Introduction: What is physiology?

Physiology is, first and foremost, a science: it is concerned with how living organisms work. Ultimately, understanding how living organisms work will allow us to understand what goes wrong in disease and provide a rational scientific basis for the treatment of disease. As a science, physiology depends on the acquisition of knowledge by observation and experiment, and the interpretation of experimental observations. Physiology is highly quantitative in its approach and has close links with biochemistry, biophysics, molecular biology, mathematical modelling, pharmacology and zoology.

Mammalian physiology may be viewed as a cornerstone of scientific medicine and it is therefore not surprising that a large part of medical research worldwide is centred on physiology.

About the department

Physical location
Faculty of Medical and Health Sciences
The University of Auckland
85 Park Road Grafton
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Website: www.fmhs.auckland.ac.nz/sms/physiology

The Department of Physiology has broad teaching and research representation within the Faculty of Medical and Health Sciences and the Faculty of Science. Our staff contribute lectures and laboratory teaching in 31 courses (16 in Science and 15 in Medicine, Nursing and Nutrition). To deliver our innovative research-informed teaching we have 16 full-time academic staff. In addition, we have 18 Research Fellows who are funded by national and international research contracts. Research Fellows also provide teaching services. The department is ably supported by seven professional staff and 10 research technicians. Including our graduate students, the Department of Physiology consists of a team of more than 75 people who contribute to our teaching and research activities.

The Department of Physiology has produced more than 45 research publications every year over the last five years. In addition, the research groups had outstanding success in attracting competitive external research funds which provides an enormous impetus for our research programmes. This in turn fuels our research-led teaching ethos. The advanced research-based teaching programmes and research-centric focus are a feature of our dynamic department.

Privacy
The University of Auckland undertakes to collect, store, use and disclose your information in accordance with the provisions of the Privacy Act 1993. Further details of how the University handles your information are set out in a brochure available by phoning 0800 61 62 63.

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

We advise that the University of Auckland is not involved in the employment of completing health professional students and can make no guarantee of post-qualification registration or employment in New Zealand or any other country.
**Why study physiology?**

Physiology is an active and developing science which promises to remain one of the most exciting biological disciplines for the foreseeable future. It offers a broad training in scientific and technical skills that naturally feed into other disciplines. However, physiology is an important subject in its own right and (for example) neurophysiology and neuroscience (which study the brain and nervous system) are some of the fastest growing areas in biology.

There are even more exciting prospects! One real challenge of the future is to take the discoveries of the molecular biologists and fit them into an integrated picture of the functioning of the whole organism. Writing in the prestigious journal: Nature, Peter Newmark stated “we must have a new generation of bright physiologists able to pick up from where the molecular approach runs out”.

Within physiology, the techniques of molecular biology are already being used by physiologists to study the fundamental workings of the nervous system and other tissues. It is even possible that in the future molecular physiologists will design specific treatments at the molecular level to reverse diseases that are due to defects in physiological processes.

**What do physiologists do?**

Physiologists have many roles in society because physiology occupies a central place amongst the biological sciences. Some examples of careers in which a training in physiology is either essential or highly desirable are:

- Audiology
- Bioengineering
- Environmental Health
- Food Science
- Nutrition
- Optometry
- Pharmacy
- Radiography
- Radiotherapy
- Sport Science
- Toxicology
- Veterinary Medicine

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Angus Grey, BTech(Hons) PhD
Sarah-Jane Guild, ME PhD
Julie Lim, MSc PhD

Research Fellows

Meagan Barclay, BSc(Hons) PhD
Vicky Benson, BSc, MSc, PhD
Juliette Cheyne, BSc(Hons) PhD
Joanne Davidson, BSc(Hons) PhD
Peter Freestone, BSc(Hons) PhD
Robert Galinsky, BSc (Hons) PhD Melbourne
Rashika Karunasinghe, MSc, PhD
Kevin Lee, BSc(Hons), PhD
Sam Mathai, MSc SP, PhD Calicut
Fiona McBryde, BSc(Hons) PhD
Max Pinkham, MSc, PhD
Jerome Plumat, PhD
Ravindra Telang, BVSc&AH Bom., MVSc PhD IVRI (jointly with Audiology)

Research in the Department of Physiology

Physiology is a research-based science which “depends on the acquisition of knowledge by observation and controlled, properly designed experiments, and the subsequent valid interpretation of experimental observations.” Opportunities for undertaking research in physiology are available at the undergraduate and graduate levels.

