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**BIOLOGICAL SCIENCES PAPERS**

All 500 Level papers are delivered subject to demand and staff availability.

**BIOL503-15A (HAM) – Data Analysis and Experimental Design**  
**15 Points**  
This paper will cover aspects of research design for experiments, and methods for analysis of ecological data using univariate and multivariate statistical techniques.  
*Convenor(s): Dr Ian Duggan*  
*Prerequisite(s): BSc*  
*Restriction(s): BIOL501*  
*Assessment: Internal assessment/examination ratio: 1 : 0*

**BIOL560-15A (HAM) – Freshwater Ecology**  
**15 Points**  
A critical examination of issues including pollution, conservation, and utilisation, that freshwater ecosystems face and methods to mitigate potentially competing interests.  
*Convenor(s): Associate Professor Ian Hogg*  
*Prerequisite(s): BSc, BIOL313 or equivalent*  
*Restriction(s): BIOL513*  
*Assessment: Internal assessment/examination ratio: 3 : 7*

**BIOL561-15B (HAM) – Aquatic Ecosystem Modelling**  
**15 Points**  
This paper examines the different types of models that may be applicable in aquatic ecosystem modelling, including statistical, empirical, and process-based models. The key steps to setting up a model application are covered as well as the limitations and pitfalls of each type of model. Applications of the models are demonstrated for different lake ecosystems, with students having an opportunity to apply the models to questions of relevance to aquatic ecosystem managers.  
*Convenor(s): Professor David Hamilton*  
*Prerequisite(s): BSc, BIOL313 or equivalent third-year ecology unit*  
*Assessment: Internal assessment/examination ratio: 1 : 0*

**BIOL562-15C (BLK) – Marine and Estuarine Ecology**  
**15 Points**  
This paper focuses on a variety of contemporary issues in marine ecology and biological oceanography including: fisheries biology and management, recruitment, ecology of disturbances, benthic-pelagic coupling, aquaculture and primary production.  
*Convenor(s): Associate Professor Conrad Pilditch*  
*Prerequisite(s): BSc, BIOL314 or equivalent*  
*Restriction(s): BIOL514*  
*Assessment: Internal assessment/examination ratio: 3 : 7*

**BIOL563-15B (HAM) – Aquatic Field Methods**  
**15 Points**  
This paper focuses on sampling methods, as well as experimental design and data analyses related to biological field studies in marine and freshwater sciences.  
*Convenor(s): Associate Professor Ian Hogg*  
*Prerequisite(s): BSc, BIOL313 or BIOL314 or equivalent*  
*Corequisite(s): BIOL560 or BIOL562*  
*Assessment: Internal assessment/examination ratio: 1 : 1*
BIOLOGICAL SCIENCES PAPERS

BIOL564-15B (HAM) – Restoration Ecology
15 Points
Aspects of health, vitality, resilience and restoration of ecosystems. Topics covered include restoration principles, theory and practice; lake restoration; river and stream restoration; wetland restoration; and forest restoration.

Convenor(s): Dr Daniel Laughlin
Prerequisite(s): BSc, BIOL312 or BIOL325 or equivalent
Corequisite(s): BIOL570
Restriction(s): BIOL515
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL565-15A (HAM) – Molecular Ecology
15 Points
This paper is open to students interested in molecular ecology, systematics, and environmental molecular biology. Topics covered include DNA barcoding, conservation and evolutionary genetics, and phylogenetics.

Convenor(s): Professor Craig Cary
Prerequisite(s): BSc, at least one of the following papers: BIOL310, BIOL312, BIOL313, BIOL326, BIOL338, BIOL341 or equivalent
Restriction(s): BIOL522
Assessment: Internal assessment/examination ratio: 3 : 7

BIOL570-15A (HAM) – Plant Ecology
15 Points
Contemporary and advanced topics in plant ecology, including the structure and functioning of plant communities, species and community distribution theory, vegetation dynamics, vegetation surveying and data analysis.

Convenor(s): Dr Daniel Laughlin
Prerequisite(s): BSc, BIOL312, BIOL313 or BIOL325 or equivalent
Corequisite(s): BIOL571
Restriction(s): BIOL521
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL571-15B (HAM) – Plant Function
15 Points
Contemporary topics in plant environmental physiology, with an emphasis on the functioning of plants at the physiological, whole plant and ecological level. Topics will include the acquisition of carbon and water by plants and limitations to plant productivity in natural and managed environments.

Convenor(s): Dr Mike Clearwater
Prerequisite(s): BSc, BIOL312 or BIOL325 or equivalent
Corequisite(s): BIOL570
Restriction(s): BIOL521
Assessment: Internal assessment/examination ratio: 1 : 1
BIOL572-15B (HAM) – Animal Behaviour
15 Points
The purpose of this paper is to provide students with an understanding of contemporary approaches to the study of animal behaviour, exploring recent literature on (1) the function of behaviour, (2) the evolutionary history of behaviour, (3) the development of behaviour, and (4) the mechanisms of behaviour. Special attention will be devoted to developing an appreciation of experimental design and fostering an ability to think critically about ethological research questions.

Convenor(s): Professor Joseph Waas
Prerequisite(s): BSc, BIOL333 or equivalent
Restriction(s): BIOL533
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL573-15A (HAM) – Conservation Biology
15 Points
The purpose of this paper is to explore the general principles of conservation biology, with special reference to threatened species, aquatic animals and plants.

