



Anatomy & Physiology

Course Syllabus



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Anatomy & Physiology - Course Syllabus

Aims

By the end of the course the student will be able:

- To provide an introduction to the workings of the human body
- To provide an understanding of the anatomical terms associated with describing the human body
- To provide an awareness of the chemistry underlying the functioning of the human body
- To develop an understanding of the organisation of the human body from cells to systems
- To provide a thorough understanding of the normal physiology of the human body
- To develop an awareness of what constitutes a deviation from normal functioning
- To describe signs and symptoms of these deviations
- To develop an awareness of how the human body responds to stress
- To provide an understanding of the mechanisms by which repair may be effected

Introduction to the Human Body

By the end of this section the student will be able to:

- Define: Anatomy, physiology and pathology, metabolism, energy and homeostasis
- Differentiate: Acute, chronic, contagion and infection
- Describe: Anatomical position and directional terms related to it
- Recognise: The individual systems of the body, main cavities of the body and organs contained in each
- Utilise: Common anatomical and physiological terms
- Identify: The principles of pathology in the listed conditions to enable selection and application of appropriate treatment techniques and oils. Also to recognise conditions which contraindicate treatment, require special care or referral.

The Chemistry of Life

By the end of this section student will be able to:

- Differentiate between organic and inorganic substances
- Recognise the main chemical elements in the human body and describe their functions
- Explain the importance of water to the body
- Define acid, base and salt
- Explain how the pH scale relates to acidity and alkalinity
- Name the major groups of organic compounds found in the body and their building blocks, i.e. carbohydrates, proteins, lipids, nucleic acids
- Explain the term enzyme and explain how they work

Cells

The Student will be able to:

- Explain why a cell is the basic unit of life in terms of organisations, metabolism, responsiveness, growth, repair and reproduction
- Describe the structure of a typical human cell and the structure and functions of the following organelles:
 - cell membrane
 - Golgi apparatus
 - cytoplasm
 - endoplasmic reticulum
 - centrosome
 - nucleolus
 - nucleus
 - ribosome
 - chromosome
 - mitochondria
- Describe how cells vary according to function
- Explain briefly the composition, location and functions of DNA and RNA in the cell
- Describe the processes of mitosis and meiosis
- Define the terms diffusion, osmosis, filtration, active and passive transport, phagocytosis and pinocytosis in relation to cell membrane
- Explain how free radicals, glucose and the ageing process affect cells.

Tissues - type of tissue, locations and functions

By the end of this section the student will be able to:

- Define the term tissue and list the four principal types of tissue found in the human body, together with their functions:
- Describe the relationship of matrix to cells in each group of connective tissue

Epithelial:

Simple, stratified & pseudo-stratified

Squamous, cuboidal, columnar

Glandular (exocrine /endocrine)

Ciliated

Connective:

Loose & fatty (areolar, adipose, reticular)
Dense (dense regular, dense irregular, elastic)
Cartilage (hyaline, elastic, fibrocartilage)
Bone
Liquid (blood & lymph)

Muscular:

Skeletal voluntary
Smooth involuntary
Cardiac striated & non striated

Nervous:

Neurones
Neuroglia

- Explain the process of tissue repair and the conditions affecting it
- Recognise the importance of Homeostatic mechanisms in all systems to maintain normal function

The Integumentary System

By the end of this section the student will be able to:

- Name the constituent parts of the integumentary system and briefly describe its functions:
 - Temperature regulation
 - Absorption & excretion
 - Protection
 - Synthesis of vitamin D
 - Sensory perception
 - Immunity
- Label correctly a diagram of the skin, to identify the following:

Epidermis: Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale (germinativum)

Dermis: Papillary region
Reticular region
Subcutaneous layer e.g. blood vessels, nerve ending

