): *Dr Johan Verbeek*
Restriction(s): *ENMP281*
Assessment: *Internal assessment/examination ratio: 1 : 1*

300 Level Papers

ENME351-15A (HAM) – Dynamics and Mechanisms
20 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

Introduction to force, moment, equilibrium, free body diagram, work, energy, impulse, momentum and Newton's Laws. Kinematics and kinetics of particles and rigid bodies, vibrations. Function and design of mechanical components. Students will learn to construct and solve mathematical models describing the effects of force and motion on a variety of structures, machines and other dynamic systems.

Co-ordinator(s): *Dr Marcus Wilson*
Prerequisite(s): *PHYS103*
Equivalent: *ENGG351*
Required book(s): *Meriam and Kraige **Engineering Mechanics** Vol 12 (Wiley) 2003*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENME352-15B (HAM) – Machine Dynamics and Control
20 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

Topics covered include vibrations of multiple degree of freedom systems, modelling and analysis for design improvements, vibration control, mathematical modelling, time, feedback and frequency response, control actions and controllers. Students will gain skills to allow them to design dynamic systems.

Co-ordinator(s): *Professor Ilanko*
Prerequisite(s): *ENME351*
Equivalent: *ENGG352*
Restriction(s): *ENEL317*
Recommended book(s): *Tongue **Principles of Vibration** (Oxford)*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENME380-15B (HAM) – Mechanical Engineering Design
20 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

Aspects of machine design and power transmission are covered. Engineering drawing and design techniques are further developed and applied through project work. The benefits and pitfalls of simulating mechanical designs is demonstrated and discussed. Electrical machines including DC, AC motors and solenoids are explained in a mechanical engineering context.

Co-ordinator(s): *Associate Professor Mike Duke*
Prerequisite(s): *ENGG282 and ENMP213*
Required book(s): Childs ***Mechanical Design*** 2nd ed (Arnold) 2004
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP301-15A/B/S/Y (HAM) – Special Topics in Technology
20 Points
This paper consists of directed studies on an aspect of technology or technological innovation. It may involve specified topics from other papers and/or independent theoretical literature, or experimental investigations. Students require permission from the Head of School to enrol in this course.

Co-ordinator(s): *Dr James Carson*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENMP311-15B (HAM) – Materials 2
20 Points
This paper advances knowledge presented in ENMP211 on structure, property, processing relationships fundamental to materials science engineering. The paper focuses on aspects of new materials, and the concept of advanced hi-tech materials. This paper includes microstructure modification, new materials and applications. With a basic understanding of the concepts, students will now start to understand the design philosophy. By the end of the paper, students will be able to understand the requirements for a particular application and be able to select materials on the basis of their properties.

Note(s): *This paper is recommended if proceeding to masters-level study in materials-related research.*

Co-ordinator(s): *Professor Kim Pickering*
Prerequisite(s): *ENMP211*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP313-15A (HAM) – Mechanics of Materials 2
20 Points
This paper aims to provide students with the knowledge and skills to design components and structures at an advanced level. It examines the scientific principles and relationships underlying mechanics and performance of materials, stress and strain transformations, failure criteria, deflections and angle of twist, stress in bending and fatigue. A major design project is incorporated in the paper to give students opportunities to apply the knowledge learnt in solving practical problems. By the end of the course students will have the essential knowledge and skills needed in designing components and structures in many engineering situations.

Co-ordinator(s): *Professor Brian Gabbitas*
Prerequisite(s): *ENMP213*
Assessment: *Internal assessment/examination ratio: 1 : 1*

MATERIALS AND PROCESSING PAPERS

ENMP321-15B (HAM) – Process Engineering and Design
20 Points
This paper provides advanced aspects of design and process technology for commercial production of biological, chemical and mineral products. The principles of chemical and biological engineering, including designing production systems, process simulation; process economics equipment design and separation technology. Once physical processes have been reviewed, the emphasis moves to process design – how to put together an integrated process and how to assess and implement it. A key component in the paper is process economics – will the process make money or not?

Co-ordinator(s): *Dr Johan Verbeek*
Prerequisite(s): *ENMP221*
Required text(s): *Seider, et al* ***Product & Process Design Principles*** *2nd ed (John Wiley and Sons, Inc.) 2004*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP322-15B (HAM) – Biotechnology
20 Points
The paper includes: Industrial biotechnological applications of enzymes and micro-organisms, principles of bioreactor and fermenter design and operation, industrial separation and purification of biological material, and selected unit operations for bioprocessing. Topics may also include biomass and alcohol production, enzymes in food processing, and biotechnologies in food and by-products. The computing laboratories cover aspects of bioreactor operation, fermentations and bioseparations.