Convenor(s): Professor Joseph Waas
Prerequisite(s): BSc and BIOL312, BIOL333, BIOL338 or equivalent
Restriction(s): BIOL533
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL574-15A (HAM) – Mammalian Physiology
15 Points
This paper examines selected topics in the physiology of humans and other mammals. Students will develop an understanding of physiological control systems and the integration of structure and function. We will discuss issues related to health and disease in the context of molecular, systems and behavioural physiology.

Convenor(s): Dr Pawel Olszewski
Prerequisite(s): BSc, BIOL335 (or external equivalent)
Restriction(s): BIOL535
Assessment: Internal assessment/examination ratio: 2 : 3

BIOL575-15B (HAM) – Applied Topics in Physiology
15 Points
This paper examines selected topics in animal physiology with particular emphasis on applicability of physiology research in the biomedical and agricultural setting. University, hospital and industry-based lecturers contribute to this class, helping students to develop an understanding of the application of physiological knowledge and principles to commercial and medical technologies.

Convenor(s): Dr Pawel Olszewski
Prerequisite(s): BSc, BIOL335 (or external equivalent)
Restriction(s): BIOL535
Assessment: Internal assessment/examination ratio: 2 : 3
BIOLOGICAL SCIENCES PAPERS

BIOL576-15A (HAM) – Animal Ecophysiology
15 Points
This paper provides an introduction to specified topics in animal environmental physiology. Critical evaluation of selected readings from the scientific literature will provide a theoretical framework for the specified topics and an introduction to recent research in those fields. Students will develop an understanding of how animals are challenged by and adapt to challenging or extreme environments.

Convenor(s): Associate Professor Nicholas Ling
Prerequisite(s): BSc, BIOL335 or BIOL338 (or external equivalent)
Restriction(s): BIOL538
Assessment: Internal assessment/examination ratio: 2 : 3

BIOL577-15B (BLK) – Aquatic Toxicology
15 Points
This paper provides an introduction to specified topics in aquatic toxicology including toxicology analysis and bioaccumulation. Critical evaluation of selected readings from the scientific literature will provide a theoretical framework for the specified topics and an introduction to recent research in those fields. Students will develop an understanding of ecological impacts of water-borne contaminants and methods for the bioassay of toxicant effects.

Convenor(s): Associate Professor Nicholas Ling
Prerequisite(s): BSc
Restriction(s): BIOL538
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL580-15A (HAM) – Human and Applied Microbiology
15 Points
Microbial biology associated with human health and extreme environments.

Convenor(s): To be advised
Prerequisite(s): BSc, BIOL341 or equivalent
Restriction(s): BIOL541
Assessment: Internal assessment/examination ratio: 1 : 0

BIOL581-15B (HAM) – Microbial Ecology
15 Points
Molecular microbial ecology, stable isotopes in microbial ecology, metagenomics, biogeography, and other current topics in microbial ecology.

Convenor(s): Associate Professor Ian McDonald
Prerequisite(s): BSc, BIOL341 or equivalent
Restriction(s): BIOL541
Assessment: Internal assessment/examination ratio: 1 : 0

BIOL582-15A (HAM) – Biomolecular Structure and Function
15 Points
An in-depth examination of biomolecular structure and function using selected examples from the biochemistry literature.

Convenor(s): Professor Vic Arcus
Prerequisite(s): BSc, BIOL351, CHEM301 or equivalent
Restriction(s): BIOL551
Assessment: Internal assessment/examination ratio: 1 : 4
BIOL583-15B (HAM) – Molecular Biochemistry and Metabolism
15 Points
An in-depth examination of molecular biochemistry and metabolism using selected examples from biochemistry literature.
Convenor(s): Dr Ryan Martinus
Prerequisite(s): BSc, BIOL351, CHEM301 or equivalent
Restriction(s): BIOL551
Assessment: Internal assessment/examination ratio: 1 : 4

BIOL584-15A(HAM) – Molecular Genetics
15 Points
This paper explores how molecular biology and bioinformatic research contribute to our understanding of molecular genetics. Subjects covered in this course will include molecular technologies, comparative genomics and evolution, epigenetics, genetic diversity, genetic diseases, pharmacogenomics and personalised medicine.
Convenor(s): Dr Ray Cursons
Prerequisite(s): BSc, BIOL310 or equivalent
Restriction(s): BIOL510
Assessment: Internal assessment/examination ratio: 2 : 3

BIOL585-15B (HAM) – Human Genetics
15 Points
This paper explores the genetics of human evolution, adaptation and disease. The topics will extend from classical population genetics into contemporary areas of molecular biology and bioinformatics. Particular attention will be paid to key genetic changes that occurred during hominid evolution, polymorphic variations and disease susceptibility in humans and the role of somatic mutations in cancer.
Convenor(s): Dr Ray Cursons
Prerequisite(s): BSc, BIOL310 or equivalent
Restriction(s): BIOL510
Assessment: Internal assessment/examination ratio: 2 : 3

BIOL588-15A/B (HAM) – Special Topic
15 Points
Guided individual study on an aspect of Biological Sciences. By arrangement, and with the approval of the Graduate Convenor.
Convenor(s): Associate Professor Ian Hogg
Prerequisite(s): BSc or equivalent
Restriction(s): BIOL555
Assessment: Internal assessment/examination ratio: 1 : 0
BIOLOGICAL SCIENCES PAPERS

BIOL590-15C/D (HAM) – Directed Study
30 Points
May involve a literature review, the preparation of a proposal or a preliminary investigation. Generally a research paper will be required, but there will be no formal examination.

