

BIOL 1108 Principles of Biology II (4 credits) Lecture Syllabus

Instructor: Dr. Gretchen K. Bielmyer

Office: BC 1097

Office hours: Tues., Wed., Thurs. 2:00-3:45 pm; or by appointment

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Lecture (BC 1011): Tues., Thurs 8:00-9:15 am.

Prerequisite: BIOL 1107 or permission of the instructor.

Description: An introduction to physiological processes in plants and animals. Structure, nutrition, transport, coordination, reproduction, and development will be addressed.

Course goals and objectives: The primary goal of this course is to introduce physiological processes of animals and plants. This is the second introductory course, and it is expected that the student is familiar with topics covered in BIOL1107. By the end of the semester students should have sufficient background to successfully complete higher level courses that will cover specific topics in much greater detail.

The Department of Biology seeks to help develop general skills, such as communication skills and information processing skills. Communication skills will be exercised through laboratory assignments and lab practicals and lecture exams. Information processing skills will be developed because of the nature of biology. A lot of information will be given to students in a relatively short period of time, and students are expected to retain this information, not only for the final exam, but for future courses.

Learning goals include:

- Understanding physiology of the major systems in animals and plants that include:
 - Structure/function relationships
 - Nutrition
 - Transport
 - Movement
 - Reproduction
 - Development
 - Sensory systems
- Learning common experimental tools and techniques used in physiology
- Strengthening your ability to think critically and process information and data

These goals support the Department of Biology Education Outcome #2, #3 and #5 and VSU General Education #5.

Textbook: Life: The Science Biology 8th or 9th edition. Sadava *et al.* (2008) ISBN 978-0-7167-7671-0

Attendance: Attendance in lecture is expected by all students. Attendance in laboratory is mandatory; see lab policy.

Access to Slides/Information: Lecture slides will be made available on BlazeView by 5:00pm the day before lecture. These slides will not have all the information on them; it is the student's responsibility to come to class and take notes. Students are responsible for getting the notes from other students if they miss a lecture. The professor will NOT email notes that are missed.

Lecture Conduct:

- Arrive on time.
- Turn off cell phones during class and lab; there is no reason you should be texting or calling anyone.
- Don't talk during lecture; if you don't understand something or didn't hear something ask.
- If you would like to use a laptop to take notes, please sit in the first two rows.

- Unless it's an emergency (and using your cell phone does not constitute an emergency) do not get up in the middle of lecture, leave and come back.
- Do not leave class early unless you have informed me prior to the start of the class or if it's an emergency.
- During exams NOBODY can leave the exam and re-enter the exam room. If a student leaves, their exam will be graded as is; the student will not be allowed to finish the exam.

Withdrawing from the course: The last day to withdraw without penalty is February 1st, 2011. If you don't officially withdraw, and instead just stop coming to class, you will receive an "F" for the course.

Academic conduct: Cheating and plagiarism will not be tolerated and may result in a failing grade for the assignment, exam or the class. The Department of Biology has a plagiarism policy, which will be handed out during the first lab period.

Privacy Act (FERPA): The Family Educational Rights and Privacy Act (FERPA) prohibits the public posting of grades by social security number or in any manner personally identifiable to the individual student. No grades can be given over the telephone or over email because positive identification can't be made.

Students with disabilities: Students requiring special accommodations because of disability must discuss their needs with me as soon as possible. Those needing accommodations who are not registered with the Special Services Program must contact the Access Office for Students with Disabilities located in Farber Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

Exams: The dates for the exams are included in the Tentative Class Schedule. Note, that these are TENTATIVE, therefore the professor reserves the right to adjust the dates of the exams. YOU MUST BRING A PENCIL WITH YOU. All cell phones must be turned off during exams. All bookbags, books, purses etc. must be placed on the stage (in the front of the room) at the start of the exam; NO EXCEPTIONS. If you do not feel comfortable putting your purse, bag, books, etc. on the stage don't bring them with you to class. Hats cannot be worn during exams.

The lowest exam score (excluding the final) will be dropped. Therefore, no make-up exams will be given. If you miss one exam for any reason, then that exam score will be dropped from your overall grade. If you miss more than one exam then you will receive a zero on the missed exam(s). Only students with a University related excuse may take an exam early.

Final: The final will be cumulative and will have a format similar to the other exams. The date of the final is **Wednesday, May 2 (10:15 a.m. -12:15 p.m.)**. **NO EARLY EXAMS WILL BE GIVEN!**

Grade Scale:

For Biology majors, a grade of C or higher is required for this course.

