



MEDICAL AND HEALTH SCIENCES

MEDSCI 201: Human Structure and Function

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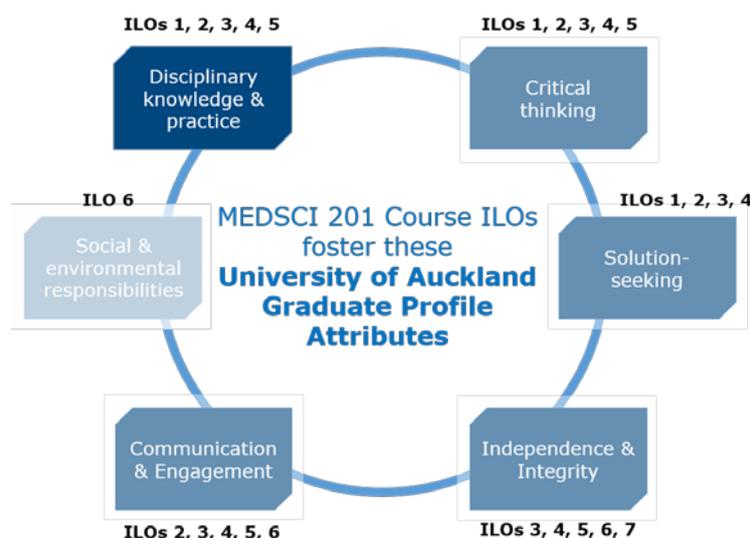
Description

This course presents the structure of biological systems with special reference to human biology, from the levels of histology through to gross anatomy. Specific examples of the correlation between structure and function will be considered. An introduction to current techniques for the visualisation of biological structure will be presented.

Intended Learning Outcomes (ILOs) of the course

Upon successful completion of the course, students should be able to:

1. Demonstrate a holistic understanding of the complex interdependence of separate organ systems that together ensure reliable functioning of the human body.
2. Explain how any imbalance can affect health and lead to disease.
3. Describe in depth the importance of particular organ system.
4. Integrate your practical skills to enhance your learning/understanding of particular organ systems.
5. Use and develop your intellectual and cognitive skills to complete any associated 'on-task' activities.
6. Communicate your knowledge and understanding with fellow students, the academic faculty and the community.
7. Plan and evaluate your own progress toward achieving your academic, personal and professional goals.



Requisites

Prerequisite:	30 points from BIOSCI 107, HUMANBIO 142, MEDSCI 142
Restriction:	ANATOMY 201
Enrolment capacity for 2019:	150
Waitlist GPA threshold:	3.5 (C+/B- average)

Course Contacts

Please contact **Angela Tsai** in the first instance for any generic queries relating to the course.



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Assessment

Description	Format	Indicative timeline	% of final grade
Lab-related tasks	Various		30%
Theory Test 1 Lectures 1-15	Multiple-choice questions & written justifications	Week 6/7 of semester, evening	15%
Theory Test 2 Lectures 16-31	Multiple-choice questions & written justifications	Week 12 of semester, evening	15%
Final exam All lectures & labs	Short-answer & diagrams	To be scheduled by Exams Office	40%

Self-directed learning is an important aspect of this course. Students are expected to prepare for classes by reading specified sections from the textbook or other sources, and self-manage time so that activities are completed in a timely fashion.

Lectures

35 lectures, each of 50 minutes in duration.

Recordings of these lectures are posted on Canvas within 48 hours of the class for student revision. Material to be covered in the lecture is available in the course guide (printed and PDF versions available) to encourage pre-lecture familiarity and enhance learning during class.

Laboratory (practical) classes

A programme of six, fortnightly 2.5-hour laboratory sessions complements the lectures.

1. Histology (histology)
2. Joint (dissection of a bovine knee)
3. Reproduction (dissection of bovine ovaries, histology, models and plastinated human tissue)
4. Renal & Alimentary (demonstration models; plastinated specimens; latexed kidneys; x-rays; histology)
5. Musculoskeletal system (plastinated human tissue with a focus on the upper limb)
6. Cardio-respiratory (dissection of a sheep lung; histology of airways and blood supply; histology of blood vessels)

Labs run fortnightly, in EVEN weeks only. These sessions are interactive, with students working in groups in which discussion and problem solving is encouraged.

