Anatomy and Cell Biology

The Department of Anatomy and Cell Biology is very active in both teaching and research. Undergraduate teaching and learning specialises in topographic (gross) anatomy, microscopic anatomy (histology), cell biology, embryology, developmental biology and neurosciences. Strong research groups are supported by excellent external funding and Departmental infrastructure, providing ample facilities and positions for undergraduate and postgraduate students. Our outstanding research performance underpins and invigorates our undergraduate teaching. The Department of Anatomy and Cell Biology offers undergraduate majors in anatomy and neuroscience as well as contributing to majors in cell and molecular biology (with botany), and reproduction and development (with zoology). All majors require students to undertake the life sciences package in first year. Subjects taught by the Department can also be selected to complement majors in other areas.

The Department, in conjunction with the School of Botany and the Department of Zoology, plays a major role in teaching cell biology at 200 and 300-levels. Besides providing subjects in embryology and developmental biology the Department also teaches in the reproduction and development major, in conjunction with the Department of Zoology.

Majors

Detailed course plans for these majors can be found on page 762 and page 767.

Anatomy

The anatomy major enables students to undertake studies in gross anatomy (upper and lower limbs, back, thorax, abdomen and pelvis), microscopic anatomy (histology) and embryology (embryogenesis and organogenesis) at the 200-level. At the 300-level, studies focus on head and neck as well as functional and applied anatomy. These can be combined with studies in neuroscience or cell and developmental biology, allowing students to undertake studies in the areas which best suit their anatomical leanings. 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 undertake various combinations of subjects from physiology, zoology, cell biology, biochemistry and molecular biology, psychology or behavioural sciences providing them with the best background for their choice of major. At 300-level the following specialisations allow students to focus their study of Neuroscience.

Cell and molecular neuroscience

This option provides a strong basis in neuroscience, emphasizing cellular mechanisms. It is suited to students who want to enter neuroscience research, drug development in relation to the nervous system, or studies of factors that influence the growth, maturation and repair of the nervous system.

Neuroscience

This specialisation provides students with the conceptual and knowledge base to enter most areas of basic or applied neuroscience research and teaching. Neuroscience is studied at a cell and systems level.

Behavioural science

This specialisation provides the student with an understanding of how brain functions relate to behaviour. It is particularly suited to students interested in neuropsychology and in the biological and neurochemical basis of normal and altered behaviour. It is relevant to the study of mechanisms underlying mental disorders.

Bachelor of Science (Honours)

For information about the faculty and departmental entry requirements for Honours, please refer to *Bachelor of Science (Honours) and Bachelor of Information Systems (Honours) (p.883)*. These requirements should be considered when planning your course.

200-level subjects

516-201 Microanatomy: Cells and Tissues

Note: Previously known as 516-201 Histology.

Students must register for practical classes by writing their name and preference (two alternative times will be available) on the sheets displayed outside Room E241 during Orientation Week (26 February to 2 March). A subject handbook, containing timetables, lecture outlines and practical notes, is available from the Department during Orientation Week.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C Anderson

Prerequisites: Biology 600-141 and 600-142 (Before 1996: Biology 600-101)

Contact: 24 lectures (two a week) and 36 hours practical work (3 hours a week) *(Semester 1)*.

Description: This subject introduces students to the structure of normal mammalian cells, tissues and organs. The subject, with its emphasis on the functional microanatomy of cells and tissues, complements a wide range of other subjects, including gross anatomy, developmental biology, biochemistry, cell biology, pathology, physiology and zoology. The subject makes full use of modern multimedia teaching tools and also provides a self-paced learning environment to complement the lectures and practical classes.

Upon completion of this subject students should:

- understand the relationship between the microscopic structure of a cell or tissue and relate them to its function, be able to identify a range of cells and tissues from their light microscope or electron microscopic appearance and be able to appreciate the functional significance of the structural specialisations observed;
- recognise the contribution of specific cells or tissues to the organisation of a range of organs and appreciate the role that the cells or tissues play within each organ, and understand the way that cells and tissues interact within an organ to give rise to the distinctive function(s) of that organ; and
- develop specific communication skills relevant to the description and informed discussion of the microscopic anatomy of cells, tissues and organs, and develop an ability to interpret complex light or electron microscopic images of cells, tissues and organs, including their three dimensional structure, natural variation and functional significance.

While the subject will centre on the structure of cells, tissues and organs, it will always emphasise the relationship between structure and function. The subject will not attempt to describe all possible tissue and organ systems in the body. It will cover a range of cell types, tissue and organ systems, each selected to illustrate a specific concept governing the organisation of such structures in general. Laboratory work will emphasise the functional significance of the examples shown.