Co-ordinator(s): *Dr Aydin Berenjian*
Prerequisite(s): *One of BIOL241, ENMP221 or ENMP222*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP323-15A (HAM) – Transport Processes and Unit Operations
20 Points
This paper covers analysis and application of fluid phase equilibria, heat and mass transfer and separation processes. The fundamentals of drying, evaporation, membrane separations, and distillation are discussed.

Co-ordinator(s): *Dr James Carson*
Prerequisite(s): *ENMP223*
Recommended book(s): ***Unit Operations of Chemical Engineers****, 7th ed (McGraw-Hill)*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP325-15A (HAM) – Engineering Microbiology
20 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

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.

Lecturer(s): *Associate Professor Ian McDonald*
Prerequisite(s): *ENMP221 and either BIOL101 or BIOL102*
Restriction(s): *BIOL241*
Required book(s): *Madigan et al* ***Brock Biology of Microorganisms*** *13th ed (Prentice-Hall)*
Assessment: *Internal assessment/examination ratio: 1 : 2*

ENMP341-15A (HAM) – Environmental Technology 2
20 Points
The paper focuses on technologies for air, water and energy that maximise the efficiency of resource utilisation and minimise waste generation and environmental impact. Energy technology and fuel science, particularly the development of renewable energy sources, minimisation of carbon emissions and air quality issues (indoor and outdoor) are important themes of the paper.

Co-ordinator(s): *Dr Mark Lay*
Prerequisite(s): *30 points at 100 Level in Science and Engineering papers*
Required book(s): *Nazaroff and Alvarez-Cohen **Environmental Engineering Science** (Wiley) 2001*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP381-15B (HAM) – Technological Innovation and its Management
20 Points
This paper is directed towards understanding the innovation process and examines the issues and important factors that ensure the new knowledge generated by scientific research finds application. It is designed to be interactive and draws upon and develops students' differing experiences of science and technology. Course content is organised in teaching blocks with topics including invention and creative thinking, technology evaluation, information technology, technological economics and technology project management. A feature of the paper is creating, evaluating and business planning for technological innovations, which is done in a small group environment.

The paper is internally assessed. Exercises of appropriate weighting are based upon each of the teaching blocks.

This paper will not normally be available for a major in Materials and Processing.

Co-ordinator(s): *Dr Mark Lay*
Prerequisite(s): *20 points from either ENMP282 or any 100 level Management subject, or 60 points from any 200 level Science and Engineering subject(s)*
Assessment: *Internal assessment/examination ratio: 1 : 0*

400 Level Papers

ENME440-15A (HAM) – Finite Element Analysis and Applications
20 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

This paper explains a general computational strategy to determine the response of a physical system to loads or other stimuli, in which the system is first divided into a large number of small finite elements of regular shape whose behaviour can be numerically modelled by solving the equations governed by the relevant laws of physics. Applications include finding the stresses and displacements due to loading in a structure, or the temperature distribution in a heat exchanger due to heat input. Practical application of the theory includes computer laboratory exercises where students will develop their own computer programs for simple problems and the use of commercial software to solve more complicated problems.

Co-ordinator(s): *Professor Ilanko*
Prerequisite(s): *ENGG285 or MATH251, and ENGG284 or MATH255, and ENMP313*
Restriction(s): *ENGG440, ENSC440, ENGG540 and ENSC540*
Assessment: *Internal assessment/examination ratio: 1 : 0*

MATERIALS AND PROCESSING PAPERS

ENME451-15B (HAM) – Mechanics of Vibration
10 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.
Note(s): *This paper will be offered only if there is sufficient student interest.*

Students will learn how to apply Newton's laws of motion and energy principles to complex mechanical systems, including continuous systems and how to calculate natural frequencies and dynamic response of machines and machine components.

Co-ordinators(s): *Professor Ilanko*
Prerequisite(s): *ENME351 and ENME352*
Restriction(s): *ENME352*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENME480-15A (HAM) – Advanced Product Development
10 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

The paper explains the technologically-driven changes affecting modern product development. It also teaches the most common rapid prototyping technologies and when to apply them. Examples of virtual engineering and simulation are demonstrated. Advanced manufacturing techniques are explained and demonstrated.

Co-ordinator(s): *Associate Professor Mike Duke*
Prerequisite(s): *ENGG180, ENGG282 and ENME380*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENMP407-15A/B (HAM) – Materials and Processing Elective
10 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

An advanced study in materials and processing. Possible options include: advanced composites; metals; bioseparations processing; environmental technology. Sub-topics include: available processing options; effect of material characteristics on processing parameters.