- A 90-100%
- B 80-89%
- C 70-79%
- D 60-69%
- F < 60

Grade Calculation:

Final grades will be based on both the lecture and laboratory components of the course. Lecture is worth 75% of your final grade, and lab is worth 25% of the final grade.

Lecture component (total 450 points):

- 4 lecture exams (each worth 100 points; total of 300 points with one dropped exam)
- Cumulative final (worth 150 points)

Lab component:

- Various lab assignments and 2 lab practical exams

To calculate your final grade:

- Lecture component: Add points earned from each of the exams and final and divide by 450. Multiply this number by 0.75.
- Laboratory component: Add points earned from each of the laboratory assignments and practicals and divide by total points possible. Multiply this number by 0.25
- Finally, do the following: Take the lecture component and laboratory component numbers you just calculated and add them together. Multiply this number by 100. This will give you your final percentage you earned.

SPRING 2011 TENTATIVE LECTURE SCHEDULE

January

10 Introduction; Phylogeny; Animal Structure and Function
12 Chapter 40: Homeostasis in Animals & the Role of Physiological Systems

17 Chapter 41: Animal Hormones
19 Animal Hormones (continued);
Chapter 42: Animal Reproduction (Ch. 43 in the 9th ed.)

24 Animal Reproduction (continued)
26 Chapters 44 and 46: Nervous System (Ch. 44 and 45 in the 9th ed.)

31 Chapter 45: Sensory Systems (Ch. 46 in 9th ed.); Review for Exam 1

February

2 EXAM 1

7 Chapter 47: Muscles (Ch. 48 in the 9th ed.)
9 Chapter 48: Gas Exchange (Ch. 49 in the 9th ed.)

14 Gas Exchange (continued); Chapter 49: Circulatory System (Ch. 50 in the 9th ed.)
16 Circulatory System (continued)

21 Chapter 50: Nutrition and Digestion (Ch. 51 in the 9th ed.)
23 Chapter 51: Salt and Water Balance (Ch. 52 in the 9th ed.)

28 Review for Exam 2

March

1 EXAM 2

6 Chapter 28: Seedless Plants
8 Chapter 29: Evolution of Seed Plants

13 NO CLASS SPRING BREAK
15 NO CLASS SPRING BREAK

20 Evolution of Seed Plants (continued); Chapter 34: The Plant Body
22 The Plant Body (continued); Chapter 35: Transport in Plants

27 Transport in Plants (continued)
29 Review for Exam 3

April

3

Exam 3

5

Chapter 36: Plant Nutrition

10

Plant Nutrition (continued); Chapter 37: Regulation of Plant Growth

12

Chapter 38: Reproduction in Flowering Plants

17

Reproduction in Flowering Plants (continued); Chapter 39: Plant Responses to Environmental Challenges

19

Review for Exam 4

24

Exam 4

26

Review for Final Exam

May

2

10:15 am-12:15 pm

Topics Covered on GRE Biology Subject Test

The approximate distribution of questions by content category is shown below.

I. Cellular and Molecular Biology (33-34%): Introduced in BIOL 1107

Fundamentals of cellular biology, genetics, and molecular biology are addressed. Major topics in cellular structure and function include metabolic pathways and their regulation, membrane dynamics and cell surfaces, organelles, cytoskeleton, and cell cycle. Major areas in genetics and molecular biology include chromatin and chromosomal structure, genomic organization and maintenance, and the regulation of gene expression. The cellular basis of immunity and the mechanisms of antigen-antibody interactions are included. Distinctions between prokaryotic and eukaryotic cells are considered where appropriate. Attention is also given to experimental methodology.

II. Organismal Biology (33-34%): Introduced in BIOL1108

The structure, physiology, behavior, and development of plants and animals are addressed. Topics covered include nutrient procurement and processing, gas exchange, internal transport, regulation of fluids, control mechanisms and effectors, and reproduction in autotrophic and heterotrophic organisms. Examples of developmental phenomena range from fertilization through differentiation and morphogenesis. Perceptions and responses to environmental stimuli are examined as they pertain to both plants and animals. Major distinguishing characteristics and phylogenetic relationships of selected groups from the various kingdoms are also covered.

