

HIBBING COMMUNITY COLLEGE COURSE OUTLINE

COURSE NUMBER & TITLE: BIOL 2151: Human Physiology

CREDITS: 4 (Lecture 3 / Lab 1)

PREREQUISITES: Human Anatomy or Integrated Science recommended

CATALOG DESCRIPTION:

Human Physiology is the study of organ systems and tissues of the human body. Systems included are the cardiovascular, respiratory, lymphatic, digestive, urinary, and reproductive. The focus is on the endocrine, nervous, and integrated control mechanisms of physiology in these systems. This course is intended for practical nurses enrolled in the associate degree nursing program and students in health-related fields as well as liberal arts students. MNTC goal areas: (3)Natural Science.

OUTLINE OF MAJOR CONTENT AREAS:

- I. Overview of physiology
 - A. Functional characteristics
 - B. Homeostasis
- II. Basic chemistry and biochemistry
 - A. Bonds and reactions
 - B. Acids, bases, and salts
 - C. Organic compounds
- III. Cells and tissues
 - A. Membranes
 1. Transport
 2. Electrical potential
 3. Cell interactions
 4. Metabolic functions
 - B. Epithelium
 1. Type
 2. Location
 3. Function
 - C. Connective tissue
 - D. Blood
 1. Composition
 2. Formed elements including cells
 3. Plasma
 4. Hemostasis
- IV. Integumentary system
 - A. Functions of skin
 1. Protection
 2. Temperature regulation

- 3. Secretion
 - 4. Synthesis
- V. Skeletal system
 - A. Bone development and growth
 - B. Calcium regulation
 - C. Remodeling and repair
- VI. Muscular system
 - A. Muscle and muscle fiber contraction
 - 1. Single fiber contraction
 - 2. Motor unit coordination
 - B. Muscle metabolism
 - 1. Effects of exercise
 - 2. Comparison of smooth muscle
 - C. Skeletal muscle physiology
- VII. Nervous system
 - A. Organization of the nervous system
 - B. Neurophysiology
 - 1. Synapse
 - 2. Neurotransmitters
 - C. Functions of the brain and spinal cord
 - D. Functions of the peripheral nervous system
 - 1. Receptors
 - 2. Motor endings
 - 3. Cranial nerves
 - 4. Spinal nerve reflexes
 - E. Functions of the autonomic nervous system
 - 1. Sympathetic division
 - 2. Parasympathetic division
 - 3. Interactions and control
 - F. Special senses
 - 1. Taste and smell
 - 2. Eye and vision
 - 3. Ear: hearing and balance
- VIII. Endocrine system
 - A. Hormones
 - 1. Target cell specificity
 - 2. Mechanisms of action
 - 3. Control of hormone release
 - B. Endocrine organs
 - 1. Functions of the pituitary gland
 - 2. Hypothalamus interactions
 - 3. Other glands
 - 4. Integration and regulation
- IX. Cardiovascular system
 - A. Heart physiology
 - 1. Electrical events
 - 2. Heart sounds and contraction

- 3. Cardiac output
- B. Blood vessels
 - 1. Functions of the arteries, capillaries, and veins
 - 2. Blood flow, pressure, and resistance
 - 3. Circulatory pathways
- X. Lymphatic system
 - A. Functions of the lymphatic vessels
 - B. Functions of the lymph nodes
 - C. Functions of the spleen, thymus, and tonsils
 - D. Immunity
 - 1. Nonspecific cell and chemical defense
 - 2. Phagocytes and inflammation
 - 3. Antigen-antibody response
 - 4. Cell-mediated immune response
 - 5. Immunological memory
 - 6. Imbalances of immunity
- XI. Respiratory system
 - A. Functional anatomy
 - B. Mechanics of breathing
 - C. Gas exchanges
 - D. Transport of gases by blood
 - E. Control of respiration
- XII. Digestive system
 - A. Functional anatomy
 - B. Digestive physiology
 - 1. Chemical digestion
 - 2. Absorption
 - 3. Nutrition
 - 4. Metabolism and the role of the liver
 - 5. Energy balance
- XIII. Urinary system
 - A. Kidney physiology
 - 1. Filtration
 - 2. Reabsorption
 - 3. Secretion
 - B. Urine
 - 1. Regulation
 - 2. Composition
 - 3. Voiding
 - C. Fluid and electrolyte balance
 - D. Acid-base balance
- XIV. Reproductive system
 - A. Physiology of male system
 - B. Physiology of female system
 - 1. Hormonal regulation of ovarian cycles
 - 2. Hormonal regulation of uterine cycles
 - C. Physiology of pregnancy