Co-ordinator(s): *Dr James Carson*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENMP411-15A (HAM) – Advanced Materials Engineering
10 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

An advanced study of the relationships between processing and microstructure of engineering materials. Sub-topics include solidification, ceramic processing, joining and repairs of composite materials and powder metallurgy.

Co-ordinator(s): *To be advised*
Prerequisite(s): *ENMP311*
Assessment: *Internal assessment/examination ratio: 1 : 4*

ENMP413-15B (HAM) – Materials Performance in Service
10 Points
This paper is normally only available to students enrolled in the BE(Hons) degree.

Students will learn the importance of design to avoid fracture using fracture mechanics, advanced stress analysis, including plasticity and advanced fatigue, and creep behaviour at elevated temperature.

Co-ordinator(s): *Professor Brian Gabbitas*
Prerequisite(s): *ENMP313*
Required book(s): *Jones **Engineering Materials 3** (Pergamon) 1993*
Assessment: *Internal assessment/examination ratio: 3 : 7*

ENMP422-15A (HAM) – Advanced Process Simulation and Control
20 points
This paper is normally only available to students enrolled in the BE(Hons) degree.

Process dynamics, simulation and control and modern control systems, including open and closed loop, linear and non-linear systems, PID control, stability and tuning. Includes process simulation with commercial software packages.

Convenor(s): *Associate Professor Michael Walmsley*
Prerequisite(s): *ENMP321 or ENME352*
Restriction(s): *ENMP421*
Required book(s): *Seborg et al **Process Dynamics and Control** (Wiley)*
Assessment: *Internal assessment/examination ratio: 2 : 3*

ENMP427-15A (HAM) – Biochemical Engineering
20 points
This paper is normally only available to students enrolled in the BE(Hons) degree.

This paper describes concepts of using biological materials for producing biomolecules, cell-based products and tissues, and carrying out transformations. The principles of downstream separation processes important in the bioprocess industries; modelling and costing such processes are included.

Co-ordinator(s): *Dr Mark Lay*
Prerequisite(s): *ENMP321 and ENMP322*
Restriction(s): *ENMP426*
Assessment: *Internal assessment/examination ratio: 1 : 1*

ENMP442 – Environmental Technology 3
20 points
This paper will not be offered in 2015.

PHYSICS PAPERS

100 Level Papers

ENEL111-15A (HAM) – Introduction to Electronics
15 Points
For details see Electronics ENEL11.

PHYS100-15A (HAM) – Exploring Physics
15 Points
This introductory paper requires only a basic knowledge of school mathematics or physics. This paper is of interest and importance to scientists, technologists, mathematicians, engineers and teachers in all disciplines who want to understand the laws and processes that govern the world around us. Students who successfully complete this paper can also take PHYS103.

Co-ordinator(s):	*Dr Michael Cree*
Prerequisite(s):	*14 credits at Level 2 NCEA in one of Mathematics or Physics, or a minimum of 8 credits at Level 3 in NCEA across Statistics and Modelling and/or Mathematics with Calculus and/or Physics*
Required book(s):	*Kirkpatrick and Francis* ***Physics: A Conceptual World View*** *(7th ed) with Problem Solving Supplement (Brooks/Cole) 2010*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

PHYS103-15B (HAM) & 14B (SEC) – Physics for Scientists and Engineers 1
15 Points
An introduction to physics for scientists and engineers. Applications of physics to the real world will be emphasised. There are three modules: Module 1 – Dynamics Module; 2 – Electricity and magnetism, electromagnetic waves, optics; and Module 3 – Statics. All students will study Module 1. The choice of second module will depend on the student's nominated degree programme.

Note(s): *A minimum mark of 40% is required in the examination to receive a passing grade.*

Co-ordinator(s):	*Associate Professor Alistair Steyn-Ross*
Prerequisite(s):	*(14 credits NCEA Level 3 Physics OR PHYS100) AND (14 credits NCEA Level 3 Calculus OR one of MATH165, MATH101 or MATH102)*
Required book(s):	Module 1: *Wolfson* ***Essential University Physics****, Vol 1 (Pearson Addison-Wesley) 2013* Module 2: *Wolfson* ***Essential University Physics****, Vol 2 (Pearson Addison-Wesley) 2013* Module 3: *Meriam and Kraige* ***Engineering Mechanics: Statics*** *(Wiley) 2012*
Assessment:	*Internal assessment/examination ratio: 1 : 1*

200 Level Papers

ENEL205-15B (HAM) – Analog Electronics and Circuit Analysis
20 Points
For details see Electronics ENEL205.

