



Course Syllabus

BIOL 1409 - Biology for Non-Science Majors II

Catalog Description: A study of selected topics of biological sciences including all systems of the human body, disease, evolution, ecology and man in relation to his environment. Recommended for non-science majors (Lab fee) (2601015103) Lecture hours = 3, Lab hours = 1

Prerequisites: None

Semester Credit Hours: 4

Lecture Hours per Week: 3 **Lab Hours per Week:** 3

Contact Hours per Semester: 96

State Approval Code: 2601015103

Course Subject/Catalog Number: BIOL 1409

Course Title: Biology for Non-Science Majors II

Course Curriculum: State Criteria (those marked with an X reflect the state-mandated competencies taught in this course) (*double-click on the box and choose 'checked' or 'not-checked'*)

Basic Intellectual Competencies in the Core Curriculum

- Reading
- Writing
- Speaking
- Listening
- Critical thinking
- Computer literacy

Perspectives in the Core Curriculum

- Establish broad and multiple perspectives on the individual in relationship to the larger society and world in which he/she lives, and to understand the responsibilities of living in a culturally and ethnically diversified world.
- Stimulate a capacity to discuss and reflect upon individual, political, economic, and social aspects of life in order to understand ways in which to be a responsible member of society.
- Recognize the importance of maintaining health and wellness.
- Develop a capacity to use knowledge of how technology and science affect their lives.
- Develop personal values for ethical behavior.
- Develop the ability to make aesthetic judgments.
- Use logical reasoning in problem solving.
- Integrate knowledge and understand the interrelationships of the scholarly disciplines.

Mathematics

The objective of the mathematics component of the core curriculum is to develop a quantitatively literate college graduate. Every college graduate should be able to apply basic mathematical tools in the solution of real-world problems.

- To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
- To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
- To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
- To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
- To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
- To recognize the limitations of mathematical and statistical models.
- To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.

Natural Sciences

The objective of the study of a natural sciences component of a core curriculum is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the bases for building and testing theories.

- To understand and apply method and appropriate technology to the study of natural sciences.
- To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
- To identify and recognize the differences among competing scientific theories.
- To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
- To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.

Instructional Goals and Purposes: To provide instruction in an atmosphere of mutual respect where students may develop their intellect and skills. To contribute to the development of students as responsible and informed members of society. To provide courses for students wishing to complete certificate programs, associate degree programs or wishing to transfer to a baccalaureate program

General Course Objectives:

1. To help students become better informed citizens by providing opportunities to learn the differences between science as a way of knowing and other disciplines such as art, philosophy and religion
2. To provide students an opportunity to understand and appreciate the complexity and relationships of living systems.
3. To help students become better informed regarding their own health and better informed as health services consumers by coming to a better understanding of the complexities of the human body
4. To make students aware of changing technologies in science and the responsibilities and ethical decisions that come with the use of various technologies.
5. To help students become better informed regarding environmental issues.

Specific Course Objectives:

Unit 1: Animal Organization and Homeostasis; Transport Systems

Organization and Homeostasis

1. define tissue; identify the four major types of tissues by structure and function
2. identify and describe major components and functions of the various types of connective tissues
3. identify the functions of blood and lymph
4. describe the structure and function of the three types of vertebrate muscles
5. describe the structure and function of neurons and neuroglial cells
6. compare organ and organ system
7. describe the function of the skin; identify the different structural components that comprise the skin and indicate specific functions
8. identify the major organ systems and indicate general functions
9. identify major body cavities and indicate various organs located within each
10. define homeostasis; compare positive and negative feedback
11. describe how body temperature is under homeostatic control

Transport Systems

1. identify the functions of blood and lymph
2. identify why simple invertebrates lack a circulatory system
3. compare open and closed circulatory systems
4. describe the structural components involved in the vertebrate closed circulatory system
5. compare the three different circulatory pathways in vertebrates
6. describe the flow of blood through the heart
7. identify the function of valves within the heart
8. compare systole and diastole
9. relate the main components of an electrocardiogram to the cardiac cycle
10. identify the function of the SA and AV nodes
11. distinguish between the pulmonary and systemic circuits; identify the importance of a portal system
12. define blood pressure; identify how blood is moved through arteries and veins
13. identify different preventative measures to prevent cardiovascular disease
14. identify the function of different formed elements within the blood
15. identify steps in the blood clotting process
16. describe how exchanges occur between the blood and tissue fluid
17. identify the four ABO blood types; indicate the antigens on the red blood cells and the antibodies in the plasma
18. identify the main structural components of the lymphatic system
19. describe the importance of the various lymphatic organs