A. Animal Structure, Function, and Organization (10%)

1. Exchange with environment
 - Nutrient, salt, and water exchange
 - Gas exchange
 - Energy
2. Internal transport and exchange
 - (circulatory, gastrovascular, and digestive systems)
3. Support and movement
 - Support systems (external, internal, and hydrostatic)
 - Movement systems (flagellar, ciliary, and muscular)
4. Integration and control mechanisms
 - Nervous and endocrine systems
5. Behavior (communication, orientation, learning, and instinct)
6. Metabolic rates (temperature, body size, and activity)

B. Animal Reproduction and Development (6%)

1. Reproductive structures
2. Meiosis, gametogenesis, and fertilization
3. Early development (e.g., polarity, cleavage, and gastrulation)
4. Developmental processes (e.g., induction, determination, differentiation, morphogenesis, and metamorphosis)
5. External control mechanisms (e.g., photoperiod)

C. Plant Structure, Function, and Organization, with Emphasis on Flowering Plants (7%)

1. Organs, tissue systems, and tissues
2. Water transport, including absorption and transpiration
3. Phloem transport and storage
4. Mineral nutrition
5. Plant energetics (e.g., respiration and photosynthesis)

D. Plant Reproduction, Growth, and Development, with Emphasis on Flowering Plants (5%)

1. Reproductive structures
2. Meiosis and sporogenesis
3. Gametogenesis and fertilization
4. Embryogeny and seed development
5. Meristems, growth, morphogenesis, and differentiation
6. Control mechanisms (e.g., hormones, photoperiod, and tropisms)

E. Diversity of Life (6%)

1. Archaea
2. Bacteria (including cyanobacteria)
3. Protista
4. Fungi
5. Animalia with emphasis on major phyla
 - Major distinguishing characteristics
 - Phylogenetic relationships
6. Plantae with emphasis on major phyla
 - Alternation of generations
 - Major distinguishing characteristics
 - Phylogenetic relationships

III. Ecology and Evolution (33-34%)

This section deals with the interactions of organisms and their environment, emphasizing biological principles at levels above the individual. Ecological and evolutionary topics are given equal weight. Ecological questions range from physiological adaptations to the functioning of ecosystems. Although principles are emphasized, some questions may consider applications to current environmental problems. Questions in evolution range from its genetic foundations through evolutionary processes to their consequences. Evolution is considered at the molecular, individual, population, and higher levels. Principles of ecology, genetics, and evolution are interrelated in many questions. Some questions may require quantitative skills, including the interpretation of simple mathematical models.