Convenor(s): To be advised
Assessment: Internal assessment/examination ratio: 1 : 0

COMP555-15B (HAM) – Bioinformatics
15 Points
For a full description, see the Faculty of Computing & Mathematical Sciences Handbook.

SCIE501-15B (HAM) – Research Methods in the Sciences
15 Points
This paper will enable students to develop the necessary communication skills and familiarity with research methods to allow them to progress to the thesis component of a masters degree in the sciences, or to extend communication and research skills in those not taking a full research degree.

Convenor(s): Professor David Lowe
Restriction(s): A student cannot take SCIE501 if they have already completed the equivalent version within a specific subject (eg BIOL501, ERTH501)
Assessment: Internal assessment/examination ratio: 1 : 0

Dissertations and Theses for MSc, MSc(Research) and MSc(Tech)

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CHEMISTRY PAPERS

All 500 Level papers are delivered subject to demand and staff availability.

CHEM511-15A (HAM) – Advanced Organic Chemistry (Structural Characterisation)
15 Points
Use of NMR spectroscopy and mass spectrometry for structural characterisation of organic molecules. This course will have a practical section using instrumentation.

Convenor(s): Associate Professor Merilyn Manley-Harris
Prerequisite(s): CHEM301
Restriction(s): CHEM501
Assessment: Internal assessment/examination ratio: 1 : 1

CHEM512-15A (HAM) – Topics in Advanced Physical Chemistry
15 Points
An in-depth investigation of some topic in advanced physical chemistry.

Convenor(s): To be advised
Prerequisite(s): CHEM111 and CHEM112. CHEM202 and CHEM302 are recommended but not essential.
Assessment: Internal assessment/examination ratio: 1 : 0

CHEM513-15A (HAM) – Organometallic Chemistry and Catalysis
15 Points
An advanced study of organometallic chemistry.

Convenor(s): Professor Bill Henderson
Prerequisite(s): CHEM303
Restriction(s): CHEM503
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM514-15A (HAM) – Special Topics in Chemistry A
15 Points
An advanced study of topics relating to staff members’ areas of research expertise, which may include organic, inorganic, physical, analytical or environmental themes.

Convenor(s): Associate Professor Graham Saunders
Prerequisite(s): Normally any three of CHEM301, CHEM302, CHEM303 and CHEM306
Restriction(s): CHEM504
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM516-15A (HAM) – Isotope Geochemistry
15 Points
An advanced study of the theory, applications and practice of isotope geochemistry.

Convenor(s): Dr Adam Hartland
Restriction(s): CHEM561
Assessment: Internal assessment/examination ratio: 1 : 0
CHEMISTRY PAPERS

CHEM517-15A (HAM) – Applied and Environmental Analytical Chemistry A
15 Points
With special reference to the commercial context, a critical examination of analytical methodologies for organic substances, eg pesticides.
Convenor(s): Dr Michèle Prinsep
Prerequisite(s): CHEM204, CHEM306
Restriction(s): CHEMS07
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM521-15B (HAM) – Advanced Organic Chemistry
15 Points
An advanced study of natural products chemistry and a study of structure and mechanism in carbohydrate chemistry.
Convenor(s): Dr Michèle Prinsep
Prerequisite(s): CHEM301
Restriction(s): CHEM501
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM522-15B (HAM) – Computational Chemistry
15 Points
A practical introduction to computational chemistry and its increasing use in modern chemical research.
Convenor(s): Dr Joseph Lane
Prerequisite(s): CHEM111 and CHEM112. CHEM302 is recommended but not essential. CHEMS02
Restriction(s): CHEM502
Assessment: Internal assessment/examination ratio: 1 : 0

CHEM523-15B (HAM) – Inorganic Materials Chemistry
15 Points
A study of inorganic materials.
Convenor(s): Professor Bill Henderson
Prerequisite(s): CHEM303
Restriction(s): CHEMS03
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM524-15B (HAM) – Special Topics in Chemistry B
15 Points
An advanced study of topics relating to staff members’ areas of research expertise, which may include organic, inorganic, physical, analytical or environmental themes.
Convenor(s): Associate Professor Graham Saunders
Prerequisite(s): Normally any 3 of CHEM301, CHEM302, CHEM303 and CHEM306
Restriction(s): CHEMS04
Assessment: Internal assessment/examination ratio: 0 : 1
CHEM527 – Applied and Environmental Analytical Chemistry B
15 Points
An advanced study of instrumental analytical techniques for organic and inorganic compounds and comparison of their efficacies.
Convenor(s): To be advised
Prerequisite(s): CHEM204, CHEM306 or an equivalent course
Restriction(s): CHEM507
Assessment: Internal assessment/examination ratio: 0 : 1

CHEM589-15A/B/C/S (HAM) – Directed Study
15 points
May involve a literature review or the preparation of a proposal.
Convenor(s): Associate Professor Graham Saunders
Assessment: Internal assessment/examination ratio: 1 : 0

CHEM590-15C/D (HAM) – Directed Study
30 Points
This paper allows an indepth study of a specific topic.
Convenor(s): Associate Professor Graham Saunders
Assessment: Internal assessment/examination ratio: 1 : 0

SCIE501-15B (HAM) – Research Methods in the Sciences
15 Points
This paper will enable students to develop the necessary communication skills and familiarity with research methods to allow them to progress to the thesis component of a Masters degree in the sciences, or to extend communication and research skills in those not taking a full research degree.
Convenor(s): Professor David Lowe
Restriction(s): A student cannot take SCIE501 if they have already completed the equivalent version within a specific subject (eg BIOL501, ERTH501)
Assessment: Internal assessment/examination ratio: 1 : 0

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EARTH SCIENCES PAPERS

All 500 Level papers are delivered subject to demand and staff availability.

