



LEADING THE WAY
KHALĪFAH • AMĀNAH • IQRA' • RAHMATAN LIL-ĀLĀMĪN
LEADING THE WORLD



AN INTERNATIONAL AWARD-WINNING INSTITUTION FOR SUSTAINABILITY

DEPARTMENT OF BASIC MEDICAL SCIENCES
KULLIYAH OF MEDICINE
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

PHYSIOLOGY STUDY GUIDE

Academic Session 2022/2023

**MASTER OF MEDICAL SCIENCES,
MASTER OF HEALTH SCIENCES
&
PhD IN HEALTH SCIENCES**

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Prepared by:

Asst. Prof. Dr Aszrin Abdullah

Asst. Prof. Dr Nour El Huda Abd Rahim

Asst. Prof. Dr Wan Muhamad Salahudin Wan Salleh

Sr. Nur Hayati Bujang

Sr. Nur Asma Afiqah Mohd Yusof

Checked by:

Prof. Dr Sirajudeen Kuttulebbai Naina Mohamed Salam, Head of Department of Basic Medical Sciences, Kulliyah of Medicine

Prof. Dr Azrina Md Ralib, Deputy Dean Postgraduate, Kulliyah of Medicine

Prof. Dr Jamalludin A. Rahman, Dean, Kulliyah of Medicine

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Any absence due to sickness or any unforeseen circumstances must be notified to the course coordinators as soon as possible and must be supported by suitable documentation e.g. sick certification

PHYSIOLOGY

Directory of Course Instructors

No.	Name	Email	Department
1.	Assoc. Prof. Dr. Roslina Abdul Rahim	roslinaar@iium.edu.my	Basic Medical Sciences, KOM
2.	Asst. Prof. Dr. Aszrin Abdullah	draszrin@iium.edu.my	Basic Medical Sciences, KOM
3.	Asst. Prof. Dr. Maizura Mohd Zainudin	zmaizura@iium.edu.my	Basic Medical Sciences, KOM
4.	Asst. Prof. Dr. Norbaiyah Mohamed Bakrim	drbaiyah@iium.edu.my	Basic Medical Sciences, KOM
5.	Asst. Prof. Dr. Wan Fatein Wan Omar	fateinwanomar@iium.edu.my	Basic Medical Sciences, KOM

List of Courses

	Course Title	Course Code	Course Classification	Credit Hours
1.	Introduction to Medical Physiology	PHYL 7021	Special Req	2
2.	Advanced Physiology II	PHYL 7220	Elective	2
3.	Physiology of Special Senses	PHYL 7221	Elective	2
4.	Renal Physiology	PHYL 7223	Elective	2
5.	Gastrointestinal Tract Physiology	PHYL 7225	Elective	2
6.	Endocrine Physiology	PHYL 7226	Elective	2
7.	Reproductive Physiology	PHYL 7227	Elective	2
8.	Physiology of the Central Nervous System II	PHYL 7228	Elective	2
9.	Advanced Physiology I	PHYL 7229	Elective	2
10.	CVS Physiology	PHYL 7322	Core	3
11.	Physiology of the Central Nervous System I	PHYL 7323	Core	3
12.	Respiratory Physiology	PHYL 7324	Core	3

PHYL 7021: Introduction to Medical Physiology

Course Coordinator: Asst. Prof. Dr. Aszrin Abdullah

Section 1: Course Synopsis

This course has been designed to introduce students to the fundamental principles of physiology. The course includes an introduction to the concept of homeostasis and the homeostatic control systems, cellular physiology and principles of neural and hormonal communication. The course will assist students in understanding the integrative nature of the discipline and form the conceptual basis for the whole course.