Assessment: Continuous assessment in practical classes throughout the semester (15%), a 2-hour written examination at the end of semester that will include multiple choice questions (60%), and a 30-minute practical examination, also at the end of the semester (25%).

Prescribed texts: M H Ross, L J Romrell and G I Kaye, *Histology: A Text and Atlas*, 3rd ed., 1995.

516-202 Human Embryology

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr P Kitchener

Prerequisites: Either anatomy and cell biology 516-201, or biochemistry and molecular biology 521-213. Prerequisites may be waived by the head of department.

Contact: 24 lectures (two a week), 24 hours practical work (2 hours a week) and 7 hours tutorials *(Semester 2)*.

Description: By the end of this subject students should:

- comprehend the terminology of embryology; the principles and essential factual information regarding developmental processes, formation of the embryo, development of the placenta, organ and system development; the role of the developmental events in the organisation of adult structure; the correlation of developing structure with function;
- develop observational and organisational skills to identify and interpret the light-microscopic appearances of developing cells, tissues, organs and systems; the ability to visualise three-dimensional structure from two-dimensional data; communication skills (written and oral) to describe the development of normal structure; and
- appreciate the range of variation of microscopic structure within normal developing tissue; the embryological basis of certain birth defects; the importance of one's own observations; the scientific basis of knowledge about development; the need for continuing independent learning to keep pace with future advances.

The following topics are considered:

Mammalian reproduction: gametogenesis; embryogenesis: embryo formative processes, foetal maternal relationships, development of basic tissues; organogenesis: development of nervous system, skeletal system, cardiovascular system, respiratory system, urogenital system, head and neck, gastrointestinal system, endocrine systems.

Assessment: A 2-hour written exam and a 20-minute practical exam at the end of the semester, plus four 10-minute practical tests during semester.

Prescribed texts: W K Larsen, *Human Embryology*, Churchill Livingstone, 1993. • M A England, *Life Before Birth*, 2nd ed., Mosby-Williams and Wilkins, 1996.

516-204 Anatomy 1(Back,Thorax and Upper Limb)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof C A Briggs

Prerequisites: Biology 600-141 plus 600-142 (Before 1996: Biology 600-101)

Contact: 24 lectures (two 1-hour lectures per week) and 36 hours practical work (one 3-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, thorax and upper limb; 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, thorax and upper limb; 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: 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, thorax and upper limb into regions, and the specific structures forming the boundaries and contents of these regions. The applied anatomy of each region is studied.

Assessment: Continuous assessment in practical classes throughout the semester, a 2-hour written examination, a 30-minute practical examination at the end of the semester.

Prescribed texts: K L Moore, *Clinically Oriented Anatomy*, 4th ed., Williams and Wilkins, 1999.

516-207 Anatomy 2 (Abdomen, Pelvis & Lower Limb)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr I Grkovic

Prerequisites: Biology 600-141 plus 600-142 (Before 1996: Biology 600-101)

Contact: 24 lectures (two 1-hour lectures per week) and 36 hours practical work (one 3-hour practical class per week) *(Semester 2).*

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

- comprehend 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 abdomen and pelvis and the boundaries and contents of the lower limb; the applied anatomy of the 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 abdomen, pelvis and lower limb; 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 the**:** organisation of the abdomen, pelvis and lower limb and the structures which form their walls, boundaries and contents as well as the applied anatomy of the abdomen, pelvis and lower limb.

Assessment: Continuous assessment in practical classes throughout the semester, a 2-hour written examination, a 30-minute practical examination at the end of the semester.

Prescribed texts: K L Moore, *Clinically Oriented Anatomy*, 4th ed., Williams and Wilkins, 1999.

516-208 Structure & Function of the Brain

Note: Only available to Bachelor of Optometry students.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof A W Goodwin

Contact: 24 lectures (two a week) and 27 hours of practical work *(Semester 2).*

Description: By the end of this subject students should:

- comprehend the terminology of neuroscience, the principles and essential information regarding the macroscopic and microscopic structure of the nervous system and the functional components of the nervous system including their organisation and major connections, the correlation of structure with function including behaviour, the major effects of lesions to clinically important areas and pathways;
- develop observational and organisational skills to identify and interpret the macroscopic appearance of the brain and spinal cord including cut sections, and the microscopic appearance of the nervous system, skills to analyse the structural and functional changes which occur in disorders of the nervous system; and
- appreciate the extent and limitations of current knowledge of the organisation of the central nervous system, particularly in the context of recent profound advances in neuroscience, the implications of such limitations in our understanding of how the brain works.

