

Anatomy and cell biology

The Department of Anatomy and Cell Biology is very active in both teaching and research. Our undergraduate teaching and learning specialises in three main areas: cell and developmental biology; neuroscience; and human anatomy. These disciplines represent some of the most active fields of research in the biological sciences today. Training in these areas will open up many exciting and rapidly expanding career opportunities in the biomedical sciences. Strong research groups within the department are supported by excellent external funding and departmental infrastructure. Our outstanding research performance underpins and invigorates our undergraduate teaching.

The Department of Anatomy and Cell Biology offers undergraduate majors in human anatomy, neuroscience, cell and molecular biology (with the School of Botany) and reproduction and development (with the Department of Zoology). All of these majors require students to undertake the life sciences package in first year. Subjects taught by the department complement majors in other areas.

Majors

The Department of Anatomy and Cell Biology coordinates the anatomy and neuroscience majors and teaches several subjects in the cell and molecular biology (coordinated by the School of Botany) and reproduction and development (coordinated by the Department of Zoology) majors. Detailed course plans for these majors are listed under *Majors (p.11)*.

Anatomy

The anatomy major enables students to undertake studies in anatomy at 200- and 300-level. The two 200-level subjects provide an introduction to basic principles of topographic anatomy. The 300-level subjects focus on the advanced aspects of anatomy and the organisation of connective tissues and joints. These subjects can be combined with studies in neuroscience or cell and developmental biology, allowing students to undertake studies in the areas that best suit their anatomical interests. This major is designed for students interested in a solid grounding in anatomy with an intention of a future career in research or academia, or for those students interested in a career as a health professional.

Neuroscience

At 200-level, students wishing to do the neuroscience major take a new subject, 516-209 Introductory Neuroscience (*p.2*), taught in conjunction with the Department of Physiology. This subject provides a broad introduction to neuroscience, covering topics ranging from molecular and cellular neuroscience to higher-level brain functions. It can be combined with complementary 200-level subjects in physiology, zoology, cell biology, biochemistry and molecular biology, psychology or behavioural sciences. At 300-level, students take two core subjects in neuroscience, taught by the Departments of Anatomy and Cell Biology and Physiology, together with a range of elective subjects which enable them to focus their interests in a particular area of neuroscience. This major provides ideal training for a career in basic or clinical neuroscience within university departments, research institutes and hospitals.

Cell biology

Students who choose this major undertake a core of 200-level subjects in cell biology, tissue and organ biology and molecular biology taught by the Departments of Anatomy and Cell Biology, the School of Botany and the Department of Biochemistry and Molecular Biology. This provides a suitable background for third-year studies in the areas of cell and developmental biology. A range of 300-level subjects in these areas is offered by the Departments of Anatomy and Cell Biology, the School of Botany and the Department of Zoology. This major will equip you for a career in many exciting new areas of biomedical science, including stem cell research and functional genomics.

Reproduction and development

This major requires the student to take a core of 200-level units in cell and tissue biology (taught by the Department of Anatomy and Cell Biology) and animal structure and function (taught by the Department of Zoology). At the 300-level, the major comprises a core of two subjects in reproductive and developmental biology, offered by the Departments of Zoology and Anatomy and Cell Biology plus a choice of elective subjects in cell biology or marsupial biology.

Bachelor of Science (Degree with Honours)

For information about the faculty and departmental entry requirements for honours, please refer to *Bachelor of Science (Degree with Honours) and Bachelor of Information Systems (Degree with Honours) (p.1)*. These requirements should be considered when planning your course.

Further information

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Subject descriptions

200-level subjects

516-201 Cell Biology: Tissues and Organs

Note: Not available to students enrolled in BBiomedSc.

Students must register for a practical class and purchase a practical manual (cost \$10.00) during the first week of semester. Details of time and place for registration and manual purchase will be posted on Webrat.

Credit points: 12.5

Coordinator: Dr R de Iongh

Prerequisites: Biology 650-141 and 650-142 (prior to 2004: 600-141 and 600-142).

