

In the Name of God

Course Guide for Cell Physiology I and II – Doctor of Medicine Program **Course Code: 111**

Course Instructor: Dr. Elham Karimi-Sales

Contact Number / Student Access: +98 41 33364664

Prerequisite / Corequisite: None

Semester Offered: Both Semesters

Credits: 0.8 (0.6 for Cell I and 0.2 for Cell II)

Course Type: Theoretical

Program Level: Basic Medical Sciences – First Semester

Number of Sessions: Cell I – 5 sessions; Cell II – 2 sessions

Course Schedule:

- **Cell I:** From the beginning of the semester to week 5
- **Cell II:** From one week after the Cell I exam for two weeks

Weekly Schedule: Saturday 12:00–14:00

Online Class Link: All sessions are held in person.

General Objective of the Course

In this course, students are expected to learn the physiological concepts, principles, and mechanisms related to cellular function in the following topics and be able to identify these processes under normal and altered physiological conditions.

Cell Physiology I

1. Definition and scope of physiology; cellular signaling
2. The cell membrane and its components; transport mechanisms across the membrane
3. Resting and action potentials
4. The internal environment and homeostasis; the role of organ systems in maintaining it
5. Differences in the composition of intracellular and extracellular fluids and their causes
6. Intracellular signaling mechanisms
7. Absolute and relative refractory periods and their physiological basis

Cell Physiology II

8. Skeletal muscle contraction
9. Smooth muscle contraction and its differences from skeletal muscle

Specific Objectives

After completing Cell Physiology I, students should be able to:

1. Define terms such as physiology, internal environment, homeostasis, and cellular signaling.
2. List the body's homeostatic systems and briefly describe their functions.
3. Explain negative, positive, and feedforward feedback control mechanisms with examples.
4. Describe the differences between intracellular and extracellular fluid compositions and their causes; explain the structure, arrangement, and function of membrane components.
5. Describe the mechanisms of substance exchange and transport across the cell membrane (diffusion, facilitated diffusion, active transport, osmosis).
6. Define the concept of resting membrane potential.
7. Explain the Nernst and Goldman–Hodgkin–Katz equations.
8. Identify types of action potentials, their phases, and the mechanisms of initiation and propagation.
9. Explain absolute and relative refractory periods and their causes.

After completing Cell Physiology II, students should be able to:

1. Describe the physiological structure of skeletal muscle.
2. Explain the excitation–contraction coupling mechanism in skeletal muscle.
3. Define the concepts of motor unit and muscle tension.
4. Classify motor unit types and describe their roles in contraction strength.
5. Explain the relationship between load and contraction velocity.
6. Define atrophy, hypertrophy, hypotrophy, and rigor mortis.
7. Describe the structure and features of the neuromuscular junction.
8. Explain calcium release from the sarcoplasmic reticulum.
9. Describe the histological structure of smooth muscle and compare it with skeletal muscle.
10. Classify types of smooth muscle and explain their distinct features.
11. Explain the excitation and contraction mechanisms in smooth muscle.
12. Describe membrane potential and action potentials in smooth muscle and the effects of hormonal and local factors.
13. Identify the calcium sources for smooth muscle contraction.
14. Explain electrical membrane changes in smooth muscle, including slow waves and plateau potentials.

Teaching Methods

1. Lectures delivered in person according to the announced course schedule.
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.

Evaluation

1. Multiple-choice exams (total score: 20).
2. Additional points may be awarded for regular attendance, active participation, and completion of optional assignments.

Passing Grade: 10 out of 20

Absence Policy:

According to the total number of instructional hours allocated to this course (as per the approved academic regulations), the student is not permitted to be absent from any session. Absence is allowed only in justified cases, and only up to a maximum of four seventeenths of the total course hours.

References

- *Guyton and Hall Textbook of Medical Physiology* (latest edition)
- *Ganong's Review of Medical Physiology* (latest edition)

Contact Information

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