The wide range of research carried out in the Department of Physiology is internationally recognised. We employ state of the art methods and staff are regularly invited to international symposia to present their research work to expert audiences. Teaching benefits from up to date teaching and the enthusiasm of staff for their subjects.

All research in the Department of Physiology is directed towards understanding fundamental mechanisms directly relevant to human and animal medicine. All student research is directed towards current problems and is expected to contribute to publications.

Physiology Department research work is:
- Well funded by outside bodies such as the Health Research Council, Neurological Foundation, National Heart Foundation, New Zealand Lottery Grant Board, Marsden Fund and Deafness Research Foundation.
- Usually a team effort involving people working together in research groups in the division.
- Reported regularly at national and international conferences.
- Published regularly in top quality, international, refereed journals.

Research opportunities for students include:
- Summer studentships.
- Bachelor of Science (Hons)
- Bachelor of Biomedical Science (Hons)
- Master of Science
- Master of Biomedical Science
- Master of Audiology, Master of Health Sciences.
- PhD projects.
Specific research areas

The Department of Physiology has an international reputation in many areas. Several groups have developed revolutionary techniques that have had a major impact. Most of the research is a team effort involving people working together in research groups. These groups may also include members from other departments within the School of Medical Sciences, within the Faculty of Medical and Health Sciences, and the greater University.

Research in Physiology is well funded by outside bodies such as the Health Research Council, Neurological Foundation, National Heart Foundation, New Zealand Lottery Grant Board, Marsden Fund and Deafness Research Foundation and Auckland Medical Research Foundation (AMRF).

Molecular neurophysiology
Prof J Lipski, Dr Peter Freestone

The aim of our research is to characterise the cellular and molecular mechanisms of neuronal damage occurring in Parkinson’s disease, and to study the modulation of neuronal activity within the basal ganglia network. Currently, we are focusing on the pathophysiology of dopaminergic neurons of the Substantia Nigra pars compacta which degenerate in this disease. In this neuronal group, we are studying the effects of parkinsonian toxins such as 6-hydroxydopamine, rotenone and MPTP. One of the main objectives is to test the hypothesis that damage of dopaminergic neurons is associated with activation of calcium channels and metabolic/oxidative stress. We also aim at improving treatments for Parkinson’s disease using drugs which enhance dopamine production after levodopa (Ldopa) application. Finally, we try to elucidate the role endocannabinoids (cannabis-like substances that are produced naturally in the brain) play in regulating the activity of dopamine neurons. We take advantage of two new techniques: (1) optogenetics, which uses light to precisely activate specific brain cells; and (2) fast-scan controlled adsorption voltammetry (FSCAV) which we use to precisely measure the levels of extracellular dopamine. These techniques allow us to study the complex cell networks controlling dopamine production in greater detail than previously possible.

Cardiac structure and function
Prof Bruce Small, Assoc Prof Ian LeGrice

Research on the structure of the heart and how this influences the spread of cardiac electrical activation and the mechanical performance of the heart. The current emphasis of the work is on pathological changes that occur to cardiac architecture in heart failure and after myocardial infarction and how these changes lead to abnormal cardiac rhythms and impaired mechanical performance. The work involves a combination of experimental studies, whole heart and microscopic imaging and computer analysis and modelling, and draws on research staff and students from the Department of Physiology, the Department of Medicine and Auckland Bioengineering Institute.

Fetal physiology and neurosciene
Prof Alistair Gunn, Prof Laura Bennet

The group comprises physiologists and clinicians who have wide ranging biomedical research interests looking at the impact of oxygen deprivation before birth, how it causes injury, and how that injury can be detected, prevented and/or treated. The team’s research projects offer a substantial opportunity for students at all levels and emerging researchers to train in a multidisciplinary biomedical laboratory, to learn applied systems physiology, histology, immunohistochemistry, and molecular biology techniques as well as get experience in applying basic biomedical science clinically. Laura’s specialist interests are cardiovascular and cerebrovascular physiology and brain development. Her current research focus is on the impact of asphyxia on the very vulnerable preterm fetus.

Auditory neurobiology
Prof Peter Thorn, Assoc Prof Srdjan Vlajkovic

The Auditory Neuroscience Group studies the cellular and molecular basis of cochlear homeostasis in conditions of stress and injury. Our current research focuses on understanding how abnormal regulation of ions (e.g. potassium) essential for detection of sound underlies inner ear injury. We are also developing diagnostic methods such as Magnetic Resonance Imaging (MRI) for studying chronic disease processes in the inner ear. Our programme of research incorporates a series of projects that directly investigate the protective role of purinergic signalling on the development of noise-induced cochlear injury and other forms of oxidative stress in the inner ear. These studies form a multidisciplinary programme of research to prevent, treat and reduce hearing impairment.

