I. INTRODUCTION

A. Fundamental biological concepts relevant to animals, including systematics, evolution, structure and function, cellular and molecular metabolism, reproduction, development, diversity, phylogeny, and ecology. (This course is intended for science majors.)

B. This course can be used to meet the core requirements for AA/AS degrees and transfers to other Texas public colleges and universities for BA/BS degrees. This course also satisfies the science requirements in most curricula and may serve as preparation for careers in science.

C. In support of the objectives of the Texas core curriculum, the course provides significant exercise of a student’s critical thinking skills, communication skills, teamwork, and empirical and quantitative skills. These objectives form a foundation of intellectual and practical skills that are essential for all learning.
   * Critical thinking skills include creative thinking; innovation inquiry; analysis, evaluation, and synthesis of information.
   * Communication skills include effective development, interpretation, and expression of ideas through written, oral, and visual means.
   * Teamwork includes the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.
   * Empirical and quantitative skills include the ability to manipulate and analyze numerical data or observable facts to reach informed conclusions.

D. Prerequisite: Successful completion of College Algebra or concurrent enrollment in higher level mathematics is recommended.

II. LEARNING OUTCOMES

Upon successful completion of this course the student will be able to:

A. Apply scientific reasoning to investigate questions and utilize scientific tools such as microscopes and laboratory equipment to collect and analyze data.

B. Use critical thinking and scientific problem-solving to make informed decisions in the laboratory.
C. Communicate effectively the results of scientific investigations.
D. Compare and contrast the structures, reproduction, and characteristics of animals.
E. Describe the characteristics of life and the basic properties of substances needed for life.
F. Identify the principles of inheritance and solve classical genetic problems.
G. Describe phylogenetic relationships and classification schemes.
H. Identify the major phyla of life with an emphasis on animals, including the basis for classification, structural and physiological adaptations, evolutionary history, and ecological significance.
I. Identify the chemical structures, synthesis, and regulation of nucleic acids and proteins.
J. Identify the substrates, products, and important chemical pathways in respiration.
K. Describe the unity and diversity of animals and the evidence for evolution through natural selection.
L. Describe the reasoning processes applied to scientific investigations and thinking.
M. Describe basic animal physiology and homeostasis as maintained by organ systems.
N. Describe modern evolutionary synthesis, natural selection, population genetics, micro and macroevolution, and speciation.
O. Describe the structure of cell membranes and the movement of molecules across a membrane.

III. INSTRUCTIONAL MATERIALS

B. Online access via https://legacy.cnx.org/content/col11672/1.1

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<tr>
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<th>General Zoology Vol I</th>
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C. Required Lab Manual: As noted in CTC Instructional Materials website, 
http://www.ctcd.edu/academics/booksinstructional-materials/

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<thead>
<tr>
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<tbody>
<tr>
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D. Required Materials:
- Scantrons (type: Advantage #28040), available at CTC Bookstore: one for each lecture exam and lab quiz
- Protective eyewear for dissections
- Supplement to the lab manual – see below.


IV. COURSE REQUIREMENTS

A. Class Participation: Students are expected to attend lecture and lab during their scheduled time. Leaving class early will be counted as an absence. See section VII below for information on consequences of insufficient attendance.

B. Laboratory Activities: Participation in lab involves exercises that may or may not be in the lab manual. You must print out or buy the supplement to the lab manual – available at CTC bookstore. Bring these to lab every day.

V. ASSESSMENTS

A. Lecture Exams:
There will be 5 lecture exams during your scheduled lecture time. These exams consist of multiple-choice, matching, and true/false.
- Exams cover lecture material and related readings from assigned chapters. Therefore, when studying, be sure to read the chapters, review your lecture notes and do the chapter quizzes posted on BlackBoard.
- The only materials allowed to be used are a scantron and pencil. The exam must be completed within one hour and 20 minutes.
- If you miss the lecture exam, you have 2 days to make it up. Contact instructor to make arrangements for makeup as soon as possible. Regardless of excuse, 10% will be deducted if the make-up is taken within the first 24 hours, 20% if taken within the second 24 hours. The lowest of 5 lecture exam grades will be dropped.
B. **Lab Quizzes:**
There will be 6 lab quizzes during your scheduled lab time. Each lab quiz will occur during the first half of the lab time.
- Lab quizzes consist of material covered in lab. It is important to: complete exercises, answer assigned questions, then check answers to those questions. Additional resources to help you study for lab quizzes are posted on BlackBoard.
- There are *no* make-up lab quizzes, but your lowest lab quiz grade will be dropped.

C. **Participation:** Your instructor will evaluate your attendance, participation and civility in lecture and lab throughout the semester. See section VII below for an explanation of civility.

