

Biology 153 - Winter 2005***Anatomy and Physiology for Nursing*****INTRODUCTION**

Biology 153 is the second half of a two-semester course on the anatomy and physiology of the human body with applications to clinical nursing practice. The course traces anatomy and physiology of cells, tissues and selected organ systems. Themes, which will be integrated in the course, include physical assessment, diagnostic testing, basic pharmacology, nutrition and development.

INSTRUCTORS**Biology**

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Nursing

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TEXTBOOKS - Required

Martini, F. (2004). *Fundamentals of Anatomy and Physiology*. (6th Ed.) Benjamin Cummings, San Francisco.

Martini, F. and Welch, K. (2004). *Applications Manual: Fundamentals of Anatomy and Physiology*. (6th Ed.) Benjamin Cummings, San Francisco.

Martini, F. (2004). *Martini's Atlas of the Human Body*. Benjamin Cummings, San Francisco.

Camosun College, Department of Biology. *Biology 153: Course Outline, Learning Objectives and Laboratory Directions* — Fall 2004.

TEXTBOOKS – Required by those students in Nursing Program

Dugas, B., Esson, L. & Ronaldson, S. (1999). *Nursing foundations: A Canadian Perspective*. (2nd Ed.) Scarborough, Ontario: Prentice Hall Canada Inc.

Estes, M. (2002). *Health assessment & physical examination*. (2nd Ed.) Toronto: Delmar Publishers.

Eisenhauer, L., Wemett, L., Spencer, R., & Burgan, F. (1998). *Clinical pharmacology & nursing management*. (5th Ed.) New York: Lippincott.

TEXTBOOKS, Optional

Seiger, C. (2004). *Study Guide: Fundamentals of anatomy and physiology*. (6th Ed.) Benjamin Cummings, San Francisco.

*Kapit, W. and Elson, L. (2002). *The Anatomy Coloring Book*. New York, NY: Harper & Row.

*or other similar publication

Lab requirements

1. Lab coat. Disposable lab coats are acceptable.
2. Binder for laboratory modules and assignments with lined and blank loose-leaf paper.
3. Coloured pencils.

EVALUATION

There will be two theory examinations during the term, a midterm laboratory examination and final comprehensive theory and laboratory examinations. Examination questions in Biology 153 will incorporate critical thinking and problem-solving. Theory examinations will include both the nursing (15%) and biology (85%) components of the course. Marks may be awarded for assignments, laboratory reports and class presentations.

Assignments	10%
Midterm lecture exam.....	30%
Midterm Lab Exam	10%
Final Comprehensive Lab Exam	15%
Final Comprehensive Theory Exam	35%

TOTAL	100%
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Examinations will be given at times indicated on the Course Schedule. Assignments will be due at times as announced in class. **There will be only ONE makeup examination and it will only be granted for genuine emergencies, supported by documentation acceptable to the department.** In case of illness or emergency, the student must notify the instructor **in advance** of the examination in order for alternate arrangements to be made. **Note:** *Vacation plans do not constitute an emergency.* Please see STUDENT RESPONSIBILITIES.

The following grades will be applied to examinations and other forms of evaluation in this course:

A+	=	95% - 100%	C+	=	65% - 69%
A	=	90% - 94%	C	=	60% - 64%
A-	=	85% - 89%	D	=	50% - 59%
B+	=	80% - 84%	F	=	less than 50%
B	=	75% - 79%			
B-	=	70% - 74%			

STUDENT RESPONSIBILITIES

1. Attendance is important to ensure success. If unable to attend a session, the student is responsible for arranging with a classmate to obtain information such as notes, handouts and announcements.
2. If out of class assignments are given, students are expected to hand in the assignments to the instructor on time.
3. Students are expected to use acceptable pronunciation and spelling for presentations and evaluations. Legible handwriting is required. Penalties for spelling errors and illegible handwriting will be applied.
4. Late assignments will be accepted at the discretion of the instructor and only if the assignment has not been returned to other students. If the instructor agrees to accept a late assignment, there will be a penalty of 10% per day for each weekday. If an assignment is due on Friday, a penalty of 10% will be applied to Saturday/Sunday period.
5. Examinations must be written as scheduled. Exceptions will be made at the discretion of the instructor and only if documentation of the illness or emergency acceptable to the department is received. The student must notify the instructor in advance of the examination.