ENEL284-15B (HAM) – Electricity and Magnetism
10 Points
For details see Electronics ENEL284.

ENEL285-15A (HAM) – Quantum and Solid State Physics
10 Points
For details see Electronics ENEL284.

PHYS204-15B (HAM) – Experimental Physics
20 Points
A laboratory-based paper with emphasis on developing experimental techniques, measurement skills, analysis and organisation of results. Experiments cover measurement of fundamental constants, biophysics, scientific and industrial applications and use of physical devices and instruments.

Co-ordinator(s):	*Dr Marcus Wilson*
Prerequisite(s):	*PHYS103*
Recommended book(s):	*Kirkup **Experimental Methods** (Wiley) 1994; Squires **Practical Physics**, 4th ed (Cambridge) 2001*
Assessment:	*Internal assessment/examination ratio: 1 : 0*

PHYS205-15A (HAM) – Relativity, Nuclear and Astrophysics
10 Points
This paper covers special and general relativity, nuclear physics and elementary astrophysics and cosmology.

Co-ordinator(s):	*Professor Moira Steyn-Ross*
Prerequisite(s):	*MATH101 and one 100 level Physics paper, or 24 credits at Level 3 in NCEA physics and mathematics with calculus, or equivalent.*
Corequisite(s):	*ENEL285, MATH251, MATH253, MATH255*
Restriction(s):	*ENEL281, PHYS202, PHYS304*
Required book(s):	*Krane **Modern Physics**, 2nd ed (Wiley)*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

PHYS206-15B (HAM) – Statistical and Thermal Physics
10 Points
This paper covers topics such as temperature, thermodynamics and thermal properties of matter.

Co-ordinator(s):	*Dr Michael Cree*
Prerequisite(s):	*MATH101 and PHYS103*
Corequisite(s):	*MATH251, MATH253 and 20 further points at 200 level in mathematics*
Required book(s):	*Carter **Classical and Statistical Thermodynamics** (Prentice-Hall) 2001*
Assessment:	*Internal assessment/examination ratio: 1 : 2*

PHYSICS PAPERS

300 Level Papers

ENEL312-15A (HAM) – Electromagnetic Waves
20 Points
For details see ENEL312 Electronics.

ENEL324-15A (HAM) – Optoelectronics
20 Points
For details see ENEL324 Electronics.

PHYS302-15B (HAM) – Quantum Physics
20 Points
This paper covers classical Lagrangian theory, Hamilton's equations, basic postulates of quantum mechanics, representations, Dirac notion, angular momentum, perturbation theory, conceptual problems and solid state theory.

Co-ordinator(s): *Professor Moira Steyn-Ross*
Prerequisite(s): *PHYS205 and ENEL285 (or only PHYS202), and MATH251 and MATH253*
Assessment: *Internal assessment/examination ratio: 1 : 2*

PHYS315-15A (HAM) – Computational Biophysics
20 Points
This is a lecture and computer laboratory paper on computational methods used in neuroscience and biophysics. Topics covered include linear and non-linear differential equations, Euler and Runge-Kutta integration methods, limit cycles, action potential generation, hysteresis and memory in simple neural systems, stability, noise simulation, and root finding. The programming language used is MATLAB.

Co-ordinator(s): *Associate Professor Alistair Steyn-Ross*
Prerequisite(s): *PHYS103 and any two of MATH251, MATH253, MATH255, ENGG283, ENGG284, ENGG285, and ENGG287*
Restriction(s): *PHYS516*
Recommended book(s): The Student Edition of ***MATLAB Student User Guide*** latest edition *(Prentice-Hall); Wilson* ***Spikes, Decisions, and Actions*** *(Oxford University Press) 1999*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PHYS318-15A/B/C/Y (HAM) – Special Topics in Physics
20 Points
A library research paper and/or experimental project in selected topics in physics, supervised on a tutorial basis and examined by written reports and/or experimental exercises.

Note(s): *Available on invitation only.*

Co-ordinator(s): *Dr Marcus Wilson*
Corequisite(s): *As appropriate to topic*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYCHOLOGY PAPERS

Note(s): *Papers marked * are considered Science papers for the BSc degree. Papers not marked with an * will contribute towards the points allowed outside Science.*

100 Level Papers

PSYC101-15S (HAM) (NET) – Foundations of Psychology
15 Points
The course will introduce the student to some of the major issues and discoveries in the science of psychology. These range from the study of biological basis of behaviour, motivation and emotion; mental processes like memory, thinking and language; social perceptions and co-operation; through to abnormal psychology and the practice of clinical psychology. An overview of the many and varied careers available to people trained in psychology will also be discussed.