Contact: 24 lectures (two a week) and 36 hours practical work (three hours a week) (*Semester 1*).

Description: Subject-specific skills that will be developed in this subject include the ability to:

- identify the range of cellular activities that are especially relevant to multicellular organisation;
- understand how external signals can regulate these activities;
- understand how the properties of tissues and organs arise from the properties of their constituent cells and their interactions;
- understand how cellular activities are regulated to ensure an orderly replacement of lost cells in the adult body; and
- understand how tissues and organs are first assembled during embryonic development and how these processes are regulated at the molecular level.

Generic skills that will be fostered in this subject include:

- the development of generic analytical and problem-solving skills;
- collaborative learning in practical class groups;
- skills in observation and interpretation; and
- integration of seemingly disparate types of knowledge.

Assessment: Ongoing assessment on theory and practical work during the semester (30%); 2-hour written examination in the examination period (70%).

Prescribed texts: B Alberts et al, *Molecular Biology of the Cell*, 4th Ed. 2002.

Recommended texts: LP Gartner and JL Hiatt, *Colour Textbook of Histology*, 2nd edn.

516-204 Anatomy 1

Credit points: 12.5

Coordinator: A/Prof C Briggs

Prerequisites: Biology 650-141 and 650-142 (prior to 2004: 600-141 and 600-142).

Contact: 32 lectures (two to three 1-hour lectures per week) and 28 hours practical work (one 2-hour practical class per week) (*Semester 1*).

Description: By the end of this subject, students should:

- comprehend the terminology of topographic anatomy; the principles relating to each of the following types of anatomical structure: skin, fascia and skeletal muscles, bones and joints, vessels, nerves and viscera; the organisation of the back and upper limb into regions and the trunk into cavities; the essential factual information regarding the specific anatomical structures which form the boundaries and contents of the back, upper limb, neck and head; the applied anatomy of each region;
- develop observational and organisational skills to identify and interpret exposed anatomical structures and regions; communication skills (written and oral) to describe the normal structure of the back, upper limb, neck and head; skills in the manipulation of anatomical structures (with dissecting instruments); and
- appreciate the common occurrence of anatomical variation; the scientific basis of knowledge of structure.

The subject provides detailed information on:

- organogenesis; development of nervous system, skeletal system; and
- the terminology of topographic anatomy, principles related to each type of anatomical structure; skin, fascia and skeletal muscles, bones and joints, vessels, nerves and viscera; the organisation of the back, upper limb, neck

and head into regions, and the specific structures forming the boundaries and contents of these regions. The applied anatomy of each region is studied.

Assessment: Ongoing assessment on theory and practical work throughout the semester (25%); a 2-hour written examination in the examination period (50%); a 30-minute practical examination in the examination period (25%).

Prescribed texts: KL Moore and AMR Agur, *Essential Clinical Anatomy*, 2nd edn, Lippincott, Williams and Wilkins..

516-207 Anatomy 2

Credit points: 12.5

Coordinator: A/Prof C Briggs

Prerequisites: Anatomy 516-204; biology 650-141 and 650-142 (prior to 2004: 600-141 and 600-142).

Contact: 32 lectures (two to three 1-hour lectures per week) and 28 hours practical work (one 2-hour practical class per week) (*Semester 2*).

Description: By the end of this subject, the student should be able to:

- comprehend the development of the cardiorespiratory, gastrointestinal and urogenital systems; the terminology of topographic anatomy; the organisation of the trunk into cavities and the lower limb into regions; the essential factual information regarding the specific anatomical structures which form the walls and contents of the thorax, abdomen and pelvis and the boundaries and contents of the lower limb; the applied anatomy of the thorax, abdomen, pelvis and lower limb;
- develop observational and organisational skills to identify and interpret exposed anatomical structures and regions; communication skills (written and oral) to describe the normal structure of the thorax, abdomen, pelvis and lower limb; skills in the manipulation of anatomical structures (with dissecting instruments); and
- appreciate the embryonic basis of certain birth defects relating to the cardiorespiratory, gastrointestinal and urogenital systems; the common occurrence of anatomical variation; the scientific basis of knowledge about development and structure; the importance of one's own observations; the need for continuing independent learning to keep pace with future advances.