ENV5524-15A (HAM) – Environmental Evaluation
15 Points
Explores the interface between science and environmental planning. Insight into the resource consent process and the role of science in supporting sustainable resource management under the RMA is developed.
Convenor(s): Dr Megan Balks
Restriction(s): ENV5521
Assessment: Internal assessment/examination ratio: 1 : 0

ERTH512-15A/B/C (HAM) – Special Topic
15 Points
Guided individual study on an aspect of Earth sciences. By arrangement, and with the approval of the graduate co-ordinator of Earth Sciences.
Convenor(s): Professor David Lowe
Restriction(s): ERTH511
Assessment: Internal assessment/examination ratio: 1 : 0

ERTH513-15A/B/C (HAM) – Special Topic
15 Points
Guided individual study on an aspect of Earth sciences. By arrangement, and with the approval of the graduate co-ordinator of Earth Sciences.
Convenor(s): Professor David Lowe
Restriction(s): ERTH511
Assessment: Internal assessment/examination ratio: 1 : 0

ERTH524-15A (HAM) – Volcanic Processes and Hazards
15 Points
A study of volcanic landforms, physical characteristics of volcanic deposits, processes associated with the eruption, transport and deposition of volcanic products, tephrochronology, and volcanic hazards in active volcanic regions.
Convenor(s): Dr Adrian Pittari
Prerequisite(s): ERTH321
Restriction(s): ERTH521
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH525-15B (HAM) – Hydrothermal Mineral and Energy Systems in New Zealand
15 Points
A study of geochemical approaches and methods to solve various problems in the Earth sciences including volcanic environments, with particular attention to hydrothermal systems, geothermal energy, and the formation of hydrothermal ore deposits.
Convenor(s): Dr Shaun Barker and guest lecturers
Prerequisite(s): Either ERTH321 or ERTH322
Restriction(s): ERTH521
Assessment: Internal assessment/examination ratio: 1 : 0
ERTH526-15C (HAM) – Field Analysis of Sedimentary Basins
15 Points
A paper teaching the application of field methods in the analysis of sedimentary successions and basins. This paper includes a compulsory field trip in the week after B Semester exams in November (week 46). There is an essay due before the field trip and a report due Monday 14 December 2015. Subject co-ordinator approval required.

Convenor(s): Professor Peter Kamp and Dr Beth Fox
Prerequisite(s): ERTH322
Restriction(s): ERTH522
Assessment: Internal assessment/examination ratio: 1 : 0

ERTH527-15A (HAM) – Sedimentary and Petroleum Geology
15 Points
A paper documenting the application of sedimentary geological and geophysical principles in the exploration and analysis of petroleum systems of New Zealand and other sedimentary basins.

Convenor(s): Dr Beth Fox
Prerequisite(s): ERTH322
Restriction(s): ERTH522
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH528-15A (HAM) – Quaternary: Past Environments
15 Points
This paper examines environmental change during the Quaternary – the last 2.6 million years – and analyses some important methods and evidence used in reconstructing past environments using a stratigraphic framework and geochronology. The paper usually includes a two-day workshop in mid May, held at the GNS Science National Isotope Centre.

Convenor(s): Professor David Lowe
Prerequisite(s): 40 points at 300 level in Earth Sciences. ERTH321 and ERTH322 are highly recommended.
Restriction(s): ERTH523
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH533-15B (HAM) – Soil and Greenhouse Gases
15 Points
This paper examines the role that soils and their management play in the production and consumption of the greenhouse gases including a specific focus on the importance of soil carbon.

Convenor(s): Professor Louis Schipper
Prerequisite(s): ERTH334
Restriction(s): ERTH531
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH535-15A (HAM) – Land and Soil Evaluation
15 Points
This paper examines how soil and land may be evaluated to provide an improved understanding of sustainable land management, taking into account productivity and environmental goals.

Convenor(s): Professor David Lowe
Prerequisite(s): ERTH333 or ERTH334 or ERTH384
Restriction(s): ERTH531
Assessment: Internal assessment/examination ratio: 3 : 2
ERTH547-15B (HAM) – Introduction to Hydrological Modelling
15 Points
Optimal use of water resources is an essential part of national economic development. Hydrological science is overviewed, with emphasis on techniques of water resource studies through hydrological model construction and simulations.

Convenor(s): Associate Professor Earl Bardsley
Prerequisite(s): ERTH345 or ERTH346
Restriction(s): ERTH541
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH548-15A (HAM) – Ecohydrology
15 Points
Ecohydrology is the interdisciplinary study of the interactions between water and ecosystems. It views water, carbon and energy as essential ingredients for living systems, and recognises that ecosystems may modify the hydrological systems of which they are a part. This paper bridges hydrology, soil science, ecology, and climate science.