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

PSYC102-15B (HAM) (TGA) – Social and Developmental Psychology*
15 Points
An overview of psychological research and development of the person as a social being and on the interaction between the individual person and the groups, communities and global society to which we all belong.

Required book(s): *Text book to be advised*
Assessment: *Internal assessment/examination ratio: 6 : 4*

PSYC103-15A (HAM) (TGA) – General and Experimental Psychology*
15 Points
The emphasis in this paper is on the individual human being and his or her functioning. This involves examining the processes of development; learning, perception and cognition; and an introduction to the underlying biological basis of behaviour. There is a basic statistics component. Later sections of the paper deal with more applied aspects such as psychological testing and clinical psychology.

Required book(s): *Text book to be advised;* ***Statistics and Laboratory Manual****: available from Campus Copy*
Assessment: *Internal assessment/examination ratio: 4 : 1*

200 Level Papers

PSYC206-15B (HAM) – Animal Behaviour: Principles and Applications*
20 Points
This paper is for BSc or BSc(Tech) students only. (See PSYC304 for details).

Restriction(s): *PSYC304*
Assessment: *Internal assessment/examination ratio: 3 : 1*

PSYC208-15B (HAM) (TGA) – Psychological Research: Analysis, Design and Measurement*
20 Points
As a science, psychology involves certain standard research procedures so that a particular piece of research will provide an unambiguous result. In common with other social sciences, psychology has developed research methods different to those of the physical sciences. Anyone who wishes to read and understand research reports in psychology must be aware of typical research designs and statistical techniques common to such designs. The paper covers both data analysis and research methods.

Prerequisite(s): *PSYC103 or equivalent*
Assessment: *Internal assessment/examination ratio: 3 : 1*

PSYCHOLOGY PAPERS

PSYC209-15S (HAM) – Companion Animal Behaviour*
20 Points
Research on contemporary issues of interest to those who own or work with companion animals will be examined, including topics surrounding human-animal interactions and companion animal welfare. Strategies for dealing with people in an advisory setting will also be covered. Determinants of problem behaviours such as stereotypies, phobias, animal-animal aggression and animal-human aggression will be examined, along with strategies to modify or manage these problems. The application of learning theory to promote desired behaviours will also be discussed.

Note(s): *Students would normally have taken 15 points in Psychology or Biological Sciences. This paper cannot be used as a substitute for an existing prerequisite for other courses that constitute the major in Psychology.*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC225-15A (HAM) (TGA) – Behavioural Psychology and Learning*
10 Points
This paper extends further the study of learning and behaviour given in the 100 Level paper PSYC103 and will prepare you for the 300 Level paper PSYC314. This paper covers some of the philosophy and subject matter of behavioural psychology and examines some applications. Laboratory work involving animals is required.

Prerequisite(s): *PSYC103 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 2 or 2 : 1*

PSYC226-15A (HAM) (TGA) – The Psychology of Perception*
10 Points
You will be introduced to the problems and methods involved in the study of perceptual and cognitive processes. The aim is to make you "more observant of your environment, more aware of your own perceptions, and more appreciative of the miraculous process that transforms energy falling on receptors into the richness of experience" (Goldstein, Sensation and Perception).

Prerequisite(s): *PSYC103 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC227-15A (HAM) (TGA) – Foundations of Behavioural Neuroscience*
10 Points
This paper explores how physiological processes of the nervous system can interact with behaviour, and as important, how behaviour, cognition, and environment may exert their influence on bodily systems.

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

PSYC228 -15A (HAM) (TGA) – Culture, Ethnicity and Psychology

10 Points
This paper explores culture, with an emphasis on Māori culture, as well as ethnicity and context and how these all play a major role in understanding behaviour and how psychological knowledge is constructed and applied within Aotearoa/New Zealand. This paper explores a psychological understanding of culture and ethnicity. Topics include Aotearoa/New Zealand in the global context, the Treaty of Waitangi, cultural concepts in the Māori world, kaupapa Māori and cross-cultural research, cross-cultural interaction styles, discrimination, networking in diverse communities, and ethical issues in Māori-focused research.

Prerequisite(s): *PSYC102 or equivalent*
Assessment: *Internal assessment/examination ratio: 2 : 1*

PSYC229-15B (HAM) (TGA) – Contemporary Issues and Social Psychology
10 Points
Social issues can be considered using both foundational and emerging theories of psychology that focus on social behaviour. This paper examines key theories in social psychology in relation to issues in contemporary society.

