

## 064-AA Bachelor of Biomedical Science

<b>Year and Campus:</b>	2008
<b>Fees Information:</b>	Subject EFTSL, Level, Discipline & Census Date, <a href="http://enrolment.unimelb.edu.au/fees">http://enrolment.unimelb.edu.au/fees</a>
<b>Level:</b>	Undergraduate
<b>Duration &amp; Credit Points:</b>	
<b>Contact:</b>	Faculty of Science Office Ground Floor Old Geology Building University of Melbourne Victoria 3010 AUSTRALIA Telephone +61 3 8344 6404 Facsimile +61 3 8344 5803
<b>Course Overview:</b>	<p>There is no first year intake into this course from 2008.</p> <p>The Bachelor of Biomedical Science aims to produce flexible and well-informed graduates with specific training in a wide range of biomedical applications of the basic sciences. The course has been designed with a particular emphasis on the development of integrated knowledge of genome structure and its role in whole animal systems biology. The design takes into account the rapidly emerging importance of computational molecular biology (bioinformatics) and opportunities for exploiting knowledge of complete genome structures in biomedical contexts.</p>
<b>Objectives:</b>	<p>The specific course objectives are that graduates should:</p> <ul style="list-style-type: none"> <li># have a broad knowledge of science across a range of disciplines, with a high level of understanding and appreciation in specialist areas of the biomedical sciences;</li> <li># have an appreciation of integrated cellular tissue and whole body systems, particularly in the context of the new age of cell and molecular biology, genetic manipulation, rational drug design and therapeutics;</li> <li># have an appreciation of comparative biology and the value of a range of single cell organisms (eg. yeasts) as model systems for investigating biomedically-relevant cellular processes;</li> <li># have well developed skills in bioinformatics (computational molecular biology) and an awareness of state-of-the-art laboratory techniques of biomedical relevance and their application.</li> </ul>
<b>Course Structure &amp; Available Subjects:</b>	<p>The Bachelor of Biomedical Science course is closely aligned with the Bachelor of Science course and makes provision for some common areas of study in a broad range of the biomedical sciences. However it is distinct in its provision for compulsory (core) subjects at each year level. These subjects have been designed to achieve the vertical integration of major themes of the new biologies, biomedical biotechnology and bioinformatics.</p>
<b>Subject Options:</b>	<p>A minimum (and maximum) of 300 points is required, comprising:</p> <ul style="list-style-type: none"> <li># 175 points of core subjects (12 subjects):</li> </ul> <p>(NB Equivalent subjects offered by the Faculty of Science may replace the first-year core subjects with the approval of the course coordinator).</p> <ul style="list-style-type: none"> <li># 75 points of 300-level subjects as specified in one of eight specialist streams in biomedical sciences; and</li> <li># 50 points of science subjects in a biomedical science discipline.</li> </ul> <p>Students must pass the four prerequisite chemistry and biology subjects before proceeding to 200-level core subjects, and must pass both 200-level core subjects before proceeding to 300-level core subjects.</p> <p>The selection of subjects outside the core subjects at the 200- and 300-levels of the course will depend on the requirements of the individual specialist stream of interest to the student. The design of the 300-level streams requires that students select the necessary prerequisite(s) at the 200-level. In addition to the two 200-level generic core subjects, students must take 200-level subjects in individual biomedical science discipline areas. A requirement of no more than two 12.5-point prerequisite subjects (total of 25 points) within any one discipline at the 200-level exists for any 300-level subjects offered with the BBiomedSc degree. With this provision, a student will be able to select from at least two possible streams at the third-year level.</p>

Due to the multidisciplinary content of the 200-level Integrated Biomedical Science generic core subjects, students enrolled in the BBiomedSc degree are not permitted to enrol in any of the following 200-level science subjects:

516-201 Cell Biology: Tissues and Organs  
 521-211 Biochemistry & Molecular Biology Part A  
 521-212 Biochemistry & Molecular Biology Part B  
 521-220 Techniques in Protein & Gene Technology  
 606-205 Cell Biology: Concepts and Diversity  
 536-201 Principles of Physiology  
 536-211 Physiology:Control of Body Function  
 536-222 Experimental Physiology  
 536-233 Research-based & Integrative Physiology  
 652-215 Genes and Genomes

### Year 1

Completion of 100 points of core subjects at 100-level:

650-131 Biomed: Molecules, Cells & Organisms  
 650-132 Biomed: Genetics & Biodiversity  
 610-051 Chemistry (Biomedical Science A)  
 610-052 Chemistry (Biomedical Science B)  
 620-151 Introduction to Biomedical Mathematics  
 620-152 Introduction to Biomedical Statistics  
 640-151 Physics for Biomedical Science A  
 640-152 Physics for Biomedical Science B

Students who did not complete these 100-level subjects prior to 2008 should seek advice from the Faculty of Science Office about appropriate alternative subjects.