VI. **SEMESTER GRADE COMPUTATIONS**

A. Your best 4 lecture exams are worth 125 points each. Your best 5 lab quizzes are worth 100 points each. Your course grade is based on a total of 1000 points:

   A: 900-1,000  B: 800-899  C: 700-799  D: 600-699  F: 000-599

VII. **NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR**

A. **Course Withdrawal:** It is the student’s responsibility to officially withdraw from a course if circumstances prevent attendance. To do so, complete and sign the Central Texas College Application for Withdrawal (CTC Form 59) any time prior to Friday the 12th week of classes during the 16-week fall and spring semesters. The deadline for withdrawal is published each semester in the Schedule Bulletin. A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F” or “FN” for nonattendance.

B. **Administrative Withdrawal:** An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. An instructor may withdraw a student from a course if the student has more than 4 absences. For example, I may withdraw you from this course if you miss 2 lectures and 2 labs. Such insufficient attendance may result in a grade of “FN” if the deadline for withdrawal has passed.

C. **Incomplete Grade:** If a student has made satisfactory progress in a course with the exception of a major quiz, final exam, or other project, the instructor may – after reviewing documentation showing the reason for missed work – grant a temporary grade of incomplete, “IP”. See current college catalog for more information.

D. **American’s With Disabilities Act (ADA):** Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at
www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

E. **Civility:** Individuals are expected to be cognizant of what a constructive educational experience is and be respectful of those participating in a learning environment. Examples of uncivil conduct in class include, but are not limited to: eating or drinking; talking; using inappropriate language; use of electronic media for communication or entertainment; tardiness, leaving class early. Note that all of these activities distract other students and disrupt their learning experience. The offending student may or may not be given a warning before a CTC Counseling and Disciplinary Referral Form is filed and may receive disciplinary action up to and including expulsion. See Student Handbook for more information.

F. **Cheating:** You may not leave the room until your exam is turned in. Use of books, notes, electronics, etc. is prohibited. A formal charge against the student may be made to the College Disciplinary Board.

G. **Signature Forms:** Each student must sign and hand in the signature of policies form and the release form by the second week of class. A copy of it can be found on BlackBoard (Syllabus folder).

H. **Instructor Discretion:** The instructor reserves the right of final decision in course requirements.

I. **Courtesy:** Students are expected to discuss any course-related issue or problem with their instructor first. If the problem has not been resolved at that level, students may contact the Head of the Science Department.

**VIII. COURSE OUTLINE**

A. **TOPIC: SCIENCE AND BIOLOGY**

1. **Learning Outcomes:**
   a) Define science, biology, and zoology.
   b) Describe the scientific method.
   c) Distinguish between hypothesis and theory.
   d) In the hierarchy of organization of the natural world, organize the biological levels from smallest to largest.
   e) Identify characteristics of life.
   f) Describe the 2 basic kinds of cells and give examples of organisms that have them.
   g) State the Cell Theory.
   h) Identify the basic components of a eukaryotic cell.
   i) Describe the basic composition and function of the plasma membrane.
   j) Describe the movement of substances across the plasma membrane - diffusion, osmosis, active transport and endocytosis.
k) Summarize the process of cell respiration, including reactants and products.

2. Learning Materials: textbook chapters 1, 4, 5, 6; lab manual chapter 2
3. Learning Assessment: Exam 1

B. TOPIC: EVOLUTION

1. Learning Outcomes:
   a) Summarize pre-Darwinian theories of evolution.
   b) Describe Darwin’s development of his theory of evolution.
   c) Understand the main concepts of Darwin’s theory of evolution: common descent, adaptation, natural selection, relative fitness.
   d) Recognize sources of evidence for evolution.
   e) Describe neo-Darwinism.
   f) Address some common misconceptions about evolution.
   g) Distinguish between macroevolution and microevolution.
   h) Identify agents of microevolution: genetic drift, gene flow, mutation, and natural selection.
   i) Define sexual selection and distinguish between intersexual and intrasexual selection.
   j) Describe the process of speciation and identify reproductive barriers.
   k) Characterize adaptive radiation and provide examples.
   l) Contrast sympatric and allopatric speciation.
   m) Contrast the theories of gradualism and punctuated equilibrium.

2. Learning Materials: textbook chapters 15, 16
3. Learning Assessment: Exam 1

C. TOPIC: CLASSIFICATION

1. Learning Outcomes:
   a) Describe the Linnean classification system.
   b) Recognize and write a scientific name.
   c) Describe the scope of systematics.
   d) Define convergent evolution, analogy, and homology.
   e) Describe what a cladogram shows.
   f) Recognize monophyletic, paraphyletic, and polyphyletic groups.