Prerequisite(s): *PSYC102 or equivalent*
Assessment: *Internal assessment/examination ratio: 3 : 2*

PSYC230-15B (HAM) (TGA) – Cognitive Psychology*
10 Points
This paper will introduce you to issues, theories, and research in the study of human cognition, and give you an understanding of the mental processes underlying memory, thinking and language use.

Prerequisite(s): *PSYC103 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 0*

300 Level Papers

HDCO340-15A (HAM) – Perspectives on Counselling
20 Points
An examination of the philosophical, psychological and sociological principles that underpin the aims and methods of the helping professions in general, and counselling in particular.

Prerequisite(s): *40 points at 200 Level in Education Studies, Human Development, Professional Education or Psychology*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC301-15B (HAM) (TGA) – Community, Culture and Diversity: Applied Social Psychology
20 Points
Applied social and community psychologists cover a diverse set of research areas, theoretical stances and approaches to researching and addressing social issues. Additionally, there are connections between the topic areas studied by applied social and community psychologists and other social scientists. Thus, in applied settings, social psychologists often learn from and work with people from other disciplines. In this paper we explore different approaches to applied social and community psychologies and examine a selection of particular issues that are informed by major theoretical orientations. These include diversity, Tiriti O Waitangi, health, criminal justice, media, social power, poverty, and interventions.

Prerequisite(s): *PSYC228*
Restriction(s): *PSYC312, PSYC313, PSYC318, PSYC327, PSYC328*
Assessment: *Internal assessment/examination ratio: 7 : 3*

PSYC304-15B (HAM) – Animal Behaviour: Principles and Applications*
20 Points
A review of experimental evidence on the determinants of animal behaviour and animal welfare, with special emphasis on domestic animals and practical aspects of animal handling and care. The paper uses farm companion, wild and other animals as illustrations, furnishing an understanding of how to care for and handle animals with due regard to their welfare. Domestic animal behaviour is considered in relation to practical problems in animal handling and New Zealand agriculture. Laboratory and fieldwork are required.

Restriction(s): *PSYC206*
Assessment: *Internal assessment/examination ratio: 3 : 1*

PSYCHOLOGY PAPERS

PSYC307-15A (HAM) (TGA) – Research Methods*
20 Points
This paper examines research design, research methods and statistical methods additional to those covered in PSYC208. Topics include qualitative methods, single-subject designs and some multivariate analysis methods. Practicals involve training in computer-based data analysis. This paper is required for students who wish to proceed to graduate study in psychology.

Prerequisite(s): *PSYC208 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC310-15B (HAM) (TGA) – Psychology and Gender
10 Points
This paper examines the contribution of psychological research and theory to understanding issues of gender, sexual orientation, gender roles and gender relationships.

Restriction(s): *PSYC309*
Assessment: *Internal assessment/examination ratio: 2 : 1*

PSYC314-15B (HAM) – Behaviour Analysis*
20 Points
This paper examines experimental, applied and conceptual/philosophical issues in learning and behaviour analysis. The content follows from PSYC225 and extends coverage of applied behaviour analysis, introduces behaviour therapies and provides the background required for studying learning and its applications to human and animal behaviour at graduate level. Emphasis is placed on linking the experimental and applied literatures to foster a scientist-practitioner approach to problem solving. There are required readings, two 2-hour lectures per week, and practicals involving brief experiments with humans as well as experience in shaping and altering the behaviour of an animal under laboratory conditions.

Prerequisite(s): *PSYC225 or equivalent*
Assessment: *Internal assessment/examination ratio: 2 : 1 or 1 : 2*

PSYC317-15B (HAM) – Organisational Psychology
20 Points
This paper will introduce you to the psychology of work and organisational behaviour. Topics include job-relevant issues such as job design and work attitudes, career choice and personnel selection, training and performance appraisal, quality of work life and job stress. The paper also considers organisational processes such as leadership, communication, conflict management and organisational development. Emphasis is given to understanding and applying psychological theory and research.

Prerequisite(s): *One of PSYC102, HRMG241, HRMG341 or HRMG342 or equivalents*
Assessment: *Internal assessment/examination ratio: 3 : 1*

PSYC319-15B (HAM) (TGA) – Psychological Perspectives on Child Development
10 Points
This paper focuses on the psychological study of children's cognitive, emotional, and social development, with attention to the applications and implications of these findings in the New Zealand context.