### Year 2

Completion of 50 points (two subjects) of core subjects at 200-level.

Plus 50 points of subjects selected from existing science subjects according to the intended specialist stream at 300-level.

### Year 2

Core 200-level subjects

Subject	Study Period Commencement:	Credit Points:
521-213 Integrated Biomedical Science I	1	25.000
536-250 Integrated Biomedical Science II	Not offered 2008	25

### Year 3

Completion of 25 points (two subjects) of core subjects at 300-level.

Plus completion of 75 points of subjects at 300-level in a specialist stream selected from the following:

Stream 1: Functional, computational and applied genomics  
 Stream 2: Physiological genomics  
 Stream 3: Biotechnology and therapeutics  
 Stream 4: Molecular biology of the cell in health and disease  
 Stream 5: Reproductive and developmental biology  
 Stream 6: Neuroscience  
 Stream 7: Microorganisms, infection and immunity  
 Stream 8: Biomedical physics and chemistry

### Year 3

Core 300-level subjects for all streams.

Subject	Study Period Commencement:	Credit Points:
521-308 Genome Science	Semester 1	12.50
536-350 Genes to Phenotype:Control & Integration	Semester 2	12.50

Stream 1: Functional, computational and applied genomics

Coordinators: Assoc Prof Ian van Driel and Prof J Camakaris

Students completing this stream will achieve an understanding of the organisation and expression of the human genome, and other eukaryotic and prokaryotic genomes, obtain insight into the human proteome project (HPP), and acquire valuable skills in several areas of molecular biology, functional genomics, proteomic techniques, genetic analysis, computational genomics (bioinformatics), and analysis of protein structure, function and post-translational modifications. Basic knowledge will be integrated with applications such as gene mapping and discovery, gene therapy, biotechnology, and understanding the molecular basis of genetic diseases and cancer. This stream provides an excellent grounding for careers in basic science, medical research, proteomics, bioinformatics and biotechnology. Employment and post-graduate study opportunities will exist in university departments, research institutes (eg. Bio21 Institute) and hospitals, and in the biotechnology, pharmaceutical and bioinformatics industries.

### Stream 1A: Functional and applied genomics

Stream-specific core subjects (50 points): 652-302, 652-304, 521-302; plus one of 521-322, 531-303, 652-301, 652-303.

Electives (25 points): Two of 521-301, 521-303, 521-321, 526-301, 531-301, 652-305, 516-302, 521-307, 521-322, 531-303, 606-306, 652-301, 652-303, 652-306.

Subject	Study Period Commencement:	Credit Points:
652-302 Genes: Organisation and Function	Semester 1	12.50
652-304 Genetic Analysis	Semester 2	12.50
521-301 Protein Structure and Function	Semester 2	12.50
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50
521-321 Gene Technology & Protein Expression	1	12.500
526-301 Microbial Cells and Genomes	Semester 2	12.50
531-301 Cellular Basis of Disease	Semester 1	12.50
652-305 Human and Medical Genetics	Semester 2	12.50
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
652-301 Evolutionary Genetics and Genomics	Semester 1	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50
516-302 Developmental Biology	Semester 2	12.50
521-307 Biomolecular Structure & Bioinformatics	Not offered 2008	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
606-306 Plant Molecular Biology & Biotechnology	Semester 2	12.50
652-301 Evolutionary Genetics and Genomics	Semester 1	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50
652-306 Experimental Genetics	2	12.500

### Stream 1B: Proteomics and computational genomics

Stream-specific core subjects (37.5 points): 521-301, 521-307, 521-322.

Electives (37.5 points): Three of 521-303, 521-305, 521-321, 526-301, 531-301, 652-305, 521-302, 521-304, 534-306, 606-306, 652-301.

