SAGRADO
Universidad del Sagrado Corazón

SYLLABUS

TITLE: Human Physiology

CODE: BIO 310

PREREQUISITE: BIO 112

CREDITS: 4 credits | 45 hours contact | 45 hours of laboratory |1 term

DESCRIPTION

Physiological principles that govern the functioning of the systems that compose the human organism are discussed. Basic concepts of cellular physiology and the tissues that compose the organs are presented. The physiological principles that govern the function of the different organs and systems of the body are discussed. It explains how the physiology of the different systems is integrated to provide responses to different physiological conditions and maintain homeostasis. In order for the student to have a broader knowledge of the functioning of the body. Some principles of the physiopathology of the systems that will be studied are discussed. This course is intended for students of Natural Sciences for their general training in the field of health. The course consists of lectures and class discussions integrating laboratory experiences related to the topics covered. Ethical aspects related to health professions and biomedical research are analyzed in the course.

JUSTIFICATION

Physiology is concerned primarily with the functional integration of the tissues and organs of which the body is composed. A solid and concise foundation in human physiology provides the student with knowledge that usually cannot be acquired in other courses. In addition, physiology is one of the most important disciplines in the development of the biological sciences. The emphasis of the course is on human physiology, directed towards the understanding of body homeostasis and different pathological conditions of the systems. The course takes into account, when necessary, the physiology of systems in other organisms. In this way, the student acquires a broad knowledge of the subject, fundamental to pursue graduate studies in medicine, dentistry, veterinary medicine, pharmacy, chiropractic, physical therapy and other branches of biomedical sciences.

COMPETENCES

The course develops in the student the following competences:

- **Communication**
- **Ethical sense and social justice**
- **Critical Thinking**

OBJECTIVES

At the end of the course, students will be trained to:

1. Know basic concepts of cellular physiology and the tissues that compose the organs.
2. Recognize and explain the physiological principles that govern the function of the different organs and systems of the body.
3. Identify the structures and explain the general functions of the cardiovascular, respiratory, urinary, nervous, digestive, endocrine, and reproductive systems.
4. Explain how the physiology of the different systems is integrated to provide responses to different physiological conditions and maintain homeostasis.
5. Interpret some principles of the pathophysiology of the systems to be studied.
6. Demonstrate ethical sense towards health professions and biomedical research.

CONTENT

I. Cell Physiology

   A. Cell and its composition
      1. Chemical composition
      2. Cellular organelles
      3. Tissues
   B. Cellular Functional Systems
      1. Function of the plasma membrane and cell organelles
      2. Mechanisms for the passage of substance across the cell membrane
      3. Diffusion and Osmosis
      4. Facilitated diffusion
      5. Active transport
      6. Receptors on membranes
   C. Genetic control of protein synthesis
      1. Transcription

2. Translation

D. Cell reproduction
    1. Replication process
    2. Cell cycle

II. Blood and Immunity

A. Blood
    1. Functions and composition of blood
    2. Components of blood plasma
    3. Blood corpuscles (blood cells and platelets)
    4. Hematopoiesis and its regulation
    5. Pathological conditions

B. Lymphatic and Immune System
    1. General characteristics of the lymphatic system
    2. Inflammation and other non-specific defenses
    3. Specific defenses: relationship between macrophages, T-lymphocytes and B-lymphocytes
    4. Immunoglobulins
    5. Active and passive immunity
    6. Pathological conditions

C. Coagulation and blood transfusion
    1. Mechanisms of coagulation
    2. Hemorrhagic diseases
    3. Compatibility tests for blood transfusion

III. Cardiovascular Physiology

A. Cardiac function and its regulation
    1. Gross anatomy of the heart
    2. Cardiac muscle and its contraction
    3. Valve function
    4. Heart rhythm regulation and cardiac electrocardiograms
    5. Cardiac cycle
    6. Pathological conditions

B. Systemic circulation and its regulation
    1. Pulmonary, coronary, cerebral and portal circulation
    2. Tissue composition and structures of arteries, veins and capillaries
    3. Regulation of blood flow and blood pressure by vessels
    4. Distribution of blood in the body
    5. Blood pressure and venous pressure

6. Hypertension
7. Cardiac output
8. Heart failure

C. Capillary membrane dynamics
1. Anatomy of the capillary system
2. System pressures
3. Interstitial fluid pressure

IV. Respiration

A. Structure of the respiratory system
B. Pulmonary Function
1. Mechanism of ventilation
2. External respiration
3. Internal respiration

C. Gas transport
1. Oxygen and carbon dioxide
2. Buffering in the blood
3. Hemoglobin

D. Regulation of ventilation
1. Neural control
2. Respiratory centers
3. Chemical control of ventilation

E. Respiratory physiopathology

V. Body fluids and their regulation

A. Functions of the Urinary System
1. Physiologic anatomy of the kidney
2. Function of the nephron

B. Regulation of the components and volumes of body fluids
1. Ion regulation
2. Acid-base balance regulation
3. Regulation of blood volume
4. Regulation of filtration pressure

