INTRODUCTION TO THE STUDENT

This syllabus is to be used as a general outline for the Anatomy and Physiology II course.

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Outline</td>
<td>2</td>
</tr>
<tr>
<td>Blood Objectives</td>
<td>5</td>
</tr>
<tr>
<td>Cardiovascular System Outline (Heart)</td>
<td>6</td>
</tr>
<tr>
<td>Cardiovascular System Objectives (Heart)</td>
<td>7</td>
</tr>
<tr>
<td>Cardiovascular System Outline (Blood Vessels)</td>
<td>8</td>
</tr>
<tr>
<td>Cardiovascular System Objectives (Blood Vessels)</td>
<td>10</td>
</tr>
<tr>
<td>Lymphatic System Outline</td>
<td>11</td>
</tr>
<tr>
<td>Lymphatic System Objectives</td>
<td>12</td>
</tr>
<tr>
<td>Immune System Outline</td>
<td>13</td>
</tr>
<tr>
<td>Immune System Objectives</td>
<td>15</td>
</tr>
<tr>
<td>Respiratory System Outline</td>
<td>16</td>
</tr>
<tr>
<td>Respiratory System Objectives</td>
<td>19</td>
</tr>
<tr>
<td>Digestive System Outline</td>
<td>20</td>
</tr>
<tr>
<td>Digestive System Objectives</td>
<td>23</td>
</tr>
<tr>
<td>Urinary System Outline</td>
<td>24</td>
</tr>
<tr>
<td>Urinary System Objectives</td>
<td>25</td>
</tr>
<tr>
<td>Body Fluids and Electrolyte Balance Outline</td>
<td>26</td>
</tr>
<tr>
<td>Body Fluids and Electrolyte Objectives</td>
<td>27</td>
</tr>
<tr>
<td>Laboratory Outline</td>
<td>28</td>
</tr>
</tbody>
</table>

Lecture Hrs: 3. Lab Hrs: 3. Credit Hrs: 4.
Text: Marieb & Hoehn, HUMAN ANATOMY & PHYSIOLOGY, Pearson Publ.
I. Blood
   A. Comparison of Extracellular Fluids
   B. Functions of Blood
      1. Transport of oxygen, carbon dioxide, nutrients, metabolic wastes, enzymes and hormones
      2. Regulation of Ph, body temperature and water content
      3. Protection against microbes by way of phagocytic WBC attack and the production of circulating antibodies
   C. Physical and Chemical Characteristic of Blood
      1. Color
      2. Volume
      3. Viscosity
      4. Specific Gravity
      5. Ph
   D. Components of Blood
      1. Formed elements
         a. Erythrocytes (RBCs)
         b. Leucocytes (WBCs)
         c. Platelets
      2. Plasma
         a. Water
         b. Dissolved substances
   E. Formation of Blood Cells
      1. Hematopoietic tissue
         a. Myelogenous hematopoietic tissue
         b. Lymphogenous hematopoietic tissue
      2. Hemocytoblasts (committed stem cells)
      3. Origin of the cellular fraction of blood
   F. Erythrocytes (Red Blood Cells)
      1. Physical characteristics
      2. Hemoglobin
      3. Numbers in circulation
      4. Life span
      5. Fate of RBCs
         a. Role of macrophages
         b. Biliverdin
         c. Bilirubin
         d. Transferritin
         e. Role of the liver
         f. Role of the biliary apparatus
         g. Role of the large intestine
         h. Role of the kidney
6. Dietary factors affecting RBC production
7. Anemias

G. Leucocytes (WBCs)
1. Types
   a. Physical characteristics of each type
      1) Neutrophils
      2) Eosinophils
      3) Basophils
      4) Lymphocytes
      5) Monocytes
2. Function of each type
3. Numbers
4. Life span of each type
5. Inflammation and the inflammatory response

