

BIOL 1108 Principles of Biology II (4 credits) Syllabus

Instructor: Dr. Theresa J. Grove
Office: BC 1099
Office hours: Tuesday 2:00-4:00 p.m. or by appointment
Email: tjgrove@valdosta.edu (do **NOT** email me on Blazeview)

Lecture (BC 1023): Tuesday and Thursday 8:00 - 9:15 a.m.
Lab (BC 1073): Section A: Monday 1:00 - 3:50 p.m.
Section B: Monday 4:00 - 6:50 p.m.
Section C: Tuesday 9:30 a.m. - 12:20 p.m.

Prerequisite: BIOL 1107 (or the equivalent) 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 plants and animals. 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 plants and animals 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.

Lecture Textbook: Life: The Science Biology by Sadava *et al.* 9th ed. Sinauer Associates, Inc.

Lab Manual: Principles of Biology II Lab Manual by T. J. Grove

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

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. Quizzes missed due to late arrival or leaving early cannot be taken at a later 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.
- 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 Thursday, October 6. If you don't officially withdraw, and instead just stop coming to class, you will earn 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).

Quizzes: During lecture approximately 15 quizzes each worth 5pts. Your highest 10 quiz scores will be combined for a 50 point grade that will be included in your final grade. Make-up quizzes are not available. The format of the quiz will vary and quiz dates will NOT be announced.

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. Four exams (excluding the final) will be given throughout the semester. Each exam will be worth 100 points and will consist of a variety of types of questions that will include (but aren't limited to) matching, multiple choice, labeling, fill in the blank, and short answer. The lowest exam grade will be dropped.

During the exam all cell phones must be turned off during exams. All bookbags, books, purses etc. must be placed in the front of the classroom; 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 and hoods cannot be worn during exams. All hands must remain above the desk at all times during exams.

Review sheets with topics on which the students will be tested will be posted prior to the exam. These review sheets will contain a list of topics that the student is expected to understand; the review sheets do NOT contain the details that may appear on the exam. While the professor makes a reasonable effort to make these sheets all inclusive, it is entirely possible that a topic will be inadvertently left off that will show up on the exam.

No make-up exams will be given. A missed exam (for any reason) will be the exam dropped. Only students with a University related excuse may take an exam early. Exam grades will be returned in class ~7 days after exam date, but students will not be allowed to keep exams.

Final: The final will be cumulative and will be multiple choice. It is mandatory! The date of the final is Wednesday, December 7 (10:15 a.m. -12:15 p.m.). **NO EARLY EXAMS WILL BE GIVEN!**

LAB CONDUCT

- Arrive on time.
- Emailed assignments will not be accepted.
- It is strongly advised that students keep a laboratory notebook, which will help students complete assignments and study for lab practicals.
- No eating or drinking during the lab. There are **NO** exceptions!
- Attendance is mandatory. Excused absences are usually given for medical emergencies and documentation must be provided; the professor determines whether or not an absence is "excused" or not. If a student misses three labs *for any reason* the student cannot earn higher than a D for his/her final grade. Labs cannot be made up outside of scheduled laboratory sessions. Students are still responsible for all lab content even if they received an excused absence.
- Students must take care of lab equipment. Notify the professor if something is not working properly or if something breaks during the course of the lab.
- Students will be assigned a microscope. It is the student's responsibility to properly use the microscope. After lab the professor will check each scope to make sure that it was put away properly. Failure to do so will result in one (1) point being subtracted from the student's total lab points (not the final percentage) each week it is not put away properly. Notify the professor if your microscope is not functioning properly.
- Cell phones are not allowed to be used in lab with the exception of using them as timers.

Lab assignments

Throughout the semester students will complete assignments that deal with either data analysis or comprehension of topics covered in the lab. No late assignments and no emailed assignments will be accepted.

Lab Practicals

Two lab practicals will be given, one covering animals and one covering plants. Anything that the student had to examine or study in the lab is fair game for a lab practical. The lab practicals will be timed. More information will follow.

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

To Calculate your Final Grade:

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 600 points):

- 3 lecture exams (each worth 100 points; total 300 points)
- 10 quizzes (each worth 5 points; total 50 points)
- Cumulative final (worth 200 points)

Lab component:

- Lab assignments (variable points)
- 2 lab practicals (each worth 50 points; total 100 points)

To calculate your final grade:

- Lecture component: Add points earned from each of the exams, quizzes and final and divide by 550. 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.