- Describe the location, structure and functions of the appendages of the skin:
 - Sebaceous glands
 - Ceruminous glands
 - Sweat glands
 - Hair and nails
- Explain the functions of keratin and melanin
- Explain the process of absorption through the skin
- Define the term erythema
- Explain how ageing affects the skin
- Describe the process of pigmentation and how the effects of excessive exposure to sunlight may affect the skin
- Name & briefly describe common disorders/diseases of the skin including:

Infections:	Bacterial:	Acne, impetigo
	Fungal:	Tineas (e.g. athlete's foot)
	Viral:	Herpes simplex, Herpes zoster
		Papillomas (e.g. warts)
		Decubitus ulcers
		Pediculosis (lice)
		Rubella, varicella, hives
		Scabies
Allergies and reactions:		General allergies
		Dermatitis
		Photosensitivity
		Burns
Chronic skin conditions:		Eczema
		Psoriasis
		Scleroderma
		Skin Cancers
		Chronic ulcers

The Skeletal System

By the end of this section the student will be able to:

- Explain the main functions of the skeletal system:
 - Support
 - Protection
 - Movement
 - Mineral storage
 - Production of blood cells
- Classify bones according to location, shape and function
- Describe the structure and development of bone cells
- Recognise prominent bony points by surface marking
- Describe the structure of a typical long bone and label a simple diagram
- Name the components and describe the functions of the axial and appendicular skeletons
- Recognise and name the main facial and cranial bones and sinuses:
 - Cranial bones: Frontal
Parietal
Temporal
Occipital
Sphenoid
Ethmoid
 - Sinuses: Ethmoidal sinus
Frontal sinus
Sphenoidal sinus
Maxillary sinus
 - Facial bones: Nasal
Maxilla & mandible
- Describe the arrangement of the vertebrae in the spinal column:
- Describe the normal curvatures of the spine and recognise disorders
- Name and locate the major bones of the body of on a simple diagram
- Describe the effects of ageing on bone

Joints (Articulations)

By the end of this section the student will be able to:

- Describe the classification of joints by structure and function
- Describe a typical synovial joint and explain the functions of its constituent parts
- Recognise each type of synovial joint and give examples of each:
i.e. hinge, ball & socket, condyloid, saddle, pivot
- Describe the type of movement at each type of joint
- Explain “range of movement” and describe the factors which limit movement at joints
- Describe the effects of ageing on synovial joints
- Name & briefly describe common disorders/diseases of the skeletal system including:
 - Arthritic conditions: Osteoarthritis
Rheumatoid arthritis
Ankylosing spondylitis
Reactive arthropathies
Infective arthropathies
Joint replacements
 - Soft tissue conditions: Bursitis
Tendonitis
Sprains & Strains
Synovitis
 - General: Gout
Non-specific back pain
Postural defects, including lordosis, scoliosis and kyphosis
Subluxation (dislocation)
Contractures
Osteoporosis

The Muscular System

By the end of this section the student will be able to:

- Describe the structure & functions of the three types of muscle tissue:
 - skeletal (striated)
 - smooth (non-striated)

- cardiac
- Describe the gross and microscopic structure of skeletal muscle
- Describe the mechanism of the process of muscle contraction
- Define muscle tone, isotonic and isometric contraction, agonist, and antagonist
- Indicate on a model or diagram the principal superficial muscles of the body
- List the points of origin & insertion of the major muscles and their actions
- Describe the direction of fibres
- Explain the process of muscle fatigue
- Explain the structure and functions of tendons and ligaments
- Name & briefly describe common disorders/diseases of the muscular system including:
 - Local: Fibrositis
 Fibromyalgia
 Repetitive strain injury
 Carpel tunnel syndrome
 Ganglion cysts
 Dupuytren's contracture
 - General: Muscle wasting diseases e.g. Myasthenia gravis, Muscular dystrophy
 Chronic fatigue syndrome (ME)
 Peripheral neuropathies e.g. diabetes, drug induced

The Nervous System

By the end of this section the student will be able to:

- Explain how the nervous system acts as one of the body's control systems
- Describe the structure and functions of neurones and glial cells
- Label a diagram of a typical motor neurone
- Define the terms sensory, motor, afferent, efferent, mixed and tracts in relation to the nervous system

- Define the terms reception, transmission, integration and response in relation to the nervous system
- Define a synapse and explain its role in relation to the transmission of a nerve impulse

Central Nervous System (CNS)

- Summarise the functions & organisation of the central nervous system
- Describe the protection of the brain and spinal cord (meninges and CSF)
- Describe the gross structure and functions of the spinal cord
- Describe a reflex arc
- Outline the structure and main functions of the brain
- Indicate the location and functions of the principal parts (brain stem: medulla, pons & mid brain, cerebellum, cerebrum, cerebral cortex)
- Name the major structures comprising the Limbic System and describe their functions:
Hypothalamus, amygdala, hippocampus, fornix, cingulate gyrus
- Describe briefly the process of sensory reception and sensory adaptation

Peripheral Nervous System

- Name the following cranial & somatic peripheral nerves in relation to their function, location and type

Cranial:	facial
	olfactory
	trigeminal
	vagus
	accessory
Somatic:	brachial
	sciatic & branches
	obdurator
- Explain the arrangement of plexuses & ganglia
- Explain the importance and relevance of dermatomes

Autonomic Nervous System

- Outline the structure of the component parts of the autonomic nervous system
- Compare and contrast the functions of the sympathetic & parasympathetic nervous system, explaining the physiological effects of each.
- Briefly describe the integration and control of autonomic functions

The Special Senses

By the end of this section the student will be able to:

- Explain the process of sensory reception
- Describe the five types of receptor and the types of energy they detect:
 - Chemoreceptors: odours, tastes, body fluid composition
 - Thermoreceptors: heat & cold
 - Nociceptors: pain, heat & chemicals
 - Mechanoreceptors: touch, pressure
 - Photoreceptors: light
- Describe the structure and functions of the special senses: hearing, sight, taste, touch and smell
- Describe the process of olfaction to include the component structures, their functions and the pathways and mechanisms by which odours are thought to be perceived
- Explain how adaptation affects the sense of smell
- Explain the relationship of the sense of smell to emotions and memory
- Differentiate between upper and lower motor neurone lesions
- Name and describe Common Disorders of the Nervous System including:
 - Central nervous system**
 - Transient ischaemic attack (TIA)
 - Multiple sclerosis
 - Cerebrovascular accident (stroke)
 - Epilepsy
 - Cerebral palsy
 - Alzheimer's
 - Meningitis

Migraine
Parkinson's disease
Spinal cord injury
Motor neurone disease

Peripheral nervous system

Sciatica
Multiple sclerosis
Poliomyelitis
Bell's palsy
Trigeminal neuralgia
Herpes zoster

Psychological

Post natal depression
Seasonal affective disorder (SAD)
Clinical Depression

Sensory disorders

Olfactory disorders i.e.: anosmia
Taste alterations i.e.: mouth ulcers
Visual disturbances i.e.: cataracts, glaucoma, conjunctivitis,
Auditory disturbances i.e.: deafness, tinnitus, vertigo, and otitis media

The Endocrine System

By the end of this section the student will be able to:

- Describe briefly the functions of the endocrine system in relation to homeostasis
- Distinguish between endocrine and exocrine glands
- Define the term hormone and list the functions of hormones
- Identify and locate on a diagram the principal endocrine glands, list the hormones produced by them, their functions and target organs
- Describe the four principal classes of hormones
- Explain the terms “negative and positive feedback” in relation to the release of hormones
- Explain the means by which the body controls hormonal levels