H. Immunity and the Immune Response
1. Nonspecific resistance to disease (innate immunity)
2. Acquired immunity
   a. Formation of B and T lymphocytes
   b. Types of immune responses
      1) Cell-mediated immunity
      2) Antibody-mediated immunity
3. Antigens
4. Antibodies
5. Immunological memory
6. Primary vs. secondary responses
7. Vaccines
8. Transplantation and tissue rejection
9. Autoimmunity

I. Platelets
1. Physical characteristics
2. Numbers
3. Life span
4. Fate
5. Functions (hemostasis)

J. Blood Plasma
1. Composition
2. Functions
   a. Plasma proteins
   b. Gases and nutrients
   c. Nonprotein nitrogenous substances
   d. Plasma electrolytes
K. Hemostasis
   1. Vascular spasm
   2. Platelet plug formation
   3. Coagulation of blood
      a. Phase I
         1) Extrinsic pathway
         2) Intrinsic pathway
      b. Phase II
      c. Phase III
   4. Anticoagulants

L. Blood Storage

M. Blood Groups
   1. ABO blood group
   2. Rh blood group
BLOOD OBJECTIVES

The student should be able to:

1. Describe the composition of whole blood;
2. Describe the physical and chemical characteristics of blood;
3. List the functions of blood;
4. Differentiate between fluid and the formed elements of blood;
5. Describe the structure and function of erythrocytes (RBCs);
6. Discuss hemoglobin with respect to chemical composition and functions;
7. Define erythropoiesis and the characteristics of the cells that are precursors of erythrocytes;
8. Discuss the fate of “worn-out” erythrocytes;
9. Discuss the fate of hemoglobin, iron storage, the origin of bilirubin and jaundice;
10. List and explain the anemias;
11. Describe the structure and function of the five types of leucocytes (WBCs);
12. Differentiate between innate and acquired immunity;
13. List the events that occur during an inflammatory response;
14. Define antigen;
15. Discuss acquired immunity: antibody-mediated immunity vs. cell-mediated response;
16. Discuss the role that B-lymphocytes and plasma cells play in an antibody-mediated response;
17. Discuss the role that the various T-lymphocytes play in a cell-mediated response;
18. Describe the structure of an antibody;
19. List the five antibody types and their specific roles in immunity;
20. Discuss primary versus secondary responses to an antigen and explain long-lasting immunity;
21. Describe the structure and function of platelets;
22. Discuss the composition and functions of plasma and its constituents;
23. Define hemostasis and list the major hemostatic mechanisms in the body;
24. List and explain the three phases of coagulation;
25. Distinguish between intrinsic and extrinsic coagulation;
26. Explain the importance of the balance that exists between coagulation vs. anticoagulation factors;
27. List and explain the mechanism of action of four endogenous anticoagulants;
28. Describe the mechanism of action of clinically used anticoagulants;
29. Explain the ABO and Rh blood groups;
30. Discuss the storage of blood.
CARDIOVASCULAR SYSTEM

I. Heart
   A. Structural Features
      1. Size, location and orientation
      2. Coverings of the heart
      3. Layers of the heart wall
      4. Chambers and associated great vessels
   B. Pathway of Blood Through the Heart – Pulmonary and Systemic Circuits
   C. Coronary Circulation
   D. Heart Valves
   E. Properties of Cardiac Muscle Fibers – Microscopic Anatomy
   F. Mechanisms and Events of Contraction
      1. Energy requirements
      2. Electrical Events
         a. Setting the basic rhythm: intrinsic conduction system
         b. Modifying the basic rhythm: extrinsic innervation of the heart
   G. Electrocardiography
   H. Cardiac Cycle
   I. Heart Sounds
   J. Cardiac Output
   K. Regulation of Stroke Volume
      1. Preload
      2. Contractility
      3. Afterload
   L. Regulation of Heart Rate
      1. Autonomic nervous system
      2. Chemical regulation
         a. Hormones
         b. Ions
         c. Other factors: age, gender, exercise, body temperature
   M. Developmental Aspects of the Heart
   N. Fetal Circulation Through the Heart
   O. Homeostatic Imbalances of the Heart
      1. Pericarditis
      2. Coronary heart disease
         a. Angina pectoris
         b. Myocardial infarction
      3. Stenotic and incompetent heart valves
      4. Arrhythmias
      5. Murmurs
      6. Congestive heart failure
      7. Congenital heart defects
HEART OBJECTIVES

