I. INTRODUCTION

A. Provides a survey of biological principles with an emphasis on humans, including chemistry of life, cell structure, cell function and cell reproduction.
B. This course may satisfy the Biology requirement in some curricula. Please check your degree plan to determine the status of this course in your program of study.
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, 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: None. Math, reading and writing will be required in this course. It is best to be finished with all developmental courses prior to enrollment in this course.

II. LEARNING OUTCOMES—from the Texas Academic Course Guide Manual (ACGM)

Upon successful completion of this course, Biology for Non-Science Majors I, the student will:

A. Distinguish between prokaryotic, eukaryotic, plant and animal cells, and identify major cell structures.
B. Identify stages of the cell cycle, mitosis (plant and animal), and meiosis.
C. Interpret results from cell physiology experiments involving movement across membranes, enzymes, photosynthesis, and cellular respiration.
D. Apply genetic principles to predict the outcome of genetic crosses and statistically analyze results.
E. Describe karyotyping, pedigrees, and biotechnology and provide an example of the uses of each.

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F. Identify parts of a DNA molecule, and describe replication, transcription, and translation.

G. Analyze evidence for evolution and natural selection.

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

I. Use critical thinking and scientific problem-solving to make informed decisions in the laboratory.

J. Effectively communicate the results of scientific investigations.

III. INSTRUCTIONAL MATERIALS

A. The instructional materials identified for this course are viewable through www.ctcd.edu/books

IV. COURSE REQUIREMENTS:

A. Lots of Reading:
Specific chapters from the textbook will be required reading. There will also be reading and preparation or homework assignments in the lab manual.

B. Completion of lab materials
This course includes a lecture and a lab component in a single course. You must complete the lab materials to be successful in the course.

C. Attendance and participation in both lecture and lab:
Attendance is measured differently in on-line and in-face classes. However, your participation in the course material is essential to your success.

D. Integrity and scholarship
All students are required to maintain the highest standards of scholastic honesty in the preparation of all coursework and examinations. Examples of scholastic dishonesty include plagiarism, collusion, and cheating, copying homework or lab work. This is not a comprehensive list. Students guilty of scholastic dishonesty will be administratively dropped from the course with a grade of “F” and subject to disciplinary action, which may include suspension or expulsion from the school.

E. Checking blackboard
It is the student’s responsibility to check blackboard on a regular basis. It would be best to check every day, but you should check at minimum every other day.

V. EXAMINATIONS:

Unit tests will be given via the McMillian Lauchpad approximately every two chapters. There will be a total of seven tests. There will also be a midterm and a final each worth 25% of the course grade.
VI. SEMESTER GRADE COMPUTATIONS

Use of Launchpad 5 % (0% or 100%)   50
Use of Flashcards 5% (0% or 100%)    50
Pretests 5 % (scores earned)     50
Chapter Tests 7 x 5% each = 35% (scores earned)           350
Midterm 25%                250
Final 25%                  250

Labs may add up to 50 extra credit points (50)
to the total earned points.
Pretests include only text-book/lecture material.
Tests include lecture and lab material
Midterm and Final include lecture and lab material

Grade Scale (1000 points)
A   900-1000
B   800-899
C   700-799
D   600-699
F   0- 599

This grade scale may be changed by the instructor during the semester. If so, you will be supplied via blackboard with the changes. This is an unlikely event, but could occur.

VII. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR

A. Course Withdrawal: It is the student’s responsibility to officially drop/withdraw from a class if circumstances prevent attendance or if the student decides not to continue with the course and this must be done before the withdrawal date. An instructor cannot initiate a withdrawal based on the student’s request. GoArmyEd students should contact their ACES counselor before withdrawing and withdraw through the GoArmyEd portal. All other students who desire to or must officially withdraw from a course on or after the first scheduled class meeting must file an Application for Withdrawal with the local CTC representative by the last date to withdraw. Students enrolled in distance learning courses and who do not have access to a local CTC representative should submit a withdrawal form to EaglesOnCall@ctcd.edu or the CTC Records Office in Killeen, Texas.

*Applications for Withdrawal will be accepted at any time before the completion of the 12th week of classes for 16-week courses, the sixth week of classes for eight-week courses, or the fourth week of classes for six-week courses.
*For non-GoArmyEd active military students, the effective date of withdrawal is the filing date with the Education Center. For all other students, the effective date of withdrawal is the date that the withdrawal application is received by the Central
Texas College representative.
*Students who used financial aid, military tuition assistance, VA benefits, or other non-personal funds may be required to repay tuition and fees to the funding agency. For specific repayment requirements, contact the Office of Student Financial Aid or Veterans Services Office before withdrawing. Military tuition assistance students should visit their military Education Center or Navy College Office.
*Students may not withdraw from a class for which the instructor has previously issued a grade of “F.”