FALL 2011 TENTATIVE LECTURE SCHEDULE

August

- 16 Introduction to Phylogenies
- 18 Chapter 28: Seedless Plants
- 23 Seedless Plants (cont'd) and Chapter 29: Evolution of Seed Plants
- 25 Seed Plants (cont'd)
- 30 Chapter 34: The Plant Body

September

- 1 The Plant Body (cont'd)
- 6 Chapter 35: Transport in Plants
- 8 Catch-up and Review
- 13 **EXAM 1**
- 15 Chapter 36: Plant Nutrition
- 20 Chapter 37: Regulation of Plant Growth
- 22 Chapter 38: Reproduction in Flowering Plants
- 27 Reproduction (cont'd)
- 29 Chapter 39: Plant Responses to Environmental Challenges

October

- 4 Catch-up and Review
- 6 **EXAM 2**
- 11 Chapter 40: Homeostasis in Animals and the Role of Physiological Systems
- 13 Chapter 41: Animal Hormones
- 18 Chapter 43: Animal Reproduction
- 20 Chapter 45: Neurons and the Nervous System
- 25 *NO CLASS FALL BREAK*
- 27 Chapter 47: Mammalian Nervous System

November

- 1 Chapter 46: Sensory Systems
- 3 **Exam 3**
- 8 Chapter 48: Muscles
- 10 Chapter 49: Gas Exchange
- 15 Chapter 50: Circulatory System
- 17 Circulatory System (cont'd)
- 22 Chapter 51: Nutrition and Digestion
- 24 *NO CLASS THANKSGIVING BREAK*
- 29 Chapter 52: Salt and Water Balance

December

- 1 **Exam 4**

FALL 2011 TENTATIVE LAB SCHEDULE

August

- 15/16 *NO LAB*
- 22/23 How to use Excel to Analyze Basic Biological Data
- 29/30 Non-Vascular, Seedless Plants

September

- 5/6 *NO LAB*
- 12/13 Vascular Plants
- 19/20 Roots, Stems and Leaves
- 26/27 Angiosperm Development

October

- 3/4 Growth and Transpiration
Pollution
- 10/11 **Lab Practical**
- 17/18 Diversity: Porifera and Cnidaria
Animal Tissues
- 24/25 *NO LAB*

November

- 31/1 Diversity: Platyhelminthes
Vertebrate Anatomy
- 7/8 Diversity: Annelida and Mollusca
Sensory Systems
- 14/15 Diversity: Nematoda and Arthropoda
Cardiovascular System
- 21/22 Diversity of Echinodermata and Chordata
Excretory System
- 28/29 **Lab Practical**

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

SPECIALIZED EUKARYOTIC CELLS AND TISSUES

A. Nerve Cell/Neural

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
 - a. transmitter molecules
 - b. synaptic knobs
 - c. fatigue
 - d. propagation between cells without resistance loss
8. Resting potential (electrochemical gradient)
9. Action potential
 - a. threshold, all-or-none
 - b. sodium-potassium pump
10. Excitatory and inhibitory nerve fibers (summation, frequency of firing)

B. Muscle Cell/Contractile

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

C. Other Specialized Cell Types

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)

NERVOUS AND ENDOCRINE SYSTEMS

A. Endocrine System: Hormones

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

B. Endocrine System: Mechanisms of Hormone Action

1. Cellular mechanisms of hormone action
2. Transport of hormones (bloodstream)
3. Specificity of hormones (target tissue)
4. Integration with nervous system (feedback control)

C. Nervous System: Structure and Function

1. Major functions
 - 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
 - a. feedback loop, reflex arc, effects on flexor and extensor muscles
 - b. roles of spinal cord, brain
 - c. efferent control

D. Nervous System: Sensory Reception and Processing

1. Skin, proprioceptive and somatic sensors
2. Olfaction, taste
3. Hearing
 - a. ear structure
 - b. mechanism of hearing
4. Vision
 - a. light receptors
 - b. eye structure
 - c. visual image processing

CIRCULATORY, LYMPHATIC, IMMUNE SYSTEMS

A. Circulatory System

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)
 - a. structural and functional differences
 - b. pressure and flow characteristics
7. Capillary beds
 - a. mechanisms of gas and solute exchange
 - b. mechanism of heat exchange
8. Composition of blood
 - a. plasma, chemicals, blood cells
 - b. erythrocyte production and destruction (spleen, bone marrow)