The student should be able to:

1. Describe the size and shape of the heart, and indicate its location and orientation in the thorax;
2. Name the coverings of the heart;
3. Describe the structure and function of each of the three layers of the heart wall;
4. Describe the structure and the functions of the four chambers;
5. Name the great blood vessels entering and exiting the heart;
6. Trace the pathway of blood through the heart;
7. Name the major branches of the coronary arteries and describe their distribution;
8. Name the heart valves and describe their location, function, and mechanism of action;
9. Describe the structural and functional properties of cardiac muscle, and explain how it differs from skeletal muscle;
10. Briefly describe the events of cardiac muscle cell contraction;
11. Name the components of the conduction system of the heart, and trace the conduction pathway;
12. Name the individual waves and intervals of the electrocardiograph and indicate what each represents;
13. Describe the timing and the events of the cardiac cycle;
14. Describe the normal heart sounds;
15. Name and explain the effects of the various factors involved in regulating stroke volume and heart rate;
16. Explain the role of the autonomic nervous system in regulating cardiac output;
17. Describe fetal heart circulation of blood;
18. Briefly explain the nature of the various cardiac abnormalities studied in lecture class.
II. Blood Vessels
   A. Structure
      1. Tunics
      2. Lumen
   B. Arterial System
      1. Arteries
         a. Elastic (conducting)
         b. Muscular (distributing)
         c. Arterioles (resistance)
      2. Capillaries
         a. Types of capillaries
         b. Capillary beds
   C. Venous System
      1. Veins (capacitance vessels; blood reservoirs)
      2. Venules
   D. Vascular Anastomoses
   E. Blood Flow, Blood Pressure and Resistance
   F. Systemic Blood Pressure
      1. Systolic
      2. Diastolic
      3. Mean Arterial Pressure (MAP) – pulse pressure
   G. Capillary Blood Pressure
   H. Venous Blood Pressure – Factors Aiding in Venous Return
      1. Respiratory pump
      2. Muscular pump
   I. Maintaining Blood Pressure
      1. Short-term mechanisms
         a. Neural
         b. Chemical
      2. Long-term mechanisms – renal
   J. Monitoring Circulatory Efficiency
      1. Vital signs
      2. Taking a pulse
      3. Measuring blood pressure
   K. Blood Flow Through Body Tissues
      1. Velocity of blood flow
      2. Autoregulation
         a. Metabolic controls
         b. Myogenic controls
L. Blood Flow in Special Areas
   1. Skeletal muscle
   2. Brain
   3. Skin
   4. Lungs
   5. Heart

M. Capillary Dynamics
   1. Hydrostatic pressures
   2. Colloid osmotic pressures
   3. Hydrostatic-osmotic pressure interactions

N. Homeostatic Imbalances
   1. Varicose veins
   2. Hypertension
   3. Hypotension
   4. Arteriosclerosis
   5. Circulatory shock
BLOOD VESSEL OBJECTIVES

The student should be able to:

1. Describe the three layers that typically form the wall of a blood vessel, and state the function of each;
2. Define vasoconstriction and vasodilation;
3. Compare and contrast the structure and function of the three types of arteries;
4. Describe the structure and function of veins, and explain how veins differ from arteries;
5. Describe the structure and function of a capillary bed;
6. Define blood flow, blood pressure and resistance, and explain the relationships between these factors;
7. List and explain the factors that influence blood pressure, and describe how blood pressure is regulated;
8. Define hypertension and describe both its symptoms and consequences;
9. Explain how blood flow is regulated in the body in general and in its specific organs;
10. Outline the factors involved in capillary dynamics, and explain the significance of each;
11. Define circulatory shock;
12. List several possible causes of circulatory shock;
13. Trace the pathway of blood through the pulmonary and systemic circuits;
14. Briefly explain the nature of the various vascular abnormalities discussed in lecture class.
LYMPHATIC SYSTEM

