I. INTRODUCTION

A. Fundamental principles of living organisms will be studied, including physical and chemical properties of life, organization, function, evolutionary adaptation, and classification. Concepts of cytology, reproduction, genetics, and scientific reasoning are included. The laboratory course provides practical experience and reinforcement of the topics discussed in the lecture.

B. This course satisfies the Biology requirement in most curricula. Please check your degree plan to determine the status of this course in your program of study.

C. This course is occupationally related and serves as preparation for careers in science.

D. Prerequisite: TSI Math 350+; ASSET II of 45 or completion of DM0303.

E. Recommended Prerequisite: MATH 1314 Successful completion of College Algebra or concurrent enrollment in higher-level mathematics is recommended.

II. LEARNING OUTCOMES

Upon successful completion of this course, Biology 1406 Biology for Science Majors I, the student will:

A. Describe the characteristics of life.

B. Explain the methods of inquiry used by scientists.

C. Identify the basic requirements of life and the properties of the major molecules needed for life.

D. Compare and contrast the structures, reproduction, and characteristics of viruses, prokaryotic cells, and eukaryotic cells.

E. Describe the structure of cell membranes and the movement of molecules across a membrane.

F. Identify the substrates, products, and important chemical pathways in metabolism.

G. Identify the principles of inheritance and solve classical genetic problems.

H. Identify the chemical structures, synthesis, and regulation of nucleic acids and proteins.

I. Describe the unity and diversity of life and the evidence for evolution through natural selection.
III. INSTRUCTIONAL MATERIALS

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

IV. COURSE REQUIREMENTS:

A. Reading Assignments:
   Specific chapters from Open Stax College, Biology, Rice University; Houston, TX, 2013 will be included in the course outline (Section VIII). Students should read each chapter prior to lecture; take notes during the lecture, read the chapter a second time and rewrite notes during this second reading in a way that makes the greatest amount of sense to the student as well as make drawings of cellular structures and processes and critically examine the material repetitiously multiple days in advance of the exam. The chapter learning outcomes that are recorded in the syllabus provide a great deal of guidance for studying. Using lecture notes, take the time to write out responses to the learning outcomes for each chapter and study on a daily or every other day basis. This will also serve as a study guide for the comprehensive final at the end of the semester. A good rule of thumb is to spend 3 hours of study time for every 1 hour of class time. Lecture exams will be centered on the learning outcomes.

B. Class Performance:
   Students are expected to attend lecture and lab during their scheduled time. It is the responsibility of the student to sign-in during lecture and lab. If for any reason a student cannot or decides not to complete the course, then it is the responsibility of the student to withdraw from the course prior to the withdrawal date. The Instructor will not withdraw/drop a student from the course at any time. If a student ceases to attend class and does not withdraw from the course, then an appropriate course grade will be submitted at the end of the semester.

   You will be provided a lecture schedule which lists the reading requirements. Reading should always be done before the corresponding lecture to ensure that you have the appropriate background to understand the lecture material.

   If you must be absent from any class meeting, it is your responsibility to find out what happened in class while you were gone. Make friends with one or more other students in class so that you can ask them what happened and secure any assignments which were given during your absence. Absenteeism is no excuse for not being ready for the current class.

   This course, like most science courses, builds on itself. Concepts presented at the beginning of the course will be expanded on and provide the foundation for later material. If you do poorly on any exam, it is important that you go back over the material to be sure that you understand it.
V. EXAMINATIONS:
There will be five unit exams that students will take during their regularly scheduled lecture time. If a student is late to class on exam day no extra time will be allotted for taking the exam. These exams may consist of multiple choice, matching, true/false, short answer, labeling, definitions, and essay questions. Each lecture period is an explanation/review of the material students need to grasp before an exam. If a student misses an exam then the percent scored on the comprehensive final lecture exam will count in place of the one missed exam. Other missed exams will result in a zero being recorded in the gradebook. Students are encouraged to come by my office to see which questions were missed on an exam and to seek understanding of the missed material. The opportunity to view a previously taken exam will made available for two weeks after the exam results have been provided to students. The five unit exams will not be available for viewing at the end of the semester. Under no circumstances are you allowed to copy the exam, copy questions from the exam, photograph the exam or reproduce the exam in any other way. Reproducing exam questions in any way constitutes cheating and will lead to the student being dropped from the course with a grade of “F”. The final exam is worth 150 points and the percentage you score on it can be used to replace one missed exam or one lower unit exam grade.