6. If acceptable documentation for missing a theory examination is received, the student will be given the opportunity to write a makeup examination in week 13 which will be valued at the percentage allocated to the missed examination(s). This makeup examination will include all material covered up to and including week 12.
7. If a student is unable to take the midterm laboratory examination and provides acceptable documentation, the final comprehensive laboratory examination will be weighted 25% of the course mark.
8. If a student is unable to take the final laboratory examination and provides acceptable documentation, an oral laboratory examination will be given.
9. Any evaluation of work for in-class/lab assignments, reports and/or participation will not be given if a student is not present for any reason.
10. Students are expected to work independently on reports unless instructed that the evaluation is based on group effort and evaluation. Please see Student Conduct Policy.

Unacceptable student behaviour includes, but is not limited to, the following:

- giving or receiving unauthorized information to or from another student during any examination or test.
- obtaining or providing, without authorization, questions or answers relating to any examination or test prior to the time of the examination or test.
- using unauthorized sources of information during any examination or test.
- asking or arranging for another person to take any examination or test in one's place.
- plagiarizing, that is, appropriating the work of another or parts or passages of another's writing, or the ideas or language of the same, and passing them off as the product of one's own mind or manual skill.

According to Camosun College Student Conduct policy, a grade of 'F' for the work involved or for the course may be assigned.

10. Students must know and follow all Safety Rules and Procedures. Failure to adhere to safety rules will be dealt with as outlined in the Student Conduct Policy.

BIOLOGY 153 COURSE SCHEDULE WINTER 2005

The following is a **tentative** schedule of lectures and labs. Changes may be announced in class.

Wee k	Date	Lecture	Lab Activity
1	Jan 10-14	Cardiovascular System <i>Nursing – Cardiovascular 2</i> (Continued from Biol 152)	LAB 1: Lab Safety Cardiovascular blood
2	Jan 17-21	Cardiovascular System <i>Nursing – Cardiovascular</i>	LAB 2: Cardiovascular ECG
3	Jan 24-28	Respiratory System	LAB 3: Respiratory System Anatomy
4	Jan 31- Feb 4	Respiratory System <i>Nursing – temperature and respiratory regulation</i>	LAB 4 : Respiratory Physiology
5	Feb 7-11 Feb 10-11	Digestive System READING BREAK	NO LAB
6	Feb 14-18	Digestive System <i>Nursing: Nutrition, bowel elimination</i>	LAB 5: Digestive System and Nutrition
7	Feb 21-25	Digestion Metabolism	LAB EXAM #1
8	Feb 28- Mar 4	MIDTERM EXAM Microbiology	LAB 6: Microbiology 1
9	Mar 7-11	Microbiology <i>Nursing: Prevention of Infection</i>	LAB 7: Microbiology 2
10	Mar 14-18	Lymphatic System / Immunology	LAB 8: Lymphatic System
11	Mar 21-25 Mar 25	Urinary System EASTER	NO LAB
12	Mar 28 Mar 28- April 11	EASTER Urinary System <i>Nursing – Urinary elimination</i>	LAB 9: Urinary System/Urinalysis
13	April 4-8	Urinary System Reproductive System	LAB EXAM #2
14	April 11-15	Reproductive System	LAB 10: Reproductive System
15/16	April 18-26	FINAL COMPREHENSIVE EXAM College exam period Date TBA	

LEARNING OUTCOMES

Upon successful completion of Biology 153, you will be able to:

- use your knowledge of normal anatomy and physiology to differentiate normal from abnormal when you are doing physical assessments of clients
- use and understand correct terminology when you are communicating with other members of the health care team
- use your knowledge of anatomy and physiology as a basis for further study of pathophysiology
- help clients by explaining basic anatomy and physiology, nutrition and pharmacology in the maintenance of health and prevention of disease.