- Explain the function of the hypothalamus in relation to the endocrine system.
- Identify the hormones secreted by the anterior and posterior lobes of the pituitary gland and list their actions
- Identify those hormones secreted by the thyroid and parathyroid glands and list their actions
- Explain the roles of insulin and glucagon in the control of blood glucose
- Describe the role of the adrenal medulla and cortex, the hormones they produce and their effects on the body.
- List the hormonal changes in the male and female during puberty and the female in breast development and during pregnancy, lactation and menopause
- List the principle actions of the gonadotropic hormones and ovarian hormones and discuss the feedback mechanisms involved in their regulation
- Describe briefly the term prostaglandin
- Explain how stress may affect the endocrine system
- Name and briefly describe common disorders/diseases of the endocrine system, including:

Pituitary: Acromegaly
Diabetes insipidus

Thyroid: Hyperthyroidism
Graves disease
Hypothyroidism

Parathyroid: Calcium deficiency

Pancreas: Diabetes mellitus (type 1 & 11)

Adrenal: Addison's disease
Cushing syndrome

Other: Premenstrual syndrome

The Cardiovascular System

By the end of this section the student will be able to:

The Blood

- Describe the physical characteristics of whole blood
- Explain the functions of whole blood
- Describe the functions and composition of plasma and the cells it contains
- Describe the mechanism of blood clotting
- Relate the process of agglutination to blood groups and the Rhesus factor
- Explain the importance of iron, vitamin B12 and folic acid
- Name & briefly describe common disorders/diseases of the blood including:
 - Anaemia/iron deficiency
 - Haematoma
 - Leukaemia
 - Septicaemia
 - Glandular fever
 - Deep vein thrombosis and other clotting disorders

The Heart

- Describe the location, structure and function of the heart and label a simple diagram of it.
- Describe the coverings of the heart and their functions
- Describe the events of the cardiac cycle
- Describe the control of blood pressure
- Describe briefly the conducting system of the heart.
- Define systole and diastole and their relationship to blood pressure
- Describe the cardiac/coronary circulation
- Name and briefly describe common diseases/disorders of the heart:
 - including:
 - Valve disorders: rheumatic fever, congenital defects

Arrhythmia: ventricular fibrillation atrial flutter
Congestive heart failure
Cardiomyopathy
Endocarditis
Atherosclerosis
Myocardial infarction
Coronary artery disease
Ischaemic heart disease

Blood Vessels

- Label a diagram of the principal arteries & veins of the body
- Compare the structure and function of arteries, capillaries and veins and label a cross-section of each
- Explain the significance of vasoconstriction and dilation
- Explain the function of valves in major veins
- Define systolic and diastolic blood pressure
- Describe the factors governing blood pressure
- Describe briefly the exchange of gases and nutrients at capillaries within the tissues
- Describe the pulmonary and systemic circulations
- Describe briefly the hepatic, pulmonary, portal, cerebral and coronary circulation
- Describe the effects of exercise, eating, heat, cold and stress on blood flow
- Name & briefly describe common disorders/diseases of the blood vessels, including:
 - Arterial**
 - Hypotension
 - Hypertension
 - Arteriosclerosis
 - CVA (stroke)
 - Reynaud's syndrome
 - Intermittent claudication

Venous

Phlebitis
Haemorrhoids
Varicose Veins
Thrombosis

The Lymphatic System

By the end of this section the student will be able to:

- Describe the functions of the lymphatic system
- Identify the main structures of the lymphatic system (tonsils, spleen, thymus, lymph nodes and vessels)
- Describe the structure of a lymph capillary and its relation to the blood capillaries
- Explain the composition, circulation and functions of lymph
- Locate the major groups of lymph nodes and lymphatic tissue throughout the body and describe their structure
- Describe the formation of lymph and the mechanisms responsible for lymph flow
- Describe the structure of a lymph node
- Describe the role of the lymphatic system in the inflammatory process
- Explain the role of the lymphatic system in fighting infection
- Name & describe briefly common disorders/diseases of the lymphatic system including:
 - Oedema
 - Enlarged Lymph Nodes
 - Hodgkin's disease
 - Non-Hodgkin's lymphatic disease
 - Lymphoedema
 - Tonsillitis

The Immune System

By the end of this section the student will be able to:

- Distinguish between specific immunity and non-specific defence mechanisms
- Identify non-specific defence mechanisms such as skin, stomach acid, respiratory passageways and explain how they protect against infection.
- Relate the physiological changes and clinical symptoms associated with inflammation to its role in the defence of the body.
- Describe the process of phagocytosis
- Compare the types of T and B lymphocytes with respect to life cycle and function and identify other cells such as macrophages that function in immune responses
- Define the terms antigen and antibody and describe how antigens stimulate the immune response
- Describe the mechanisms of antibody mediated immunity
- Describe the mechanisms of cell-mediated immunity, including the development of memory cells
- Define active and passive immunity/ define inborn immunity and compare it with naturally and artificially acquired immunity
- Describe the allergic response both local and general
- Differentiate between the allergic response and sensitivity
- Name & briefly describe common disorders/diseases of the immune system, including:
 - Allergies
 - Auto – immune diseases e.g. ankylosing spondylitis, colitis, psoriasis SLE, RA, Graves
 - Immunodeficiency diseases e.g. AIDS
 - Immuno-suppression e.g. after organ transplant
 - Chronic fatigue syndrome

The Respiratory System

By the end of this section the student will be able to:

- Identify the major structures of the respiratory system and their relative positions:
nose, nasal cavity, pharynx, epiglottis, larynx, bronchi, bronchioles, alveoli, pleura, sinuses
- Describe the structure and function of the lungs
- Define and differentiate between pulmonary ventilation, external respiration and internal respiration
- Describe the mechanism and regulation of breathing including internal and external respiration, inspiration, expiration and exchange of gases
- Recognise the ways in which oxygen and carbon dioxide are transported in the blood
- Name & briefly describe common disorders/disease of the Respiratory system, including:

Acute

Tuberculosis

Pleurisy

Bronchitis

Pneumonia

Seasonal rhinitis (hayfever)

Sinusitis

Coryza (common cold)

Influenza

Laryngitis

Chronic

Chronic obstructive pulmonary disease (COPD)

Asthma

Lung cancer

Emphysema

Rhinitis

The Digestive System

By the end of this section the student will be able to:

- Identify the component parts of the digestive system, including the accessory organs of digestion
- Name the two main functions of the digestive system
- Explain the processes of ingestion, digestion, absorption and elimination
- Describe briefly the functions of each part of the digestive system, including the accessory organs
- Define peristalsis and explain its importance in digestion
- List the gastric secretions, points of origin and explain their role in digestion
- Explain the general role of enzymes in digestion
- Describe the structure of the small intestine & explain its role in the digestion and absorption of carbohydrates, fats and proteins in the small intestine
- Describe the regulation of pancreatic and hepatic secretions into the duodenum
- Describe the structure of the large intestine and explain its role in absorption, motility and defecation
- Name and describe briefly common disorders/diseases of the digestive system:

Conditions of tract or organs

Gingivitis

Oesophageal reflux

Gastric and duodenal ulcers

Stomach cancer

Hiatus hernia

Irritable bowel syndrome

Cirrhosis

Hepatitis – A, B, C, D, E

Diverticulitis

Jaundice

Crohn's disease

Biliary calculi (gallstones)
Colorectal cancer
Coeliac disease
Ulcerative colitis

Other conditions

Anorexia Nervosa
Obesity
Malnutrition
Diarrhoea & constipation

The Urinary System

By the end of this section the student will be able to:

- Identify on a diagram the major structures of the urinary system
- Describe the functions of the urinary system
- Describe the gross and microscopic structure of the kidney and its function
- Describe the structure and functions of a nephron
- Describe briefly renal blood flow
- Explain the importance of antidiuretic hormone, renin and erythropoetin
- List the constituents of normal urine
- Discuss the micturition reflex and explain the voluntary role of voiding
- Describe the function and importance of water and electrolyte balance to the body
- Recognise implications for the patient after renal transplant i.e. fluid intake
- Name & describe briefly common disorders/diseases of the urinary system:
 - Inflammatory disorders e.g. urinary tract infections, cystitis, and pyelonephritis
 - Renal calculi (kidney stones)
 - Effects of poor and ineffective elimination
 - Renal colic, insufficiency, failure
 - Acute glomerulonephritis
 - Urinary incontinence