Subject	Study Period Commencement:	Credit Points:
521-301 Protein Structure and Function	Semester 2	12.50
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50
521-305 Biochemistry of Metabolism & Nutrition	Semester 1	12.50
521-321 Gene Technology & Protein Expression	1	12.500
526-301 Microbial Cells and Genomes	Semester 2	12.50
531-301 Cellular Basis of Disease	Semester 1	12.50
625-305 Economic Geology	Semester 2	12.50
521-307 Biomolecular Structure & Bioinformatics	Not offered 2008	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
606-306 Plant Molecular Biology & Biotechnology	Semester 2	12.50
652-301 Evolutionary Genetics and Genomics	Semester 1	12.50

#### Stream 2: Physiological genomics

Coordinator: Professor S Harrap

This stream is for students wishing to enter the rapidly expanding world of physiological genomics. This new post-genomic discipline defines the function of genes in living tissues. Physiological genomics is important in tracing the effects of newly discovered genes and mutations and provides insights into new means of preventing or treating genetic diseases. It combines molecular and physiological skills in the context of complex living systems. Students will develop an understanding of the interactions that characterise the integrated and coordinated way in which genetic codes are translated into the function of cells, tissues, organs and the organism. With the emerging application of genomic discoveries, graduates could consider careers in basic science as well as clinical research. Employment opportunities exist in university academic departments, research institutes, hospitals, the pharmaceutical industry and biotechnology companies.

#### Stream 2: Physiological genomics

Stream-specific core subjects (37.5 points): 536-301, 536-308, 536-311.

Electives (37.5 points): Three of 516-307, 521-305, 534-302, 600-311, 652-304, 652-305, 516-302, 521-302, 521-304, 536-302, 536-304, 600-312, 652-303.

Subject	Study Period Commencement:	Credit Points:
536-301 Cardiovascular Health: Genes & Hormones	Semester 1	12.50
536-308 Physiology of Muscle & Exercise	Semester 1	12.50
516-307 Research Project	Semester 1, Semester 2, Summer	12.50
521-305 Biochemistry of Metabolism & Nutrition	Semester 1	12.50
534-302 Neuropharmacology	Semester 1	12.50
600-311 Research Project A	Semester 1	12.50

652-304 Genetic Analysis	Semester 2	12.50
652-305 Human and Medical Genetics	Semester 2	12.50
536-311 Molecular/Cellular Basis of Physiology	Semester 2	12.50
516-302 Developmental Biology	Semester 2	12.50
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
536-302 Molecular Neurophysiology	Semester 2	12.50
536-304 Advanced Experimental Physiology	Semester 2	12.50
600-312 Research Project B	Semester 2, Summer	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50

### Stream 3: Biotechnology and therapeutics

Coordinator (Biotechnology): Dr D Tribe

Coordinator (Therapeutics): Prof A Stewart

Coordinators (Drug Technology): Dr U Wille and Prof A Stewart

Within Stream 3 there are three themes of study which are designed to provide insight into the rapidly developing interdisciplinary approaches that are providing new molecular innovations to improve our quality of life. Biotechnology is concerned with the commercial development and production of new agents, whereas pharmacology is concerned with the discovery and mechanism of action of such agents. Graduates with research training in these areas could be destined for a career in the pharmaceutical industry or in regulatory affairs. Research opportunities also exist in universities, research institutes, hospitals and an increasing number of start-up biotechnology companies.

The biotechnology theme will provide students with an understanding of the wide range of tools and techniques that are being used to manipulate genes, manage cell growth, and control enzyme catalysis for the creation of new products and manufacturing processes. It also provides familiarity with the ongoing conceptual advances and scientific innovations that are driving the continued expansion of biotechnology. Students may choose subjects that constitute a plant biotechnology substream.

The therapeutics theme will provide students with an understanding of the principles of pharmacology, which is the science of drug action at the molecular and physiological level. New developments in methods of drug discovery will be described and students will be given practical experience in the skills used by pharmacologists to unravel the mechanisms by which drugs produce their effects. Other topics include the study of the toxic actions of drugs and other environmental chemicals and the way that the body breaks down and eliminates such chemicals.