I. Lymphatic Vessels
   A. Distribution
   B. Structure

II. Lymph Transport

III. Lymphoid Cells
   A. Lymphocytes
      1. B-Lymphocytes
      2. T-Lymphocytes
   B. Plasma Cells
   C. Macrophages
   D. Dendritic Cells
   E. Reticular Cells

IV. Lymphoid Tissue (Reticular Connective Tissue)
   A. Diffuse
   B. Lymphoid Follicles (Nodules)

V. Lymphoid Organs
   A. Lymph Nodes
      1. Structure
      2. Function
   B. Spleen
      1. Structure
      2. Function
   C. Thymus
      1. Structure
      2. Function
   D. Mucosa-Associated Lymphoid Tissue
   E. Homeostatic Imbalances
      1. Lymphangitis
      2. Lymphedema
      3. Lymphadenitis
      4. Splenic Rupture
      5. Tonsillitis
      6. Appendicitis
LYMPHATIC SYSTEM OBJECTIVES

The student should be able to:

1. Describe the structure and distribution of the lymphatic vessels and note their important function;
2. Describe the source of lymph and the mechanisms of lymph transport;
3. Describe the composition of lymphoid tissue and name the major lymphoid organs;
4. Describe the general location, histological structure and function of the lymph nodes;
5. Describe the general location, histological structure and function of the other major lymphoid organs and compare them with lymph nodes, structurally and functionally;
6. Briefly explain the nature of the various lymphatic abnormalities discussed in lecture class.
IMMUNE SYSTEM

I. Innate (Nonspecific) Immunity
   A. Surface Barriers – Skin and Mucosae
   B. Internal Defenses
      1. Cells
         a. Phagocytes
         b. Natural Killer Cells (NK)
      2. Antimicrobial Proteins
         a. Interferon
         b. Complement
      3. Inflammation
      4. Fever

II. Adaptive (Specific) Immunity
   A. Humoral
   B. Cell-Mediated

III. Antigens
   A. Complete
   B. Incomplete (Haptens)
   C. Immunogenicity
   D. Reactivity
   E. Antigenic Determinant
   F. Self-Antigens: MHC Proteins

IV. Cells of the Adaptive Immune System
   A. Lymphocytes
      1. Immunocompetency
      2. Self-tolerance
   B. antigen-Presenting Cells

V. Humoral Immune Response
   A. Clonal Selection and Differentiation of B Cells
   B. Immunological Memory
      1. Primary response
      2. Secondary response
   C. Active and Passive Humoral Immunity
   D. Antibodies
      1. Structure
      2. Classes
      3. Targets
4. Function
   a. Complement fixation and activation
   b. Neutralization
   c. Agglutination
   d. Precipitation

VI. Cell-Mediated Immune Response
   A. Clonal Selection and Differentiation of T Cells
      1. Antigen recognition and MHC restrictions
      2. T Cell activation – cytokines
   B. Specific T Cell Roles
      1. Helper T Cells
      2. Cytotoxic T Cells
      3. Suppressor T Cells

VII. Homeostatic Imbalances
   A. Immunodeficiencies
   B. Autoimmune Disease
   C. Hypersensitivities
IMMUNE SYSTEM OBJECTIVES

The student should be able to:

1. Describe the surface membrane barriers and their protective functions;
2. Explain the importance of phagocytosis and natural killer cells in nonspecific body defense;
3. Describe the inflammatory process;
4. Identify several inflammatory chemicals and indicate their specific roles;
5. Name the body’s antimicrobial substances and describe their function;
6. Explain how fever help protects the body;
7. Define antigen and explain how antigens affect the immune system;
8. Define complex antigens, hapten and antigenic determinant;
9. Follow antigen processing in the body;
10. Compare and contrast the origin, maturation process and general function of B and T lymphocytes;
11. Describe the role of macrophages and other phagocytes;
12. Define immunocompetence and self-tolerance;
13. Define humoral immunity;
14. Describe the process of clonal selection of a B cell;
15. Explain the role of plasma cells and memory cells in humoral immunity;
16. Describe the structure of an antibody;
17. Name the classes of antibodies;
18. Explain the functions of antibodies;
19. Define cell-mediated immunity;
20. Describe the process of activation and clonal selections of T cells;
21. Describe T cell functions in the body;
22. Briefly explain the nature of the various immunological abnormalities discussed in lecture class.
RESPIRATORY SYSTEM