Circulatory control
Prof Simon Malpas, Dr Carolyn Barett

The focus of the Circulatory Control Laboratory is the control of blood pressure with particular regard to the mechanisms responsible for the development of hypertension and other cardiovascular diseases. The main approach of the laboratory is an integrated approach of monitoring of a number of cardiovascular variables such as blood pressure, sympathetic nerve activity, heart rate and blood flow for an extended period of time. Interests include the role of the sympathetic nervous system in the genesis of hypertension and the development of heart failure following myocardial infarction.

Molecular neuroendocrinology
Assoc Prof Kathy Mountjoy

POMC derived peptides and melanocortin receptor signalling

The physiological responses to pro-opiomelanocortin (POMC)-derived peptides include pigmentation, adrenal gland development and steroid hormone synthesis, food intake and feed efficiency, metabolism, body weight, insulin secretion, immune and cardiovascular regulation. POMC and MC4R have been shown to be pivotal in the regulation of energy homeostasis. POMC, produced primarily in the pituitary and hypothalamus, is processed through a coordinated, tissue-specific, series of proteolytic cleavages and post-translational modifications that influence the activity of the peptides. We are interested in how N-terminal acetylation of the POMC peptide enhances some activities (pigmentation; inhibition of food intake) of this peptide and virtually eliminates others. Our research involves the use of mutant and transgenic mice, and cell lines either overexpressing, or endogenously expressing, melanocortin receptors and their accessory proteins.
Muscle energetics
Assoc Prof Denis Loiselle
Whether working or resting, muscles expend metabolic energy. It is the aim of muscle energetics to understand the manifold energy pathways that run from sources in glycolysis and oxidative phosphorylation to sinks in the various ATPases that support excitation, activation and contraction. By understanding energy supply and demand we hope to clarify how various essential processes in the cell interact to maintain cell function. Methodologies range from calorimetry to intracellular ion measurement.

Synaptic function
Assoc Prof Johanna Montgomery
Our primary research focus is in understanding the cellular and molecular mechanisms that guide the formation, maintenance, plasticity and elimination of excitatory synapses in the vertebrate central nervous system. We combine electrophysiological, molecular biology and imaging techniques to investigate the function of specific synaptic proteins, the molecular mechanisms of synaptic plasticity, and how changes in synapse function or strength could manifest into network changes and disease.

Muscle cell function
Dr Marie Ward
Cytoplasmic calcium (Ca2+) concentration underlies many important physiological activities, including muscle contraction. My research interest is in the cellular and molecular factors involved in the control of muscle function. In particular, my research focuses on the dynamic, yet delicate balance of intracellular Ca2+ within cardiac muscle cells. Variations in this Ca2+ balance are crucial to physiological and pharmacological mechanisms that increase the force of contraction in the heart. Disturbances of intracellular Ca2+ handling can be responsible for pathological states (e.g. incomplete relaxation between beats and the generation of cardiac arrhythmias).

Developmental brain injury and glial cell biology
Dr Justin Dean
My aim is to characterize the molecular and cellular mechanisms underlying the impairments in white matter and cortical maturation that occur following preterm birth. My current focus includes:
- Astrogliaosis as an inhibitory environment for cell plasticity.
- Oligodendrocyte cell biology and responses to injury.
- The physiological and pathophysiological roles of the extracellular matrix glycosaminoglycan hyaluronic acid in oligodendrocyte progenitor cell (OPC) proliferation and maturation.
- Impact of prenatal insults on cortical development and neuronal maturation.
- Glial/axonal signaling.

The use of high-field strength MRI for imaging of brain injury. The overall goal is to develop therapeutic strategies targeted to overcome oligodendrocyte injury and myelination deficits, and impaired cortical maturation, that occur following infection or cerebral hypoxia-ischemia in the developing brain.

Cellular and Molecular Cardiology
Dr Kimberley Mellor
Understanding the mechanisms of cardiac dysfunction in disease states is a key priority for developing targeted interventions for therapeutic applications. Heart failure, cardiac hypertrophy and diabetes are major contributors to mortality and morbidity. By linking disturbances in cell death processes, intracellular structural organisation and molecular adaptations with functional disturbances in these disease settings, key targets for intervention can be identified. These investigations are undertaken at the whole body, whole organ and single cell level.