The drug technology theme will provide students with theory and practical experience in the drug development operations of the pharmaceutical industry. Rational design of pharmaceuticals at the molecular level is replacing previous 'hit and miss' random screening methods. Contemporary techniques in combinatorial chemistry, high-throughput analysis and computer-based rational drug design techniques (based on molecular structure) will be covered.

### Stream 3A: Biotechnology

Stream-specific core subjects (37.5 points): 521-301, 526-301, 521-322.

Electives (37.5 points): Three of 521-303, 521-305, 521-321, 531-301, 534-302, 536-301, 606-304, 606-309, 610-332, 521-302, 521-304, 521-307, 531-303, 534-305, 534-306, 536-302, 536-311, 606-306, 652-303.

Subject	Study Period Commencement:	Credit Points:
521-301 Protein Structure and Function	Semester 2	12.50
526-301 Microbial Cells and Genomes	Semester 2	12.50
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50

521-305 Biochemistry of Metabolism & Nutrition	Semester 1	12.50
521-321 Gene Technology & Protein Expression	1	12.500
531-301 Cellular Basis of Disease	Semester 1	12.50
534-302 Neuropharmacology	Semester 1	12.50
536-301 Cardiovascular Health: Genes & Hormones	Semester 1	12.50
606-304 Environmental Plant Physiology	Semester 1	12.50
606-309 Frontiers of Cell Biology	Semester 1	12.50
610-332 Bio-organic Chemistry	Semester 1	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
521-307 Biomolecular Structure & Bioinformatics	Not offered 2008	12.50
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
534-305 Toxicology	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
536-302 Molecular Neurophysiology	Semester 2	12.50
536-311 Molecular/Cellular Basis of Physiology	Semester 2	12.50
606-306 Plant Molecular Biology & Biotechnology	Semester 2	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50

### Stream 3B: Therapeutics

Stream-specific core subjects (50 points): 534-301; plus either 534-304 or two of 534-305, 536-306, 534-311.

Electives (25 points): Two of 516-307, 521-301, 521-303, 521-305, 521-321, 526-301, 531-301, 534-302, 536-301, 536-302, 606-304, 606-309, 610-332, 521-302, 521-304, 521-307, 531-303, 534-305, 534-306, 534-311, 536-311, 606-306, 652-303.

Subject	Study Period Commencement:	Credit Points:
534-301 Cellular and Molecular Pharmacology	Semester 1	25
516-307 Research Project	Semester 1, Semester 2, Summer	12.50
521-301 Protein Structure and Function	Semester 2	12.50
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50
521-305 Biochemistry of Metabolism & Nutrition	Semester 1	12.50
521-321 Gene Technology & Protein Expression	1	12.500
526-301 Microbial Cells and Genomes	Semester 2	12.50
531-301 Cellular Basis of Disease	Semester 1	12.50
534-302 Neuropharmacology	Semester 1	12.50

536-301 Cardiovascular Health: Genes & Hormones	Semester 1	12.50
536-302 Molecular Neurophysiology	Semester 2	12.50
606-304 Environmental Plant Physiology	Semester 1	12.50
606-309 Frontiers of Cell Biology	Semester 1	12.50
610-332 Bio-organic Chemistry	Semester 1	12.50
534-304 Pharmacology of Therapeutic Substances	Semester 2	25
534-305 Toxicology	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
534-311 Drug Development Techniques	Not offered 2008	12.500
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
521-307 Biomolecular Structure & Bioinformatics	Not offered 2008	12.50
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
534-305 Toxicology	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
534-311 Drug Development Techniques	Not offered 2008	12.500
536-311 Molecular/Cellular Basis of Physiology	Semester 2	12.50
606-306 Plant Molecular Biology & Biotechnology	Semester 2	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50

### Stream 3C: Drug technology

Stream-specific core subjects (37.5 points): 534-301 and 610-320.

Electives (37.5 points): Three of 610-332, 610-310, 610-340, 610-320, 534-305, 534-306, 534-311, 610-399, 610-360.