It is important that you are familiar with material that has already been covered in the prerequisite courses, Biology 12 or 080, Biology 152 and Chemistry 11 . This information is necessary in order to understand concepts taught in Biology 153. Students are expected to review this prerequisite material, if necessary, as it too is testable. The learning outcomes for Biology 12 can be accessed at the following website: <http://www.bced.gov.bc.ca/irp/curric/biolo.htm#gr12>

N.B. You will obtain information from several sources including lectures, class discussions, text books, videos, labs and clinical courses. Do not rely exclusively on any one, or only some of the sources.

UNIT V. THE CARDIOVASCULAR SYSTEM

This unit is a continuation of Biology 152 Unit V. You will have to review information taught last year in relation to the objectives listed below. Some of these topics may have already been covered in Biology 152 and will NOT be re-taught.

A. ANATOMY

1. Describe the components of the circulatory system and identify the major circulatory subsystems.
2. Identify the blood vessels listed in the lab manual and define the areas they supply and drain.

B. BLOOD

1. Discuss the composition and functions of plasma.
2. Describe the origin, production and characteristics of the formed elements of blood.
 - erythrocytes, leukocytes and platelets
3. Describe the structure of hemoglobin and its functions.
4. Explain the production, degradation and recycling of erythrocytes.
5. Categorize leukocytes on the basis of their characteristic structures and functions.
6. Explain the processes associated with hemostasis
 - describe the three phases of hemostasis: vascular, platelet and coagulation
 - discuss the regulation of the three phases
 - identify specific clotting factors and the significance of calcium ions and vitamin K in blood coagulation
7. Explain the basis of blood typing of ABO and Rh antigens and the situations that may lead to incompatibilities.

C. CARDIOVASCULAR PHYSIOLOGY

Cardiovascular physiology will be taught in the first and second semesters. Some of the following topics may not be covered in semester 1.

1. Define stroke volume and cardiac output, discuss the influencing factors and effects of alterations on the cardiovascular system.
2. Discuss factors that affect heart function.
3. Discuss the physiology of blood pressure, blood flow and capillary exchange.
 - explain the mechanisms that regulate blood flow through the vessels
 - describe the factors that influence and regulate blood pressure.
 - describe the mechanisms associated with the movement of fluids between capillaries and interstitial spaces.
4. Describe the events involved in generating an action potential in cardiac muscle and show the importance of calcium ions to the contractile process.
5. Discuss the function of cardiac nodal and conducting cells.
6. Describe the components of the cardiac conducting system and their functioning.
7. Explain the events of the cardiac cycle and relate heart sounds to specific events of the cycle.
8. Explain the electrical events associated with an electrocardiogram, describe an ECG tracing and relate it to cardiac contraction and relaxation, valvular action and blood flow through the heart.
9. Discuss the hormones that influence cardiovascular function.

UNIT VI. THE RESPIRATORY SYSTEM

1. List the main functions of the respiratory system.
2. Describe the organization of the respiratory system
 - upper and lower respiratory systems
 - conducting and respiratory portions
 - respiratory mucosa
3. Describe the gross structure and microstructure of the lungs
 - visceral and parietal pleurae, the pleural cavities and their relationship to the mediastinum
 - alveoli and pulmonary interstitium
4. Describe the relationship between pulmonary perfusion and gaseous exchange.
5. Distinguish between internal, external and cellular respiration.
6. Describe the mechanisms of pulmonary ventilation
 - atmospheric pressure, intrapulmonary and intrapleural pressures
 - muscle actions and pressure changes
 - distinguish between quiet and forced breathing
7. Describe the influence of the following factors on ventilation
 - airway resistance
 - compliance
 - interstitial elasticity
 - surface tension (role of surfactant)
8. Identify and distinguish the following lung volumes and capacities
 - tidal volume
 - inspiratory reserve volume
 - expiratory reserve volume
 - residual volume
 - vital capacity
 - total lung capacity
 - forced expiratory volume