Physiology Related Topics Covered on MCAT

<p>SPECIALIZED EUKARYOTIC CELLS AND TISSUES</p> <p>A. Nerve Cell/Neural</p> <ol style="list-style-type: none"> 1. Cell body (site of nucleus and organelles) 2. Axon (structure, function) 3. Dendrites (structure, function) 4. Myelin sheath, Schwann cells, oligodendrocytes, insulation of axon 5. Nodes of Ranvier (role in propagation of nerve impulse along axon) 6. Synapse (site of impulse propagation between cells) 7. Synaptic activity <ol style="list-style-type: none"> a. transmitter molecules b. synaptic knobs c. fatigue d. propagation between cells without resistance loss 8. Resting potential (electrochemical gradient) 9. Action potential <ol style="list-style-type: none"> a. threshold, all-or-none b. sodium–potassium pump 10. Excitatory and inhibitory nerve fibers (summation, frequency of firing) <p>B. Muscle Cell/Contractile</p> <ol style="list-style-type: none"> 1. Abundant mitochondria in red muscle cells (ATP source) 2. Organization of contractile elements (actin and myosin filaments, cross bridges, sliding filament model) 3. Calcium regulation of contraction, sarcoplasmic reticulum 4. Sarcomeres (—I and —A] bands, —M] and —Z] lines, —H] zone—general structure only) 5. Presence of troponin and tropomyosin <p>C. Other Specialized Cell Types</p> <ol style="list-style-type: none"> 1. Epithelial cells (cell types, simple epithelium, stratified epithelium) 2. Endothelial cells 3. Connective tissue cells (major tissues and cell types, fiber types, loose versus dense, extracellular matrix) <p>NERVOUS AND ENDOCRINE SYSTEMS</p> <p>A. Endocrine System: Hormones</p> <ol style="list-style-type: none"> 1. Function of endocrine system (specific chemical control at cell, tissue, and organ levels) 2. Definitions of endocrine gland, hormone 3. Major endocrine glands (names, locations, products) 4. Major types of hormones <p>B. Endocrine System: Mechanisms of Hormone Action</p> <ol style="list-style-type: none"> 1. Cellular mechanisms of hormone action 2. Transport of hormones (bloodstream) 3. Specificity of hormones (target tissue) 4. Integration with nervous system (feedback control) <p>C. Nervous System: Structure and Function</p> <ol style="list-style-type: none"> 1. Major functions <ol style="list-style-type: none"> a. high-level control and integration of body systems b. response to external influences c. sensory input d. integrative and cognitive abilities 2. Organization of vertebrate nervous system 3. Sensor and effector neurons 4. Sympathetic and parasympathetic nervous systems (functions, antagonistic control) 5. Reflexes <ol style="list-style-type: none"> a. feedback loop, reflex arc, effects on flexor and extensor muscles b. roles of spinal cord, brain c. efferent control <p>D. Nervous System: Sensory Reception and Processing</p> <ol style="list-style-type: none"> 1. Skin, proprioceptive and somatic sensors 2. Olfaction, taste 3. Hearing <ol style="list-style-type: none"> a. ear structure b. mechanism of hearing 4. Vision <ol style="list-style-type: none"> a. light receptors b. eye structure c. visual image processing <p>CIRCULATORY, LYMPHATIC, IMMUNE SYSTEMS</p> <p>A. Circulatory System</p> <ol style="list-style-type: none"> 1. Functions (circulation of oxygen, nutrients, hormones, ions, and fluids; removal of metabolic waste) 2. Role in thermoregulation 3. Four-chambered heart (structure, function) 4. Systolic and diastolic pressure 5. Pulmonary and systemic circulation 6. Arterial and venous systems (arteries, arterioles, venules, veins) <ol style="list-style-type: none"> a. structural and functional differences b. pressure and flow characteristics 7. Capillary beds <ol style="list-style-type: none"> a. mechanisms of gas and solute exchange b. mechanism of heat exchange 8. Composition of blood <ol style="list-style-type: none"> a. plasma, chemicals, blood cells b. erythrocyte production and destruction (spleen, bone marrow) 	<ol style="list-style-type: none"> c. regulation of plasma volume d. coagulation, clotting mechanisms, role of liver in production of clotting factors 9. Oxygen and carbon dioxide transport by blood <ol style="list-style-type: none"> a. hemoglobin, hematocrit b. oxygen content c. oxygen affinity 10. Details of oxygen transport: biochemical characteristics of hemoglobin <ol style="list-style-type: none"> a. modification of oxygen affinity <p>B. Lymphatic System</p> <ol style="list-style-type: none"> 1. Major functions <ol style="list-style-type: none"> a. equalization of fluid distribution b. transport of proteins and large glycerides c. return of materials to the blood 2. Composition of lymph (similarity to blood plasma; substances transported) 3. Source of lymph (diffusion from capillaries by differential pressure) 4. Lymph nodes (activation of lymphocytes) <p>C. Immune System: Innate and Adaptive Systems</p> <ol style="list-style-type: none"> 1. Cells and their basic functions <ol style="list-style-type: none"> a. macrophages, neutrophils, mast cells, natural killer cells, dendritic cells b. T lymphocytes c. B lymphocytes, plasma cells 2. Tissues <ol style="list-style-type: none"> a. bone marrow b. spleen c. thymus d. lymph nodes 3. Basic aspects of innate immunity and inflammatory response 4. Concepts of antigen and antibody 5. Structure of antibody molecule 6. Mechanism of stimulation by antigen; antigen presentation <p>DIGESTIVE AND EXCRETORY SYSTEMS</p> <p>A. Digestive System</p> <ol