

College of Micronesia-FSM
P. O. Box 159 Colonia
Pohnpei FM 96941

Course Outline
[REDACTED]

Human Anatomy and Physiology II
[REDACTED]

Division of Natural Sciences and Mathematics SC M

Course Description: SC 122 B Emphasizes structure and function of the human body. Intergrades related facts, principles and concepts of the cell, chemistry, biochemistry and homeostasis includes study of endocrine, respiratory, cardiovascular, digestive, immune, urinary and reproductive systems.

Course Prepared by: Dr. Mike Dema

State/Campus: Pohnpei/National

Date prepared: 01/05/2004

	3	x 16	x 48/16	=	4
	3				
				=	4

Purpose of Course

Degree Requirement:

Degree Elective:

Certificate:

Remedial:

Other:

Prerequisite Course: SC 120 **Biology**

Date approved by Committee:

Date approved by President:

Spencer James McCoy
Michael Latu 1-20-04

General Objectives (Course learning outcomes)

Students will be able to:

- (A). Describe the anatomy and physiology of the major endocrine glands. Explain the differences between hormonal and neuronal control of homeostasis.
- (B). Explain the composition and function of blood, the basis of transfusion reactions and the mechanisms and diagnosis of blood disorders.
- (C). Describe the anatomy and physiology of the heart and cardiac muscle cell contraction.
- (D). Describe the structure and function of blood vessels. Explain the physiology of circulation, and list the major blood vessels of the body.
- (E). Describe the structure and function of the lymphatic system.
- (F). Explain the importance of innate and adaptive defense mechanisms.
- (G). Describe the structure and function of the respiratory system.
- (H). Describe the anatomy and the physiology of the digestive system.
- (I). Explain the importance of proper nutrition and how nutrients are used in our body.
- (J). Describe the structure and function of the urinary system.
- (K). Explain how water and electrolytes are used in maintaining homeostasis.
- (L). Explain the acid-base mechanism in maintaining homeostasis.
- (M). Describe the anatomy and physiology of the male and female reproductive system.
- (N). Explain the sequence of sexual development.
- (O). Explain the process of conception, embryonic and fetal development, and parturition.
- (P). Explain the concepts of genetic variation, inheritance, and the influence of heredity and environment on the developing human body.

Specific Objectives (Specific Student Learning Outcomes)

Students will be able to:

- (A). 1. Describe the differences between hormonal and neural controls of homeostasis. Describe how hormones are classified chemically, how hormones are acting on their target tissues and how their release is regulated.
- (A). 2. Describe the anatomy and physiology of the anterior and posterior pituitary gland, its interconnection with the hypothalamus. Describe the anatomy and physiology of the thyroid, parathyroid, adrenal gland, pancreas, and gonads. List and describe the effects of the pituitary, thyroid, parathyroid, pancreatic, adrenal, testicular, and ovarian hormones, and the consequences of hypo or hyper secretion of these hormones. Explain the effects of the Natriuretic Factor and the hormones produced by the placenta, kidneys, skin, and fat tissue.
- (B). 3. Explain the structure, function, and production of Erythrocytes, Leukocytes, and Thrombocytes. Explain hemoglobin synthesis and what factors affect its synthesis. Describe the mechanisms involved

in blood clotting and clot removal. Describe the ABO and Rh blood groups and the importance of blood typing in transfusions. Describe the function of blood expanders and their use in medical practice.

(C). 4. Explain the location, size, and thoracic orientation of the heart. Describe the anatomy and physiology of the four (4) heart chambers. Name the major branches of the coronary arteries and veins, name the valves and their location and function, and the components of the cardiac conductive pathway. Describe the events that occur in each chamber during a complete cardiac cycle. Explain the significance of the P, Q, R, S, T waves and the associated intervals on a standard ECG. Describe the normal heart sounds. Explain the importance of Autonomic Nervous System, Hormones, Ions, and other factors in controlling the heart. Explain the cardiac output, stroke volume, heart rate, and the factors affecting them.