Section 2: Learning Outcome

1. Evaluate, integrate and organize the concept of homeostasis and the homeostatic control systems.
2. Point out, identify and sketch cellular structure and function.
3. Point out, identify and organize membrane transport; unassisted and assisted.
4. Point out, identify and organize the principles of neural and hormonal communication.
5. Evaluate, integrate and organize the physiological functions of the body systems.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Self-directed learning

Section 4: Course Assessment

Participation/Attendance	10%
Assignment	15%
Presentation	15%
Viva	60%

Section 5: Course Content

No.	Topic
1.	The concept of homeostasis and the homeostatic control systems
2.	Cellular structure and function
3.	Membrane transport; unassisted and assisted
4.	Membrane potential, excitable tissues, graded potentials and action potentials
5.	Synapses and neuronal integration
6.	Intercellular communication and signal transduction
7.	Principles of hormonal communication
8.	The physiological function of the body systems

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7220: Advance Physiology II

Course Coordinator: Asst. Prof. Dr. Maizura Mohd Zainudin

Section 1: Course Synopsis

This course covers the physiology of growth and aging and the common disorders in childhood and elderly. It also covers the basic acid base homeostasis and the common disorders of acid-base imbalance.

Section 2: Learning Outcome

1. Evaluate, integrate and organize the growth process that is influenced by genetic, endocrine function, environmental factors, diseases and stress.
2. Evaluate, integrate and organize the theory that explains aging process which include genetic factors, random mutation, increase cross link in collagen and proteins, and accumulation of free radicals.
3. Point out, identify and organize the changes and characteristics of aging in various organs/system.
4. Evaluate, integrate and organize the role of acid base balance and apply to its disorder.
5. Evaluate, integrate and construct the knowledge acquired into Islamic perspective and research.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Seminar
4. Problem-based learning
5. Self-directed learning

Section 4: Course Assessment

Participation/Attendance	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Physiology of bone formation and degeneration
2.	Growth physiology
3.	Dwarfism
4.	Gigantism and Marfan syndrome.
5.	Aging physiology
6.	Osteoporosis and osteomalacia
7.	Menopause
8.	Dementia
9.	Weak and strong acid and base
10.	Acid base homeostasis
11.	Metabolic acidosis and its common disorder
12.	Metabolic alkalosis and its common disorder
13.	Respiratory acidosis and its common disorder
14.	Respiratory alkalosis and its common disorder

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7221: Physiology of the Special Senses

Course Coordinator: Assoc. Prof. Dr. Roslina Abdul Rahim

Section 1: Course Synopsis

This course covers the general functions of the sensory system of the body, the specific functions of the eyeball, and sight including the functions of the ear and hearing. It also includes the physiology of taste and smell, as well as the physiology of the balance and equilibrium of the body.

Section 2: Learning Outcome

1. Point out, integrate and organize the sensory receptors, pain and how information reaches the brain.
2. Point out, identify and organize the mechanism of sound transmission and the electrical event in normal and hearing dysfunction.
3. Point out, identify and organize the function of vestibular system involved in postural balance.
4. Point out, identify and explain the functional anatomy and mechanism of vision, smell and taste and integrate its dysfunction.
5. Evaluate, integrate and construct the knowledge acquired into Islamic perspective and research.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Participation/Attendance	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Somatosensory System: <ul style="list-style-type: none"> • Somatovisceral sensory receptors. • Microneurography. • Spinal Roots and Dermatomes
2.	Sensation of the Face: <ul style="list-style-type: none"> • Trigeminal Nociceptive. • Thermoreceptive System.
3.	Sensation of the Face (cont.): <ul style="list-style-type: none"> • Somatosensory pathways. • Physiology of pain. • Higher processing of Somatosensory Information.
4.	The visual System: <ul style="list-style-type: none"> • Physics of Light. • Structure of the eye. • Retina
5.	The visual System (cont.): <ul style="list-style-type: none"> • The visual pathway • Visual field defects. • Colour vision.
6.	The visual System (cont.): <ul style="list-style-type: none"> • Extrastriate visual cortex • Other visual pathways.
7.	The auditory System: <ul style="list-style-type: none"> • Physics of sound. • Anatomy of the auditory organs.
8.	The auditory System: <ul style="list-style-type: none"> • Sound transduction • Central auditory pathways.
9.	Functional organization of the central auditory system: <ul style="list-style-type: none"> • Binaural interactions. • Cortical organization. • Audiometry and other hearing test.
10.	The vestibular System: <ul style="list-style-type: none"> • Structure of the vestibular apparatus. • Vestibular transduction. • Central vestibular pathways
11.	The Chemical Senses: Taste sensation.
12.	The Chemical Senses: Smell sensation.
13.	Practical on vision and hearing
14.	Common disorders involving special senses.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). *Ganong's review of medical physiology* (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). *Human physiology: From cells to systems* (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). *Guyton and Hall textbook of medical physiology* (13th ed.). Elsevier.