I. Functional Anatomy of the Respiratory System
   A. Nose, Nasal Cavity and Paranasal Sinuses
   B. Pharynx
   C. Larynx
   D. Trachea
   E. Bronchi
   F. Bronchioles
   G. Alveolar Ducts and Sacs

II. Lungs and Pleural Coverings
   A. Gross Anatomy
   B. Blood Supply and Innervation
   C. Pleurae

III. Mechanics of Breathing
   A. Pressure Relationships in the Thoracic Cavity
      1. Atmospheric pressure
      2. Intrapulmonary pressure
      3. Intrapleural pressure
   B. Pulmonary Ventilation
      1. Boyle’s Law
      2. Inspiration
      3. Expiration
      4. Physical factors influencing pulmonary ventilation
         a. airway resistance
         b. alveolar surface tension forces
         c. lung compliance
   C. Pulmonary Volumes and Pulmonary Function Tests
      1. Respiratory and volumes and capacities
      2. Dead space
      3. Spirometry
      4. Alveolar ventilation

IV. Gas Exchanges in the Body
   A. Basic Properties of Gases
      1. Dalton’s Law of Partial Pressures
      2. Henry’s Law
   B. Composition of Alveolar Gas
C. Gas Exchanges Between the Blood, Lungs and Tissues
   1. External respiration – pulmonary gas exchange
      a. partial pressure gradients and gas solubilities
      b. ventilation-perfusion coupling
      c. thickness of the respiratory membrane
      d. surface area of gas exchange
   2. Internal respiration – capillary gas exchange in the body tissues

V. Transport of Respiratory Gases by Blood – Oxygen Transport
   A. Association and Dissociation of Oxygen and Hemoglobin
      1. Influence of $P_{O_2}$ on hemoglobin saturation
      2. Influence of temperature, $P_{H_2}$, $P_{CO_2}$ and BPG on hemoglobin saturation
   B. Bohr Effect

VI. Carbon Dioxide Transport
   A. Haldane Effect
   B. Influence of Carbon Dioxide on Blood $pH$

VII. Control of Respiration
   A. Medullary Respiratory Centers
   B. Pons Respiratory
   C. Genesis of Respiratory Rhythm

VIII. Factors Influencing the Rate and Depth of Breathing
   A. Pulmonary Irritant Reflexes
   B. Inflation Reflex
   C. Influence of Higher Brain Centers
      1. Hypothalamic
      2. Cortical
   D. Chemical Factors
      1. Influence of $P_{CO_2}$
      2. Influence of $P_{O_2}$
      3. Influence of arterial $pH$

IX. Respiratory Adjustments During Exercise and at High Altitudes

X. Homeostatic Imbalances
   A. Inflammation of the Upper Respiratory Tract
   B. Pleurisy
   C. Infant Respiratory Distress Syndrome
   D. Oxygen Toxicity
   E. Hypoxia – Types
   F. Hypocapnia; Hypercapnia
   G. Hypoventilation; Hyperventilation
   H. Dyspnea
I. Chronic Obstructive Pulmonary Disease
   1. Emphysema
   2. Bronchitis
   3. Asthma
   4. Tuberculosis

J. Lung Cancer
J. Cystic Fibrosis
RESPIRATORY SYSTEM OBJECTIVES

The student should be able to:

1. Describe the overall function of the respiratory system;
2. Identify the organs forming the respiratory passageways in descending order;
3. Distinguish between conducting zone and respiratory zone structures;
4. List and describe several protective mechanisms of the respiratory system;
5. Describe the makeup of the respiratory membrane, and relate its structure to its function;
6. Describe the gross structure of the lungs;
7. Describe the pleural coverings;
8. Relate Boyle’s Law to the events of inspiration and expiration;
9. Explain the relative roles of the respiratory muscles and lung elasticity in producing the volume changes that cause air flow into and out of the lungs;
10. Explain the functional importance of the partial vacuum that exists in the intrapleural space;
11. List several factors that influence pulmonary ventilation;
12. Explain and compare the various lung volumes and capacities;
13. Indicate the types of information that can be gained from pulmonary function tests;
14. Define dead space;
15. Describe, in general terms, how atmospheric pressure and alveolar air differ in composition, and explain these differences;
16. State Dalton’s Law of partial pressures and Henry’s Law and relate each to events of external and internal respiration;
17. Describe how oxygen is transported in the blood, and explain how oxygen loading and unloading is affected by temperature, BPG and PCO2;
18. Describe carbon dioxide transport in the blood;
19. Describe the neural controls of respiration;
20. Compare and contrast the influences of lung reflexes, volition, emotions, arterial Ph, and partial pressure of oxygen and carbon dioxide in arterial blood on respiratory rate and depth;
21. Compare the hyperpnea of exercise with involuntary hyperventilation;
22. Describe the process and the effects of acclimatization to high altitude;
23. Briefly explain the nature of the various respiratory abnormalities covered in lecture class.

19
DIGESTIVE SYSTEM

I. Relationship and Structural Plan of the Digestive System
   A. Relationship of the Digestive Organs to the Peritoneum
   B. Histology of the Alimentary Canal
   C. Enteric Nervous System of the Alimentary Canal

II. Mouth – Gross Anatomy – Regions

III. Pharynx – Gross Anatomy – Regions

IV. Esophagus – Gross Anatomy – Regions

V. Stomach
   A. Gross Anatomy
      1. Regions
      2. Spincters
      3. Curvatures
   B. Microscopic Anatomy
      1. Gastric pits
      2. Gastric glands
         a. Mucous neck cells
         b. Parietal (Oxyntic) cells
         c. Chief (Zymogenic) cells
         d. Enteroendocrine cells

VI. Digestive Processes of the Stomach
   A. Regulation of Gastric Secretion
      1. Cephalic phase
      2. Gastric phase
      3. Intestinal phase
   B. Gastric Motility and Emptying
      1. Response of stomach to filling
      2. Gastric contractile activity

VII. Small Intestines
   A. Gross Anatomy
      1. Parts
      2. Sphincters
   B. Microscopic Anatomy – Modifications for Absorption
      1. Plicae circulares
      2. Villi
      3. Microvilli
   C. Histology of the Intestinal Wall
D. Intestinal Juice  
   1. Composition  
   2. Control  

VIII. Digestive Processes Occurring in the Small Intestines  
   A. Requirements for Optimal Intestinal Activity  
   B. Motility of the Small Intestines  

IX. Large Intestines  
   A. Gross Anatomy  
      1. Parts  
      2. Sphincters  
   B. Microscopic Anatomy  
   C. Bacterial Flora  

X. Digestive Processes Occurring in the Large Intestine  
   A. Motility  
      1. Haustral Contractions  
      2. Mass Movements  
      3. Gastrocolic Reflex  
   B. Defecation – Defecation Reflex  

XI. Accessory Organs  
   A. tongue  
   B. Teeth  
   C. Salivary Glands  
      1. Types  
      2. composition of saliva – control of salivation  
   D. Liver  
      1. Gross anatomy  
      2. Microscopic anatomy  
      3. Composition of bile – regulation of bile release  
   E. Gall Bladder  
      1. Anatomy  
      2. Function  
   F. Pancreas  
      1. Gross anatomy – regions  
      2. Composition of pancreatic juice  
      3. Regulation of pancreatic secretion  

XII. Physiology of Chemical Digestion and Absorption  
   A. Chemical Digestion – Enzymatic Hydrolysis
B. Chemical Digestion of Specific Food Groups
   1. Carbohydrates
   2. Proteins
   3. Lipids
   4. Nucleic Acids
C. Absorption of Specific Nutrients
   1. Carbohydrates
   2. Proteins
   3. Lipids
   4. Nucleic Acids
   5. Vitamins
   6. Electrolytes
   7. Water