In week 1 of the semester, there will be an **'Introduction to the Medical Sciences Learning Centre and Human Anatomy Lab' session**. This opportunity is optional, and students may attend whichever session their timetable permits (Tuesday or Thursday of Week 1, 10:15am)

Laboratory expectations

MEDSCI 201 (anatomy) labs are different from 202 (microbiology), 203 (pathology) and 205 (physiology) labs. Anatomy labs are an extension of the lectures. Students should not expect to be developing the same skills as in other courses (e.g. experimentally driven, comprehensive written lab reports, or 'take-home' worksheets).

The overall workload, however, should be comparable across different courses. Students should be spending as much time and effort on their MEDSCI 201 labs (on integrating and applying knowledge), as they do researching and writing lab reports for other courses.

Some of the lab-related assessments are due after the semester has officially ended. This is beyond the control of the course, since the final lab topic is scheduled in week 12. Students are advised to manage their time accordingly to accommodate these requirements.

Some feedback from former students

"I, and a number of my colleagues, thoroughly enjoyed the course (due to a combination of great content and clear and interesting lectures) and thought that the organization and administration of the course was exceptional (which is universally appreciated by us students)."

"I thought all the lecturers were brilliant and I really enjoyed the labs with the stations."

"Overall we had great lectures and labs. Our lecture notes were always clear and easy to understand. The topics were interesting. I found the practice lab tests very helpful. I enjoyed the course, thank you."

"The labs strongly correlated to the lecture material to help reinforce the material covered in the lectures. Having practical and theory tests throughout the semester meant that revision had to be done throughout and made it easier to keep up with the course and study for the exam. Receiving information on which questions were answered correctly or incorrectly by you, and the rest of the class, also helped by highlighting problem areas where more study needed to be done or areas that were done well."

"Anatomy was presented in a very clear way with many diagrams that made it easier to study the particular section at hand. As well as this, the lecturers made the presentation of the material interesting as well."

"MEDSCI 201 should be a core course for stage II studies as it underpins many stage III studies (and also helps with MEDSCI 205 and 203 and 206)."

2019 timetable / lecture sequence (for sample purposes)

	MONDAY	TUESDAY	WED	THURSDAY	FRIDAY
Tchng Week	1-2pm 505-007	LAB stream 1: 10:15am-12:45pm MDL (Ground), Grafton	4-5pm 501-B09 / 505-011	LAB stream 2: 10:15am-12:45pm MDL (Ground), Grafton	2-3pm 505-011 / 505-007
1	4-Mar LEC 1: Histology of tissues 1 Dr Fabiana Kubke	5-Mar Introductory lab to the Human Anatomy Lab & Medical Sciences Learning Centre	6-Mar LEC 2: Histology of tissues 2 Dr Fabiana Kubke	7-Mar Introductory lab to the Human Anatomy Lab & Medical Sciences Learning Centre	8-Mar LEC 3: Histology of tissues 3 Dr Fabiana Kubke
2	11-Mar LEC 4: Histology of tissues 4 Dr Fabiana Kubke	12-Mar LAB 1: Histology Dr Fabiana Kubke Pre-lab quiz due	13-Mar LEC 5: TUL 1 Dr Sue McGlashan - 505-011	14-Mar LAB 1: Histology Dr Fabiana Kubke Pre-lab quiz due	15-Mar LEC 6: TUL 2 Dr Sue McGlashan
3	18-Mar LEC 7: TUL 3 Dr Sue McGlashan	19-Mar	20-Mar LEC 8: TUL 4 Peter Riordan	21-Mar LEC 9: Reproduction 1 Professor Larry Chamley	22-Mar Lab 1 online quiz due
4	25-Mar LEC 10: Reproduction 2 Professor Larry Chamley	26-Mar LAB 2: Joint Peter Riordan	27-Mar LEC 11: Reproduction 3 Professor Larry Chamley	28-Mar LAB 2: Joint Peter Riordan	29-Mar LEC 12: Reproduction 4 Professor Larry Chamley
5	1-Apr LEC 13: Alimentary System 1 Angela Tsai	2-Apr	3-Apr LEC 14: Alimentary System 2 Angela Tsai	4-Apr LEC 15: Alimentary System 3 Angela Tsai	5-Apr
6	8-Apr LEC 16: Renal 1 Angela Tsai	9-Apr LAB 3: Reproduction Prof Larry Chamley	10-Apr LEC 17: Renal 2 Angela Tsai	11-Apr LAB 3: Reproduction Prof Larry Chamley	12-Apr LEC 18: Axial skeleton Peter Riordan Theory Test 1 - Grafton
Easter and Mid-semester break Sat 13 March - Sunday 28 April					
Lab 2 & 3 revision quiz due 10pm Friday 26 April					
7	29-Apr LEC 19: Musculoskeletal System 1 Peter Riordan	30-Apr MDL Lab Test - Labs 2 & 3	1-May LEC 20: Musculoskeletal System 2 Peter Riordan	2-May LEC 21: Musculoskeletal System 3 Peter Riordan	3-May
8	6-May LEC 22: Musculoskeletal System 4 Peter Riordan	7-May LAB 4: Renal / Gut Angela Tsai Pre-lab quiz due	8-May LEC 23: Musculoskeletal System 5 Peter Riordan	9-May LAB 4: Renal / Gut Angela Tsai Pre-lab quiz due	10-May LEC 24: Cardiovascular System 1 Peter Riordan - 505-007
9	13-May LEC 25: Cardiovascular System 2 Peter Riordan	14-May	15-May LEC 26: Cardiovascular System 3 Peter Riordan	16-May LEC 27: Respiratory 1 Dr Sue McGlashan	17-May
10	20-May LEC 28: Respiratory 2 Dr Sue McGlashan	21-May LAB 5: Musculoskeletal Peter Riordan	22-May LEC 29: Neural 1 Dr Simon O'Carroll	23-May LAB 5: Musculoskeletal Peter Riordan	24-May LEC 30: Neural 2 Dr Simon O'Carroll
11	27-May LEC 31: Skin & Hypertrophic scars Dr Simon O'Carroll	28-May	29-May LEC 32: Endocrine 1 A/Prof Kathy Mountjoy	30-May LEC 33: Endocrine 2 A/Prof Kathy Mountjoy	31-May Theory Test 2 Lab 5 revision quiz due
12	3-Jun QUEEN'S BOAY	4-Jun LAB 6: Cardiovascular / Respiratory Dr Sue McGlashan MDL Lab Test - Labs 4 & 5	5-Jun LEC 34: Endocrine 3 A/Prof Kathy Mountjoy	6-Jun LAB 6: Cardiovascular / Respiratory	7-Jun LEC 35: Endocrine 4 A/Prof Kathy Mountjoy
13	10-Jun	11-Jun	12-Jun	13-Jun Exams start	14-Jun Lab 6 revision quiz & Lab 6 online quiz due