PHYL 7223: Renal Physiology

Course Coordinator: Asst. Prof. Dr. Maizura Mohd Zainudin

Section 1: Course Synopsis

This course has been designed to introduce students to the fundamentals of the urinary system physiology which include the functional anatomy, function, regulation and integrated responses of the kidney. It also covers the mechanism of urine formation, micturition process and its regulation. The course will expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Point out, identify and sketch the functional anatomy of the urinary system.
2. Evaluate, integrate and organize the normal functions of every component of the kidney.
3. Evaluate, integrate and construct the neural and hormonal factors affecting the renal physiology and its regulatory mechanism.
4. Evaluate, integrate and construct the renal physiology and Islamic medical perspectives.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Functional anatomy and the nephron
2.	Renal circulation
3.	Glomerular filtration rate
4.	Tubular function
5.	Renal handling of Na ⁺ , H ⁺ , glucose
6.	Renal handling of H ₂ O, K ⁺ , Cl ⁻ and urea
7.	Renal clearance
8.	Renal blood flow (RBF)
9.	Factors affecting the GFR
10.	Regulation of GFR and RBF
11.	Renin angiotensin aldosterone system
12.	Countercurrent system
13.	Urine test
14.	Bladder filling and micturition

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall, J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7225: Gastrointestinal Physiology

Course Coordinator: Asst. Prof. Dr. Norbaiyah Mohamed Bakrim

Section 1: Course Synopsis

This course has been designed to introduce students to the fundamentals of the gastro intestinal tract (GIT) system physiology which include the functional anatomy, function, regulation, the integrated responses of the GIT and liver to a meal, the enteric nervous system and the sensory neurons. It also covers the GIT hormones and receptors, the brain- gut axis and the aspects of secretion, absorption and nutrition.

The course will expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives concern of gastro intestinal system will also be highlighted.

Section 2: Learning Outcome

1. Point out, integrate and organize the digestion and absorption of food.
2. Point out, identify and sketch the absorption of water, electrolytes and vitamin.
3. Point out, integrate and organize the functions of guts, pancreas, liver and their abnormalities.
4. Point out and evaluate abnormalities in digestive system and integrate them to some pathological conditions.
5. Evaluate, integrate and construct the knowledge acquired into Islamic perspective and research.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Functional anatomy of the gastro intestinal system
2.	Components of the GIT: GIT hormones and receptors
3.	Components of the GIT (cont.): <ul style="list-style-type: none">• The Brain – Gut axis• Smooth muscle of the gut• The immune system and GIT inflammation• Epithelia: Biologic principles of organization.
4.	<ul style="list-style-type: none">• The integrated response of the GIT and liver to a meal.• The enteric nervous system.• Sensory neurons of the GIT.
5.	Motility: <ul style="list-style-type: none">• Esophageal motor function• Gastric motility and gastric emptying.
6.	Motility (cont): <ul style="list-style-type: none">• Motility of the small intestine and colon• Motility of the biliary tract
7.	Secretion and absorption: Stomach
8.	Secretion and absorption (cont): Small intestine and colon
9.	Secretion and absorption cont): Pancreatic, liver and gallbladder
10.	Nutrition: Carbohydrate assimilation
11.	Nutrition (cont): Lipid
12.	Nutrition (cont): Protein digestion and assimilation
13.	Nutrition (cont): <ul style="list-style-type: none">• Vitamin and mineral absorption.• General nutritional principles
14.	Miscellaneous: <ul style="list-style-type: none">• Gastrointestinal blood flow.• Growth and development of the GIT.• Common pathological condition.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7226: Endocrine Physiology