2. Learning Materials: textbook chapter 17
3. Learning Assessment: Exam 1

D. TOPIC: ANIMAL REPRODUCTION AND DEVELOPMENT

1. Learning Outcomes:
   a) Compare and contrast sexual and asexual reproduction. List advantages and disadvantages of each.
   b) Describe various modes of asexual reproduction.
c) Distinguish between monoecious and dioecious species.
d) Describe the cell cycle for a typical somatic cell: interphase, mitosis, cytokinesis.
e) Discuss the functions, processes, and products of mitosis and meiosis.
f) Describe the structure of DNA and its replication.
g) Predict phenotypic and genotypic ratios of offspring and genes of parents, by applying Mendel’s Laws and using Punnett Squares.
h) Compare and contrast the process and products of spermatogenesis and oogenesis.
i) Distinguish among oviparity, ovoviviparity, and viviparity.
j) Describe events following fertilization.
k) Identify differences between sperm and egg.
l) Describe the correlation between the amount of yolk and the type of development (direct vs. indirect).
m) Describe the correlation between amount of yolk and type of cleavage (holo- vs. mero-blastic).
n) Describe cleavage and the formation of the morula, blastula, and gastrula.
o) Identify organs that arise from the 3 germ layers.
p) Describe the amniotic egg (4 extraembryonic membranes).

2. Learning Materials: textbook chapters 9, 32, 19; lab manual chapter 3
3. Learning Assessment: Exam 2

E. TOPIC: PROTOZOA

1. Learning Outcomes:
   a) Describe Kingdom Protista.
   b) Describe the different kinds of symbiotic relationships some protozoa have.
   c) Explain how protozoans eat, digest their food, osmoregulate, reproduce, and exchange gases and wastes with their environment.
   d) Distinguish among the following protozoan groups: flagellates, sarcodines, sporozoans, and ciliates; and give examples of each.
   e) Describe the life cycle of Plasmodium.
   f) Summarize conjugation in ciliates.
   g) Describe the adaptive value of encystment seen in many protozoans.

2. Learning Materials: textbook chapter 18; lab manual chapter 4
3. Learning Assessment: Exam 2

F. TOPIC: THE ANIMAL KINGDOM

1. Learning Outcomes:
   a) Characterize members of Kingdom Animalia.
   b) Discuss the evolution and adaptive radiation of animals.
   c) Distinguish between: Parazoa and Eumetazoa; diploblastic and triploblastic; acoelomate and coelomate; protostome and deuterostome.
G. **TOPIC: PORIFERANS**

1. Learning Outcomes:
   a) Identify characteristics of phylum Porifera.
   b) Distinguish the 3 types of body forms in sponges.
   c) Describe the basic anatomy and cellular organization of sponges.
   d) Describe water flow through a sponge.
   e) Identify the distinguishing feature used in classifying sponges.
   f) Describe the physiology of sponges (e.g. feeding, respiration, waste elimination, reproduction, development).

2. Learning Materials: textbook chapters 19, 22
3. Learning Assessment: Exam 2

H **CHAPTER NINE: CNIDARIANS**

1. Learning Outcomes:
   a) Identify characteristics of phylum Cnidaria.
   b) Compare and contrast polyp and medusa, and describe alternation of generations.
   c) Distinguish among classes Hydrozoa, Scyphozoa, Cubozoa, and Anthozoa, and recognize examples of each.
   d) Contrast extracellular and intracellular digestion.
   e) Describe support and locomotion in cnidarians.
   f) Describe sensing, feeding, movement, and gas and waste exchange in cnidarians.
   g) Identify threats to coral reefs.

2. Learning Materials: textbook chapter 20.1; lab manual chapter 5
3. Learning Assessment: Exam 3

I. **CHAPTER TEN: PLATYHELMINTHES**

1. Learning Outcomes:
   a) Identify characteristics of phylum Platyhelminthes.
   b) Distinguish among classes Turbellaria, Monogenea, Trematoda, and Cestoda and recognize examples of each.
   c) Describe sensing, feeding and locomotion in turbellarians.
   d) Describe protonephridia of freshwater turbellarians.
   e) Identify adaptations of parasitic flatworms and describe their life cycles.
   f) Recognize ways in which one can get infected with the blood fluke, liver fluke or beef tape worm.
2. Learning Materials: textbook chapter 20.3; lab manual chapter 7
3. Learning Assessment: Exam 3

J. TOPIC: ROTIFERS

1. Learning Outcomes:
   a) Identify functions and advantages of a pseudocoelom.
   b) List characteristics pseudocoelomates have in common.
   c) Describe the phylum Rotifera in terms of distinguishing characteristics, habitat, and reproduction.