The subject provides detailed information on the organisation of the thorax, abdomen, pelvis and lower limb and the structures which form their walls, boundaries and contents as well as the applied anatomy of the thorax, abdomen, pelvis and lower limb.

Assessment: Ongoing assessment on theory and practical work throughout the semester (25%); a 2-hour written examination in the examination period (50%); a 30-minute practical examination in the examination period (25%).

Prescribed texts: KL Moore and AMR Agur, *Essential Clinical Anatomy*, 2nd edn, Lippincott, Williams and Wilkins..

516-209 Introductory Neuroscience

Note: This subject is taught jointly by the Department of Anatomy and Cell Biology and the Department of Physiology.

Credit points: 12.5

Coordinator: Dr P Kitchener; Dr A Allen

Prerequisites: Life science package, or any first-year biology, chemistry, physics or mathematics subject. Prerequisites may be waived by the Head of Department.

Contact: 36 lectures (three 1-hour lectures per week) plus six two-hour tutorials (*Semester 2*).

Description: This subject provides a broad introduction to neuroscience. The topics covered range from the molecular and cellular mechanisms underlying neural function to an introduction to complex behaviours such as thought and language. It forms an ideal grounding for the more specialist third-year neuroscience subjects and should be taken by all students looking to major in neuroscience. Because of its broad nature, it is also suitable for students who wish to learn something about neuroscience without majoring in the topic.

The subject aims to provide the student with:

- an appreciation of how human behaviour, including complex functions like thought and emotion, is mediated by the brain;
- an understanding of how neurons form the building blocks of the nervous system, how they transmit information by electrical impulses, how they communicate with each other, how they are connected to form elementary circuits, how they store information;
- insight into the molecular and cellular mechanisms fundamental to neural function;
- a picture of the inter-relationships of the various parts of the nervous system; the brain, spinal cord, peripheral nervous system, automatic nervous system;
- an appreciation of the fundamentals of systems underlying sensory perception, including the transduction of sensory stimuli (for example light

and sound) and the processing of sensory information by neuronal populations leading, ultimately to perception;

- an understanding, at an elementary level, of how the nervous system initiates and controls movements of the body; and
- 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.

Assessment: Ongoing assessment comprising a maximum of four 10-minute tests during the semester (total 20%); a 50-minute written examination held mid-semester (25%); a 2-hour written examination in the examination period (55%).

300-level subjects

516-302 Developmental Biology

Note: This subject is a joint anatomy and cell biology and zoology subject.

Availability: This subject is likely to be quota-restricted this year, see *Quota subjects (p.9)*.

Credit points: 12.5

Coordinator: Dr G Hime, Dr M Familiar

Prerequisites: 516-201, or Zoology 654-203, or Biochemistry 521-211 and 521-212.

BBiomedSc students: 521-213 and 536-250. Zoology 654-304 and 654-313 and Anatomy 516-306 are recommended.

Contact: 24 lectures (two a week) and 24 hours practical/tutorial (times to be arranged) (*Semester 2*).

Description: Upon completion of this subject, students should:

- comprehend the molecular, biochemical and cellular events that regulate the development of specialised cells, tissues and organs during embryonic development, particularly cell signalling pathways that regulate embryonic induction, tissue interactions and pattern formation, and expression of regulatory genes; and
- understand the experimental strategies and techniques that are used to identify the molecular and cellular mechanisms of development.

The following topics are considered: mechanisms of cell determination and commitment; embryonic organiser; mesoderm induction; establishment of the vertebrate body plan; positional specification; tissue patterning; cell migration; epithelial-mesenchymal interactions; sex determination; developmental potency; growth control; cell and tissue transplantation; nuclear transplantation; cell ablation; cell lineage tracing; organogenesis in vitro; transgenesis; gene knockout; and developmental mutations.