Unit 2: Digestion, Respiration, Urination, Excretion, Nutrition

Digestion, Respiration, Urination, Excretion

1. compare the digestive tracts of invertebrates
2. identify structures of the human digestive tract and describe how each functions
3. identify the source of major digestive enzymes and indicate their specific function
4. identify the importance of the epiglottis and peristalsis
5. relate bile to the liver and gallbladder; identify the function of bile
6. identify the various functions of the pancreas and liver
7. define respiration; describe the major steps of respiration
8. describe mechanisms of gas exchange between aquatic and terrestrial organisms
9. identify the major structures composing the human respiratory system; identify functions of each structure
10. compare the activity of the diaphragm, lungs and rib cage during inhalation and exhalation
11. describe mechanisms involved in transporting oxygen and carbon dioxide
12. relate the effects of temperature and pH on hemoglobin saturation
13. identify different environmental and microbial linked respiratory disorders
14. contrast the osmotic regulation of a marine bony fish with that of a freshwater fish

15. describe how terrestrial animals regulate salt and water balance
16. identify three major nitrogenous waste products
17. identify the structures in the human excretory system and identify the function of each
18. describe the formation of urine in the human body
19. identify the structural components of the nephron
20. describe how blood pH levels are maintained within a narrow homeostatic range

Nutrition

1. identify the role of carbohydrates, lipids, proteins, vitamins and minerals in proper nutrition
2. define vitamin; identify the importance of some of the major vitamins required by the body
3. identify the importance of minerals to the human body
4. recognize the characteristics and problems associated with obesity
5. recognize the characteristics of selected eating disorders
6. list the components of the food pyramid
7. recognize the benefits and potential side effects of various dietary supplements

Unit 3: The Immune System, Nervous System, Endocrine System, Sensory Input and Motor Output

The Immune System

1. describe the importance of the various lymphatic organs
2. discuss nonspecific body defenses; discuss major events associated with an inflammatory reaction
3. identify the role of phagocytes, interferon and complement in body defense
4. compare antigen and antibodies; relate the role of lymphocytes to specific immunity
5. describe the characteristics of B and T cells
6. identify the function of the various types of T cells
7. describe how HIV is transmitted; identify preventative measures and treatment options
8. compare active and passive immunity
9. describe the production and application of monoclonal antibodies
10. discuss various immune system problems
11. identify why the Rh factor is important in pregnancy (supplemental)

The Control Systems (Nervous and Endocrine Systems)

1. identify the structural components of a neuron; distinguish between different types of neurons
2. identify the primary events associated with an action potential
3. describe the function of a neurotransmitter
4. recognize the levels of increasing complexity in representative nervous systems
5. contrast the structure and function between the central nervous system and the peripheral nervous system
6. identify the main components of a reflex arc
7. compare the structure and function of the two divisions of the autonomic nervous system
8. compare and contrast the structure and function of the two divisions of the autonomic nervous system
9. identify and provide a function for the major components of the brain
10. identify the consequences on the nervous systems of different types of abusive drugs
11. define hormone
12. compare the mechanism of action of steroid hormones to nonsteroid hormones
13. describe how hormones are controlled
14. identify the principal endocrine glands, the primary hormone(s) that they produce and the principal function of the hormone(s)
15. indicate several diseases that are related to hormonal imbalances
16. identify the relationship between the hypothalamus and the pituitary gland

Sensory Input and Motor Output

1. distinguish chemoreceptors, photoreceptors and mechanoreceptors
2. identify the four basic types of taste and indicate regions of the tongue where these tastes are registered
3. describe how the senses of taste and smell supplement each other
4. identify the major anatomical parts of the eye; indicate the function of each