Convenor(s): Dr David Campbell
Prerequisite(s): ERTH345 or ERTH346
Restriction(s): ERTH541
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH552-15B (HAM) – Rock Slope Engineering
15 Points
This paper considers rock mechanics within engineering geology, including the strength of intact rocks and rock joints; engineering geological hazards; slope stability modelling; and an applied site investigation project.

Convenor(s): Dr Vicki Moon
Prerequisite(s): ERTH352
Restriction(s): ERTH551
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH562-15A (HAM) – Coastal Sedimentation
15 Points
This paper addresses modern contentious issues of coastal sedimentation and sedimentary processes within a range of sedimentary environments. Both fundamental and applied contexts are examined.

Convenor(s): Dr Willem de Lange
Prerequisite(s): ERTH343
Restriction(s): ERTH543
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH563-15A (HAM) – Coastal and Estuarine Processes
15 Points
This paper provides an understanding of processes controlling movement of water in the ocean, including longwaves, baroclinic and barotropic circulation, wind-driven processes, surf-zone waves and currents, and nearbed currents in the coastal ocean.

Convenor(s): Associate Professor Karin Bryan and Dr Julia Mullarney
Prerequisite(s): ERTH344
Restriction(s): ERTH546
Assessment: Internal assessment/examination ratio: 3 : 2
ERTH564-15B (HAM) – Coastal and Freshwater Modelling: Physical Approaches
15 Points
This paper examines the use of conceptual, empirical and numerical models of coastal systems.
Convenor(s): Dr Julia Mullarney and Dr Willem de Lange
Prerequisite(s): ERTH344
Restriction(s): ERTH543 and ERTH546
Assessment: Internal assessment/examination ratio: 1 : 0

ERTH565-15B (HAM) – Time Series Analysis for Environmental Scientists
15 Points
This paper explores the use of timeseries to provide a deeper understanding of processes in Earth and environmental sciences. It assumes only a basic knowledge of statistics, but a more advanced knowledge of processes in the ocean, atmosphere, lakes or rivers.
Convenor(s): Associate Professor Karin Bryan
Prerequisite(s): Any of ERTH344, ERTH343, ERTH345, ERTH346, ERTH384 and a basic knowledge of first-year statistics.
Assessment: Internal assessment/examination ratio: 3 : 2

ERTH590-15A/B/Y (HAM) – Directed Study
30 Points
This paper allows in-depth study and research of a specific topic.
Convenor(s): Professor David Lowe
Assessment: Internal assessment/examination ratio: 1 : 0

SCIE501-15B (HAM) – Research Methods in the Sciences
15 Points
This paper will enable students to develop the necessary communication skills and familiarity with research methods to allow them to progress to the thesis component of a Masters degree in the sciences, or to extend communication and research skills in those not taking a full research degree.
Convenor(s): Professor David Lowe
Restriction(s): A student cannot take SCIE501 if they have already completed the equivalent version within a specific subject (eg BIOL501, ERTH501)
Assessment: Internal assessment/examination ratio: 1 : 0

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ELECTRONICS PAPERS

ENEL501-15A/B/Y (HAM) – Special Topics in Electronics
30 Points
This paper involves directed reading, project work and paper presentation in a defined area of electronics.
Convenor(s): Associate Professor Rainer Künemeyer
Assessment: Internal assessment/examination ratio: 1 : 0

ENEL504-15B (HAM) – Analog Filter Design
15 Points
This paper introduces the student to the design of electronic filters to process analog signals.
Note(s): This paper will only be offered with sufficient student interest.
Convenor(s): Professor Jonathan Scott
Prerequisite(s): ENEL205, ENEL312 and (ENGG285 or MATH251)
Assessment: Internal assessment/examination ratio: 1 : 0

ENEL505-15A (HAM) – Rechargeable Batteries and their Management
15 Points
This paper presents the essential characteristics of rechargeable batteries including techniques and semiconductor components used for managing batteries for optimal run time and cycle life.
Convenor(s): Nihal Kularatna
Prerequisite(s): ENEL205
Assessment: Internal assessment/examination ratio: 1 : 0

ENEL506-15B (HAM) – Surge Protection of Electronic Systems
15 Points
This course presents the fundamentals and techniques for protecting electronic systems against transients and surges, the statistical nature of the surge occurrence, and the international standards applicable.
Convenor(s): Nihal Kularatna
Prerequisite(s): ENEL205
Assessment: Internal assessment/examination ratio: 1 : 0

ENEL517-15A (HAM) – Mechatronics
30 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.
Note(s): This paper will only be offered with sufficient student interest.
Convenor(s): Professor Jonathan Scott
Prerequisite(s): ENEL317
Assessment: Internal assessment/examination ratio: 1 : 0
ENEL522-15B (HAM) – Electro-optical Instrumentation
30 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): This paper will only be offered with sufficient student interest. A minimum mark of 40% is required to receive a passing grade. Laboratories are compulsory.