The Reproductive System

By the end of this section the student will be able to:

- Name and locate on diagrams the male and female reproductive organs and state their functions
Male: Penis, scrotum, testicles, vas deferens, epididymis, prostate
Female: Structure & function of external & internal genitalia (ovaries, fallopian tubes, uterus, vagina, vulva, perineum)
- Describe briefly the menstrual cycle from menarche to menopause and the hormones that control these processes
- Describe briefly the functions of the male and female sex hormones
- Describe briefly the stages of pregnancy from fertilisation to birth
- Describe briefly the process of spermatogenesis and the passage of sperm from testicle to penis.
- Name & describe briefly common disorders/diseases of the reproductive system, including:
Sexually transmitted diseases – gonorrhoea, syphilis, non-specific urethritis (NSU), chlamydia, genital herpes, HIV, pelvic inflammatory disease

Male:

Prostate hyperplasia, testicular & other cancers, infertility, impotence

Female:

Endometriosis, infertility, premenstrual tension,
Dysmenorrhoea, amenorrhoea, post- natal depression
Pre-eclampsia, ectopic pregnancy
Breast, ovarian and cervical cancers
Fibroids
Ovarian cysts
Candida albicans & vaginitis

Stress

By the end of this section the student will be able to:

- Describe typical stressors
- Describe the physiology of the stress

- Explain how the body systems are affected by excessive stress
- Describe the three stages of the general adaptation syndrome (GAS):
 - Fight/flight response
 - Resistance reaction
 - Exhaustion
- List physical and psychological conditions, which may be stress related

Suggested Reading

- Anderson P D. 2004
Human Anatomy and Physiology
Colouring Workbook and Study Guide
Jones and Bartlett Publishers, Inc;
- Ball J. 2005
Understanding Disease: A Health
Practitioner's Handbook
Vermilion
- Blandine C G. 2004
Anatomy of Movement
Eastland Press
- Blakey P. 2008
The Muscle Book
Himalayan Institute Press
- Bowden B & J. 2002
An Illustrated atlas of the skeletal muscles,
Morton publishing, USA
- Cash M 1999
The Pocket Atlas of the Moving Body
Ebury Press
- Cohen BJ. 2008
Memmler's the Human Body in Health
and Disease
Lippincott, Williams & Wilkins
- Crawley J L. 2002
Photographic Atlas for Anatomy and
Physiology
Morton publishing, USA
- Jarmey C. 2008
The Concise Book of Muscles
Lotus Publishing
- Kapit W & Elson L. 2001
Anatomy Colouring Book
Benjamin Cummings
- Kapit W, Macey RI
& Meisami E. 1999
Physiology Colouring Book
Benjamin Cummings
- Martin E. 2007
Concise Medical Dictionary
OUP Oxford
- Parker S & Medi-mation 2007
The Human Body Book: The Ultimate
Visual Guide to Anatomy, Systems and
Disorders
Dorling Kindersely
- Thibodeau GA &
Patton KT. 2009
Tortora GJ &
The Human Body in Health and Disease,
Mosby
Principles of Anatomy and Physiology

- Grabowski SR. 2008: with Atlas and Registration Card
John Wiley
- Waugh A & Grant A. 2006 Ross and Wilson's Anatomy and
Physiology Colouring and Workbook
Churchill Livingstone
- Werner R. 2009 A massage therapist's guide to Pathology
Lippincott Williams & Wilkins,

DVD's

Anatomy for Beginners – Dr Gunther von Hagens
This was originally shown on Channel 4 television and shows an autopsy
taking place. Interesting but not for the squeamish!!

The Books & DVD's Highlighted in Red are particularly recommended