2. Learning Materials: textbook chapter 20.3
3. Learning Assessment: Exam 3

K. TOPIC: MOLLUSCS

1. Learning Outcomes:
   a) List characteristics of the phylum Mollusca.
   b) Identify advantages of a coelom.
   c) Identify characteristics of respiratory organs.
   d) Describe an open circulatory system.
   e) Distinguish among the classes Monoplacophora, Polyplacophora, Scaphopoda, Gastropoda, Bivalvia, and Cephalopoda.
   f) Describe habitat, locomotion, feeding, reproduction and development, etc. in each class.

2. Learning Materials: textbook chapter 20.3; lab manual chapter 8
3. Learning Assessment: Exam 3

L. TOPIC: ANNELIDS

1. Learning Outcomes:
   a) List advantages of metamerism.
   b) Identify characteristics of classes Polychaeta and Clitellata and subclasses Oligochaeta and Hirudinea.
   c) Describe feeding in active and sedentary polychaetes.
   d) Describe the circulatory, nervous, and excretory system of annelids.
   e) Describe locomotion in polychaetes, earthworms, and leeches.
   f) Contrast reproduction and development in polychaetes and oligochaetes.
   g) Identify examples of each taxon listed above.

2. Learning Materials: textbook chapter 20.3; lab manual chapter 9
3. Learning Assessment: Exam 4
M. TOPIC: NEMATODES

1. Learning Outcomes:
   a) Describe the phylum Nematoda in terms of general characteristics and ecological impact.
   b) Describe locomotion and reproduction in nematodes.
   c) List adaptations of parasitic nematodes.
   d) Describe the life cycles of Ascaris, the hookworm, pinworm, trichina worm and filarial worms.

2. Learning Materials: textbook chapter 20.4; lab manual chapter 10
3. Learning Assessment: Exam 4

N. TOPIC: ARTHROPODS

1. Learning Outcomes:
   a) List characteristics of phylum of Arthropoda.
   b) Discuss features associated with the evolutionary success of arthropods.
   c) Describe the structure and function of the exoskeleton.
   d) Define tagmatization and describe locomotion in arthropods.
   e) Describe circulatory and respiratory systems of arthropods.
   f) Distinguish among the arthropod subphyla Chelicerata, Crustacea, Myriapoda and Hexapoda.
   g) Distinguish among the classes of Chelicerata: Merostomata, and Arachnida.
   h) Distinguish among the classes of Crustacea: Branchiopoda, Maxillopoda, and Malacostraca.
   i) Distinguish between the classes of Myriapoda: Chilopoda and Diplopoda
   j) Describe the hexapod class, Insecta, and discuss reasons for the evolutionary success of insects.
   k) Provide examples for each taxon listed above.
   l) Distinguish between hemimetabolous and holometabolous development.
   m) Distinguish between hormones and pheromones.

2. Learning Materials: textbook chapter 20.4; lab manual chapter 11
3. Learning Assessment: Exam 4

O. TOPIC: ECHINODERMS

1. Learning Outcomes:
   a) List characteristics of phylum Echinodermata.
   b) Explain why echinoderms and chordates are sister taxa.
   c) Describe the structure and function of the water vascular skeleton.
   d) Describe gas and waste exchange with the environment.
   e) Describe characteristics of classes: Asteroidea, Ophiuroidea, Echinoidea, Holothuroidea, Crinoidea.

2. Learning Materials: textbook chapter 20.5; lab manual chapter 12
3. Learning Assessment: Exam 5

P. TOPIC:  CHORDATES

1. Learning Outcomes:
   a) Identify characteristics of chordates.
   b) Distinguish among the subphyla: Urochordata, Cephalochordata, and Craniata.
   c) Describe metamorphosis in sea squirts.
   d) Describe feeding in lancelets.
   e) Characterize craniates, vertebrates, gnathostomes, tetrapods, and amniotes; provide examples of each.
   f) Compare and contrast hagfishes and lampreys. Describe the life cycle of a sea lamprey.
   g) Distinguish among vertebrate classes: Petromyzontida, Chondrichthyes Sarcopterygii, and Actinopterygii.
   h) Describe the structure and function of gills and the lateral line system.
   i) Characterize class Amphibia and describe how amphibians are adapted to both land and water.
   j) Describe respiration and circulation in amphibians.
   k) Note adaptations of amniotes for a fully terrestrial life.
   l) Characterize class Reptilia.
   m) Characterize class Aves.
   n) Characterize class Mammalia.
   o) Distinguish among 3 mammalian groups: montremes, marsupials, and placentals.

2. Learning Materials: textbook chapter 20.5; lab manual chapter 13-18
3. Learning Assessment: Exam 5