5. briefly describe the mechanisms relating to the focusing of the human eye
6. compare the structure and function of rods and cones
7. identify preventative mechanisms to deter vision and hearing loss
8. identify the main anatomical parts of the ear; indicate the structures associated with each part
9. describe how sound is transmitted through the human ear
10. compare rotational and gravitational equilibrium; identify the importance of the semicircular canals, saccule and utricle in balance
11. compare exoskeleton and endoskeleton; identify advantages of a jointed endoskeleton
12. describe how a hydrostatic skeleton works
13. describe the functions and physical properties of bone; compare compact and spongy bone
14. describe how bone is created and absorbed
15. identify the main components of the axial and appendicular skeletons; identify major bones of each skeleton
16. identify three major classifications of joints
17. define osteoporosis; identify people that are at risk and list several preventative measures
18. describe what is meant by antagonistic pairs of muscles; describe how these work to move bones
19. identify the primary microscopic structural components of a muscle and include functions
20. identify the role of actin, myosin, calcium ions and ATP in muscle contractions
21. describe the sliding filament theory during muscular contraction
22. define neuromuscular junction; identify the structure and function of this junction

Unit 4: Reproduction and Development, Genetic Counseling

Reproduction and Development

1. differentiate between asexual and sexual reproduction
2. compare different reproductive strategies exhibited by simple invertebrates
3. identify the reproductive structures of the human male and female and describe functions of each
4. describe how sperm are produced; identify the main structural components of the sperm
5. discuss hormonal regulation in males and females
6. describe the main events that occur in the ovarian and uterine cycle of the female
7. identify common birth control methods
8. discuss symptoms, prevention and consequences of various sexually transmitted diseases
9. compare the early developmental stages of chordate embryos
10. identify the three embryonic germ layers and identify adult vertebrate structures that are derived from each layer
11. relate the amount of yolk in eggs to the site of egg development
12. identify the function of the four extraembryonic membranes
13. identify the function of the placenta
14. identify three stages of parturition

Genetic Counseling

1. describe the relationship between amniocentesis and karyotyping
2. list the two reasons that chorionic villi sampling allows a karyotype to be determined earlier than amniocentesis
3. explain why karyotypes are created from chromosomes at metaphase of mitosis
4. recognize the difference(s) between a duplication chromosome and a deletion chromosome
5. recognize the difference between a translocation chromosome with an inversion chromosome
6. explain what a genetic counselor can learn from a pedigree
7. explain what is meant by “chance has no memory” in pedigree analysis
8. explain why more males than females express X-linked recessive disorders
9. describe the inheritance pattern of a Y-linked trait
10. compare and contrast the physiological bases of Tay-Sachs disease and phenylketonuria
11. explain why sickle-shaped red blood cells result in a wide array of symptoms in individuals with sickle cell disease.
12. contrast the use of genetic markers versus DNA probes for the detection of genetic disorders
13. explain what an ultrasound image can reveal to a doctor
14. list the three ways a doctor can collect fetal cells for genetic testing

15. explain how an embryo can be tested for a genetic disorder
16. explain how egg cells can be tested for a genetic disorder
17. describe the goals of genomics research
18. describe the benefits of knowing your genetic profile
19. compare the fields of proteomics and bioinformatics
20. explain why bone marrow stem cells are preferred for ex vivo gene therapy
21. explain how ex vivo gene therapy is used to treat cancer
22. explain how in vivo gene therapy is used to treat cystic fibrosis

Unit 5: Populations, Ecology and Human Impact on the Biosphere

Ecology of populations

1. define *species* and *population*
2. recognize the components of growth rate
3. define carrying capacity
4. contrast *MDC's* and *LDC's*
5. describe or recognize why rapid population growth begin to decline
6. recognize the calculation of environmental impact (EI)
7. define *resources*
8. describe 3 types of spatial distribution in a population
9. define *range*
10. define *population density* and list major factors that influence it
11. recognize the relationship between survivorship and population size
12. list the 4 demographic characteristics of a population
13. contrast exponential growth with logistic growth
14. contrast density-independent factors with density-dependent factors
15. define *competition* and *predation*
16. explain why competition and predation are considered density-dependent factors regulating population growth
17. contrast opportunistic populations with equilibrium populations
18. list five factors that can determine whether an equilibrium population is in danger of extinction
19. recognize the levels of biological organization which are of interest to ecologists
20. recognize how conservation biology is similar to environmental science