Course Coordinator: Assoc. Prof Dr. Roslina Abdul Rahim

Section 1: Course Synopsis

This course is developed with the aims of stimulating students' interest and expanding their knowledge in the areas of endocrine and reproductive physiology. This course covers the endocrine function of the hypothalamus and pituitary gland, thyroid and parathyroid glands, adrenal gland, pancreas the function of the ovary, testis, placenta and other hormone producing tissues. The students will be exposed to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Differentiate, integrate and specify the structure, function, control and pathophysiology of endocrine systems.
2. Differentiate, integrate and specify the mechanisms associated with male and female reproduction and fertility.
3. Evaluate, integrate and specify the common medical disorders.
4. Evaluate, integrate and construct endocrine and reproductive physiology with Islamic medical perspectives.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Endocrine glands and hormone producing tissues of the body.
2.	Factors influencing hormonal action.
3.	The cerebro-hypothalamus- hypophyseal-target endocrine organ axis.
4.	Endocrine function of the hypothalamus.
5.	Function of the pituitary hormones and the underlying diseases.
6.	Function of the thyroid hormones and related diseases.
7.	Function of the pancreatic hormones and consequences of insulin deficiency.
8.	Roles of hormones in menstrual cycle.
9.	Roles of hormones in pregnancy.
10.	Hormonal function of the ovary and related diseases.
11.	Hormonal function of the placenta and related diseases.
12.	Male reproductive system.
13.	Male reproductive system related diseases.
14.	Endocrine and reproductive physiology and the Islamic medical perspectives.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7227: Reproductive Physiology

Course Coordinator: Asst. Prof. Dr. Aszrin Abdullah

Section 1: Course Synopsis

This course is developed with the aims of stimulating students' interest and expanding their knowledge in the areas of reproductive physiology, the study of developmental physiology in the fetus, newborn and pregnant woman. The course will expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Differentiate, integrate and specify the structure, function, control and pathophysiology of male and female reproductive systems.
2. Differentiate, integrate and specify the mechanisms associated with male and female reproduction and fertility.
3. Point out, identify and specify physiological adaptation in pregnancy and fetal development.
4. Evaluate, integrate and construct endocrine and reproductive physiology with Islamic medical perspectives.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Functional anatomy of female reproductive system.
2.	Functional anatomy of male reproductive system.
3.	Physiological changes with puberty.
4.	Menstrual cycle.
5.	Pregnancy and maternal physiological adaptation.
6.	Hormonal function of the placenta and related diseases.
7.	Normal fetal growth and development, post-natal adaptation and adaptation to life after birth:
8.	<ul style="list-style-type: none">• Cardiovascular structural and functional development.• Fetal fluid regulation and renal function• Lung development and fetal breathing fetal movements• Fetal endocrinology• The transition from fetal to neonatal life, lactation and early infant nutrition.
9.	Physiological changes in menopause and andropause.
10.	Hormonal contraception.
11.	Fertility, subfertility and infertility
12.	Assisted reproductive techniques.
13.	Male reproductive system related diseases.
14.	Reproductive physiology and the Islamic medical perspectives.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7228: Physiology of the Central Nervous System II