Prerequisite(s): *PSYC102 or PSYC103 or HDCO100 or equivalents*
Assessment: *Internal assessment/examination ratio: 2 : 1*

PSYC337-15A (HAM) – Psychological Measurement*
10 Points
This paper covers basic issues in psychological measurement and observation applicable across a range of psychological specialities. In addition to measurement theory topics covered include the history of measurement, intelligence and its measurement, personality theories and the measurement of personality, behavioural and clinical assessment, measurement with disability, in all topic there is an emphasis on both measures and strategies appropriate for the New Zealand context and on cultural considerations.

Prerequisite(s): *PSYC208 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 2 or 2 : 1*

PSYC338-15A (HAM) (TGA) – Abnormal Psychology*
10 Points
This paper deals with the classification and treatment of the major classes of psychopathology.

Prerequisite(s): *PSYC102 or PSYC103 or equivalent*
Assessment: *Internal assessment/examination ratio: 1 : 1*

PSYC340-15A (HAM) – Applied Cognitive Psychology*
10 Points
This paper covers theories and research into human attention, memory, cognitive workload, situation awareness, decision-making, and their application to transportation, product design, information technologies, and forensic psychology.

Prerequisite(s): *PSYC230 or equivalents*
Restriction(s): *PSYC305*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC341-15B (HAM) – Visual Neuroscience and its Applications*
10 Points
This paper examines some of the neural mechanisms underlying our sensations and perceptions (especially vision). At the completion of the course students will have acquired an understanding of the relationship between basic research findings and a broad range of applications.

Prerequisite(s): *PSYC226 or equivalent*
Restriction(s): *PSYC305*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYCHOLOGY PAPERS

PSYC344-15A (HAM) – Physiology of Human Potential and Development*
10 Points
This paper offers a continuation of the material in physiological psychology covered in PSYC227, with more coverage on physiological aspects of cognitive and physical performance and development.

Prerequisite(s): *PSYC227 or equivalent*
Restriction(s): *PSYC305*
Assessment: *Internal assessment/examination ratio: 1 : 0*

PSYC388-15A/B/S (HAM) (TGA) – Directed Study
10 Points
Please refer to explanatory narrative under PSYC390.

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

PSYC390-15A/B/S/Y (HAM) (TGA) – Directed Study
20 Points
Students may nominate a field of study and proceed to cover it by their own reading and research under the personal direction of a staff member. Entry to a directed study requires approval from Psychology prior to enrolment. A directed study cannot be taken as part of psychology major or used to raise grade average. You should obtain the lecturer's approval and signature on a directed study enrolment sheet (available from the School of Psychology office). You are advised to refer to the psychology staff photo board or the school's website (**http://psychology.waikato.ac.nz**) to find out more about the research interests of individual staff members.

Note(s): *A 300 Level Directed Study may only be taken by students who have enrolled in or passed taught 300 Level psychology papers to the value of 60 points. A directed study cannot be included in the 60 points which make up a major in Psychology. Furthermore, 300 Level Directed Studies may not be used to raise your grade average for entry into the graduate programme.*

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

WORK PLACEMENT PAPERS

Bachelor of Science (Technology) Work Placement Papers

Note(s): *For contact details of Work Placement Co-ordinators please refer to page 78.*

200 Level Papers

SCIE279-15B (HAM) – Preparation for the Professional Workplace
10 Points
This paper consists of preparation of students entering the science workplace as part of the BSc(Tech) work placement programme. The paper includes lectures, workshops, and one-on-one meetings with placement co-ordinators. The paper covers professional development, placement interview preparation and technique, career mentoring/direction, placement selection process, company background research, self-assessment tools, professional behaviour, technical writing, occupational health and safety, and placement interview attendance.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *ENMP282 and SCIE371*
Assessment: *Internal assessment/examination ratio: 1 : 0*

300 Level Papers

SCIE371-15C (HAM) – Science Work Placement 1
20 points
This paper is the first work placement for the BSc(Tech) degree and typically undertaken during the summer at the end of the second year. This paper involves 400 hours of work experience at an approved subject-related organisation. Placements are secured by the Cooperative Education Unit and students are paid seasonal rates during the work placement. Assessment is based on several assessment activities during the placement, co-ordinator site visits, and employer evaluation of the work performance. Students are required to have completed SCIE279 in order to commence this paper.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *SCIE279*
Assessment: *Internal assessment/examination ratio: 1 : 0*

SCIE372-15C (HAM) – Science Work Placement 2
20 points
This paper is the second work placement for the BSc(Tech) degree and usually the first part of the 'long placement' (400 hours). This paper commences in the summer at the end of the third year and students should have completed SCIE379 before beginning this paper. Usually students enrol in the subsequent SCIE373 paper at the beginning of the fourth year.