Communities and Ecosystems

1. define *species* and *population*
2. contrast a *community* with an *ecosystem*
3. describe what is meant by *coevolution*
4. contrast *species richness* with *diversity*
5. briefly explain *ecological succession* and the *climax-pattern model of succession*
6. contrast *primary succession* with *secondary succession*; include examples of each
7. recognize the difference between *habitat* and *ecological niche*
8. identify the expected outcomes of selected types of species interaction (*competition, predation, and symbiosis such as parasitism, commensalism, mutualism*)
9. give examples of selected types of species interaction
10. give an example of *competitive exclusion principle* and *niche specialization*
11. explain the significance of *keystone species*
12. contrast *native species* with *exotic species (introduced species)* and give examples of each from Kingdom Plantae and Kingdom Animalia.
13. describe some of the human, ecological and/or economic impacts of non-native species
14. contrast *autotrophs* and *heterotrophs* give examples of each
15. contrast *herbivores* with *carnivores*
16. explain the relationships between *producers, consumers* and *decomposers*
17. contrast the first organisms in the grazing food web with those in the detrital food web
18. contrast a *food chain* with an *ecological pyramid*

19. recognize the significance of biomass in the consideration of ecological pyramids
20. define *biogeochemical cycles*
21. describe how phosphate enters the phosphorus cycle
22. describe the significance of nitrogen fixation and nitrification to the nitrogen cycle
23. describe the relationship between the greenhouse effect and global warming.
24. define *biosphere*
25. describe the two major types of ecosystems of the biosphere
26. list the terrestrial eco systems of the world
27. explain why swamps have higher levels of primary productivity than open oceans.

Human Impact on the Biosphere

1. distinguish between *renewable* and *nonrenewable resources*
2. define pollution
3. describe or recognize two problems related to human habitation near oceans.
4. describe or recognize how humans might contribute to desertification and deforestation. Include a mention of the connection between deforestation and desertification.
5. list two problems associated with too many humans living in rain forests.
6. list or recognize the purposes for which dams are built and the problems associated with dams.
7. list or recognize some water-conservation methods.
8. describe two consequences of groundwater depletion
9. list the pros and cons of modern agricultural practices
10. recognize ways in which farmland is being degraded worldwide and how some of this degradation affects other environments such as lakes and streams..
11. describe the two green revolutions.
12. list two reasons why nuclear power is not a major fuel source
13. describe the effects of global warming (climate change)
14. list four types of renewable energy
15. explain why synthetic organic compounds are harmful
16. define *biodiversity*
17. list the direct values of biodiversity

LAB OBJECTIVES

The laboratory activities in BIOL 1409 are intended to provide students an opportunity to survey major mammalian organ systems, physiology and ecological principles through lecture, reading, and hands-on activities. The student will

Topic #1 – Microscopy Review

1. Note differences between optical and non-optical microscopes
2. Identify and give the functions of the basic parts of the compound light microscope
3. List and properly apply the steps used for bringing an object into focus with the compound microscope
4. Note image inversion and depth of field, using prepared slides of the letter e and colored threads
5. Calculate the total magnification of a given lens combination, using ocular and objective magnification

Topic #2 – The Tissue Level of Animal Organization

1. Identify four, general, types of tissues in animals and give a, general, function for each type.
2. Identify various types of epithelium, using slides, figures, and models

3. Identify general locations of epithelium in the human body
4. Identify three types of muscle tissue, using slides, figures, and models
5. Identify general location of muscle tissue in the human body
6. Identify a neuron, using slides, figures, and models
7. Identify general locations of muscle tissue in the human body
8. Identify various types of connective tissue, using slides, figures, and models

Topic #3 – The Cardiovascular System

1. Locate and identify the chambers of the heart and their attached blood vessels
2. Name and locate the valves of the heart
3. Trace the path of blood through the heart
4. Identify the major components of a sheep heart and relate them to their human counterparts
5. Locate and identify the pulmonary blood vessels, and trace the path of blood from the heart to the lungs and from the lungs to the heart
6. Locate and/or Identify the major blood vessels responsible for human extremities (arms, legs, and head)
7. Locate and/or Identify the major blood vessels responsible for key human organs
8. Confirm and measure heart rate by taking a pulse reading
9. Correlate increased heart rate with exercise and increased blood pressure with increased heart rate