Lecture learning outcomes

After actively engaging with the teaching and learning activities associated with each topic, a student should be able to:

Histology of tissues

- Describe the distinguishing characteristics of the different connective tissue types/ subtypes
- Describe the function of cellular elements and ECM of each connective tissue type/ subtype
- Identify the different connective tissue types/subtypes in histological material
- Identify the different cellular/ECM elements of each connective tissue type/subtype in histological material
- Describe the embryological processes that lead to the formation of the skeleton
- Describe the factors that lead to the formation of cartilage and bone
- Describe the process of endochondral ossification in long bones
- Describe the regions and functions of the epiphyseal plate
- Identify regions of the epiphyseal plate in histological sections
- Describe the process of appositional and interstitial growth in bone and cartilage
- Identify areas of bone and cartilage growth in histological sections
- Describe the different regions of an ideal epithelial cells
- Provide examples of epithelial polarization
- Describe the structure of the basement membrane, and the interactions with connective tissue
- Describe the morphology and function of different intercellular attachments and identify each in EM images
- Describe the distinguishing features of different apical specializations
- Provide a morphological description of different types of glands, and identify them in histological images
- Provide a functional description of different types of secretion
- Describe the morphological and functional differences and specialisations of different muscle types
- Describe the organisation of muscle and the associated connective tissue membranes in skeletal muscle and heart.
- Describe how the different elements (bands and zones) of the contractile apparatus relate to the histological appearance of muscle
- Be able to identify the different types of muscle in histological sections
- Based on the organisation of the muscle fibres, predict the effect of muscle contraction

Tissues under load

- List the different types of connective tissues
- Describe the different components that make up connective tissues
- List the four most common collagens and where they are found in the body
- Describe how collagen is formed
- Give two examples of collagen-related diseases
- Describe what a proteoglycan is, its function and location within the body
- Give examples of the different types of proteoglycans
- Describe a disease related to proteoglycan metabolism
- Give the function of three extracellular molecules other than collagen or proteoglycan
- List the different mechanical forces experienced by connective tissues
- Describe the different types of cartilage, their composition and location
- Draw a diagram of the collagen organisation in articular cartilage
- Describe how articular cartilage resists load
- Understand what goes wrong in osteoarthritis
- Describe the organisation of bone with respect to its mechanical properties
- Understand the basic mechanisms underlying osteoporosis