Students may undertake an applied project at an approved subject-related organisation. Placements are secured for you by the Cooperative Education Unit and students are paid seasonal rates during the work placement. Assessment is based on several assessment activities during the placement, co-ordinator site visits, and employer evaluation of the work performance.

There is an option of 'fast-tracking' into a masters degree by enrolling in 372, completing 10 weeks of work experience instead of six-nine months, and then commencing a masters at the beginning of the fourth year; however, this must be discussed with the course co-ordinator early in the third year.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *SCIE379*
Assessment: *Internal assessment/examination ratio: 1 : 0*

WORK PLACEMENT PAPERS

SCIE373-15C (HAM) – Science Work Placement 3
20 points
This paper is the last part of the long placement, commencing at the beginning of the fourth year and immediately after the second summer placement (SCIE372). Usually this placement is at the same supporting organisation. Assessment is based on co-ordinator site visits, evaluation of the work performance, and a comprehensive written technical report giving an overview of the work and analysis of the outcomes.

Convenor(s): *Dr Karsten Zegwaard*
Prerequisite(s): *SCIE371, SCIE379*
Assessment: *Internal assessment/examination ratio: 1 : 0*

SCIE379-15A (HAM) – Reflection on Professional Workplace Experience
10 Points
This paper consists of post-placement reflection upon completion of the first science work placement and the required preparation for the second work placement. This paper includes lectures, workshops, and one-to-one meetings with placement co-ordinators. There is a focus on reflective learning from the placement experience, self-assessment outcomes initiated in the SCIE279 paper, portfolio completion, skill and skill-gap analysis, career mentoring and direction, CV updates, and the next placement selection process. Students are required to have completed a work placement paper before commencing this paper.

Convenor(s): *Dr Karsten Zegwaard*
Prerequisite(s): *SCIE279*
Assessment: *Internal assessment/examination ratio: 1 : 0*

Bachelor of Engineering (Honours) Work Placement Papers

Note(s): *For contact details of Work Placement Co-ordinators please refer to page 78.*

200 Level Papers

ENGG279-15B (HAM) – Preparation for the Professional Workplace
0 Points
This paper consists of preparation of students entering the engineering workplace as part of the BE(Hons) work placement programme. The paper includes lectures, workshops, and one-on-one meetings with placement co-ordinators. The paper covers professional development, placement interview preparation and technique, career mentoring/direction, placement selection process, company background research, self-assessment tools, professional behaviour, technical writing, occupational health and safety, and placement interview attendance.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *ENMP282 and ENGG371*
Assessment: *Internal assessment/examination ratio: 1 : 0*

300 Level Papers

ENGG371-15C (HAM) – Engineering Work Placement 1
0 Points
The first work placement for the Bachelor of Engineering (Honours) degree is typically undertaken during summer at the end of the second year, and involves 400 hours of work experience at an approved engineering organisation relevant to your studies. Placements are secured by the Cooperative Education Unit and students are paid seasonal rates during the work placement. Assessment is based on several assessment activities during the placement, co-ordinator site visits, and evaluation of the work performance. Students are required to have completed ENGG279 before doing this paper.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *ENGG279*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENGG372-15C (HAM) – Engineering Work Placement 2
0 Points
The second work placement for the Bachelor of Engineering (Honours) degree is typically undertaken during summer at the end of the third year, and involves 400 hours of work experience at an approved engineering organisation relevant to your studies. Placements are secured by the Cooperative Education Unit and students are paid seasonal rates during the work placement. Assessment is based on several assessment activities during the placement, co-ordinator site visits, and evaluation of the work performance. Students are required to have completed ENGG379 before doing this paper.

Convenor(s): *Dr Karsten Zegwaard*
Corequisite(s): *ENGG379*
Assessment: *Internal assessment/examination ratio: 1 : 0*

ENGG379-15A (HAM) – Reflection on Professional Workplace Experience
0 Points
This paper consists of post-placement reflection upon completion of the first engineering work placement and the required preparation for the second work placement. This paper will include lectures, workshops, and one-on-one meetings with placement co-ordinators. There will be focus on reflective learning from the placement experience, self-assessment outcomes initiated in the ENGG279 paper, portfolio completion, skill and skill-gap analysis, career mentoring and direction, CV updates, and the next placement selection process. To do this paper you must have completed ENGG371 or ENGG372.

Convenor(s): *Dr Karsten Zegwaard*
Prerequisite(s): *ENGG279*
Assessment: *Internal assessment/examination ratio: 1 : 0*