Students will also gain the generic skills listed below:

- critical analysis of data;
- ability to solve complex problems;
- oral and written communication skills, including public speaking and summary reports of complex data;
- teamwork skills in the analysis and interpretation of data;
- working as a team to perform new experimental tasks; and
- time management skills.

Assessment: Ongoing assessment on theory and practical work during the semester comprising a maximum of two 30-minute multiple choice quizzes (10%); two practical reports to be completed during the practical sessions (10%); one practical report of 1000 words due during the semester (10%); a 2-hour written examination during the examination period (70%).

Prescribed texts: S Gilbert, *Developmental Biology*, 7th edn, Sinauer Associates Inc., 2003.

516-304 Functional and Applied Anatomy

Credit points: 12.5

Coordinator: Dr P Barker

Prerequisites: Two of anatomy 516-204, 516-207, 516-308.

Contact: 48 hours contact time involving approximately equal weighting of lectures and practical classes. Precise subject details will be made known at the commencement of the subject (*Semester 2*).

Description: Upon completion of this subject, students should have an appreciation of:

- the tissues and structures that comprise the musculoskeletal system - connective tissues, muscle, fascia and tendon, ligament and nerve and their response to normal and abnormal stress and strain;
- the functional and applied anatomy of the body's major joint complexes; including the joints of the vertebral column, shoulder, elbow complex, wrist and hand, pelvis, hip, knee, ankle and foot;
- a description of motion, including an examination of the forces acting on the body's motion segments in normal activities and the principles underlying gait and locomotion;

- anatomical changes that accompany growth and development, skeletal traits important in the identification of age, sex, stature and race.

The subject provides detailed information on connective tissues, muscle, tendon, ligament and nerve, and their response to normal and abnormal stress and strain; the forces acting across synovial joints and methods of measuring these forces; the applied anatomy of vision, hearing, taste and vocalisation and the cranial nerve pathways involved, the applied anatomy of the mandible and temporomandibular joint; normal and abnormal movement patterns, and the principles underlying gait and locomotion; anthropometric techniques; skeletal traits important in human identification; and dissection of selected joint structures.

Generic skills include capacity for independent study, rational inquiry and self-directed learning; ability to analyse problems; oral and written communication skills; time management skills; teamwork in interpretation and analysis of new information.

Assessment: Ongoing assessment incorporating one 50-minute quiz and reports from practical classes throughout the semester (20%); dissection project during the semester (35%); a 2-hour written examination in the examination period (45%).

Prescribed texts: CA Oatis, *The Mechanics and Pathomechanics of Human Movement*, Lippincott, Williams and Wilkins, 2004.

516-305 Neuroscience: Systems & Higher Functions

Credit points: 12.5

Coordinator: Dr E Fletcher

Prerequisites: Anatomy 516-209.

BBiomedSc students: 521-213 and 536-250.

Contact: 24 lectures (two a week) and 10 hours tutorial or practical work (*Semester 2*).

Description: The following topics will be considered: the structure and function of the main sensory systems and the motor systems; complex functions such as thought, emotion, motivation, memory and the disorders of thought and mood.

Students will acquire an understanding of the major questions in neuroscience and the experimental tools that are being used to address them; develop written communication skills; and develop a capacity for independent critical thought, rational enquiry and self-directed learning.

Assessment: A 30-minute written class test held mid-semester (20%); a 2-hour written examination during the examination period (80%).

Prescribed texts: Kandel, Schwartz and Jessell, *Principles of Neural Science*, 4th ed.

516-306 Developmental Neurobiology

Credit points: 12.5

Coordinator: A/Prof P Whittington

Prerequisites: Anatomy 516-201 plus 516-209.

BBiomedSc students: 521-213 and 536-250.