MEDSCI 201 Course Outline

- Label a diagram of the collagen organisation of tendon
- Discuss the effects of immobilisation and excessive exercise on cartilage/ bone
- Describe the concept of tissue engineering
- Explain the difference between tissue and cell engineering
- Compare the source of cells and scaffolds used for tissue engineering
- Explain why a mechanical approach is used for engineering articular cartilage
- Describe movement from the anatomical position using the correct terminology
- Describe the organisation of the bones that contribute to the human knee joint and include the important features of these bones.
- Describe how movement at the knee joint is permitted and restricted
- Describe the arrangement and function of the important supporting ligaments in the knee
- Identify and explain the function of the main muscles that move the knee
- Understand the function of the menisci
- Name the main “packing” components of the knee

Reproductive system

- Describe the female reproductive organs
- Describe the key events of follicular development
- Describe the anatomy of the male reproductive organs and their relations within the pelvis, including the major glands
- Describe the structure of the placenta and relate this to its transport functions
- Describe the anatomical changes that occur in the breast during pregnancy
- Understand the role of hormones in milk production and let down during suckling

Alimentary system

- Outline the basic plan of the digestive tube, to be used as a foundation for describing the structural variations which occur along the tract
- Describe in detail the structural characteristics of the three major salivary glands.
- Describe the key composition and functions of saliva
- Describe the tissue organisation of the oesophagus and relate the structure of the various layers to its role as conduit from the mouth to the stomach
- Describe the organisation of the stomach wall that facilitates its storage and mixing roles, and at its entry and exit, controls the movement of food materials into and out of the organ.
- Explain the digestive and absorptive roles of the stomach in terms of tissue/cell specialisations present in its mucosal membrane.
- Describe the main ways in which the functions of the gastric mucosa are regulated.
- Describe the basic tissue organisation of the intestinal wall characteristic of each of the intestinal regions, comparing and contrasting them with the basic plan of the g/i tube.
- Describe in detail the cellular organisation of the mucous membrane of each of the intestinal regions and demonstrate the relation between specific structure and specific function.
- Describe the pattern of cell renewal and differentiation in the digestive tract.
- Describe the morphology and type of gut endocrine cells and their general distribution along the digestive tract.
- Describe the system of arteries and veins associated with the liver and detail how the blood ultimately reaches the hepatic cells and is drained from them.
- Describe the cytological features of hepatocytes, in particular their structural relationship with the blood and biliary systems.
- Describe the biliary tree and its relationships with the hepatic cells and the gall bladder.

Renal system

- Describe the tissue and cellular organisation of the renal corpuscle, in particular the elements of the glomerular filter between the blood and the urinary space
- Describe the tissue and cellular organisation of the tubular components of the nephron as a basis for understanding the function of each part of the tube
- Describe the overall organisation of the unilobar and multilobar kidneys and the arrangement of individual nephrons within each type
- Detail the pathway of blood flow through the cortex and medulla of the kidney from its entrance via the renal artery to its exit via the renal vein
- Describe the tissue organisation of the ureter and bladder

Axial skeleton

- To be able to classify different bones by their shape and how they relate to the axial skeleton
- To use bone terminology to describe the common features found in the skeletal system
- Describe the structure of a typical vertebra.
- Explain the significance of the differences between various bones of the vertebral column (cervical, thoracic, lumbar, sacral, and coccygeal).