- 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
 - a. hemoglobin, hematocrit
 - b. oxygen content
 - c. oxygen affinity
 10. Details of oxygen transport: biochemical characteristics of hemoglobin
 - a. modification of oxygen affinity

B. Lymphatic System

1. Major functions
 - 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)

C. Immune System: Innate and Adaptive Systems

1. Cells and their basic functions
 - a. macrophages, neutrophils, mast cells, natural killer cells, dendritic cells
 - b. T lymphocytes
 - c. B lymphocytes, plasma cells
2. Tissues
 - 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

DIGESTIVE AND EXCRETORY SYSTEMS

A. Digestive System

1. Ingestion
 - a. saliva as lubrication and source of enzymes
 - b. epiglottal action
 - c. pharynx (function in swallowing)
 - d. esophagus (transport function)
2. Stomach
 - 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
 - a. production of bile
 - b. roles in nutrient metabolism, vitamin storage
 - c. roles in blood glucose regulation, detoxification
 - d. structure (gross)
4. Bile
 - a. storage in gallbladder
 - b. function
5. Pancreas
 - a. production of enzymes, bicarbonate
 - b. transport of enzymes to small intestine
 - c. structure (gross)
6. Small intestine
 - 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
 - a. absorption of water
 - b. bacterial flora
 - c. structure (gross)
8. Rectum (storage and elimination of waste, feces)
9. Muscular control
 - a. sphincter muscle
 - b. peristalsis

B. Excretory System

1. Roles in homeostasis
 - a. blood pressure
 - b. osmoregulation
 - c. acid-base balance
 - d. removal of soluble nitrogenous waste
2. Kidney structure
 - a. cortex
 - b. medulla
3. Nephron structure
 - a. glomerulus
 - b. Bowman's capsule
 - c. proximal tubule
 - d. loop of Henle
 - e. distal tubule
 - f. collecting duct

4. Formation of urine
 - 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)

MUSCLE AND SKELETAL SYSTEMS

A. Muscle System

1. Functions
 - 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
 - a. motor neurons
 - b. neuromuscular junctions, motor end plates
 - c. voluntary and involuntary muscles
 - d. sympathetic and parasympathetic innervation

B. Skeletal System

1. Functions
 - a. structural rigidity and support
 - b. calcium storage
 - c. physical protection
2. Skeletal structure
 - a. specialization of bone types; structures
 - b. joint structures
 - c. endoskeleton versus exoskeleton
3. Cartilage (structure, function)
4. Ligaments, tendons
5. Bone structure
 - a. calcium-protein matrix
 - b. bone growth (osteoblasts, osteoclasts)

RESPIRATORY SYSTEM

A. Respiratory System

1. General structure and function
 - a. gas exchange, thermoregulation
 - b. protection against disease, particulate matter
2. Breathing mechanisms
 - a. diaphragm, rib cage, differential pressure
 - b. resiliency and surface tension effects

SKIN SYSTEM

A. Skin System

1. Functions in homeostasis and osmoregulation
2. Functions in thermoregulation
 - 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
 - a. nails, calluses, hair
 - b. protection against abrasion, disease organisms
4. Structure
 - a. layer differentiation, cell types, tissue types (epithelial, connective)
 - b. relative impermeability to water

REPRODUCTIVE SYSTEM AND DEVELOPMENT

A. Reproductive System

1. Male and female reproductive structures and their functions
 - a. gonads
 - b. genitalia
 - c. differences between male and female structures
2. Gametogenesis by meiosis
3. Ovum and sperm
 - a. differences in formation
 - b. differences in morphology
 - c. relative contribution to next generation
4. Reproductive sequence (fertilization, implantation, development, birth)

B. Embryogenesis

1. Stages of early development (order and general features of each)
 - a. fertilization
 - b. cleavage
 - c. blastula formation
 - d. gastrulation
- ii. formation of primary germ layers (endoderm, mesoderm, ectoderm)
 - a. neurulation
2. Major structures arising out of primary germ layers

C. Developmental Mechanisms

1. Cell specialization
 - a. determination
 - b. differentiation
 - c. tissue types
2. Cell communication in development
3. Gene regulation in development
4. Programmed cell death