Course Coordinator: Asst. Prof. Dr. Wan Fatein Nabeila Wan Omar

Section 1: Course Synopsis

The brain is a mysterious organ. Scientists are still learning about this marvelous organ. This course has been designed to introduce students to the fundamentals and applied knowledge on the physiology of the central nervous system (CNS). It is hoped that the course will be able to assist students in understanding the system thus interpret new developments in the field in the near future. The course is divided into the CNS three main functional components: the sensory system, the motor system, and homeostatic and higher brain functions. The sensory and the motor systems are discussed in CNS Physiology 1 course. CNS Physiology 2 focuses on the homeostatic and higher brain functions. The course will also expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Point out, identify and sketch the structures of the central nervous system that are involved in homeostasis.
2. Point out, identify and sketch the structures of the –central nervous system that are involved in higher brain functions.
3. Evaluate, integrate and organize Blood Brain Barrier and Cerebral Metabolism.
4. Evaluate, explain and integrate the effect of aging of the central nervous system.
5. Evaluate, integrate and organize the disorders of higher brain functions.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Hypothalamus structural organization: <ul style="list-style-type: none"> • Anatomy • Circuitry of the hypothalamus: <ul style="list-style-type: none"> – Neural connections – Limbic circuits – Sensory and autonomic circuits – Neuro-humoral connections – The pituitary • Functions of the hypothalamus
2.	Central autonomic network 1: <ul style="list-style-type: none"> • Hypothalamic and extra-hypothalamic structures. • Circuitry for hypothalamic control of the autonomic nervous system.
3.	Central autonomic network 2: <ul style="list-style-type: none"> • The central autonomic network. • Central control of body temperature
4.	<ul style="list-style-type: none"> • Disorders of the central autonomic control: Horner's Syndrome, Autonomic Dysreflexia. • Disorders of thermoregulation: Fever, heat stroke.
5.	<ul style="list-style-type: none"> • Central control of feeding behavior. • Mechanisms of satiety
6.	Disorders of feeding and satiety.
7.	Limbic System: Hippocampus <ul style="list-style-type: none"> • Structure and function • Output pathways of the hippocampus
8.	Limbic System: Amygdala <ul style="list-style-type: none"> • Inputs to the amygdala. • Major output pathways of the amygdala. • Its function.
9.	Learning and Memory: <ul style="list-style-type: none"> • Types of memory. • Localization of memory. • Mechanisms of Memory.
10.	Higher Cortical Functions: Language <ul style="list-style-type: none"> • The language areas. • Five phases of language development
11.	Higher Cortical Functions: Disorders of Language: <ul style="list-style-type: none"> • The Aphasias • Broca Aphasia • Wernicke Aphasia • Global Aphasia
12.	Higher Cortical Functions: Association areas and cognitive processing.
13.	<ul style="list-style-type: none"> • Blood brain barrier and cerebral metabolism. • Brain disorders and metabolism.
14.	<ul style="list-style-type: none"> • CNS and aging. • Biological Changes in the <i>Absence of Disease</i> in Aging Humans. • Alzheimer's Disease.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). *Ganong's review of medical physiology* (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). *Human physiology: From cells to systems* (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall, J.E & Guyton A.C (2016). *Guyton and Hall textbook of medical physiology* (13th ed.). Elsevier.

PHYL 7229: Advance Physiology I

Course Coordinator: Asst. Prof. Dr. Maizura Mohd Zainudin

Section 1: Course Synopsis

This course covers the multiple systemic physiological responses to exercise. It also includes the advantages and disadvantages of exercise towards health. The physiological responses to abnormalities are also discussed which include hemorrhage, shock and heart failure.

Section 2: Learning Outcome

1. Point out, integrate and organize the physiology of exercise and its support system.
2. Specify, integrate and recommend health-related exercise benefit and disadvantages.
3. Evaluate, integrate and construct the physiological changes and homeostasis occurring in haemorrhage, shock and heart failure.
4. Evaluate, integrate and construct the Islamic perspectives of the physiological principles learnt.
5. Evaluate, integrate and construct the knowledge acquired into research..

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Difference between cardiac, smooth and skeletal muscle
2.	Skeletal muscle versus smooth muscle contraction
3.	Local control of blood flow
4.	Types of exercise
5.	The physiologic support system <ul style="list-style-type: none">• Pulmonary system• Cardiovascular System
6.	The physiologic support system (cont) <ul style="list-style-type: none">• The neuromuscular system• Hormones
7.	Training and adaptations – Aerobic & Anaerobic
8.	Factors affecting physiologic function during exercise
9.	Physiological parameters
10.	Health related exercise benefit and disadvantages
11.	Common injury during exercise
12.	Body fluid homeostasis
13.	Haemorrhage and shock
14.	Congestive cardiac failure

Section 6: Learning Resources

Required Textbook

- 1.
2. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
3. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7322: Cardiovascular Physiology

Course Coordinator: Asst. Prof. Dr. Aszrin Abdullah

Section 1: Course Synopsis

This course has been designed to introduce students to the fundamentals of cardiovascular physiology. It also provides applied knowledge on the circulatory system three basic components; the heart, blood vessels and blood as its transport medium. The course will expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Point out, identify and specify the normal function of every component of the systemic and peripheral circulation.
2. Point out, explain and specify the electrical activity of the heart.
3. Point out, explain and specify the mechanical events of the cardiac cycle.
4. Point out, explain and specify the regulatory mechanism of the heart, blood flow and blood pressure.
5. Point out, identify and specify the cardiovascular physiological adaptation in normal and common medical conditions