Musculoskeletal System

- Understand the distinction between the pectoral girdle (clavicle and scapula) and the shoulder joint (between the glenoid fossa of the scapula and the head of the humerus)
- Be able to describe the two bones of the shoulder girdle and their important features
- Know the three joints of the girdle: between the clavicle and sternum (sternoclavicular joint or S-C joint), between the clavicle and scapula (acromioclavicular joint or A-C joint), and the "conceptual joint" between the scapula and chest wall
- Be able to describe the organisation of the muscles of the pectoral girdle in such a way that you understand their main attachments and major function(s) with respect to the movement of the pectoral girdle and the arm (see also 'The Shoulder Joint' lecture)
- To be able to describe the bones that make up the shoulder joint and the important features that permit the wide range of movement found at this joint
- To identify and name the surrounding ligaments and the thicker regions of the fibrous capsule, and to be able to describe how these structures support the shoulder joint.
- To be able to identify the important bursa of the shoulder joint
- You should be able to list, and describe the actions of the muscles that move the shoulder joint (particularly the rotator cuff muscles)
- Describe the organisation of the muscular compartments and their contents found in the arm and elbow
- Describe movements of the arm and elbow and name the muscles used to action these movements
- To be able to identify the features of the long bones that make up the elbow joint (3 joints in one)
- Describe the arrangement of the muscles, ligaments and bursa in the area of the elbow joint
- Be able to describe the two bones of the forearm and understand their relation to each other and to the elbow and wrist. In particular the two radio-ulnar joints and the other mechanisms that permit pronation and supination.
- Understand the compartmentalisation of the forearm.
- Know the flexor-pronator group of muscles in terms of their main insertions, and understand their actions.
- To understand the general organisation of the bones in the wrist and hand.
- Know the extensor group of muscles in terms of their main insertions, the passage of their tendons through the wrist, and their mechanisms of action.
- To describe the actions of the muscles which contribute to pronation and supination.

MEDSCI 201 Course Outline

- Understand how the bones articulate with each other at the various joints, and what types of movements are permitted by the articulations.

Nervous system

- Describe and understand the subdivisions of the spinal cord grey and white matter.
- Describe and understand the structure of the somatic motor (pyramidal tract) pathway.
- Describe the structure of spinal nerves involved in somatic motor control.
- Describe the brachial plexus in terms of its roots, trunks, divisions, cords and terminal branches.
- Describe which muscles are innervated by which major nerve of the brachial plexus.
- Describe sensory innervation of the skin and skeletal muscle.
- Describe the structure of spinal nerves involved in somatic sensory input.
- Describe the organization of the dermatomes.
- Describe sensory discrimination and the pathways involved.
- Describe spinal reflexes.
- Describe and understand sensory mapping of the cerebral cortex.

Skin and hypertrophic scars

- To understand the structure of the skin, regional differences, and the importance of epidermal derivatives
- To understand the relationship between structural features, incisions and the formation of hypertrophic scars

Respiratory system

- Review the overall arrangement and histological features of the respiratory tree
- Describe the tissue and cellular features of the upper airways in relation to their function
- Describe the tissue and cellular organisation of the conductive zone of the lower respiratory tract
- Describe the tissue and cellular organisation of the respiratory zone
- Describe the blood and lymph supply within the lung
- Outline the development of the lung
- Describe some defects of lung development, including respiratory distress syndrome

Cardiovascular system

- Explain and/or draw the pattern of blood flow through the fetal heart
- Write brief statements about general changes in configuration of the fetal heart during its development
- Explain and/or draw the overall pattern of the fetal circulation
- Explain in logical sequence the circulatory changes which occur immediately after birth
- Relate the structure of vessels to the pressure within them and to their functional role in the circulation
- Describe the structure of muscular arteries and show an elementary knowledge of how they are affected by atherosclerosis
- Describe elastic arteries and give a brief account of aneurysms
- Describe the structure and function of each class of vessel listed
- Where appropriate, explain how disease and degeneration affects each class of vessel

Endocrine system

- Compare the basic organisation and functions of the endocrine system and the nervous system
- Define a hormone
- Locate the endocrine glands and cells in the body
- Name the major hormones produced by each endocrine gland
- Describe the structural and functional relationships between the hypothalamus and the posterior lobe of the pituitary gland
- Describe the structure of the posterior lobe of the pituitary gland, and functions of the hormones it releases
- Describe the hypothalamic control of the anterior lobe of the pituitary gland
- Discuss the structure of the anterior lobe of the pituitary gland and functions of its Hormones
- Describe the manufacture, storage, and secretion of thyroid hormones
- Describe the structure of the parathyroid gland and functions of parathyroid hormone
- Describe the location and structure of the thymus and the functions of the hormones it produces
- Describe the structure of the adrenal cortex and medulla and discuss the hormones produced in each region
- Discuss negative feedback inhibition of anterior pituitary hormones
- Describe the HPA axis and how it functions
- List and identify the function of the hormones produced by the kidneys and heart
- List and identify the function of the hormones produced by the pancreas
- List the hormones produced by the male and female gonads and discuss their functions
- Discuss the location and structure of the pineal gland, and describe the functions of melatonin
- Define the three types of hormones
- Identify the major receptor-mediated pathways for hormone action
- Identify the major intracellular signalling mechanisms for hormone action
- Discuss major classes of endocrine disorders
- Define Type I and Type II diabetes mellitus