CardioRenal Physiology Group
Dr. Rohit Ramchandra
We are interested in the autonomic control of the cardiovascular system. The emphasis of projects is on control of the circulation during normal physiological situations as well as impaired control during cardiovascular disease. Despite significant therapeutic advances, morbidity and mortality in patients suffering from cardiovascular disease remain unacceptably high. Patients with cardiovascular disease have a large increase in the activity of the sympathetic nerves to various organs including the heart and the kidney, and this increased activity is detrimental and associated with poor prognosis in these patients. Current treatments have a large number of side effects in patients and the focus of the lab is identifying novel treatment paradigms to reduce the detrimental increase in sympathetic drive.

Molecular Vision Laboratory
Professor Paul Donaldson
Paul is the Director of the Molecular Vision Laboratory and is currently the Head of the School of Medical Sciences. The Molecular Vision Laboratory has extensive molecular and cellular expertise in the general field of membrane transport. Members of the laboratory utilize electrophysiology, imaging, biochemistry, proteomics, molecular biology, and computer modeling to determine how the properties of ion channels and transporters contribute to the integrative function of ocular tissues that comprise the front of the eye. Current research projects in the lens are focused on determining how the interaction of a variety of ion channels and transporters contribute to the maintenance of lens transparency.
Perinatal Molecular Neuroscience Research Group

Assoc. Prof Mhoyra Fraser
Investigating perinatal brain development and strategies to prevent or treat brain damage in vulnerable newborns

Research focus

Studies to advance our understanding of the complex mechanisms which link preterm brain injury to infection/inflammatory processes

Being born too early and too small is associated with severe and debilitating consequences. At least half the survivors have neurodevelopmental problems that affect their daily life while 15% develop severe problems such as cerebral palsy. The cause of this injury is unclear and there is no current treatment. Hypoxia-ischaemia caused by a lack of oxygen to the brain or infection of the brain originating from the placenta and fetal membranes are major contributors to injury of the preterm brain. Currently, we are investigating how infection and hypoxia-ischaemia damages the brain, with the goal of preventing or alleviating damage in these vulnerable babies.

Studies to evaluate whether microRNAs can serve as biomarkers for risk of preterm brain injury

Preterm babies have very high risks of long-lasting disability, including cerebral palsy. Unfortunately this is usually apparent long after birth, at a time when treatment is not possible. A minimally invasive method of early detection would allow early intervention. In pilot studies we found that small amounts of genetic material (so called ‘microRNAs’), are released by the brain into the blood after low oxygen levels. We are currently investigating whether key microRNAs would provide a robust signal to identify babies at risk of disability.

Student research projects

- Preterm brain injury and the role of intrauterine infection
- Are exosomal microRNAs biomarkers for risk of cerebral palsy?
- Immunomodulatory therapies for treatment of preterm brain injury

Course and programmes

Bachelor of Science (BSc) – Physiology major

First or single major must include:
- At least 60 points from MEDSCI 309-312, 316, 317

Second major must include:
- At least 45 points from MEDSCI 309-312, 316, 317

Stage I courses

While courses in Physiology are not offered explicitly at Stage I, the Department of Physiology makes a major contribution to introductory courses at this level. Students wishing to pursue a degree in Physiology (or closely related subjects) are strongly advised to complete the following Stage I courses:
- BIOSCI 106, BIOSCI 107, CHEM 110, MEDSCI 142, PHYSICS 160

Of the above, BIOSCI 107 and MEDSCI 142 are prerequisites for Stage II Physiology courses. The other courses will facilitate further study in Physiology (as well as other biomedical sciences) and the prospective student should also have competency in mathematics to NCEA Level 3. If this is not the case, taking an appropriate mathematics course is highly advisable.

Bachelor of Science (Honours) (BSc(Hons)) – Physiology specialisation

Prerequisite
A major in Physiology and a B average in at least 90 points at Stage III

Requirements:
- 30 points from MEDSCI 725*, 733**
- up to 45 points from MEDSCI 701 or 702, MEDSCI 703, 717, 725*-734, 739
- 45 points: PHYSIOL 788 Dissertation

Postgraduate Diploma in Science (PGDipSci) – Physiology specialisation

Prerequisite
A BSc including at least 45 points from MEDSCI 309-317

Requirements
- 30 points from MEDSCI 725*, 733, 743**
- 90 additional points from MEDSCI 701-703, 717, 727-734