VI. SEMESTER GRADE COMPUTATIONS
General Biology 1406 course grade is based on a total of 1000 points.

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT EXAMS @ 100 points each</td>
<td>500</td>
</tr>
<tr>
<td>FINAL EXAM @ 150 points</td>
<td>150</td>
</tr>
<tr>
<td>TOTAL LAB POINTS</td>
<td>350</td>
</tr>
<tr>
<td>COURSE TOTAL</td>
<td>1000</td>
</tr>
</tbody>
</table>

COURSE GRADE:

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

*There are no opportunities for extra credit.

*To determine one’s standing in the course at any point in time, divide total points earned by total possible points for both lab & lecture.

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:** Cellular phones will be turned off while the student is in the classroom or laboratory. **Use of a cell phone during an exam will result in a zero for that exam.** If a student in any way makes a copy of exam questions then that student will be dropped from the course with an “F”. The number for your family members to call in an emergency is 254-526-1200. Appropriate personnel will immediately communicate the message to you.

E. **Americans 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](http://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.

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 in disciplinary action up to and including expulsion.

H. Absolutely no food or drinks in the lecture classroom or the laboratory room.

I. Courtesy dictates that you discuss any problem with your instructor first. If the issue cannot be resolved, then contact the Chair of the Science Department.

VIII. **COURSE OUTLINE**

A. **The Chemical Foundation of Life**
1. Using a periodic table, derive subatomic information for life important elements in a neutral state, ionic state and various isotope forms.
2. Explain the different kinds of bonding that are important to life.
3. Describe properties of water and the concept of pH.
4. Detail carbon’s role in molecules of life and the various functional groups attached to biologically important molecules and their important roles.
B. **Biological Macromolecules**
   1. Identify structures and functions of the 4 biologically important molecules and differentiate between the polymeric and non-polymeric molecules.
   2. Identify the major types of reactions that build macromolecules.

C. **Cell Structure**
   1. Identify the distinguishing characteristics among different types of cells.
   2. Describe the utilization of tools used in the study of cells.
   3. Recognize the different cellular ultrastructures, their functions and how they work together.

D. **Structure & Function of Plasma Membranes**
   1. Describe the fluid mosaic aspect of cellular membranes and their role in regulating the traffic of material exchange between a cell and the extracellular environment.
   2. Differentiate among the mechanisms used by cells for material exchange.
   3. Identify the importance of cells maintaining concentration gradients.

E. **Metabolism**
   1. Describe the relationship between catabolism and anabolism and how these pathways enable cellular work.
   2. Discuss characteristics/regulation of enzymes and the role they play in helping to manage the energy and material exchange of living things.

F. **Cellular Respiration**
   1. Describe the stages of cellular respiration, enzymes involved, intermediate products, final products and wastes produced.

G. **Photosynthesis**
   1. Describe the stages of photosynthesis, enzymes involved, intermediate products, final products and wastes produced.

H. **Cell Reproduction**
   1. Identify and describe the stages and regulatory mechanisms of the cell cycle which includes mitosis.
   2. Relate cellular reproduction to organismal life cycles.

I. **Meiosis And Sexual Reproduction**
   1. Identify and describe the stages and regulatory mechanisms of the cell cycle which includes meiosis.
   2. Relate meiosis and sexual reproduction to organismal life cycles.

J. **Mendel’s Experiments & Heredity**
   1. Describe Mendelian genetics and how Mendel became the father of genetics.
   2. Explain gene interactions that go beyond Mendelian genetics and perform probability determinations for genetic word problems.
K. **Modern Understandings of Inheritance**
   1. Discuss the modern understanding of X-linked genes, non-disjunction of homologous chromosomes, X-inactivation in mammals, and human genetic disorders.

L. **DNA Structure & Function**
   1. Identify and describe the individuals and their work that lead to discovery of the structure and function of DNA as the material of heredity.
   2. Explain the process that takes place during the “S” part of interphase and how this ties back to cellular reproduction in both mitosis and meiosis.
   3. Identify key enzymes and the role they play during DNA replication.

M. **Genes & Proteins**
   1. Identify similarities and differences between DNA and RNA.
   2. Describe the process of genes being copied and the copy being used to build a polypeptide.
   3. Describe the roles of different RNAs and enzymes during gene expression.