Convenor(s): Associate Professor Rainer Künemeyer
Prerequisite(s): ENEL324
Restriction(s): ENEL322 and ENEL423
Required Book(s): To be advised
Assessment: Internal assessment/examination ratio: 1:1

ENEL585-15B (HAM) – Power Electronics
30 Points
This paper covers the theory and practice of power semiconductors, power converters, power management, protection, and variable speed drives.

Convenor(s): Nihal Kularatna
Prerequisite(s): ENEL205
Restriction(s): ENEL385 and ENEL485
Required Book(s): To be advised
Assessment: Internal assessment/examination ratio: 1:1

ENEL590-15C/D (HAM) – Directed Study
30 Points
Students have the opportunity to pursue a topic of their own interest under the guidance of academic staff.

Assessment: Internal assessment/examination ratio: 1:0

Dissertations and Theses for MSc, MSc(Research) and MSc(Tech)

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### ENGINEERING PAPERS

**ENGG501-15A (HAM) – Control Theory and Image Processing**  
30 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):* ENGG401  
*Required Book(s):* Franklin et al. *Feedback Control of Dynamic Systems* 5th ed (Prentice Hall)  
*Assessment:* Internal assessment/examination ratio: 1 : 0

**ENME540-15A (HAM) – Finite Element Analysis and Application**  
30 Points  
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.  
*Note(s):* This paper will only be offered with sufficient student interest.  
*Convenor(s):* Professor Ilanko  
*Prerequisite(s):* ENGG285 or MATH251, and ENGG284 or MATH255, and ENMP313  
*Restriction(s):* ENME440  
*Assessment:* Internal assessment/examination ratio: 1 : 0

### Theses for ME

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MATERIALS AND PROCESSING PAPERS

ENMP502-15A/C (HAM) – Special Topics in Engineering 1  
15 Points  
This paper involves directed reading, project work and paper presentation in a defined topic area of technology or engineering.  
Convenor(s): Dr James Carson  
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP503-15A (HAM) – Special Topics in Engineering 2  
15 Points  
This paper involves directed reading, project work and paper presentation in a defined topic area of technology or engineering.  
Convenor(s): Dr James Carson  
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP504-15B/C (HAM) – Special Topics in Engineering 3  
15 Points  
This paper involves directed reading, project work and paper presentation in a defined topic area of technology or engineering.  
Convenor(s): Dr James Carson  
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP505-15B (HAM) – Special Topics in Engineering 4  
15 Points  
This paper involves directed reading, project work and paper presentation in a defined topic area of technology or engineering.  
Convenor(s): Dr James Carson  
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP513-15A (HAM) – Advanced Material Properties and Performance  
15 Points  
This paper builds on the materials science and engineering courses taught at undergraduate level and develops the following aspects of materials performance: microstructural/property relationships, fracture mechanics, performance modelling and other aspects of metals, polymers, ceramics and composites.  
Note(s): This paper will only be offered with sufficient student interest.  
Convenor(s): Professor Kim Pickering  
Prerequisite(s): ENMP211 or equivalent  
Restriction(s): ENMP511  
Assessment: Internal assessment/examination ratio: 1 : 4

ENMP514-15A (HAM) – Advanced Materials Processing  
15 Points  
This paper investigates the relationships between processing conditions and microstructure of different materials. Topics include: Solidification processing, powder metallurgy, ceramic processing and processing composites. This paper also examines how materials are processed into serviceable products.  
Convenor(s): To be advised  
Prerequisite(s): ENMP211 or equivalent  
Restriction(s): ENMP411, ENMP512  
Assessment: Internal assessment/examination ratio: 1 : 4
ENMP515-15A (HAM) – CAD/CAM for Engineering
15 Points
This paper will cover the fundamental theories and basic concepts underlying today’s technologies in computer-aided design (CAD) and computer-aided manufacturing (CAM). A thorough fundamental theoretical training and mastery of CAD/CAM software will make a student better equipped and more confident to solve difficult problems in design and manufacturing.
Convenor(s): Dr Chi Kit Au
Assessment: Internal assessment/examination ratio: 1 : 4

ENMP516-15B (HAM) – Materials Characterisation
15 Points
This paper covers the use of advanced analytical techniques used in materials characterisation. These include optical microscopy, x-ray diffraction, transmission electron microscopy, scanning electron microscopy and differential thermal analysis. This paper explains the theory behind these techniques.
Convenor(s): Professor Brian Gabbitas
Prerequisite(s): ENMP211 or equivalent
Assessment: Internal assessment/examination ratio: 1 : 4

ENMP542-15C (HAM) – Design for Energy and the Environment
30 Points
This interdisciplinary course focuses on the important aspects of science and technology related to new and existing energy resources and energy efficiency. Topics covered reflect the trend of current development in energy technology.
Note(s): This paper will be taught subject to staff availability.
Convenor(s): Associate Professor Michael Walmsley
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP543-15A (HAM) – Environmental Technology Water and Wastewater 1
15 Points
This is an inter-disciplinary course covering topics selected from water resources and their management, environmental chemistry, ground water hydrology, water and wastewater engineering, chemical and microbial aspects of water quality, water pollution, remediation, ecotoxicity and ecological engineering. This paper should preferably be taken with ENMP544.
Convenor(s): Dr Mark Lay
Prerequisite(s): ENMP341 or equivalent
Restriction(s): ENMP541
Assessment: Internal assessment/examination ratio: 1 : 4

ENMP544-15B (HAM) – Environmental Technology Water and Wastewater 2
15 Points
This is an inter-disciplinary course covering topics selected from water resources and their management, environmental chemistry, ground water hydrology, water and wastewater engineering, chemical and microbial aspects of water quality, water pollution, remediation, ecotoxicity and ecological engineering. This paper should preferably be taken with ENMP543.
Convenor(s): Dr Mark Lay
Prerequisite(s): ENMP341 or equivalent
Restriction(s): ENMP541
Assessment: Internal assessment/examination ratio: 1 : 4
ENMP561 – Bioprocessing 1
15 Points
This paper will not be offered in 2015.