style="list-style-type: none"> 1. Ingestion <ol style="list-style-type: none"> a. saliva as lubrication and source of enzymes b. epiglottal action c. pharynx (function in swallowing) d. esophagus (transport function) 2. Stomach <ol style="list-style-type: none"> a. storage and churning of food b. low pH, gastric juice, protection by mucus against self-destruction c. production of digestive enzymes, site of digestion d. structure (gross) 3. Liver <ol style="list-style-type: none"> a. production of bile b. roles in nutrient metabolism, vitamin storage c. roles in blood glucose regulation, detoxification 4. Bile <ol style="list-style-type: none"> a. storage in gallbladder b. function 5. Pancreas <ol style="list-style-type: none"> a. production of enzymes, bicarbonate b. transport of enzymes to small intestine c. structure (gross) 6. Small intestine <ol style="list-style-type: none"> a. absorption of food molecules and water b. function and structure of villi c. production of enzymes, site of digestion d. neutralization of stomach acid e. structure (anatomic subdivisions) 7. Large intestine <ol style="list-style-type: none"> a. absorption of water b. bacterial flora c. structure (gross) 8. Rectum (storage and elimination of waste, feces) 9. Muscular control <ol style="list-style-type: none"> a. sphincter muscle b. peristalsis <p>B. Excretory System</p> <ol style="list-style-type: none"> 1. Roles in homeostasis <ol style="list-style-type: none"> a. blood pressure b. osmoregulation c. acid–base balance d. removal of soluble nitrogenous waste 2. Kidney structure <ol style="list-style-type: none"> a. cortex b. medulla c. Nephron structure <ol style="list-style-type: none"> a. glomerulus b. Bowman’s capsule c. proximal tubule d. loop of Henle e. distal tubule f. collecting duct 	<ol style="list-style-type: none"> 4. Formation of urine <ol style="list-style-type: none"> a. glomerular filtration b. secretion and reabsorption of solutes c. concentration of urine d. countercurrent multiplier mechanism (basic function) 5. Storage and elimination (ureter, bladder, urethra) <p>MUSCLE AND SKELETAL SYSTEMS</p> <p>A. Muscle System</p> <ol style="list-style-type: none"> 1. Functions <ol style="list-style-type: none"> a. support, mobility b. peripheral circulatory assistance c. thermoregulation (shivering reflex) 2. Structural characteristics of skeletal, smooth, and cardiac muscle: striated versus nonstriated 3. Nervous control <ol style="list-style-type: none"> a. motor neurons b. neuromuscular junctions, motor end plates c. voluntary and involuntary muscles d. sympathetic and parasympathetic innervation <p>B. Skeletal System</p> <ol style="list-style-type: none"> 1. Functions <ol style="list-style-type: none"> a. structural rigidity and support b. calcium storage c. physical protection 2. Skeletal structure <ol style="list-style-type: none"> a. specialization of bone types; structures b. joint structures c. endoskeleton versus exoskeleton 3. Cartilage (structure, function) 4. Ligaments, tendons 5. Bone structure <ol style="list-style-type: none"> a. calcium–protein matrix b. bone growth (osteoblasts, osteoclasts) <p>RESPIRATORY SYSTEM</p> <p>A. Respiratory System</p> <ol style="list-style-type: none"> 1. General structure and function <ol style="list-style-type: none"> a. gas exchange, thermoregulation b. protection against disease, particulate matter 2. Breathing mechanisms <ol style="list-style-type: none"> a. diaphragm, rib cage, differential pressure b. resiliency and surface tension effects <p>SKIN SYSTEM</p> <p>A. Skin System</p> <ol style="list-style-type: none"> 1. Functions in homeostasis and osmoregulation 2. Functions in thermoregulation <ol style="list-style-type: none"> a. hair, erectile musculature b. fat layer for insulation c. sweat glands, location in dermis d. vasoconstriction and vasodilation in surface capillaries 3. Physical protection <ol style="list-style-type: none"> a. nails, calluses, hair b. protection against abrasion, disease organisms 4. Structure <ol style="list-style-type: none"> a. layer differentiation, cell types, tissue types (epithelial, connective) b. relative impermeability to water <p>REPRODUCTIVE SYSTEM AND DEVELOPMENT</p> <p>A. Reproductive System</p> <ol style="list-style-type: none"> 1. Male and female reproductive structures and their functions <ol style="list-style-type: none"> a. gonads b. genitalia c. differences between male and female structures 2. Gametogenesis by meiosis 3. Ovum and sperm <ol style="list-style-type: none"> a. differences in formation b. differences in morphology c. relative contribution to next generation 4. Reproductive sequence (fertilization, implantation, development, birth) <p>B. Embryogenesis</p> <ol style="list-style-type: none"> 1. Stages of early development (order and general features of each) <ol style="list-style-type: none"> a. fertilization b. cleavage c. blastula formation d. gastrulation <ol style="list-style-type: none"> i. first cell movements ii. formation of primary germ layers (endoderm, mesoderm, ectoderm) e. neurulation 2. Major structures arising out of primary germ layers <p>C. Developmental Mechanisms</p> <ol style="list-style-type: none"> 1. Cell specialization <ol style="list-style-type: none"> a. determination b. differentiation c. tissue types 2. Cell communication in development 3. Gene regulation in development 4. Programmed cell death
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