Master of Science (MSc) – Physiology specialisation

Prerequisite
- A BSc(Hons) or PGDipSci in Physiology

Requirement
- 120 points: PHYSIOL 796 MSc Thesis in Physiology Stage II courses – undergraduate

* Not offered in 2017. Students should enrol in MEDSCI 743
** Subject to CUAP approval
Stage II courses – undergraduate

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Points</th>
<th>Academic Director</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>MEDSCI 205</td>
<td>The Physiology of Human Organ Systems</td>
<td>15</td>
<td>Rohit Ramchandra</td>
<td>BIOSCI 107, MEDSCI 142, GPA &gt; 3.00</td>
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<tr>
<td>MEDSCI 206</td>
<td>Introduction to Neuroscience</td>
<td>15</td>
<td>Johanna Montgomery</td>
<td>BIOSCI 107, MEDSCI 142, GPA &gt; 3.00</td>
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Stage III courses – undergraduate

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<tr>
<td>MEDSCI 309</td>
<td>Biophysics of Nerve and Muscle</td>
<td>15</td>
<td>Marie Ward</td>
<td>MEDSCI 205 or 206, GPA &gt; 5.00</td>
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<tr>
<td>MEDSCI 311</td>
<td>Cardiovascular Biology</td>
<td>15</td>
<td>Laura Bennett, Anuj Bhargawa</td>
<td>MEDSCI 205, GPA &gt; 5.00</td>
</tr>
<tr>
<td>MEDSCI 312</td>
<td>Endocrinology of Growth and Metabolism</td>
<td>15</td>
<td>Kathy Mountjoy</td>
<td>30 points from two BIOSCI 203, MEDSCI 201, 205, GPA &gt; 5.00</td>
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<tr>
<td>MEDSCI 316</td>
<td>Sensory Neuroscience: From Molecules to Disease</td>
<td>15</td>
<td>Srdjan Vlajkovic</td>
<td>MEDSCI 206, GPA &gt; 5.00</td>
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<tr>
<td>MEDSCI 317</td>
<td>Integrative Neuroscience: From Fetus to Adult</td>
<td>15</td>
<td>Raj Selvaratnam, Janusz Lipski</td>
<td>MEDSCI 206, GPA &gt; 5.00</td>
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</table>

Postgraduate courses

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<tr>
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<tbody>
<tr>
<td>MEDSCI 725*</td>
<td>Experimental Design</td>
<td>15</td>
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<td>MEDSCI 727</td>
<td>Advanced Neuroscience: Neurophysiology</td>
<td>15</td>
<td>Janusz Lipski</td>
<td>Prefer MEDSCI 317</td>
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<td>MEDSCI 729</td>
<td>Perinatal and Physiology</td>
<td>15</td>
<td>Mhoyra Fraser</td>
<td>MEDSCI 312</td>
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<tr>
<td>MEDSCI 733</td>
<td>Advanced Methods in Cell Physiology</td>
<td>15</td>
<td>Johanna Montgomery</td>
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<td>MEDSCI 734</td>
<td>Advanced Integrative Physiology</td>
<td>15</td>
<td>Justin Dean</td>
<td>Prefer MEDSCI 311</td>
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<td>MEDSCI 739</td>
<td>Advanced Sensory Neuroscience</td>
<td>15</td>
<td>Srdjan Vlajkovic</td>
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<tr>
<td>MEDSCI 743**</td>
<td>Design and Analysis in Biomedical Research</td>
<td>15</td>
<td>Rohit Ramchandra</td>
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</tr>
</tbody>
</table>

* Not offered in 2017. Students should enrol in MEDSCI 743
** Subject to CUAP approval

Description of course content:

**Undergraduate**

**MEDSCI 205**
The Physiology of Human Organ Systems
15 points | Semester One, Grafton

**Assessment**
- Final exam: 65%
- CW – Mid-term test: 15%
- CW – Lab reports: 20%

**Description**
An integrative approach is used to study fundamental physiological processes which enable the body to overcome the challenge of life. Drawing on examples of normal and abnormal function, the course examines the interaction of vital physiological processes, from cellular control mechanisms to multiple organ systems. Topics include: control of fluid and electrolytes, cardiovascular control, energy use, and the delivery of oxygen and metabolites.