XIII. Homeostatic Imbalances
   A. Gastric Ulcers
   B. Gastritis
   C. Vomiting
   D. Duodenal Ulcers
   E. Duodenitis
   F. Appendicitis
   G. Hepatitis
   H. Gallstones
   I. Cancers of the Digestive System
DIGESTIVE SYSTEM OBJECTIVES

The student should be able to:

1. Describe the overall function of the digestive system;
2. Differentiate between organs of the alimentary canal and accessory digestive organs;
3. List and define the major processes occurring during digestive system activity;
4. Describe the location and the function of the peritoneum and peritoneal cavity;
5. Describe the tissue composition and the general function of each of the four layers;
6. Describe the anatomy and basic function of each organ and accessory organ of the alimentary canal;
7. Explain the difference between deciduous and permanent teeth;
8. Describe the composition and functions of saliva;
9. Explain how salivation is regulated;
10. Describe the mechanisms of chewing and swallowing;
11. Identify structural modifications of the wall of the stomach and small intestine that enhance the digestive process in these organs;
12. Describe the composition of gastric juice;
13. Name the cell types responsible for secreting the various components of gastric juice and indicate the importance of each component in stomach activity;
14. Explain how gastric secretion and motility in the stomach are regulated;
15. Describe the function of local hormones produced by the small intestine;
16. State the role of bile in digestion;
17. State the role of pancreatic secretions in the small intestine is regulated;
18. Describe how entry of bile and pancreatic secretions in the small intestine is regulated;
19. List the major functions of the large intestine;
20. Describe the regulation of defecation;
21. List some of the enzymes involved in chemical digestion, name the foodstuffs on which they act, and the end products of protein, lipid, carbohydrate and nucleic acid digestion;
22. Describe the process of absorption of digested food stuffs that occurs in the small intestine;
23. Briefly explain the nature of the various digestive abnormalities discussed in lecture class.
URINARY SYSTEM OUTLINE

I. Overview
   A. Urinary System Structure
   B. Urinary System Functions

II. Kidneys
   A. Location
   B. Shape and Size
   C. Internal Kidney Structure
   D. Functions of the Kidney
   E. Renal Blood Vessels – Pattern of Blood Flow Through the Kidney
   F. Nephrons
      1. Structure of a Nephron
         a. Bowman’s Capsule (Glomerular Capsule)
         b. Glomerulus
         c. Proximal Convoluted Tubule
         d. Loop of Henle
         e. Distal Convoluted Tubule
      2. Cortical Nephrons
      3. Juxtaglomerular Apparatus (JGA)
      4. Blood Supply of a Nephron
         a. Afferent Arteriole
         b. Glomerulus
         c. Efferent Arteriole
         d. Peritubular Capillaries – Vasa Recta

III. Urine Formation
   A. Glomerular Filtration
   B. Filtration Pressure
   C. Filtration Rate
   D. Regulation of Filtration Rate
   E. Tubular Reabsorption
   F. Tubular Secretion – Regulation of pH
   G. Regulation of Urine Concentration and Volume
      1. Hormonal Mechanisms of Control
      2. Autoregulation
      3. Effects of Sympathetic Innervation
   H. Principle of Clearance and Tubular Maximum
   I. Characteristics and Composition of Urine

IV. Elimination of Urine
   A. Ureters
   B. Urinary Bladder
   C. Urethra
   E. Micturition – Micturition Reflex
URINARY SYSTEM OBJECTIVES

The student should be able to:

1. List the functions of the urinary system;
2. Describe the location, gross anatomy and coverings of the kidney;
3. Trace the path of blood flow through the kidney;
4. Describe the anatomy of a nephron;
5. Identify the parts of the nephron responsible for glomerular filtration, tubular reabsorption and tubular secretion;
6. Explain how glomerular filtrate is produced and describe its composition;
7. Explain the various factors that affect Glomerular Filtration Rate (GFR) and explain how GFR is regulated;
8. Discuss tubular reabsorption;
9. Discuss tubular secretion;
10. Describe the countercurrent mechanism and explain its role in the formation of dilute versus concentrated urine;
11. Describe the effect of aldosterone and the antidiuretic hormone (ADH) on the kidney;
12. Describe the structure and functions of the Juxtaglomerular Apparatus (JGA);
13. List the physical and chemical characteristics of urine in health and disease;
14. Describe the general location, structure and function of the ureters;
15. Describe the general location, structure and function of the urinary bladder;
16. Describe the general location, structure and function of the urethra;
17. Discuss the process of micturition and how it is controlled.
BODY FLUIDS AND ELECTROLYTE BALANCE OUTLINE

I. Water and Electrolyte Balance
   A. Distribution of Body Fluids
      1. Body water
      2. Fluid compartments
      3. Composition of body fluids
      4. Movement of body fluids between compartments
   B. Water Balance
      1. Regulation of water intake
      2. Regulation of water output
   C. Electrolyte Balance
      1. Electrolyte intake and regulation of electrolyte intake
      2. Electrolyte output and regulation of electrolyte output
   D. Disorders in Water and Electrolyte Balance
      1. Dehydration
      2. Water intoxication
      3. Edema
      4. Imbalance in sodium and potassium concentrations
   E. Acid-Base Balance
      1. Definition and mechanics of acid-base balance
      2. Chemical buffer systems
      3. Physiological buffer systems
   F. Disorders of Acid-Base Balance - Acidosis and Alkalosis
      1. Respiratory acidosis
      2. Metabolic acidosis
      3. Respiratory alkalosis
      4. Metabolic alkalosis
BODY FLUIDS AND ELECTROLYTE BALANCE OBJECTIVES

The student should be able to:

1. List the major body fluid compartments;
2. Compare the locations of intracellular (ICF) and extracellular (ECF) fluids;
3. Compare the composition of intracellular and extracellular fluids;
4. Explain what is meant by water and electrolyte balance and discuss their importance;
5. Describe how the various body fluids move between the different compartments;
6. List the routes by which water enters and leaves the body and how water input and output are regulated;
7. Explain how electrolytes enter and leave the body and how their input and output are regulated;
8. Discuss dehydration and water intoxication and describe the consequences of each;
9. Describe the consequences of sodium and potassium imbalance;
10. Explain what is meant by acid-base balance;
11. Describe the basis of the pH scale;
12. List the major sources of hydrogen ions (acids) in the body;
13. Describe the action of the chemical buffer system in the maintenance of body pH;
14. Describe the action of the kidney and the respiratory center in the maintenance of body pH;
15. Distinguish between acidosis and alkalosis;
16. Describe how acidosis and alkalosis may arise from respiratory and metabolic factors.
# ANATOMY AND PHYSIOLOGY II LABORATORY OUTLINE

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eye</td>
</tr>
<tr>
<td>2</td>
<td>Ear</td>
</tr>
<tr>
<td>3</td>
<td>Blood</td>
</tr>
<tr>
<td>4</td>
<td>Blood</td>
</tr>
<tr>
<td>5</td>
<td>Heart</td>
</tr>
<tr>
<td>6</td>
<td>Overview of the Major Viscera</td>
</tr>
<tr>
<td>7</td>
<td>Overview of Blood Vessels</td>
</tr>
<tr>
<td>8</td>
<td>Blood Vessels</td>
</tr>
<tr>
<td>9</td>
<td>Cardiac Physiology</td>
</tr>
<tr>
<td>10</td>
<td>Respiratory</td>
</tr>
<tr>
<td>11</td>
<td>Respiratory</td>
</tr>
<tr>
<td>12</td>
<td>Digestive</td>
</tr>
<tr>
<td>13</td>
<td>Urinary</td>
</tr>
<tr>
<td>14</td>
<td>Urinary</td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>

Written tests, lab practicals and quizzes: Scheduled appropriately throughout the semester.