The following topics are considered: the structure and function of the primate nervous system with emphasis on the main sensory systems (including vision, hearing and touch) and the motor systems, and dissection and histological examination of human and macaque brains.

Assessment: A 2-hour end-of-semester written examination and 1-hour practical examination during the semester.

Prescribed texts: Kandel, Schwartz and Jessell, *Principles of Neural Science.* • J Nolte, J B Angerine, *The Human Brain in Photographs and Diagrams.*

300-level subjects

516-301 Practical Cell Biology

Note: Experiments involving the use of animals are an essential part of this subject; exemption is not possible.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof M Dziadek

Prerequisites: Anatomy and cell biology 516-201, or botany 606-206, or biochemistry and molecular biology 521-211 plus 521-212 or 521-213.

For BBiomedSc students, biochemistry and molecular biology 521-213 plus physiology 526-250.

Contact: Up to 24 lectures and 36 hours practical work to a total of 54 contact hours *(Semester 1).*

Description: Upon completion of this subject students should:

- comprehend the theoretical foundations of a range of techniques used in studying modern cell biology;
- understand the type of information about cell biology that can be obtained using particular techniques;
- appreciate the advantage of a thorough knowledge of the theory of a technique in order to fully understand the cell biological data acquired using that technique; and
- recognise the strengths and limitations of techniques used to study cell biology

In the practical component students should develop basic skills in performing techniques used to study cell biology.

A range of techniques used in modern cell biology will be considered, selected from, but not restricted to, the following: light and electron microscopy; fluorescence and confocal microscopy; histology; histochemistry; immunohistochemistry; autoradiography; in situ hybridization; cell and tissue culture; cell tracking in situ; molecular trafficking; DNA transfection into cells; mRNA and protein isolation and analysis; chromatography; electrophoresis; and PCR techniques.

Assessment: A 2-hour end-of-semester written examination (50%), and three practical reports (each approximately 1500 words) during the semester (50%).

516-302 Developmental Biology

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

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof M Dziadek; Prof M Renfree

Prerequisites: Biochemistry and Molecular Biology 521-211 plus 521-212 (Prior to 1997: 521-201) or 521-213 or Botany 606-206.

For BBiomedSc students, Biochemistry and Molecular Biology 521-213 plus Physiology 526-250.

Prerequisites may be waived by the head of department.

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 organizer; 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.

Assessment: A 2-hour end-of-semester written examination, practical reports, and critical reviews of published journal articles.

Prescribed texts: L Wolpert, R Beddington, J Brockes, T Jessell, P Lawrence and E Meyerowitz, *Principles of Development*, Oxford University Press, 1998.

516-303 Anatomy of the Head and Neck

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof C A Briggs

Prerequisites: Anatomy and cell biology 516-204 or 516-207. The prerequisite is sometimes waived for students concurrently studying neuroscience subjects.

Contact: 24 lectures (2 hours per week) and 24 hours practical work (one 2-hour practical class per week) *(Semester 1)*.

Description: By the end of the subject students should be able to:

- comprehend the terminology of topographic anatomy; the organisation of the head and neck; the essential factual information regarding the specific anatomical structures which form the boundaries and contents of the regions of the head and neck; the applied anatomy of the head and neck;
- 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 head and neck; skills in the manipulation of anatomical structures (with dissecting instruments); and
- appreciate the common occurrence of anatomical variation; and the scientific basis of knowledge of structure.

The subject provides detailed information on the organisation of the head and neck; the anatomical structures which form the boundaries and contents of the head and neck; and the applied anatomy of the head and neck.

Assessment: Continuous assessment in practical classes throughout the semester, a 2-hour written examination, a 30-minute practical examination at the end of the semester.

Prescribed texts: K L Moore, *Clinically Oriented Anatomy*, 3rd ed., Williams and Wilkins, 1992.

516-304 Functional and Applied Anatomy

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof C A Briggs

Prerequisites: One of anatomy and cell biology 516-204, 516-207, 516-303.

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 organisation of connective tissues, including their structure and function;
- the response of connective tissues to normal and abnormal loading, the forces acting across joint complexes and how these forces may be measured;
- the functional and applied anatomy of the body's major joint complexes; including the joints of the vertebral column, the shoulder, the elbow complex, the wrist and hand, the pelvis, the hip, the knee, the ankle and the joints of the foot;
- the factors responsible for normal and abnormal gait and locomotion;
- the use of anthropometric techniques in the determination of normal and abnormal postures; and
- the use and application of anthropological techniques to determine, age, sex, stature and racial affinity.