Subject	Study Period Commencement:	Credit Points:
534-301 Cellular and Molecular Pharmacology	Semester 1	25
610-332 Bio-organic Chemistry	Semester 1	12.50
610-310 Physical Chemistry IIIA	Semester 1	12.50
610-340 Inorganic Chemistry IIIA	Semester 1	12.50
610-320 Organic Chemistry IIIA	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
534-311 Drug Development Techniques	Not offered 2008	12.500
610-399 Chemical Research Project	Semester 2, Summer	12.50
534-305 Toxicology	Semester 2	12.50
610-360 Analytical & Environmental Chemistry	Semester 2	12.50

Stream 4: Molecular biology of the cell in health and disease  
Coordinators: Dr R de longh and Prof P Gleeson

The subjects in this stream deal with the links between the genome and phenome at all levels of organisation - from cells to organisms. Understanding these links is pivotal to apply recent advances in our knowledge of the human genome to the solution of medical problems. Students will emerge from this stream with a sound understanding of the genetic and molecular basis for normal cell and tissue function. They will also have an appreciation of how cellular processes can be disrupted as a result of inherited or environmentally induced mutations, inappropriate diet or infection. This stream provides an ideal grounding for careers in biomedical research into human diseases such as cancer, diabetes, hypertension etc. as well as basic research in cell and developmental biology. It opens up employment opportunities in university departments, hospitals, research institutes and biotechnology companies developing diagnostic and therapeutic products.

#### **Stream 4: Molecular biology of the cell in health and disease**

Stream-specific core subjects (50 points): 521-303, 606-309, 516-302; plus one of 521-302, 531-303, 652-303.

Electives (25 points): Two of 516-307, 521-301, 521-321, 526-301, 531-301, 531-302, 536-304, 652-302, 652-304, 652-305, 521-302, 521-304, 521-322, 526-305, 531-303, 531-304, 536-302, 536-304, 536-311, 652-303.

Subject	Study Period Commencement:	Credit Points:
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50
606-309 Frontiers of Cell Biology	Semester 1	12.50
516-307 Research Project	Semester 1, Semester 2, Summer	12.50
521-301 Protein Structure and Function	Semester 2	12.50
521-321 Gene Technology & Protein Expression	1	12.500
526-301 Microbial Cells and Genomes	Semester 2	12.50
526-304 Principles of Immunology	Semester 1	12.50
531-301 Cellular Basis of Disease	Semester 1	12.50
531-302 Techniques for Investigation of Disease	Semester 1	12.50
536-304 Advanced Experimental Physiology	Semester 2	12.50
652-302 Genes: Organisation and Function	Semester 1	12.50
652-304 Genetic Analysis	Semester 2	12.50
652-305 Human and Medical Genetics	Semester 2	12.50
516-302 Developmental Biology	Semester 2	12.50
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50
521-302 Functional Genomics and Bioinformatics	Semester 1	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
526-305 Medical and Applied Immunology	Semester 2	12.50
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50



531-304 Molecular/Genetic Basis of Disease-Prac	Semester 2	12.50
536-302 Molecular Neurophysiology	Semester 2	12.50
536-304 Advanced Experimental Physiology	Semester 2	12.50
536-311 Molecular/Cellular Basis of Physiology	Semester 2	12.50
652-303 Developmental and Cellular Genetics	Semester 2	12.50

#### Stream 5: Reproductive and developmental biology

Coordinators: Dr Andrew Pask and Dr Mary Familiari

Reproductive and developmental biology are two rapidly expanding fields offering many exciting opportunities for graduates at the forefront of biotechnology. These areas have numerous clinical applications such as in vitro fertilization (IVF), development of new contraceptives and the newest field, embryonic stem cell technology, which holds enormous therapeutic potential for the repair of diseased and damaged tissues. This stream is designed to give students a broad background in the genetics, molecular and cellular basis of diverse topics including reproduction, embryonic and fetal development in human, and other animal models. It covers the genetic and cellular events of: 1. development of egg to embryo; 2. pregnancy; 3. lactation; 4. birth and birth defects; 5. sexual differentiation; 6. fertility and control strategies for the prevention of HIV; and 7. cloning and stem cell research. This stream is taught by leading researchers in the fields of reproduction, sexual differentiation and embryonic development using state-of-the-art molecular and genetic technologies. This stream also provides a good background for those students interested in the application of assisted reproductive technology for the conservation of endangered species. The electives have been chosen to allow students to further focus on areas that particularly interest them and can lead to Honours and postgraduate research. This stream opens up employment opportunities in three broad areas: in biomedical research, biotechnology and agricultural industries. Graduates are well qualified for employment in fertility clinics; assisted reproductive technology and biotechnology companies such as IVF Australia; and veterinary and agricultural industries such as CSIRO, Environment Australia, Natural Resources and Environment, Parks Victoria and Victorian Institute of Animal Sciences. There are numerous large research centers in Victoria whose medical research focuses on aspects of reproduction and stem cell biology that offer many employment opportunities as well as opportunities for Honours and postgraduate study.