**Prerequisite:** BIOSCI 107, MEDSCI 142, GPA 3

**MEDSCI 206**
Introduction to Neuroscience
15 points | Semester Two, Grafton

**Assessment**
- Final exam: 65%
- Mid-semester Test B: 10%
- Mid-semester Test A: 10%
- Lab assignments: 15%

**Description**
The impact of neuroscience revolution on our understanding of human physiology and biomedical research is reviewed. Topics include: mechanisms of neurotransmission, learning, memory, sensory perception (vision, hearing, touch and smell) and application of gene therapy for treating neurological diseases. Special emphasis is placed on the integration and control of physiological function by the nervous system. Examples include control of movement and coordination, regulation of reproduction, blood pressure, breathing, appetite, body weight and sexuality. Developmental neuroscience is also considered. Laboratory exercises provide insight into neural structure and function and include application of neuroimaging technologies.

**Prerequisite:** BIOSCI 107, MEDSCI 142, GPA 3

**Course director:** Assoc Prof Johanna Montgomery
MEDSCI 309  
Biophysics of Nerve and Muscle  
15 points | Semester Two, Grafton

Assessment  
Final exam 60%  
MST Combined 15%  
Laboratory reports and numerical problems 25%

Description  
An advanced treatment of the physiology of excitable cells. Topics include: the biophysical basis of membrane potential, the spread of electrical activation and synaptic transmission, structure, excitation, mechanics and energetics of muscle and functional differences among muscle types. The approach is quantitative with particular emphasis on current advances in the field. Prerequisite: 30 points from MEDSCI 205, 206, PHYSIOL 210, 220; or for Bachelor of Engineering (Honours) students, 15 points from MEDSCI 205, PHYSIOL 210 and 15 points from courses at Stage II listed in Part II of the Biomedical Engineering specialisation in the Bachelor of Engineering (Honours) Schedule. Prerequisite: MEDSCI 205, GPA 5  
Course director: Dr Marie Ward

MEDSCI 311  
Cardiovascular Biology  
15 points | Semester One, Grafton

Assessment  
Final Exam 60%  
2 lab reports, 1 lab presentation 20%  
1 essay 10%  
1 mid term test 10%

Description  
An advanced treatment of the human cardiovascular system that provides an integrated framework for understanding the structure, function and regulation of the heart and circulation, and their modification by drugs. Topics include: the energetics and mechanics of the heart, the regulation of heart rhythm and the control of blood pressure and the regulation of flow through the microcirculation. The course is illustrated using examples drawn from current research in the field and from representative disease states. Prerequisite: MEDSCI 205, GPA 5  
Course director: Prof Laura Bennet

MEDSCI 312  
Endocrinology of Growth and Metabolism  
15 points | Semester Two, Grafton

Assessment  
Final exam 65%  
Test 15%  
Lab 20%

Description  
An introduction to the mechanism controlling the production of hormones and how these achieve their effects in regulating body function. The course focuses in particular on the hormone systems controlling growth and metabolism and contrasts the differences between fetal and adult life. It also highlights how defects in endocrine systems are associated with conditions such as obesity and diabetes. Prerequisite: 30 points from two of the following: BIOSCI 203, MEDSCI 201, 205. GPA 5  
Course director: Assoc Prof Kathy Mountjoy

MEDSCI 316  
Sensory Neuroscience: From Molecules to Disease  
15 points | Semester One, Grafton

Assessment  
Final exam 70%  
Test 10%  
Lab reports 20%

Description  
The physiology of neurosensory systems in health and disease with an emphasis on clinical relevance and current advances in research. The course will provide in-depth coverage of mechanisms involved in each system at a broad systemic level, down to the molecular level. Topics include vision, hearing, balance, olfaction, taste, touch and pain. Prerequisite: MEDSCI 206. GPA 5  
Restriction: MEDSCI 308, 310  
Course director: Assoc Prof Srdjan Vlajkovic

MEDSCI 317  
Integrative Neuroscience: From Fetus to Adult  
15 points | Semester Two, Grafton

Assessment  
Mid-semester test 10%  
Mini review 10%  
Lab report 20%  
Final exam 60%

Description  
The development and function of the central nervous system in health and disease. Topics include development of the CNS, functional imaging of the human brain, synaptic function in health and disease, development and pathophysiology of motor systems, perinatal and adult brain ischemia, stroke, and sleep related disorders. The topics are covered at an advanced level with emphasis on current advances in the fields. Prerequisite: MEDSCI 206. GPA 5  
Restriction: MEDSCI 308, 310  
Course director: Prof Janusz Lipski
Description of course content: Postgraduate

MEDSCI 725
Experimental Design
15 points | Semester Two, Grafton

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Final test</td>
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<tr>
<td>Mid-semester test</td>
<td>10%</td>
</tr>
<tr>
<td>Assignments</td>
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</table>

Description:
Principles of experimental design and data analysis in physiological research. Topics include: analysis of variance, post-hoc multiple comparisons, non-linear and multiple linear regression, analysis of covariance and statistical power. The approach is practical and computer statistical packages are used.