B. **Administrative Withdrawal:** A student may be administratively withdrawn by a designated member of the administrative staff of the College under the following conditions:
The student has been placed on Academic Suspension or Disciplinary Suspension; The student has an outstanding financial obligation owed to the college; or The student registered for a course without the required prerequisite or departmental permission.

The college is under no obligation to refund tuition and fees, or other costs associated with a student who is administratively withdrawn.

C. **Incomplete Grade:** Incomplete, Course in Progress (for non-developmental courses): An “IP” grade may be assigned by an instructor if a student has made satisfactory progress in a course with the exception of a major quiz, final exam, or other project. The “IP” grade may also be assigned for extenuating circumstances beyond a student’s control such as personal illness, death in the immediate family, military orders, or in the case of distance learning courses, institutional technology failures and mail delays. Notice of absences with supporting documentation may be required by the instructor. The instructor makes the final decision concerning the granting of the incomplete grade. The instructor may set a deadline for completing the remaining course requirements. In no case will the deadline exceed 110 days after the scheduled end of the course. An “IP” grade cannot be replaced by the grade of “W.” If a student elects to repeat the course, the student must register, pay full tuition and fees and repeat the entire course.

At the end of the 110 calendar days if the student has not completed the remaining coursework as required by the instructor, the “IP” will be converted to an “FI” and appear as an “F” on the student’s official transcript. A student who merely fails to show for the final examination will receive a zero for the final and a “F” for the course.

D. **Cellular Phones and Beepers:** Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. **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.

F. Instructor Discretion: The instructor reserves the right of final decision in course requirements and alterations of grading scale.

G. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result a disciplinary action up to and including expulsion. Civil behavior includes, but is not limited to, refraining from use of cell phones or electronic devices in an inappropriate manner, positive and friendly interaction with other students and instructor during class; refraining from use of inappropriate language, or hostile behavior. Decisions regarding civility are the instructor’s prerogative.

VIII. COURSE OUTLINE

A. The process of science (Relates to ACGM objectives C, H, I and J)

1. Learning Outcomes: Upon successful completion of this section, the student will:
   a. Discuss how the scientific method is used to test hypotheses.
   b. Evaluate the factors that influence the strength of scientific studies and whether the results of the study are applicable to a particular population.
   c. Evaluate the evidence in media reports of scientific studies.
   d. Explain how the scientific method applies to clinical trials designed to investigate important issues in human health.

2. Learning Activities:
   a. Lab exercises related to the topics

3. Equipment and Materials:
   a. Textbook Assignments and Lab assignments

B. The Chemical Basis of Life: chemistry and biochemistry (Relates to ACGM objectives C and F)

1. Learning Outcomes: Upon successful completion of this chapter, the student will:
   a. Explain how is matter organized into molecules of living organisms.
   b. Define life, and explain how Martian life (or life on other potential exoplanets) could be recognized.
   c. Identify the basic structural unit of life and explain how it contributes to the characteristics that are common to all living organisms.
d. Explain why is water so important for life and living organisms.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

C. **Cell Structure and function (Relates to ACGM objectives A, C, G and H)**

1. **Learning Outcomes:** Upon successful completion of this chapter, the student will:
   a. Describe structural features shared by all cells, and compare and contrast prokaryotic and eukaryotic cells.
   b. Explain how solutes and water cross membranes, and what determines the direction of movement of solutes and water in different solutions and across differing membranes.
   c. Explain how antibiotics target bacterial cells, and in what situations antibiotic therapy is indicated.
   d. Identify, and describe the structure and function of key eukaryotic organelles.
   e. Explain the theory of endosymbiosis in relation to the evolutionary origin of organelles such as mitochondria and chloroplasts.
   f. Discuss the evidence supporting the proposed origin of organelles such as mitochondria and chloroplasts.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

D. **The Working Cell: enzymes and metabolism (Relates to ACGM objective A, C and H)**

1. **Learning Outcomes:**
   a. Define macronutrients and micronutrients provided by food and discuss their relationship to the 4 major biomolecules.
   b. Explain what is meant by an essential nutrient and give examples of essential nutrients in major biochemical categories.
   c. Describe the structure and function of enzymes.
   d. Evaluate the progress of metabolic pathways based on which enzymes are present.
   d. Describe the consequences of a diet lacking sufficient nutrients.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments
E. **How Cells Harvest Chemical Energy and photosynthesis (Relates to ACGM objectives A, C and H)**

1. **Learning Outcomes:** Upon successful completion of this chapter, the student will:
   a. Discuss prokaryotic and eukaryotic photosynthetic organisms and explain why they are important to humans, both directly and indirectly.
   b. Compare and contrast different types of energy and what transformations of energy organisms carry out.
   c. Give a detailed explanation of how plants and algae convert the energy in sunlight into energy-rich organic molecules (and explain why humans cannot do this).
   d. Compare algal biofuels to other fuels in terms of costs, benefits, and sustainability.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

