In the Name of God

Course Title and Code: Cell 1 and Cell 2 Physiology – Code 111 **Program & Degree: Medicine – Doctor of Medicine (M.D.)** **Semester: First**

Offered Semester: First and Second **Weekly Schedule: Saturday 12:00–14:0** **Location: Faculty of Medicin**

Number and Type of Credits (Theoretical / Practical): 0.8 (0.6 credits for Cell I and 0.2 credits for Cell II) **Theoretical Prerequisite Courses: None**

Course Instructor: Dr. Elham Karimi-Sales **Contact Number: +98 41 33364664**

Session 1 **General Objective:** Introduction to Physiology, Cellular Signaling, and Homeostasis							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Define the terms physiology, internal environment of the body, and homeostasis. -Identify the body's homeostatic systems and briefly describe their homeostatic functions. -Describe the differences between intracellular and extracellular fluid composition and explain the reasons for these differences**.** -Explain negative feedback, positive feedback, and feed-forward control mechanisms, providing appropriate examples.	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Session 2 **General Objective:** Cytoplasm, intracellular organelles, and nucleus							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Describe the components forming the cell membrane, their arrangement, and their functional roles. -Explain the chemical composition of the cell as represented by the protoplasm. -Identify and name the cellular organelles, explain their functions, and describe their distinctive characteristics	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Session 3 **General Objective:** Membrane transport mechanisms							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -List and explain the types of transport and exchange mechanisms across the cell membrane. -Explain simple diffusion and identify the factors affecting it. -Explain facilitated diffusion with examples and describe its characteristics. -Describe the mechanism of osmosis. -Name examples of primary active transport mechanisms. -Identify the types of secondary active transport and explain each with examples. -Define endocytosis and exocytosis, list their types, and describe how each process occurs	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Session 4 **General Objective:** Membrane potential, physiology of excitable membranes, action potential, and its propagation							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Define the concept of resting membrane potential. -Explain the Nernst and Goldman–Hodgkin–Katz relationships. -Describe the mechanisms of depolarization and repolarization. -Identify the types of ion channels in the axonal membrane and explain the state of their gates in different phases of action potential. -Define and explain the concepts of excitation threshold, hyperpolarization, and their mechanisms of generation. -Explain the all-or-none law. -Distinguish between myelinated and unmyelinated nerve fibers	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Session 5 **General Objective:** Types of Action potentials							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Explain the types of action potentials. -Name the ion channels involved in the plateau-type action potential and specify their sites of generation. -Explain the causes of intrinsic rhythmic action potentials, giving examples of their sites of origin. -Define the absolute and relative refractory periods and explain their physiological basis.	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Session 6 **General Objective:** Skeletal muscle contraction							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Describe the structure of skeletal (striated) muscle. -Explain the role of transverse (T) -tubules. -Describe the structure and properties of actin and myosin filaments. -Explain the mechanism of muscle contraction. -Describe the structure and characteristics of the neuromuscular junction (motor end-plate). -Explain the mechanism of calcium release from the sarcoplasmic reticulum. -Identify the sources of energy required for muscle contraction. -Define the motor unit.	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

-Explain muscle twitch, isometric, and isotonic contractions. -Define and explain the terms atrophy, hypertrophy, hypotrophy, and rigor mortis.							

Session 7 **General Objective:** Smooth muscle contraction							
Specific Objectives	**Learning Domain**	**Instructor Activity**	**Student Activity**	**Learning Environment**	**Duration**	**Evaluation Method**	**Teaching Aids**
At the end of this session, the student is expected to be able to: -Identify the types of smooth muscle and explain the differences specific to each type. -Describe the excitation and contraction mechanisms of smooth muscle. -Explain the membrane potential and action potentials in smooth muscle and the effects of hormonal and local factors on them. -Identify the sources of calcium required for smooth muscle contraction. -Explain the electrical changes in the smooth muscle membrane, including slow waves and plateau potentials.	Cognitive (Knowledge)	-Lecture with encouragement of student participation -Active participation and class discussion	Active participation	Classroom	90 minutes	Final MCQ exam	Video projector (PowerPoint) Whiteboard

Course Policies

- **Absence and Tardiness:** According to regulations, students cannot miss any session except for justified absences (up to 4/17 of total class hours).
- **Assessment and Grading:**
  - MCQ exams (total score: 20)
  - Additional points for attendance, participation, and optional assignments
  - Passing grade: 10/20

References

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