The subject provides detailed information on connective tissues, muscle and 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; normal and abnormal movement patterns, and the principles underlying gait and locomotion; anthropometric techniques to determine posture; skeletal traits important in the identification of age, sex, stature and race; and dissection of selected joint structures.

Assessment: A 2-hour end-of-semester written examination; annotated bibliography of scientific papers OR dissection of a specific joint or region and poster presentation of the findings.

Prescribed texts: M Nordin and V H Frankel, *Basic Biomechanics of the Musculoskeletal System*, 2nd ed., Lea and Febiger, 1989.

516-305 Structure & Function of the Brain

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof A W Goodwin

Prerequisites: Any 200-level subject in anatomy and cell biology, biochemistry and molecular biology, physiology, zoology. Students without any biological background may be admitted to the subject by the head of department.

Contact: 24 lectures (two a week) and 27 hours practical work *(Semester 2)*.

Description: By the end of the subject the student should:

- comprehend the terminology of neuroscience, the principles and essential information regarding the macroscopic and microscopic structure of the nervous system and the functional components of the nervous system, including their organisation and major connections, the correlation of structure with function including behaviour, and the major effects of lesions to clinically important areas and pathways;
- develop observational and organisational skills to identify and interpret the macroscopic appearance of the brain and spinal cord, including cut sections, and the microscopic appearance of the nervous system; skills to analyse the structural and functional changes which may occur in disorders of the nervous system; and
- appreciate the extent and limitations of current knowledge of the organisation of the central nervous system, particularly in the context of recent profound advances in neuroscience; the implications of such limitations in our understanding of how the brain works.

The following topics will be considered: the structure and function of the nervous system with emphasis on the main sensory systems (including vision, hearing and touch) and the motor systems; dissection and histological examination of human and macaque brains.

Assessment: A 2-hour end of-semester written examination and a 1-hour practical examination during the semester.

Prescribed texts: Kandel Schwartz and Jessell, *Principles of Neural Science*. • J Nolte, J B Angerine, *The Human Brain in Photographs and Diagrams*.

516-306 Developmental Neurobiology

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof S Rees

Prerequisites: Either botany 606-206 or biochemistry and molecular biology 521-211 plus 521-212 (Prior to 1997: 521-201).

For BBiomedSc students, Biochemistry and Molecular Biology 521-213 plus Physiology 526-250.

Prerequisites may be waived by the head of department.

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

Description: By the end of the subject students should:

- comprehend the terminology of developmental neuroscience; the organisation, both molecular and cellular, of developing nervous tissue; the molecular and cellular events leading to the formation and early development of the vertebrate nervous system;
- develop an understanding of modern molecular approaches to questions concerning neural development; and skills to critically analyse and report on research papers in developmental neurobiology;
- appreciate the major questions currently being addressed in developmental neurobiology research; the extent and limitations of research in developmental neurobiology; and the future direction of research concerned with understanding the development of the nervous system.

This subject will deal with topics ranging from the early events leading to the induction of the neuroectoderm through to axonongenesis, pathfinding, synoptogenesis and cortical development. Factors affecting full brain development and disorders of neurodevelopment will be discussed. Emphasis will be placed on major developmental events such as phenotype commitment, cell migration, differentiation and growth cone guidance. Emphasis will be placed on modern molecular and cellular approaches to understanding these events.

Assessment: A 2-hour end-of-semester written examination and two critical reviews of scientific papers.

516-307 Project Study in Anatomy & Cell Biology

Note: Admission to the subject will depend upon the student's background and the availability of a suitable project. This subject may involve the use of animals in experiments.

Credit points: 12.5 **HECS-band:** 2

Coordinator: AssocProf A Goodwin; AssocProf M Dziadek

Prerequisites: A total of 25 points at 200-level in any combination of anatomy and cell biology, physiology or biochemistry and molecular biology, or with permission of head of department. Approval to take this subject must be obtained from the coordinator.

Contact: At least 60 hours of laboratory work *(Semester 1, repeat 2, Summer)*.

Description: By the end of the subject students should:

- comprehend the principles of research;
- develop skills to critically analyse research papers in anatomy and cell biology; and research laboratory skills;
- develop laboratory skills in a particular aspect of anatomy and cell biology;
- appreciate the extent and limitations of research in anatomy and cell biology; and
- have participated in a supervised research project focussed on anatomy and cell biology.

Assessment: Written report of research project (no more than 4000 words).