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	The heart, blood vessels and blood structure and function: <ul style="list-style-type: none"> • The cardiovascular circuit • Blood components, groups and haemostasis
2.	Electrical activity of the heart: <ul style="list-style-type: none"> • Cardiac autorhythmic cells • The cardiac contractile cells characteristic action potential
3.	Electrical activity of the heart (conts): <ul style="list-style-type: none"> • Electrocardiography • Arrhythmias
4.	The mechanical events of the cardiac cycle: <ul style="list-style-type: none"> • Cardiac output its determinants and control
5.	Regulations of the heartbeat: <ul style="list-style-type: none"> • Autonomic nervous system • Control by the higher centres
6.	Hemodynamics: <ul style="list-style-type: none"> • Velocity of the bloodstream • Relation between velocity and pressure. • Relation between pressure and flow. • Resistance to flow.
7.	The arterial system: <ul style="list-style-type: none"> • Arterial elasticity. • Determinants of arterial blood pressure. • Blood pressure measurement in humans. • Regulatory mechanism of arterial blood pressure.
8.	The microcirculation and lymphatics: <ul style="list-style-type: none"> • The structure • Role of capillary endothelium. • Lymphatics
9.	Peripheral circulation and its control: <ul style="list-style-type: none"> • Intrinsic or local control of peripheral blood flow. • Extrinsic control of peripheral blood flow.
10.	Regional circulation: <ul style="list-style-type: none"> • Coronary circulation. • Cutaneous circulation. • Skeletal muscle circulation. • Renal circulation.
11.	Regional circulation(conts): <ul style="list-style-type: none"> • Cerebral circulation. • Intestinal/ hepatic circulation. • Foetal circulation.
12.	Cardiovascular physiological adaptations in <ul style="list-style-type: none"> • Exercise. • Pregnancy
13.	Cardiovascular physiological adaptation in common medical conditions: <ul style="list-style-type: none"> • Haemorrhage. • Heart failure. • Hypertension.

14.	Cardiovascular physiology and Islamic input: <ul style="list-style-type: none">• Fiqh issues in cardiovascular diseases.
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Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

2. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7323: Physiology of the Central Nervous System I

Course Coordinator: Assoc. Prof. Dr. Roslina Abdul Rahim

Section 1: Course Synopsis

The brain is a mysterious organ. Scientists are still learning about this marvelous organ. This course has been designed to introduce students to the fundamentals and applied knowledge on the physiology of the central nervous system (CNS). It is hoped to assist students in understanding the system thus interpret new developments in the field in the near future. The course is divided into the CNS three main functional components: the sensory system, the motor system, and homeostatic and higher brain functions. CNS Physiology 1 includes the sensory and the motor systems, whilst CNS Physiology 2 focus on the homeostatic and higher brain functions. The course will also expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Point out, identify and sketch the somatosensory pathway and the different functions.
2. Differentiate, integrate and organized the motor units and motor receptors.
3. Point out, explain and organized the spinal reflexes and descending motor pathways.
4. Differentiate, explain and organized the control of movement and posture by the brain stem, cerebellum, basal ganglia and cerebral cortex.
5. Evaluate, integrate and organized the common medical disorders of the motor system.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	The somatosensory pathways and processes
2.	Pain principles: <ul style="list-style-type: none"> • Pain receptors, stimuli and pain fibers • Pain thresholds • Classification of pain and the physiological basis of different pain types (fast pain, slow pain, acute pain, chronic pain, superficial pain, deep pain and visceral pain)
3.	<ul style="list-style-type: none"> • Physiological basis of referred pain and radiating pain • Physiological basis of inflammatory pain, hyperalgesia and allodynia • Pain pathways • Pain modulation
4.	Thermoregulation: <ul style="list-style-type: none"> • Normal body temperature and physiological variations. • Body heat production and heat loss. • Body temperature regulating mechanisms. • Fever
5.	<ul style="list-style-type: none"> • Organization of the motor system: <ul style="list-style-type: none"> – Function of the four levels of motor system (the spinal cord, the brain stem, the motor cortex and the association cortex) – Function of the motor system two side loop (the basal ganglia and the cerebellum, which interact with the hierarchy through connections with the thalamus.) • The spinal cord: <ul style="list-style-type: none"> – Motor unit, motor neurons, muscle fibers and muscle receptors. • Definition of upper motor neuron and lower motor neuron.
6.	Spinal reflexes: <ul style="list-style-type: none"> • The function and control of stretch reflex • Reciprocal inhibition in the stretch reflex • Flexor reflex and crossed extension reflex • The reflex arc: monosynaptic, disynaptic and polysynaptic arc.
7.	<ul style="list-style-type: none"> • Descending motor pathway: <ul style="list-style-type: none"> – Flexor-extensor rule – Proximal-distal rule • Influences of descending pathways on spinal circuits: <ul style="list-style-type: none"> – voluntary movement – involuntary movement (reflex modulation) – alpha-gamma co-activation
8.	Descending motor pathway: <ul style="list-style-type: none"> • The control of voluntary and involuntary movements by the primary motor cortex, premotor cortex, and supplementary motor area • cortical afferents and efferents
9.	Descending motor pathway: <ul style="list-style-type: none"> • The control of voluntary and involuntary movements by the cerebellum.
10.	Descending motor pathway: <ul style="list-style-type: none"> • The control of voluntary and involuntary movements by the basal