Topic #4 – Digestion

1. Explain the function of a control in an experiment
2. Identify the major products of protein digestion
3. Describe the effect of environmental changes on protein digestion
4. Identify the major products of lipid (fat) digestion
5. Describe the importance of emulsification as it pertains to lipid digestion
6. Identify the major products of starch digestion
7. Describe the effect of temperature on enzymes

Topic #5 – The Nervous System

1. Identify the major regions and structures of the brain, using models, figures, and dissections
2. Compare the brains of various vertebrates in terms of the forebrain, midbrain, and hindbrain
3. Describe the anatomy and physiology of the human spinal cord and spinal nerves
4. Identify several major nerves in the human body, using models, figures, and posters
5. Describe the operation of a reflex as an automatic response to a stimulus
6. Test for, basic, human reflexes
7. Compare and/or contrast the eyes of various invertebrates to human eyes
8. Locate and/or Identify the major parts of the human eye and identify their, major, function
9. Explain, major, physiological aspects of human vision
10. Compare and/or contrast the auditory receptors of various animals to human ears

11. Locate and/or Identify the major parts of the human ear and identify their, major, function
12. Explain, major, physiological aspects of human auditory recognition
13. Describe the anatomy of skin using models, slides, and figures
14. Explain, major, physiological aspects of human sensory reception
15. Compare and/or contrast chemoreception in humans to that in flies

Topic #6 – Comparative Gross Anatomy: Fetal Pig Dissection

1. Identify the, major, external anatomy of the fetal pig and compare it to the external anatomy of a human
2. Explain the importance of non-human, research, specimens
3. Use external anatomy to determine the sex of a fetal pig
4. Identify the major structures of the fetal pig oral cavity and pharynx; make comparisons to human anatomy (where appropriate).
5. Identify the function of the glottis, nasopharynx, and esophagus
6. Identify the two, major, pathways that pass the pharynx
7. Identify the, major, internal anatomy of the fetal pig and compare it to the internal anatomy of a human
8. Identify the major structures and regions of the mammalian kidney, using models and dissection specimens
9. Compare and/or contrast reproductive, urinary, respiratory, digestive, and cardiovascular anatomy of humans and fetal pigs
10. Identify the microanatomy of the Testis and ovary
11. Identify the major phases of the ovarian and uterine cycle, using slides, figures, and models

Topic #7 – Genetic Counseling

1. Determine whether a pedigree represents a pattern of autosomal dominant, autosomal recessive, or X-linked recessive inheritance
2. Identify the type of testing is available for select genetic disorders and what options are available to prospective parents that have a genetic disorder
3. Relate abnormal DNA base sequences to genetic disorders

Topic #8 – Ecosystems

1. Identify various levels of an ecological pyramid (food chain)
2. Predict the effect of acid deposition on the growth of organisms
3. Predict the effect of oxygen deprivation on organisms
4. Predict the effect of thermal pollution on organisms
5. Predict the effect of cultural eutrophication on food chains
6. Describe the balance of predators and prey in a stable ecosystem

Course Content:

Course content will be taken from the adopted text and lab manual, scientific journals, current popular periodicals, appropriate online sources and pertinent reference literature.

Methods of Instruction/Course Format/Delivery: Instruction for this course will include formal instructor lectures, question/answer sessions, small group discussions, videos and interactive software.

Assessment:

Lecture assessment may include face-to-face and online testing including multiple choice, fill-in-the-blank, short answer and short essay questions as well as short reports. Lab assessment may include observations of student work, written and/or oral quizzes, graded exercises and/or reports.

Course Grade:

50% from average of Unit Exams (5 or 6 exams)

20% from the Final Exam (comprehensive over all but the last unit)

30% from the Laboratory Average (50% from quizzes, 50% from written or observed activities)

Texts, Materials, and Supplies:

Text: Essentials of Biology; Sylvia S. Mader; 2007 McGraw-Hill Companies

Lab: Essentials of Biology Laboratory; Sylvia S. Mader; 2007 McGraw-Hill Companies

Other:

- For current texts and materials, use the following link to access bookstore listings: <http://www.panola.edu/collegestore.htm>
- For testing services, use the following link: <http://www.panola.edu/instruction/dl/testing.htm>