#### **Stream 5: Reproductive and developmental biology**

Stream-specific core subjects (37.5 points): 606-309, 516-302, 654-304.

Electives (37.5 points): Three of 516-306, 521-303, 600-311, 652-302, 652-305, 654-307, 531-303, 536-311, 600-312. 300-level subjects offered within other streams of the BBiomedSc course may also be taken as electives within stream 5.

Subject	Study Period Commencement:	Credit Points:
606-309 Frontiers of Cell Biology	Semester 1	12.50
516-306 Developmental Neurobiology	Semester 1	12.50
521-303 Molecular Aspects of Cell Biology	Semester 1	12.50
600-311 Research Project A	Semester 1	12.50
652-302 Genes: Organisation and Function	Semester 1	12.50
652-305 Human and Medical Genetics	Semester 2	12.50
654-307 Evolution and the Human Condition	Semester 1	12.50
516-302 Developmental Biology	Semester 2	12.50
654-304 Reproduction	Semester 2	12.50
531-303 Molecular/Genetic Basis of Disease-Lect	Semester 2	12.50
536-311 Molecular/Cellular Basis of Physiology	Semester 2	12.50

600-312 Research Project B	Semester 2, Summer	12.50
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**Stream 6: Neuroscience**

Coordinator: Dr P Kitchener

Understanding the human brain is one of the pre-eminent scientific challenges of the 21st century. Neuroscience is a broad discipline and in this stream is addressed over a wide range from the molecular and cellular mechanisms underlying neural function to complex behaviours such as thought and language. The range of subjects offered aims to provide students with insight into the molecular and cellular mechanisms fundamental to neural function; an understanding of how neurons form the building blocks of the nervous system, how they transmit information, communicate with each other, form elementary circuits, and store information; an appreciation of the fundamentals of systems underlying sensory perception; an understanding of how the nervous system initiates and controls movements of the body; an appreciation of the plasticity of the nervous system, how it adapts to changing environments, how it ages, how nerve injuries may be repaired or may lead to irreversible damage; insight into how drugs and diseases affect the nervous system. A neuroscience background leads to career opportunities in scientific and medical research in university departments, research institutes, hospitals; and to broader opportunities in drug companies, and in bioengineering companies (diagnostic and therapeutic equipment, robotics).

**Stream 6: Neuroscience**

Stream-specific core subjects (50 points): 534-302, 536-303, 516-305, 521-304.

Electives (25 points): Two of 516-306, 516-307, 654-315, 516-302, 516-307, 536-302, 536-304.

Subject	Study Period Commencement:	Credit Points:
534-302 Neuropharmacology	Semester 1	12.50
536-303 The Brain: Neurophysiology of Behaviour	Semester 1	12.50
516-306 Developmental Neurobiology	Semester 1	12.50
516-307 Research Project	Semester 1, Semester 2, Summer	12.50
654-315 Animal Behaviour	Semester 1	12.50
516-305 Neuroscience: Systems & Higher Functions	Semester 2	12.50
521-304 Cell Signalling and Neurochemistry	Semester 2	12.50
516-302 Developmental Biology	Semester 2	12.50
536-302 Molecular Neurophysiology	Semester 2	12.50
536-304 Advanced Experimental Physiology	Semester 2	12.50