(D). 5. Describe the differences between arteries, veins, and capillaries based on their structure and function. Define vasoconstriction, vasodilation, blood flow, resistance, and blood pressure and explain these factors are regulated. Explain what is the hypertension, what are its symptoms and consequences. Describe the circulatory shock and its possible causes. Describe fetal circulation.

(D). 6. Name and give location of the major arteries and veins in the systemic circulation. Describe the anatomy and physiology of the hepatic circulation.

(E). 7. Describe the structure, function, and distribution of lymphatic vessels. Explain the process of lymph formation and transport in the body. Describe the lymphoid cells formation and their function (plasma cells, B and T lymphocytes, macrophages, reticular and dendritic cells, etc). Describe the structure and function of lymphoid organs (spleen, thymus, Peyer's patches, and tonsils).

(F). 8. Describe the function of nonspecific (innate) protective structures involved in general immunity (skin and mucous membranes, gastric pH, salivary and lacrimal lysozyme, monocytes, macrophages, natural killer cells) and explain the process of phagocytosis and phagocyte mobilization (leukocytosis, margination, diapedesis and chemotaxis). Describe the inflammatory response and explain the importance of inflammatory chemicals (histamine, kinins, prostaglandins, growth factors, and the complement system) in inflammation processes. Explain the importance of interferons, complement system, and fever as second line of general immunity.

(F). 9. Describe the function of specific (adaptative) protective structures involved in specific immunity (antibody and cell mediated immunity), antigen structure and formation, and MHC system. Explain the origin, formation, and function of B and T lymphocytes, and antigen presenting cells as part of the adaptative immunity. Explain the differences between primary and secondary immune responses and the importance of active and passive humoral immunity in maintaining general health. Explain the structure of different classes of antibodies (Ig. A, D, G, E, and M), the way antibodies destroy antigens (neutralization, agglutination, precipitation, and complement system fixation and activation) and the medical use of monoclonal antibodies. Describe the function of T cells involved in cell mediated immunity, clonal selection and differentiation, T cell activation, and explain the importance of interleukins in modulating defense mechanisms. Explain the differences between grafts (autografts, isografts, allografts, and xenografts) in organ transplants and how rejection of grafts can be prevented. Explain the pathogenesis of different congenital and aquired immunodeficiency syndromes (SCID, AIDS), autoimmune disorders, and alleregic reactions (immediate and delayed hypersensitivity reactions).

(G). 10. Describe the structure and function of different organs forming the respiratory system (nose and nasal cavity, sinuses, nasopharynx, oropharynx, laryngopharynx, larynx, trachea, bronchi, bronchioles, and alveoli). Describe the coverings, structure, and blood supply of the

lungs. Explain the relationship between Boyle's law and the respiratory cycle, the importance of respiratory muscles in breathing, and name the physical factors affecting the pulmonary ventilation. Describe the respiratory volumes forming the respiratory capacities and explain how these respiratory volumes are used to assess pulmonary function.

(G). 11. Explain the relationship between Dalton's and Henry's laws in the process of gas exchange (external and internal gas exchange). Explain the mechanism of association and dissociation of Oxygen and Hemoglobin in the blood and describe the factors affecting the blood oxygen level. Describe the most important mechanisms involved in production of hypoxia (anemic, ischemic, histotoxic, and hypoxic hypoxia). Explain how Carbon Dioxide is transported in the blood (dissolved, bound, and as bicarbonate ion), the Haldane effect, and the importance of the bicarbonate buffer system.

(G). 12. Describe the neuronal mechanisms involved in controlling the respiratory process and the factors affecting the rate and amplitude of breathing (neuronal and chemical factors). Describe the process and effects of acclimatization to high altitude. Describe the pathogenesis of COPD, asthma, lung TB, and lung cancer.