Course director: Assoc Prof Denis Loiselle
Not available 2017. Students should contact PG Advisor Kim Mellor and enrol in MEDSCI 743

MEDSCI 727
Advanced Neuroscience: Neurophysiology
15 points | Semester One, Grafton

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<tr>
<td>Final exam</td>
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<td>Four assignments</td>
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<tr>
<td>Oral presentation</td>
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Description
An advanced treatment of selected topics in neurophysiology. Involves presentations and critical analysis by the students of the current scientific literature within the context of several major research themes that encompass models from molecular and cellular to systems level.
Themes will be selected from the following areas: (1) motor control and motor disorders (Parkinson’s disease, motorneuron disease, stroke); (2) synapse physiology and pathophysiology; (3) advances in neural stem cell research.

Course director: Prof Janusz Lipski

MEDSCI 729
Perinatal Physiology and Medicine
15 points | Semester One, Grafton

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<tbody>
<tr>
<td>Final exam</td>
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<tr>
<td>Seminar</td>
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<tr>
<td>Essays</td>
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Description
Fetal development has long-term consequences for health. This advanced course offers a wide range of research themes relating to fetal development and future health. Topics include: placental development, fetal physiology, and endocrine regulation and metabolic function during fetal and postnatal life. The course explores pathogenesis of disease and injury of the fetus and newborn, and how biomedical research leads to potential clinical treatment strategies.

Prerequisite: MEDSCI 312

Course director: Assoc Prof Mhoyra Fraser
MEDSCI 733
Advanced Methods in Cell Physiology
15 points | Semester One, Grafton

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<tr>
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<td>Report optics module</td>
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<tr>
<td>Assignment 1</td>
<td>10%</td>
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<tr>
<td>Assignment 1</td>
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**Description**
The theoretical basis underpinning electrophysiological and live cell imaging techniques used to probe cellular function will be addressed. Emphasis will be placed on the instrumentation, data acquisition, and data analysis associated with each technology. The approach is practical and computer-based software programmes are used to analyse pre-recorded data, and data produced by the students themselves.

**Restriction:** MEDSCI 726
**Course director:** Assoc Prof Johanna Montgomery

MEDSCI 734
Advanced Integrative Physiology
15 points | Semester Two, Grafton

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<tr>
<th>Oral</th>
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<tbody>
<tr>
<td>Essays</td>
<td>80%</td>
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</table>

**Description**
An advanced course of selected topics in integrative physiology. The focus will be on the interplay between the different organ systems and their potential involvement in disease development. The course involves critical analysis of the current scientific literature with topics drawn from research programs within the areas of cardiovascular, fetal and neural physiology.

**Restriction:** MEDSCI 728
**Course director:** Dr Justin Dean

MEDSCI 739
Advanced Sensory Neuroscience
15 points | Semester 2, Grafton

<table>
<thead>
<tr>
<th>Oral Presentation</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
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</tbody>
</table>

**Description**
Advanced Sensory study of the physiology of neurosensory systems in health and disease. Provides an in-depth coverage of the molecular, cellular, and systematic mechanisms underlying vision and hearing.

**Course director:** Assoc Prof Srdjan Vlajkovic

MEDSCI 743
Design and Analysis in Biomedical Research
(subject to CUAP approval)
15 Points | Semester 1

An in-depth exploration of the principles of experimental design and data analysis in biomedical contexts. A focus on critical appraisal of choice of statistical tests to address experimental questions and appropriateness and limitations of analysis and interpretation of results will be undertaken. Practical and computer statistical packages are used.