**Stream 7: Microorganisms, infection and immunity**

Coordinators: Prof R Robins-Browne and Ms S Uren

Infectious diseases are the major world wide cause of morbidity and mortality. The Stream 7 core subjects provide a deep understanding of the diverse agents of infection (bacteria, viruses, fungi and parasites), and the many diseases they cause. The molecular basis of the ability of various microorganisms to cause disease (pathogenesis) will be discussed, together with strategies to interrupt this process, including the development of new antibiotics and other agents. The immunology component of the course allows students to become familiar with the way the immune system responds to defend the body against infections. Techniques to boost the immune response by the development of novel vaccines and other interventions are explored. As well, the immunology subjects provide an understanding of the mechanisms operating in response to tumours, transplants, and in allergies and autoimmune diseases. Stream 7 electives have been chosen to allow students to further focus on areas of particular interest to them. This stream opens up employment opportunities in the areas of medical microbiological and immunological diagnostics, food science, biotechnology (including medical and veterinary vaccine and therapeutics development and production), and basic research into a range of microorganisms (including those bacteria and viruses which cause diarrhoea, HIV, influenza and tuberculosis), microbial genetics and pathogenesis. The depth of the immunological content of the course allows students to continue to explore the immune system by research into such diverse areas as allergies, autoimmune diseases including diabetes and arthritis, transplantation and cancer immunology.

**Stream 7A: Combined microbiology and immunology**

Stream-specific core subjects (50 points): 526-304, 526-313, 526-314; plus one of 526-305, 526-327.

Electives (25 points): Two of 526-301, 526-321, 526-324, 526-305, 526-326.

Subject	Study Period Commencement:	Credit Points:
526-304 Principles of Immunology	Semester 1	12.50
526-313 Medical Microbiology: Cellular Pathogens	Semester 1	12.50
526-301 Microbial Cells and Genomes	Semester 2	12.50
526-321 Molecular Microbiology Techniques	Semester 1	12.50
526-324 Immunological Techniques	Semester 1	12.50
526-314 Medical Microbiology: Viruses	Semester 2	12.50
526-305 Medical and Applied Immunology	Semester 2	12.50
526-327 Projects: Microbiology	Semester 2	12.50
526-305 Medical and Applied Immunology	Semester 2	12.50
526-326 Projects: Immunology	Semester 2	12.50

**Stream 7B: Microbiology**

Stream-specific core subjects (50 points): 526-313, 526-314, 526-327; plus one of 526-304, 526-321.

Electives (25 points): Two of 526-301, 526-304, 526-321, 526-324, 526-305. Additional 300-level subjects may also be available as electives within stream 7B, with approval of the stream coordinators.

Subject	Study Period Commencement:	Credit Points:
526-313 Medical Microbiology: Cellular Pathogens	Semester 1	12.50
526-304 Principles of Immunology	Semester 1	12.50
526-321 Molecular Microbiology Techniques	Semester 1	12.50
526-301 Microbial Cells and Genomes	Semester 2	12.50
526-321 Molecular Microbiology Techniques	Semester 1	12.50
526-324 Immunological Techniques	Semester 1	12.50
526-314 Medical Microbiology: Viruses	Semester 2	12.50
526-327 Projects: Microbiology	Semester 2	12.50
526-305 Medical and Applied Immunology	Semester 2	12.50

**Stream 7C: Immunology**

Stream-specific core subjects (50 points): 526-304, 526-324, 526-305, 526-326.

Electives (25 points): Two of 526-301, 526-313, 526-314. Additional 300-level subjects may also be available as electives within stream 7C, with approval of the stream coordinators.

Subject	Study Period Commencement:	Credit Points:
526-304 Principles of Immunology	Semester 1	12.50
526-324 Immunological Techniques	Semester 1	12.50
526-301 Microbial Cells and Genomes	Semester 2	12.50

526-313 Medical Microbiology: Cellular Pathogens	Semester 1	12.50
526-305 Medical and Applied Immunology	Semester 2	12.50
526-326 Projects: Immunology	Semester 2	12.50
526-314 Medical Microbiology: Viruses	Semester 2	12.50

**Stream 8: Biomedical physics and chemistry**

Coordinator (Physics): Assoc Prof Ann Roberts

Coordinator (Chemistry): Dr U Wille

**Stream 8: Biomedical physics and chemistry**

Stream-specific core subjects (75 points): six of 521-301, 521-321, 610-332, 610-340, 640-321, 640-341, 521-307, 521-322, 534-305, 534-306, 610-320, 640-353, 640-364. Additional 300-level chemistry and physics subjects may also be available as core subjects within stream 8.