(I). 13. Describe the microscopic and macroscopic anatomy of the oral cavity, salivary glands, teeth, pharynx, esophagus, stomach, small and large intestine, liver, gallbladder, and pancreas. Explain the differences between mechanical and chemical digestion. Explain how sugars, fats, proteins, vitamins, electrolytes, and water are digested and absorbed in the gastrointestinal system. Explain the composition and functions of saliva and the mechanisms involved in controlling salivation, mastication, deglutition, gastric digestion and secretion, gastric mobility and emptying, small and large intestine digestion and absorption. Explain the process of bile production and secretion, importance of the liver and pancreas in chemical digestion, and how different hormones and neural factors affect the pancreatic secretion.

(I). 14. List the six nutrient groups and explain how they fit in the pyramid food guide. Define nutrient, essential nutrient, and calorie. Name the most important dietary sources and importance of proteins, fats, sugars, vitamins, and minerals. Explain what is an antioxidant and what foods are high in antioxidants.

(I). 15. Define metabolism and explain the differences between anabolism and catabolism. Define oxidation and reduction and explain the importance of these reactions in metabolism. Explain the function of coenzymes in cellular metabolism. Explain the differences between substrate-level phosphorylation and oxidative phosphorylation. Explain the events and products occurring during glycolysis, Krebs's cycle, and electron transport system. Define gluconeogenesis, glycogenesis, and glycogenolysis. Explain how fatty acids are used to produce energy, ketone bodies formation, and how amino acids are used to synthesize proteins and to produce energy: Explain the formation and the importance of the amino acid and sugar-fat pools. Explain the functions of the liver as a key organ in metabolism. Explain the differences between different groups of lipoproteins and their functions in the body.

(I). 16. Define basal metabolic rate and total metabolic rate and what factors are controlling each. Explain what is meant by body energy balance and indicate the common mechanisms involved in heat production and loss from the body. Describe the effects of inadequate protein intake on the fetal nervous system. Describe the cause and consequence of low metabolic rate in elderly.

(J). 17. Describe the anatomy of the kidneys, ureters, urinary bladder, and urethra. Describe the parts of a nephron and explain the main processes involved in urine formation (filtration, reabsorption, and secretion). Explain the role of Aldosterone and of Atrial Natriuretic Factor in

Sodium and Water balance. Describe the mechanism that maintains the medullary osmotic gradient, formation of dilute versus concentrated urine, and the normal physical and chemical properties of urine. List several abnormal urine components, and name the condition when each is present in detectable amounts. List several changes in urinary system structure and function that occur with age.

(K, L). 18. List the routes by which water and electrolytes enter and leave the body. Describe the feedback mechanisms that regulate water intake and hormonal controls of water output, explain the importance of obligatory water losses and describe the possible causes and consequences of dehydration, hypotonic hydration, and edema. Describe the importance of ionic Sodium in fluid and electrolyte balance, and indicate its relationship to normal cardiovascular functioning. Explain how Potassium, Calcium, Magnesium, and anion balance of plasma is regulated. Describe the influence of the respiratory system on the acid-base balance. Describe how kidneys regulate Hydrogen and Bicarbonate ion concentrations in the blood. Explain the differences between metabolic and respiratory acidosis and alkalosis and describe the importance of the respiratory and renal compensations to acid-base balance. Explain why infants and aged people are at greater risk for fluid and electrolyte imbalances than are young adults.

(M, N). 19. Describe the structure and function of the testes, male accessory organs, and penis. Explain the hormonal regulation of testicular function and the physiological effects of Testosterone on male anatomy. Describe the phases of the male sexual response. Describe the structure and function of the ovaries, female reproductive tract, female accessory organs, female external genitalia, and mammary glands. Explain the hormonal regulation of the ovarian and menstrual cycles, describe the phases of the ovarian cycle and egg formation. Describe the phases of female sexual response. Describe the events of spermatogenesis and oogenesis. Indicate the infectious agents and modes of transmission of gonorrhea, syphilis, chlamydia, and genital herpes. Explain the process of sex determination, development of male and female structures, and describe the events of puberty and menopause.