1. Placental function
2. Responses of the mother
3. Parturition and lactation
- D. Embryonic development
 1. Through gastrulation
 2. Organogenesis
 3. Fetal physiology
- XV. Genetics and inheritance
 - A. Molecular genetics
 1. DNA replication
 2. Genetic code
 - B. Heritable traits
 1. Mendelian genetics
 2. Multiple alleles
 3. X-linked traits
- XVI. Pathophysiology
 - A. General adaptation to stress
 - B. Diseases and conditions
 1. Burns
 2. Cancer
 3. Diabetes
 4. Heart disease
 5. Autoimmunity
- XVII. Pharmacology
 - Drug interactions
 1. Pharmacodynamics
 2. Pharmacokinetics
 3. Pharmaceutics

COURSE GOALS/OBJECTIVES/OUTCOMES:

Students will

1. describe the structural organization and major functions of the human body's organ systems.
2. define negative feedback and describe its role in maintaining body homeostasis.
3. compare the general structures and biological functions of the major inorganic and organic molecules in the body.
4. differentiate between the transport processes through cell membranes and how they relate to the functions of each cell type.
5. explain the functional classification of tissues indicating their chief roles and locations.
6. describe the composition, physical characteristics, and the processes involved in hemostasis of the blood.
7. describe the functional anatomy of the heart as it relates to heart sounds, EKG (electrocardiogram), and the nervous system control of cardiac output.

8. list and explain the factors that influence blood pressure and describe how blood pressure is regulated.
9. outline the relationship of lymph to the cardiovascular system, including the source and mechanisms of transport.
10. relate the components of nonspecific immunity to the events of the inflammatory process.
11. compare and contrast the general, specific, and related functions of the B and T lymphocytes.
12. describe the mechanics of breathing, gas exchanges in the body, and the transport of gases by blood.
13. summarize and explain the influences of reflexes, pH, and partial pressures on respiratory rate and depth.
14. identify and describe the overall function of the digestive system from chemical breakdown to absorption of foodstuffs.
15. distinguish between the various pathways and processes involved in the post-absorptive digestion and metabolism of biomolecules.
16. describe the nephron of the kidney and the mechanisms of urine formation.
17. explain the kidney's role in the balance of fluids, electrolytes, and pH.
18. describe hormonal regulation of testicular function and the physiological effects on male reproduction.
19. describe the regulation of the ovarian and menstrual cycles of female reproductive physiology.
20. diagram the development of an embryo from fertilization to the fetal period, including the placenta.
21. compare and contrast the two types of bone formation and how hormonal controls and physical stress regulate bone remodeling.
22. explain how muscle fibers are stimulated to contract and outline the sliding filament theory of contraction.
23. explain the factors that influence the force, velocity, and endurance of skeletal muscles and how they compare to smooth muscle.
24. describe the physical advantage of each type of lever system based on muscle attachment and joint location.
25. define and describe the fundamental nervous tissue function and how the action potential is transmitted across the synapse.
26. state the general functions and interactions of the major divisions of the brain and spinal cord.
27. successfully complete the cranial nerve project.
28. outline the components of a reflex arc and test and explain spinal and cranial reflex activity.
29. compare and contrast the physiological effects of the sympathetic and parasympathetic divisions of the autonomic nervous system on the major organs in the body.
30. describe the structures and functions of the eye and explain how the receptors of all other special senses are activated.
31. describe the mechanisms by which hormones bring about their effects on their target tissues and describe how hormone release is regulated.

32. explain the feedback mechanism which regulates hormone release.
33. state the functions of the placenta related to mother and fetus.
34. contrast the physiology of pregnant vs non-pregnant women.
35. outline the events leading up to and including birth.
36. describe the early stages of embryological development through the event called gastrulation and major events of each trimester.
37. state the function and interactions of DNA and RNA.
38. solve problems of inheritance describing the probabilities of receiving dominant and recessive traits.
39. relate the changes, adaptations, or compensations in physiologic function in response to various diseases or conditions.
40. describe the different physical, chemical, and physiological interactions of commonly used drugs and medications.

MNTC GOALS AND COMPETENCIES MET:

Natural Sciences

HCC COMPETENCIES MET:

Working Productively and Cooperatively
Communicating Clearly and Effectively
Thinking Creatively and Critically

STUDENT CONTRIBUTIONS:

Students are expected to attend all lecture and laboratory sessions, participate in and contribute to class discussions, complete all assignments on time, and request assistance when needed. Attendance is critical for the successful completion of this course.

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.

SPECIAL INFORMATION: (SPECIAL FEES, DIRECTIVES ON HAZARDOUS MATERIALS, ETC.):

Exposure to hazardous chemicals is minimal. Students may provide their own gloves (optional) which are available for purchase in the college bookstore. Students must observe all lab safety procedures.

AASC APPROVAL DATE: May 13, 2014

REVIEW DATE: May 2019

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