**Restriction:** MEDSCI 725
**Course director:** Dr Rohit Ramchandra

**Physiology pathway**

**BSc (Hons) PGDip, Masters and PhD planner**

**Prerequisites**
A major in Physiology and at least 90 points at Stage III.

**Requirements**
- 30 points from MEDSCI 725*, 733, 743**
- Up to 45 points from MEDSCI 701, or MEDSCI 702, MEDSCI 703, 717, 725, 734, 743**
- 45 points PHYSIOL 788 Dissertation

**Prerequisites**
A BSc including at least 45 points from MEDSCI 309-317.

**Requirements**
- 30 points from MEDSCI 725*, 733, 743**
- 90 additional points from MEDSCI 701-703, 717, 727, 729, 734, 739
- 120 points: PHYSIOL 796 MSc Thesis

**PhD Research Thesis and Oral exam**

* Not offered in 2017. Students should enrol in MEDSCI 743
** Subject to CUAP approval
BSc Degree Planner – Physiology

(Based on 2016 regulations)

To view regulations for majors see www.calendar.auckland.ac.nz

BSc degree requires: 360 points (24 ’15-point’ courses). Each box represents one 15-point course. It is recommended that students enrol in 8 courses each year.

### Year 1

| BIO SCI 107 | MED SCI 142 | Strongly recommended: BIO SCI 101, 106, CHEM 110 and PHYSICS 160
|-------------|-------------|--------------------------------------------------|

With appropriate prerequisites can also be filled by Stage II or III.

### Year 2

| MED SCI 205 | MED SCI 206 | STAGE II ELECTIVE | GEN ED
|-------------|-------------|-------------------|--------|

Stage II

BIO SCI 203 or MED SCI 201 is recommended as they are pre-requisites for MED SCI 312

### Year 3

|---------------------------|---------------------------|---------------------------|---------------------------|

Stage III

Stage II or III

Any stage

1. Courses in a minimum of three subjects listed in the BSc schedule.
2. At least 180 points (12 courses) must be above Stage I.
3. Up to 30 points (2 courses) may be taken in courses outside the Faculty.
4. 30 points (2 courses) must be taken from the General Education Schedule. Can be taken at any time during degree but recommended in Year 2 or 3.
5. At least 75 points must be at Stage III, of which 60 points must be in the Majoring subject.
6. Majority of Science courses have GPA requirements therefore students need to ensure they are passing, and passing well, i.e., C+ or higher. See Class Notes when doing Class Search for GPA requirements.

It is the student’s responsibility to check that the final programme complies with University Regulations. The Faculty of Medical & Health Sciences Student Centre is the final authority on the BSc regulations.
## 2017 academic year

### Semester One – 2017

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Semester One begins</td>
<td>Monday 6 March 2017</td>
</tr>
<tr>
<td>Mid-semester break/Easter</td>
<td>Friday 14 April – Saturday 29 April 2017</td>
</tr>
<tr>
<td>ANZAC Day</td>
<td>Tuesday 25 April 2017</td>
</tr>
<tr>
<td>Graduation</td>
<td>Monday 1, Wednesday 3, Friday 5 May 2017</td>
</tr>
<tr>
<td>Queen's Birthday</td>
<td>Monday 5 June 2017</td>
</tr>
<tr>
<td>Lectures end</td>
<td>Friday 9 June 2017</td>
</tr>
<tr>
<td>Study break</td>
<td>Saturday 10 June – Wednesday 14 June 2017</td>
</tr>
<tr>
<td>Exams</td>
<td>Thursday 15 June – Monday 3 July 2017</td>
</tr>
<tr>
<td>Semester One ends</td>
<td>Monday 3 July 2017</td>
</tr>
<tr>
<td>Inter-semester break</td>
<td>Tuesday 4 July – Saturday 22 July 2017</td>
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### Semester Two – 2017

<table>
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<tr>
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<tr>
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<td>Monday 24 July 2017</td>
</tr>
<tr>
<td>Course withdrawal deadline</td>
<td>Friday 4 July 2017</td>
</tr>
<tr>
<td>Mid-semester break</td>
<td>Monday 4 September - Saturday 16 September 2017</td>
</tr>
<tr>
<td>Graduation</td>
<td>Tuesday 26 September 2017</td>
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<tr>
<td>Labour Day</td>
<td>Monday 23 October 2017</td>
</tr>
<tr>
<td>Lectures end</td>
<td>Friday 27 October 2017</td>
</tr>
<tr>
<td>Study break</td>
<td>Saturday 28 October - Wednesday 1 November 2017</td>
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<tr>
<td>Exams</td>
<td>Thursday 2 November - Monday 20 November 2017</td>
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<tr>
<td>Semester Two ends</td>
<td>Monday 20 November 2017</td>
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### Semester One – 2018

<table>
<thead>
<tr>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>Semester Two begins</td>
<td>Monday 26 February 2018</td>
</tr>
</tbody>
</table>
Contact

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School of Medical Sciences
The University of Auckland
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Auckland 1142, New Zealand
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Fax: +64 9 373 7499
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