ENMP562- 15A(HAM) – Bioprocessing 2
15 points
Aspects of processing biological materials such as fermentation, membrane separations and large-scale processing.
Convenor(s): To be advised
Restriction(s): ENMP523
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP563-15A (HAM) – Food Technology 1
15 Points
This interdisciplinary course is tailored to the food technology interests of the students enrolled. It covers advanced aspects of food science, technology and engineering applications relevant to the food sector in New Zealand and/or selected countries.
Convenor(s): Dr James Carson
Restriction(s): ENMP527
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP564-15B (HAM) – Food Technology 2
15 Points
This interdisciplinary course is tailored to the food technology interests of the students involved. It covers advanced aspects of food science, technology and engineering applications relevant to the food sector in New Zealand and/or selected countries.
Convenor(s): Dr James Carson
Prerequisite(s): Level 300 process engineering or biological science
Restriction(s): ENMP527
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP568-15B (HAM) – Engineering Applied Practice 1
15 Points
An intensive practical training with some aspect of engineering or technology.
Convenor(s): Dr Mark Lay and Dr Rob Torrens
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP569-15A (HAM) – Engineering Applied Practice 2
15 Points
An intensive practical training with some aspect of engineering or technology.
Convenor(s): Dr Mark Lay and Dr Rob Torrens
Assessment: Internal assessment/examination ratio: 1 : 0
MATERIALS AND PROCESSING PAPERS

ENMP585-15A (HAM) – Industrial Technology and Innovation 1
15 Points
An interdisciplinary course designed for MSc, MSc(Research) and MSc(Tech) students to develop their ability to use scientific, management and personal skills to plan and implement programmes that maximise competitive advantage in industry through technological innovation, entrepreneurship and application or new knowledge generated by research. Case studies, readings, individual and group presentations form an important part of this course. This paper should preferably be taken with ENMP586.
Convenor(s): To be advised
Prerequisite(s): ENMP381 or equivalent
Restriction(s): ENMP581
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP586-15B (HAM) – Industrial Technology and Innovation 2
15 Points
An interdisciplinary course designed for MSc, MSc(Research) and MSc(Tech) students to develop their ability to use scientific, management and personal skills to plan and implement programmes that maximise competitive advantage in industry through technological innovation, entrepreneurship and application or new knowledge generated by research. Case studies, readings, individual and group presentations form an important part of this course.
Convenor(s): Dr Mark Lay
Prerequisite(s): ENMP381 or equivalent
Restriction(s): ENMP581
Assessment: Internal assessment/examination ratio: 1 : 0

ENMP590-15C/D (HAM) – Directed Study
30 Points
This paper allows in depth study and research of a specific technological or engineering topic.
Convenor(s): Dr James Carson
Assessment: Internal assessment/examination ratio: 1 : 0

Dissertations and Theses for MSc, MSc(Research) and MSc(Tech)

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PHYSICS PAPERS

PHYS506 – Advanced Quantum Theory
30 Points
This paper will not be offered in 2015.

PHYS511 – Particles and Fields
30 points
This paper covers relativistic kinematics and wave equations, Diracs equation and applications, elementary particles and symmetries, Langrangian field theory and quantum fields, models of strong, weak and electromagnetic interactions and the inclusion of gravity.

Note(s): This paper will only be offered with sufficient student interest.

Convenor(s): Dr Michael Cree
Restriction(s): MATH471, MATH571 and PHYS313
Assessment: Internal assessment/examination ratio: 1 : 2

PHYS516-15A (HAM) – Computational Biophysics
30 Points
This is a lecture and computer-laboratory course on the 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.

Note(s): This paper will only be offered with sufficient student interest.

Convenor(s): Associate Professor Alistair Steyn-Ross
Prerequisite(s): Any one of PHYS201, PHYS202, ENEL284 or ENEL285; and any two of MATH251, MATH253, MATH255, ENGG283, ENGG284, ENGG285, ENGG287
Restriction(s): PHYS315
Assessment: Internal assessment/examination ratio: 1 : 0

PHYS551 – Methods in Theoretical Physics 1
15 points
This paper introduces common methods in theoretical physics, for example use of Fourier Transforms and other integral transforms, complex functions, and maximisation/minimisation methods.

Note(s): This paper will only be offered with sufficient student interest.

Convenor(s): Dr Marcus Wilson
Prerequisite(s): MATH251 and one of MATH252, MATH253, MATH255
Assessment: Internal assessment/examination ratio: 1 : 1

PHYS552 - Methods in Theoretical Physics 2
15 Points
This paper will not be offered in 2015.
PHYSICS PAPERS

PHYS560-15A/B/Y (HAM) – Special Topics in Physics 1
15 Points
This paper involves directed reading, project work and paper presentation in a defined topic area of physics.

