Internship/Apprenticeship course plan

The name of the course: Medical Physiology for M.Sc. Students in Medical Physics

Attendance Days in Department: Wednesdays

Program Duration (Course length**): 2 units**

Start and End Dates: **From the beginning of the semester to week 16**

Department attendance hours: 12:00 to 14:00

Location of In-Person Sessions: Faculty of Medicine

Clinical trainers' information table

First Name	Last Name	Rank	Group	Phone Number	Email
Elham	Karimi-Sales	Assistant Professor	Physiology	+984133364664	karimi.sales@gmail.com
Behnaz	Mokhtari	Assistant Professor	Physiology	+984133364664	behnaz.sa.mokhtari@gmail.com

Main goal of the course:

In this course, students are expected to learn the concepts, principles, and physiological mechanisms related to the following areas:

1. Understand the structure and function of cellular components, and explain membrane physiology and the electrical properties of cells underlying the resting membrane potential and action potential.
2. Understand the physiology of the cardiovascular system, including the mechanisms of cardiac function, blood pressure regulation, and blood flow control.
3. Explain the general principles of gastrointestinal physiology and the processes of digestion and absorption.
4. Understand the physiology of respiration, including ventilation, gas exchange and transport, as well as the neural and chemical regulation of respiration.
5. Explain the structure and function of the kidneys, including the mechanisms of filtration, reabsorption, secretion, and the regulation of body fluid, electrolyte, and acid–base balance.
6. Understand the structure, functions, and regulatory mechanisms of the endocrine glands, and explain the hormonal control of metabolism, growth, and calcium homeostasis.
7. Understand the organization and functions of the central and peripheral nervous systems, and explain the mechanisms of neural communication, autonomic regulation, and reflex activity.

Learning objectives:

Learners, after completing this course, are expected to:

Cell Physiology

1. Describe the structure and function of cellular organelles.
2. Explain the structure and function of the cell membrane.
3. Describe mechanisms of transport across the membrane and provide examples.
4. Explain the structure and function of ion channels and carriers.
5. Explain the concept of resting membrane potential.
6. Describe the basis of action potential generation and propagation.

Heart and Circulation

1. Define the cardiac cycle and list its phases.
2. Explain the relationship between electrical and mechanical events in the heart.
3. Describe the characteristics of a normal electrocardiogram (ECG).
4. Determine heart rate and electrical axis from an ECG.
5. Explain Frank–Starling's law of the heart.
6. Define cardiac output, end-systolic volume, and end-diastolic volume.
7. Define blood pressure and explain systolic and diastolic pressures.
8. Explain the relationship between blood pressure, blood flow, and vascular resistance.
9. Describe neural and hormonal regulation of blood pressure.
10. Describe local control of blood flow and capillary exchange mechanisms.

Gastrointestinal Physiology

1. Explain the neural and hormonal regulation of the gastrointestinal system.
2. Describe chewing, swallowing, and the roles of the esophageal sphincters.
3. Explain gastric motility and the factors affecting gastric emptying.
4. Describe small and large intestinal movements and their functions.
5. Explain the defecation reflex and its regulation.
6. Describe the composition and function of salivary, gastric, pancreatic, and biliary secretions.
7. Explain the mechanisms of digestion and absorption of carbohydrates, proteins, and fats.

Respiratory Physiology

1. Explain the mechanics of inspiration and expiration.
2. Describe the role of pleural pressure, compliance, and surfactant.
3. Define lung volumes and capacities and state their normal values.
4. Explain gas exchange between alveoli and blood.
5. Describe oxygen and carbon dioxide transport in the blood.
6. Explain the oxygen–hemoglobin dissociation curve and its physiological significance.

Renal Physiology

1. Identify the components of the nephron and describe their functions.
2. Explain the process of glomerular filtration and factors affecting glomerular filtration rate (GFR).
3. Describe tubular reabsorption and secretion.
4. Explain mechanisms of urine concentration and dilution and the roles of ADH and the vasa recta.
5. Describe renal regulation of water, electrolyte, and acid–base balance.

Endocrine System

1. List the major endocrine glands and their hormones.
2. Explain the regulation and physiological effects of pituitary hormones.
3. Describe thyroid and adrenal gland functions and their control mechanisms.
4. Explain insulin and glucagon secretion and their roles in metabolism.
5. Describe the physiological role of parathyroid hormone, vitamin D, and calcitonin in calcium homeostasis.

Nervous System

1. Describe the organization of the central and peripheral nervous systems.
2. Explain synaptic transmission and neurotransmitter mechanisms.
3. Describe the functional differences between somatic and autonomic nervous systems.
4. Explain the role of the sympathetic and parasympathetic systems in regulating organ function.

Teaching Methods

Objective/Setting	Morning Report/ Educational Rounds/ Outpatient clinics	Clinical Skills Center (Skill lab)	Other
Students will learn the concepts, principles, and physiological mechanisms related to the areas listed above, and to be able to identify them in both normal and altered physiological processes.	-	-	1. Lectures. 2. Use of educational aids such as PowerPoint slides, whiteboard, and instructional videos. 3. In-class questioning, discussions, and participatory learning to enhance motivation and understanding.

Student Evaluation Methods and rubric

1. The theoretical exam will be conducted as a written MCQ (multiple-choice questions) worth 18 points.
2. A score of 2 point will be given for regular class attendance, active participation in discussions, and completion of optional assignments.

Topic	Logbook	DOPS	Written Exam	OSCE	Other	The weight of the total score
			*		Class Activity	
Total			18		2	20

Minimum Passing Grade: 10

The maximum number of excused absences permitted for this course unit, subject to the trainer(s)'s approval:

Only in cases of justified absence, the student is permitted to be absent for up to four seventeenths of the total hours.

Educational References:

Guyton and Hall Textbook of Medical Physiology (latest edition)

Supplementary Learning References:

Ganong's Review of Medical Physiology (latest edition)

Learning Opportunities

The Weekly Journal Club in the Physiology Department is held on Tuesdays from 12:30 to 14:00.

Contact Information:

- Trainer(s): (Phone, Email)

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- Course Coordinator: (Phone, Email)

Dr. Elham Karimi-Sales; +984133364664; karimi.sales@gmail.com

- Educational staff of the department: (Phone, Email)

Prof. Reza Badalzadeh, +984133364664; reza.badalzadeh@gmail.com

Signature of Course Director:

Dr. Elham Karimi-Sales

Signature of Department Chair:

Signature of the head of Educational Development Office (EDO):