9. Describe the process of gas exchange at the respiratory membrane and in the tissues in terms of
- partial pressures (Dalton's Law)
 - gas solubilities (Henry's law)
 - the effects of :
 - respiratory membrane thickness
 - solubility and diffusion coefficients
 - surface area
 - partial pressure differences
 - the coordination of blood flow and airflow in the alveoli
 - perfusion/ventilation imbalance
 - the coordination of blood flow and tissue hypoxia
 - loading and unloading of oxygen and carbon dioxide
10. Describe how oxygen is transported in blood including loading and unloading
- oxygen-hemoglobin saturation/dissociation curve
 - effect of temperature
 - effect of pH (Bohr effect)
 - effect of 2,3-bisphosphoglycerate
 - the importance of fetal hemoglobin
 - effects of carbon monoxide and high altitude on oxygen transport
11. Describe how carbon dioxide is transported in the blood including loading and unloading
- interconversion of carbon dioxide, carbonic acid and bicarbonate
 - role of carbonic anhydrase
 - roles of the plasma and red blood cell in carbon dioxide transport
 - function of carbaminohemoglobin
 - the chloride shift
 - effect of carbon dioxide concentration on plasma pH
12. Describe the control of ventilation
- the location and role of the respiratory centers
 - the chemical control of ventilation centers in terms of
 - chemoreceptor locations
 - effect of pH in the CSF
 - effect of $p\text{CO}_2$
 - effect of $p\text{O}_2$
 - the baroreceptor reflexes

UNIT VII. THE DIGESTIVE SYSTEM

A. ANATOMY OF THE DIGESTIVE SYSTEM

1. Identify the organs of the digestive tract and associated accessory structures
 - Digestive tract: oral region, pharynx, esophagus, stomach, small and large intestine
 - Accessory organs: liver, gall bladder, pancreas
 - Hepatic, pancreatic and biliary ducts
2. Describe the anatomical and histological characteristics of the organs of the digestive tract.
3. Describe the structure of the liver, gall bladder and pancreas.
4. Describe the membranes associated with the Gastrointestinal (GI) tract.
 - Peritoneum (visceral and parietal)
 - Falciform ligament
 - Round ligament
 - Greater omentum
 - Lesser omentum
 - Mesentery

B. PHYSIOLOGY OF THE DIGESTIVE SYSTEM

1. Describe the processes of digestion and absorption of carbohydrates, lipids and proteins, indicating where in the digestive tract each occurs
2. Describe the mechanisms involved in water, electrolyte and vitamin absorption
3. Explain the functions and regulation of intestinal secretions
4. Describe the roles of the liver, pancreas and gall bladder in digestion and absorption

C. METABOLISM

1. Define metabolism and differentiate between anabolism and catabolism
2. Differentiate amongst the following terms:
 - glycogenesis
 - gluconeogenesis
 - glycolysis
 - glycogenolysis
3. Differentiate between the absorptive and post-absorptive metabolic states and summarize the characteristics of each.
4. Define Basal Metabolic Rate (BMR) and discuss factors involved in determining an individual's metabolic rate.

UNIT VIII. INTRODUCTORY MICROBIOLOGY

1. Briefly describe the history of the development of Medical Microbiology and Epidemiology and its significance to nursing practice.
2. Describe the major agents of infectious diseases, mechanisms of pathogenesis and methods of control of microorganisms.
3. Bacteria
 - Describe the structure of the bacterial cell
 - Describe bacterial cell morphologies and arrangements
 - Briefly describe some bacterial mechanisms of pathogenesis
 - Describe physical and chemical methods of controlling bacteria
 - List some common bacterial diseases
 - Discuss the importance of normal flora to human health
4. Viruses
 - Describe the structure of a typical virus
 - Describe the lytic and lysogenic life cycles of viruses
 - List some common viral diseases
5. Briefly discuss other agents of disease (Fungi, Protozoa, and Metazoan parasites) and list some common examples of diseases in each category
6. Discuss nosocomial infections
 - prevalence of nosocomial infections
 - examples of common nosocomial infections
 - role of health care workers in preventing and controlling nosocomial infections