Contact: 36 lectures (three 1-hour lectures per week) (*Semester 1*).

Description: On completion of this subject, students should:

- appreciate the major processes involved in the development of the nervous system, including neural induction, neural patterning, neural and glial cell proliferation, determination of neural fate, neuronal migration, axon guidance, regulation of neuron survival and synaptogenesis;
- have gained some insights into the cellular and molecular basis of those processes and understand how disorders in developmental processes can lead to neural defects;
- be aware of the regenerative ability of the nervous system and the prospects for therapeutic treatment of neural injury and disease;
- be familiar with outstanding questions currently being addressed in research in neural development; and
- be familiar with modern experimental approaches used to investigate the development of the nervous system and appreciate their strengths and limitations.

This subject will help students develop the following generic skills:

- critical analysis of scientific research papers;
- literature searching skills;
- capacity for independent critical thought, rational enquiry and self-directed learning;
- ability to plan work and use time effectively; and
- ability to synthesise apparently disparate types of knowledge.

Assessment: A 45-minute written class test during the semester (15%); a 2000 word essay due during the semester (20%); a 2-hour written examination in the examination period (65%).

Recommended texts: Kandel, Schwartz and Jessell, *Principles of Neural Science*, 4th ed. or B Sanes et al, *Development of the Nervous System*, 2nd ed, 2006.

516-307 Research Project

Note:

- This subject may involve the use of animals in experiments.
- 516-307 as part of a science major: 516-307 can be taken in a number of discipline areas and, with the permission of the department administering the major, could replace an existing subject in an appropriate major.

Credit points: 12.5

Coordinator: Dr G Hime

Prerequisites: A suitable background in a discipline appropriate to the project; approval of the coordinator.

Note: Enrolment in this subject is contingent on the availability of a supervisor. A suitable supervisor may not be available in any particular semester.

Contact: At least 60 hours of laboratory work and up to 4 hours of lectures (*Semester 1, repeat 2, Summer*).

Description: A purely research laboratory-based subject. The student will design, carry out and present the results of a research project, under the supervision of a member of staff of the Departments of Anatomy and Cell Biology, Physiology or Pharmacology.

Assessment: A written report on the research project of no more than 4000 words submitted at the end of semester (70%); a 15-minute oral defence of the research project in the examination period (20%); supervisor's assessment of laboratory performance (10%).

516-308 Advanced Studies in Human Anatomy

Credit points: 12.5

Coordinator: A/Prof C Briggs

Prerequisites: 516-204 and 516-207.

Contact: 12 lecture/tutorials (one per week) and up to 48 hours of practical work (one 3- to 4-hour practical class per week) (*Semester 1*).

Description: Upon completion of this subject, students should have an appreciation of:

- the organisation of the human body into regions and the detailed anatomy of the structures forming the boundaries and contents of these regions;
- the applied and clinical anatomy of each region studied;
- the incidence of anatomical variations and their clinical significance.

The subject provides detailed information at an advanced level on the developmental and comparative anatomy of the head and neck; anatomy of the joints and regions of the limbs; and the detailed regional anatomy of the back, thorax, abdomen and pelvis.

Major generic skills include capacity for independent study, rational inquiry and self-directed learning, the ability to analyse problems, oral and written communication skills, time management skills, and teamwork in interpretation and analysis of new information.

Assessment: Ongoing assessment incorporating a 10-minute quiz and reports from practical classes throughout the semester (15%); folio of anatomical variations due at the end of semester (15%); a practical examination up to 1-hour duration in the examination period (25%); a 2-hour written examination in the examination period (45%).

Prescribed texts: KL Moore and AF Dalley, *Clinically (Oriented Anatomy)*, 4th edn, Lippincott Williams and Wilkins 1999. or C Rosse and P Gaddum-Rosse, *Hollinshead's Textbook of Anatomy*, 5th edn, Lippincott-Raven 1997. • N Eizenberg and C Briggs, *Practical Anatomy: Guide and Dissector*.