F. **Cellular utilization of stored energy (Relates to ACGM objectives C and H)**

1. **Learning Outcomes:**
   a. Discuss the probable reasons why humans weigh more now than in the past.
   b. Explain how the body uses the energy in food via cellular respiration.
   c. Discuss how Aerobic respiration extracts useful energy from food during each of the four major steps: Glycolysis, Pyruvate metabolism, Citric Acid Cycle and the electron transport chain.
   d. Discuss why some organisms or cells within larger organisms perform fermentation occur. Describe the types of fermentation including the end products and explain why fermentation cannot sustain human life.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

G. **DNA Structure and replication (Relates to ACGM objectives B, E, F, G & I)**

1. **Learning Outcomes:**
   a. Describe in detail the structure of DNA, and explain how DNA is organized in cells.
   b. Explain how is DNA copied in living cells, and how DNA can be amplified for forensics.
   c. Explain how DNA profiling makes use of genetic variation in DNA sequences.
   d. Discuss how DNA evidence fits into forensic investigations.
2. **Learning Activities:**
a. Lab exercises related to the topics

3. **Equipment and Materials:**
a. Textbook Assignments and Lab assignments

H. **How Genes code for Proteins (Relates to ACGM objectives E, F and I)**

1. **Learning Outcomes:**
a. Explain how the shape of a protein is determined by the 4 levels of protein structure and by cellular components involved in protein formation.
b. List the major steps of gene expression, and explain where they occur in cells.
c. Discuss how animals may be genetically modified to produce human proteins with therapeutic uses.
d. Describe some practical applications of genetically modified organisms in treating human diseases.
e. Explain why knowing the sequence of the human genome is important.
f. Discuss the similarities and differences between the approaches used by the two research teams that sequenced the human genome.

2. **Learning Activities:**
a. Lab exercises related to the topics

3. **Equipment and Materials:**
a. Textbook Assignments and Lab assignments

I. **Cell division and mitosis (Relates to ACGM objectives B and E)**

1. **Learning Outcomes:**
a. Explain why cell division occurs in the body and describe the cell types which divide regularly in adults and cell types that normally do not divide in adults.
b. Explain how normal cells and cancer cells differ with respect to cell division.
c. Explain how cancer treatment decisions are made for a given patient.
d. Explain how new cancer drugs are developed.

2. **Learning Activities:**
a. Lab exercises related to the topics

3. **Equipment and Materials:**
a. Textbook Assignments and Lab assignments

J. **Mutations and Cancer**

1. **Learning Outcomes: (Relates to ACGM objectives E, G and I)**
a. Define the term mutations and discuss the factors that can cause them.
b. Explain how cancer develops, and how can people reduce their risk.
c. Explain why people with “inherited” cancer often develop cancer at a relatively young age compared to cancers triggered by the environment.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

K. **Single gene inheritance and meiosis (Relates to ACGM objectives B, D and E, I and J)**
   1. **Learning Outcomes:**
      a. Describe the organization of chromosomes, genes, and their alleles and discuss how these contribute to human traits.
      b. Explain the purpose of meiosis and relate meiosis to gamete formation in plants and animals.
      c. Explain why different traits may have different inheritance patterns.
      d. List some practical applications of understanding the genetic basis of human disease.
      e. Solve single trait and two trait genetics problems involving complete dominance.
      f. Make or use pedigrees to aid in solving genetics problems.
      g. Discuss how Mendel was able to recognize the transmission of alleles before the discovery of DNA.
      h. State Mendel’s two laws of inheritance and explain how these laws explain the inheritance of some traits.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

L. **Inheritance of complex genetic traits (Relates to ACGM objectives D, E, I, J)**
   1. **Learning Outcomes:**
      a. Explain how chromosomes determine sex, and how sex may influence the inheritance of some traits.
      b. Discuss complex inheritance patterns including: sex linkage, incomplete dominance, codominance, multiple alleles, multifactorial and polygenic traits. Solve genetics problems that include traits with these characteristics.
      c. Describe how do numerical abnormalities of chromosomes occur. Relate these to the meiosis process and explain the consequences of these abnormalities.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments
M. Stem cells and cell differentiation

1. **Learning Outcomes:** (Relates to ACGM objectives C, E, H, I)
   a. Explain the structure of tissues and organs. Discuss how organs can be repaired or replaced.
   b. Describe the properties of specialized cells in tissues, and relate these properties to those of stem cells. Explain how stem cells differentiate into these specialized cells.
   c. Discuss how stem cells contribute to regenerative medicine, and how we obtain or produce stem cells for this purpose.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments

N. Natural Selection and adaptation

1. **Learning Outcomes:** (Relates to ACGM objectives A, G, H)
   a. Discuss the prevalence of Staph bacteria both in cases of infection and in cases where no infection is occurring.
   b. Explain how bacteria resist the effects of antibiotics.
   c. Explain how populations evolve, and the role of evolution in antibiotic resistance.

2. **Learning Activities:**
   a. Lab exercises related to the topics

3. **Equipment and Materials:**
   a. Textbook Assignments and Lab assignments