UNIT IX. THE LYMPHATIC SYSTEM AND IMMUNOLOGY

1. List the general functions of the lymphatic system.
2. Describe the major components the lymphatic system, noting the function of each
 - lymphatic vessels - lymphatic capillaries, superficial and deep lymphatics, thoracic duct and lymphatic ducts
 - lymphocytes
 - lymphoid tissues
 - lymphoid nodules, gut associated lymphoid tissue and tonsils
 - lymphoid organs
3. Describe nonspecific defenses of the body
 - physical barriers
 - phagocytes
 - NK cells
 - interferons
 - complement
 - inflammation
 - fever
4. Discuss specific defenses of the body (the immune system)
 - cell-mediated and humoral immunity
 - acquired, innate, active and passive immunity
5. Describe the role of T cells in cell mediated immunity
 - antigen presentation
 - antigen recognition
 - costimulation
 - cytotoxic T cells, suppressor T cells and helper T cells
6. Describe the role of B cells in humoral immunity - sensitization and activation
7. Describe the role of antibodies in humoral immunity
 - antibody structure
 - classes of antibodies
 - actions of antibodies
8. Describe and distinguish between primary and secondary responses to antigen exposure

UNIT X. THE URINARY SYSTEM

A. ANATOMY OF THE URINARY SYSTEM

1. Describe the structural components and overall functions of the urinary system
2. Describe the anatomy of the kidney
3. Describe the structure of the nephron
4. Identify the blood vessels associated with the kidney and describe the blood flow through the kidney
5. Describe the structure of the ureters, urinary bladder and urethra
6. Describe the structural and functional differences between the male and female urethra

B. PHYSIOLOGY OF THE URINARY SYSTEM

1. Describe glomerular filtration, explaining what is filtered and where this occurs
2. List and describe the factors that influence filtration pressure and the rate of filtrate formation
3. Identify the transport mechanisms along the nephron and discuss reabsorptive and secretory functions in the nephron segments and collecting ducts
4. Discuss voluntary and involuntary control of urination
5. Discuss the role of the Loop of Henle and countercurrent exchange in adjusting urine concentrating
6. Describe the normal characteristics, composition and solute concentration of representative urine samples
7. Discuss the significance of laboratory tests of the urinary system
8. Discuss the influences of specific hormones on the urinary system
9. Describe the role of the kidney in maintaining fluid, electrolyte and acid-base balance
 - fluid compartments
 - regulation of the concentration of major ions
 - influence of thirst, kidney function and evaporation on water content
 - regulation of acid-base balance

UNIT XI. THE REPRODUCTIVE SYSTEM

A. REPRODUCTIVE SYSTEM OF THE MALE

1. Identify and describe the male reproductive organs in terms of location, structure and function
 - Testes including seminiferous tubules, Leydig cells (interstitial cells), Sertoli cells, rete testis, efferent ducts
 - Epididymis
 - Vas/ductus deferens, ejaculatory duct and urethra
 - External genitalia
 - Accessory glands
2. Describe the process of spermatogenesis
 - spermatogonia, primary and secondary spermatocytes, spermatids, spermatozoa
 - location and function of Sertoli cells (sustentacular cells) and Leydig cells (interstitial cells)
3. Discuss the hormonal control of male reproductive function

B. REPRODUCTIVE SYSTEM OF THE FEMALE

1. Identify and describe the female reproductive organs in terms of location, structure and function
 - Ovaries
 - Uterine tubes
 - Uterus
 - Vagina
 - External genitalia
 - Accessory glands
2. Describe the process of oogenesis
 - oogonia, primary oocytes, primary and secondary follicles, graafian follicles, secondary oocyte, polar bodies
 - ovulation
3. Discuss the hormonal control of female reproductive function
 - menstrual cycle including the ovarian and uterine cycles

C. FERTILIZATION AND DEVELOPMENT

1. Describe the site and process of fertilization
2. Identify the three trimesters of gestation and briefly describe the major events occurring in each
3. Briefly describe
 - Cleavage and blastocyst formation
 - Implantation
 - Placentation
4. Briefly describe the major features of fetal circulation and show how this pattern changes at and after birth