VI. Nerve and muscle cell physiology

A. Neurons and membrane potentials
1. Types and function of neurons and neuroglia
2. Membrane potentials
3. Action potentials

4. Impulse conduction

VII. Function of the nervous system

A. Central and Peripheral Nervous System
   1. Cerebral cortex, thalamus, hypothalamus, limbic system, cerebellum, medulla and Pons
B. Reflexes
   1. Reflex arc
   2. General properties
   3. Types of reflexes
C. Sensory organs (In the laboratory)
   1. Vision
   2. Hearing and balance
   3. Taste and smell
   4. Other sensory receptors
D. Muscle physiology
   1. Striated muscle: anatomy and physiology
   2. Cardiac muscle
   3. Smooth muscle

VIII. Digestive system and metabolism

A. Gastrointestinal movements and secretions and their regulation.
   1. Anatomy and physiology of the digestive tract
   2. Gastrointestinal secretions
   3. Functions of the liver and pancreas
B. Digestion and assimilation
   1. Carbohydrates, fats, proteins

IX. Endocrinology and reproduction

A. Endocrinology
   1. Hormones of the hypothalamus and pituitary gland
   2. Thyroid and parathyroid
   3. Pancreas (insulin and glucagon)
   4. Cortex and medulla of the adrenal gland
   5. Testes and ovaries
B. Sexual functions of the male and female
   1. Structure and function of the male and female reproductive organs
   2. Hormonal regulation in the male and in the female
C. Early stages of development

X. Ethical aspects of the health professions and biomedical scientific research

A. Ethical problems in the health professions
B. Ethical problems in biomedical scientific research

LABORATORY EXPERIENCES

A. Introduction
B. Microscopy
C. Study of Tissues
D. Hematology
E. Cardiovascular System
F. Renal System
G. Respiratory System
H. Nervous System
I. Reproductive System
J. Embryology

METHODOLOGY

The following strategies of the active learning methodology are recommended:

- Lectures
- Class discussions
- Case studies
- Analysis questions
- Problem solving
- Oral presentations
- Laboratory experience
- Simulations

EVALUATION

Participation	5%
Partial Assignment	40%
Compositions	10%
Immersive Experience	25%
Project or final exam	20%
Total	100%

LEARNING ASSESSMENT

The institutional assessment rubric is applied to the core activity of the course.

BIBLIOGRAPHY

TEXT

Martini, F., Nath, J. & Bartholomew, E. (2017). Fundamentals of Anatomy & Physiology. (11th ed.). Pearson.

Martini, F., Nath, J. & Bartholomew, E. (2015). Applications Manual, Fundamentals of Anatomy & Physiology. (10th ed.). Pearson.

REFERENCES

Fox, S., (2017, July 6). Fisiología. (14va ed.). LUIV4.

Hall, J., (2016). Guyton y Hall. Tratado de Fisiología Médica. (13ra ed.). Elsevier.

Koeppen, B. & Stanton, B., (2018, February 23). Berne y Levy. Fisiología. (7ma ed.). Elsevier.

Tortora, G. & Derrickson, B. (2018, January 1). Principios de Anatomía y Fisiología. (15va ed.). Editorial Médica Panamericana S.A.

ELECTRONIC RESOURCES

Altitude Org. (2015, June 30) Oxygen calculator.

http://www.altitude.org/oxygen_levels.php

Biodigitad 3D Human- https://www.biodigitalhuman.com/home/#

HHMIs Biointeractive- Cardiovascular animations

http://www.hhmi.org/biointeractive/cardiovascular/animations.html

Human anatomy and physiology - Khan Academy

https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology

Human anatomy and physiology- Free-ed.net

http://www.free-ed.net/freeed/Resources/Sci/Biol/AnatomyPhysiol/Human01.asp

The Heart Site - http://www.heartsite.com/

UH Anatomy and Physiology Tutoring

http://www.uh.edu/sibs/tutorial/ap2.htm#reproductive

Visible Human Server- http://visiblehuman.epfl.ch/login.php

Zygote 3d Human body- http://www.zygotebody.com/

Find more information resources related to the course topics on the library page http://biblioteca.sagrado.edu/

REASONABLE ACCOMMODATION

To obtain detailed information on the process and the required documentation, you must visit the corresponding office. To guarantee equal conditions, in compliance with the ADA (1990) and the Rehabilitation Act (1973), as amended, all students who need reasonable accommodation services or special assistance must complete the process established by the Vice Presidency for Academic Affairs.

ACADEMIC HONESTY, FRAUD AND PLAGIARISM

Any student who misses the policy of honesty, fraud and plagiarism is exposed to the following sanctions: received a grade of zero in the evaluation and / or repetition of the work in the course, grade of F (*) in the seminar: suspension or expulsion as established in the Academic Honesty Policy document (DAEE 205-001) effective August 2005.