Subject	Study Period Commencement:	Credit Points:
521-301 Protein Structure and Function	Semester 2	12.50
521-321 Gene Technology & Protein Expression	1	12.500
610-332 Bio-organic Chemistry	Semester 1	12.50
610-340 Inorganic Chemistry IIIA	Semester 1	12.50
640-321 Quantum Mechanics (Adv)	Semester 1	12.50
640-341 Quantum Mechanics	Semester 1	12.50
521-307 Biomolecular Structure & Bioinformatics	Not offered 2008	12.50
521-322 Protein Biochemistry and Proteomics	2	12.500
534-305 Toxicology	Semester 2	12.50
534-306 Drug Discovery	Semester 2	12.50
610-320 Organic Chemistry IIIA	Semester 2	12.50
640-353 Atomic, Molecular & Solid State Physics	Semester 2	12.50
640-364 Computational Physics	Semester 2	12.50

**Entry Requirements:**

There is no first year intake into this course from 2008.

For enquiries about admission requirements for later year entry into this program, please contact the Faculty of Science Office.

**Core Participation Requirements:**

It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact upon their active and safe participation in a subject are encouraged to discuss this with the relevant subject coordinator and the Disability Liaison Unit.

**Further Study:**

An honours option is available for graduates of the Bachelor of Biomedical Science through the Bachelor of Science (Degree with Honours) course.

**Graduate Attributes:**

In biomedical science at the University of Melbourne we expect to educate our students in the fundamental skill of transforming information into knowledge. This outcome is fully consistent with the University's general ambition for our graduates, and emphasises the transferability of the skills practised in science. Throughout their course, students will find that many of the abilities that they develop are shared, valued, and applicable to activities in all walks of life. In particular, these are the skills that are essential to providing leadership to the biomedical science industries of the Australian economy and culture. Bachelor of Biomedical Science graduates have concentrated knowledge across the range of biomedical discipline areas, as

well as particular areas of specialisation. The integrated nature of the course means that they are able to apply this knowledge readily to different issues, problems or workplaces. They are also able to see beyond specific discipline boundaries and can evaluate and integrate new information and ideas readily into their existing knowledge base. Having undertaken laboratory and tutorial classes, biomedical science graduates are adept at activity planning as well as the application of theory to practice. They are well versed in a variety of state-of-the-art laboratory techniques of biomedical relevance as well as skills in bioinformatics. Many graduates will have been exposed to laboratory research in research institutes associated with the University. They are not only able to work independently on basic research projects, but are also familiar with professional work cultures and readily adapt to new organisations. In addition they are aware of the bioethical issues surrounding areas such as new genetics and animal cloning investigations. The scientific training of these graduates gives them strong cognitive skills and they are able to: observe, record and evaluate data or evidence appropriately; deal with complex data sets and apply their strong numerical competence to identify and analyse key factors and components; make effective use of information to identify and solve problems; and synthesise and integrate disparate elements into a meaningful whole. Graduates take these skills further in the creative realm, formulating hypotheses that can be tested for validity. They are used to extrapolating from the known to the unknown and are comfortable working with analogues rather than needing to deal with literal situations. They understand the need to question and clarify before developing a response to a particular issue or problem, enabling them to analyse critically. Science disciplines value clear reporting. Consequently, the biomedical science graduate has developed skills of efficient and effective communication of ideas and results, whether in the accepted modes of scientific report writing or through more informal oral presentations. Graduates recognise the need to present information and ideas in an effective written form that is appropriate to the purpose and the reader. The need to manage the multiplicity of tasks (lectures, laboratory and assignment work), means that biomedical science graduates are aware of the need to structure and manage time effectively and efficiently, to retain balance, and to prioritise their activities. They are able to juggle several tasks simultaneously, take responsibility for their own work, independently or within a group, and to plan their schedule appropriately.

**Generic Skills:**

Upon completion of this course students should have developed the following generic skills:

# when solving scientific problems:

- be capable of applying appropriate knowledge,
- be able to access relevant information particularly through the use of information technology and traditional libraries,
- understand the principles of project and experimental design,
- have a capacity to apply practical skills, technology and computational systems;

# be able to communicate the results of their studies in written and oral form and through computer-based presentations;

# have experience in teamwork and leadership;

# have an appreciation of the historical background and evolution of scientific concepts; and

# have an awareness of bioethics, particularly in the context of areas such as the new genetics and animal cloning investigations.