	ganglia.
11.	Disorders of the motor system: <ul style="list-style-type: none"> • Cerebral cortex (Stroke)
12.	Disorders of the motor system: <ul style="list-style-type: none"> • Abnormal gait and movement disorders (Parkinson disease and Huntington's disease).
13.	Disorders of the motor system: <ul style="list-style-type: none"> • Abnormal posturing: (Decerebrate and decorticate rigidity).
14.	CNS physiology and the Islamic perspectives.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.

PHYL 7324: Respiratory Physiology

Course Coordinator: Assoc. Prof. Dr. Roslina Abdul Rahim

Section 1: Course Synopsis

This course has been designed to introduce students to the fundamentals of the respiratory system physiology which include the functional anatomy, mechanics of breathing, gas transport and exchange and regulation of respiration. The course will expose the students to physiological adaptation in normal and common medical conditions. Ethical and Islamic medical perspectives will also be highlighted.

Section 2: Learning Outcome

1. Point out, identify and sketch the functional anatomy of the respiratory system.
2. Evaluate, integrate and organize the factors affecting and its regulatory mechanism.
3. Evaluate, integrate and organize the physiological adaptation in normal and common medical conditions
4. Evaluate, integrate and construct the respiratory physiology and Islamic medical perspectives.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Written assignment
3. Tutorial
4. Seminar
5. Problem-based learning
6. Self-directed learning

Section 4: Course Assessment

Class participation	10%
Assignment	15%
Presentation	15%
Final Examination	60%

Section 5: Course Content

No.	Topic
1.	Structure of the respiratory system
2.	Function of the respiratory system
3.	Mechanics of ventilation and lung volumes
4.	Physical properties of the lung
5.	Ventilation/ Perfusion ratio in different regions of the lung.
6.	Factors that determine V/P ratio
7.	The transport of respiratory gases
8.	Regulation of respiration
9.	Respiratory changes in exercise
10.	Respiratory failure. (Type I and II).
11.	Effects of breathing on heart rate and lung function tests
12.	Hypoxia: its origins and consequences
13.	<ul style="list-style-type: none">• Acclimatization to high altitude.• Effect of deep-sea diving on the body
14.	Non- pulmonary function of the respiratory system.

Section 6: Learning Resources

Required Textbook

1. Barrett, K. E. & Ganong, W. F. (2016). Ganong's review of medical physiology (25th ed.). Mac Graw Hill.
2. Sherwood, L. (2016). Human physiology: From cells to systems (9th ed.). Cengage Learning.

Recommended Textbook

1. Hall. J.E & Guyton A.C (2016). Guyton and Hall textbook of medical physiology (13th ed.). Elsevier.