(O). 20. Explain the process of cleavage, fertilization, gastrulation, organogenesis, and describe the major events of fetal development. Describe changes in maternal reproductive organs and in cardiovascular, respiratory, and urinary system functioning during pregnancy. Explain the effects of pregnancy on maternal metabolism and posture. Explain how labor is initiated and describe the 3 stages of labor. Describe the changes that occur in fetal circulation after birth and explain how the breasts are prepared for lactation.

(P). 21. Describe events that lead to genetic variability and explain what is an allele, phenotype, genotype, dominant-recessive inheritance, incomplete dominance and codominance. Describe the mechanism of sex-linked inheritance and explain how polygene inheritance differs from that resulting from the action of a single pair of alleles. Explain how gene expression may be modified by environmental factors. Describe how genomic imprinting and mitochondrial inheritance differ from classical inheritance. List and explain several procedures used to determine or predict genetic diseases.

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Course content

(A). The Endocrine System

- hormones
- major endocrine organs

(B). Blood

- blood plasma
- formed elements
- homeostasis
- transfusion and blood replacement
- diagnostic blood tests

(C). The Cardiovascular System

- heart anatomy
- heart physiology
- properties of cardiac muscle cells

(D). Blood Vessels

- blood vessel structure and function
- physiology of circulation
- circulatory pathways

(E). The Lymphatic System

- lymphatic vessels
- lymphoid cells and tissues
- lymph nodes

(F). The Immune System: Innate and Adaptive Body Defenses

1. Innate Defenses

- surface barriers: skin and mucosae
- internal defenses: cells and chemicals

2. Adaptive Defenses

- antigens
- cells of adaptive defenses
- humoral immune response
- cell-mediated immune response
- homeostatic imbalances of immunity
- developmental aspects of the immune system

(G). The Respiratory System

- functional anatomy of the respiratory system
- mechanics of breathing
- gas exchanges in the body and transport of respiratory gases in the blood
- control of respiration
- respiratory adjustments during exercise and at high altitudes
- homeostatic imbalances of the respiratory system
- developmental aspects of the respiratory system

(H). The Digestive System

- functional anatomy of the digestive system
- physiology of chemical digestion and absorption developmental aspects of the digestive system

(I). Nutrition, Metabolism, and Body Temperature Regulation

- nutrition
- metabolism
- body energy balance
- developmental aspects of nutrition and metabolism

(J). The Urinary System

- kidney anatomy
- kidney physiology: urine formation
- ureters
- urinary bladder
- urethra
- micturition
- developmental aspects of the urinary system

(K, L). Fluid, Electrolyte, and Acid-Base Balance

- body fluids
- water balance
- electrolyte balance
- acid-base balance

-developmental aspects of fluid, electrolyte, and acid-base balance

(M,N). The Reproductive System

- anatomy of the male reproductive system
- physiology of the male reproductive system
- anatomy of the female reproductive system
- sexually transmitted diseases
- developmental aspects of the reproductive system: chronology of sexual development

(O). Pregnancy and Human Development

- from egg to embryo
- events of embryonic development
- events of fetal development
- effects of pregnancy on the mother
- parturition
- adjustments of the infant to extra uterine life
- lactation

(P). Heredity

- genetic vocabulary
- sexual sources of genetic variations
- types of inheritance
- the influence of environmental factors on gene expression
- nontraditional inheritance
- genetic screening, counseling, and therapy

Textbook

-Human Anatomy and Physiology, 6th edition, by Elaine N. Marieb

Methods of instruction

- lecture
- visual aids
- films
- classroom discussion
- demonstration

Evaluation

-unit tests, mid terms, and final exam. Points averaged and grades reported using college catalog guidelines.

Grading scale

-as per College catalog

Attendance

-as per College catalog

Academic honesty policy

-dishonesty or cheating on any test or examination will result in a grade of "F" for the course.