Internship/Apprenticeship course plan

The name of the course: Physiology of the Heart

Attendance Days in Department: Mondays

Program Duration (Course length)**: 0.44 theoretical units, 0.06 practical units**

Start and End Dates: **December 1 to January 5**

Department attendance hours: 8:00 AM to 10:00 AM

Location of In-Person Sessions: Faculty of Medicine

Clinical trainers' information table

First Name	Last Name	Rank	Group	Mobile Number	Email
Behnaz	**Mokhtari**	**Assistant Professor**	**Physiology**	**+989143826286**	**behnaz.sa.mokhtari@gmail.com**

Main goal of the course:

In this course, the student is expected to learn the concepts, principles, and physiological mechanisms related to the function of the heart in each of the following areas and be able to identify them in normal and altered physiological processes:

1. The heart, its chambers, and layers
2. Cardiac muscle, heart action potential, contraction of cardiac muscle cells
3. The cardiac cycle and its phases
4. Control of heart activity
5. Electrocardiogram curves
6. Blood flow pathway in the heart during a cardiac cycle
7. Physiological characteristics of cardiac muscle and its similarities and differences with skeletal muscle
8. Stages and mechanisms of cardiac muscle contraction
9. Action potential of cardiac muscle cells, its phases, and differences with skeletal muscle

10. Components of the cardiac conduction system and heart rate control
11. The cardiac cycle and its phases (repeated)
12. Concepts of cardiac output, end-systolic volume, end-diastolic volume, and stroke volume
13. Preload, afterload, and their effects on cardiac output
14. The sympathetic and parasympathetic systems in cardiac function control
15. Electrocardiogram curves and their components
16. Cardiac derivations and electrode placement
17. Mechanisms of generation of P, QRS, and T waves in the electrocardiogram

Learning objectives:

After completing this course, learners are expected to be able to:

Theoretical Unit

1. Describe the physiological anatomy of cardiac muscle.
2. Explain the blood flow through the heart chambers.
3. Describe the practical pacemaker function in the heart.
4. Explain the generation of action potential and refractory phases in the heart.
5. Describe the excitation-contraction relationship of cardiac muscle.
6. Define the cardiac cycle and name its different phases.
7. Explain the phases of ventricular filling and emptying.
8. Describe isovolumetric contraction and relaxation.
9. Draw the pressure-volume curve of the heart and explain the stages of the cardiac cycle on it.
10. Explain cardiac output and how the heart consumes energy.
11. Identify the location and function of heart valves and papillary muscles.
12. Describe the generation of heart sounds and their relation to the pumping function of the heart.
13. Define cardiac output, end-systolic volume, and end-diastolic volume.
14. Define preload, afterload, contractile force, and contractility of the heart.
15. Explain intrinsic self-regulation of cardiac function (Frank-Starling mechanism).
16. Explain the effect of the autonomic nervous system on heart function.
17. Describe the relationship between preload, afterload, stroke volume, and cardiac output in normal and altered states.
18. Explain the impact of various factors such as ions and temperature changes on cardiac function.

Practical Unit

1. Become familiar with the method of recording electrocardiograms.
2. Perform a basic interpretation of electrocardiograms.

Teaching Methods

Objective/Setting	Morning Report	Educational Rounds	Outpatient clinics	Clinical Skills Center (Skill lab)	Other
Students will learn the structural and functional physiology of the heart, including the anatomy of cardiac muscle, blood flow through heart chambers, and the cardiac pacemaker system. They will understand the cardiac cycle phases, excitation-contraction coupling, and cardiac action potentials. The course covers heart sounds, valve functions, and regulation of cardiac output including preload, afterload, and autonomic nervous control.					Lecture Sessions
Students will learn to record electrocardiograms accurately and interpret them meaningfully, as well as understand how various factors affect heart function.					Laboratory Practical

Student Evaluation Methods and rubric

1. The theoretical exam will be conducted as a written MCQ (multiple-choice questions) worth 17 points, and the practical exam will be worth 2 points.
2. A score of 1 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		2	17		1	20

Minimum Passing Grade: 10

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

According to the total educational hours of this course (based on approved educational regulations), the student is not allowed to be absent from any session. Only in cases of justified absence, the student is permitted to be absent for up to four seventeenths of the total hours.

Educational References:

The latest editions for recommended physiology books are:

1. Guyton and Hall Medical Physiology: Latest edition 2024 (13th Edition)
2. Ganong Review of Medical Physiology: Latest edition 27th Edition, 2021
3. Berne & Levy Physiology: Latest edition 8th Edition, 2024, translated by Dr. Seyed Ali Haeri Rouhani and others, published by Andisheh Rafie

For practical lessons:

1. Practical Physiology book authored by faculty members of the Physiology Department, available in the Physiology Department laboratories.

Supplementary Learning References:

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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)

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

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

Signature of Course Director:

Dr. Behnaz Mokhtari

Signature of Department Chair:

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