Convenor(s): Professor Moira Steyn-Ross
Prerequisite(s): Topic dependent
Assessment: Internal assessment/examination ratio: 1 : 1

PHYS561-15A/B/Y (HAM) – Special Topics in Physics 2
15 Points
This paper involves directed reading, project work and paper presentation in a defined topic area of physics.

Convenor(s): Professor Moira Steyn-Ross
Prerequisite(s): Topic dependent
Assessment: Internal assessment/examination ratio: 1 : 1

PHYS590-15A/B/Y (HAM) – Directed Study
30 Points
Convenor(s): Dr James Carson
Assessment: Internal assessment/examination ratio: 1 : 0

Dissertations and Theses for MSc, MSc(Research) and MSc(Tech)

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PSYCHOLOGY PAPERS

Note(s): For full descriptions of these papers, please see the Psychology Graduate Handbook, available from the Psychology Office, or the Faculty of Arts & Social Sciences Graduate Handbook. Papers marked * do not count towards a Psychology qualification in Science, but may be taken as papers outside the field of the degree.

PSYC511-15A (HAM) – Evaluation Research Design
15 Points

PSYC513-15B (BLK) – Evaluation Research Analysis
30 Points

PSYC517 – The Social Psychology of Anti-Social Behaviour*
15 Points
This paper will not be offered in 2015 (alternates with PSYC518).

PSYC518-15B (HAM) – Family Violence: Research and Interventions
15 Points

PSYC538-15B (HAM) (NET) – Applications of Behaviour Analysis
15 Points

PSYC539-15A (HAM) – Graduate Research Methods in Psychology
15 Points

PSYC556-15A (HAM) – Advanced Topics in Abnormal Adult Psychology
15 Points

PSYC559-15B (HAM) (NET) – Animal Behaviour and Welfare Research
15 Points

PSYC560-15A (HAM) (NET) – Applied Behaviour Analysis: Theory and Issues
15 Points

PSYC561-15A (HAM) (NET) – Behaviour Analysis Research and Theory
15 Points

PSYC562-15B (HAM) – Theories of Psychotherapy
15 Points

PSYC564-15B (HAM) – Developmental Psychopathology
15 Points

PSYC568-15A (HAM) – Techniques in Applied Psychology
15 Points

PSYC571-15B (HAM) – Psychology of Careers
15 Points

PSYC572-15A (HAM) – Personnel Selection
15 Points
PSYCHOLOGY PAPERS

PSYC573-15A (HAM) – Personnel Training and Development
15 Points

PSYC575-15A (HAM) – Psychological Applications and the Treaty of Waitangi*
15 Points

PSYC577-15B (HAM) (NET) – Recent Research in Behaviour Analysis
15 Points

PSYC579-15B (HAM) – Advances in Organisational Psychology
15 Points

PSYC580-15B (HAM) – The Psychology of Criminal Conduct
15 Points

PSYC581-15A (HAM) – Psychological Assessment*
15 Points

PSYC582-15B (BLK) – Community Health Psychology*
15 Points

PSYC583-15A (BLK) – Foundations of Community Psychology*
15 Points

PSYC585-15B (HAM) – Positive Organisation Development
15 Points

PSYC587-15Y (HAM) (NET) – Behaviour Analysis Practicum
15 Points

PSYC588-15A/B/S (HAM) – Directed Study
15 Points

PSYC589-15A/B/S (HAM) – Directed Study
15 Points

PSYC590-15A/B/S/Y (HAM) – Directed Study
30 Points

PSYC591-15Y (HAM) – Honours Dissertation
30 Points

Dissertations and Theses for MSc, MSc(Research)

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COMPUTING & MATHEMATICAL SCIENCES PAPERS

For details of the following papers please refer to the *Computing & Mathematical Sciences Handbook* or the *2015 University of Waikato Calendar*.

**Computer Science Papers**

*Papers are worth 15 points unless specified.*

- COMP501-15A – Topics in Operating Systems
- COMP513-15A – Topics in Computer Networks
- COMP514-15B – Carrier and ISP Networks
- COMP521-15A – Machine Learning Algorithms
- COMP535 – Image Processing†
- COMP536-15B – Advanced Graphics and Computer Games
- COMP537 – User Interfaces for Information Retrieval†
- COMP538 – Topics in Human-Computer Interaction†
- COMP539-15A – Usability Engineering
- COMP543-15B – Information Management
- COMP552-15A – Model Checking
- COMP553-15A – Extremely Parallel Programming
- COMP554 – Specification Languages and Models†
- COMP555-15B – Bioinformatics
- COMP560-15A/C – Turing Topics in Computer Science

†*Not offered in 2015.*

**Mathematics Papers**

- MATH501 – Metric Spaces†
- MATH505 – Topics in Analysis and Topology†
- MATH509 – Number Theory†
- MATH511-15A – Semigroups and Universal Algebra
- MATH512-15B – Continuous Groups
- MATH513 – Finite Groups†
- MATH515-15A – Analytical Number Theory
- MATH516 – Topics in Discrete Mathematics†
- MATH541-15B – Classical Partial Differential Equations
- MATH542-15B – Advanced Partial Differential Equations
- MATH581-15A/B – Special Topic in Mathematics 1
- MATH582-15A/B – Special Topic in Mathematics 2

†*Not offered in 2015.*