COURSE OUTLINE
General Biology

Course Description
BI 110. General Biology. 5 hours credit. This course will enable the student to apply basic biological principles to relevant situations in his/her daily life. The student will apply the scientific process to problem solving and deductive reasoning to analyze and interpret observations. This course is not intended for biology majors. The learning outcomes and competencies detailed in this outline meet, or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Project for this course, as approved by the Kansas Board of Regents (Transfers as BIO1010).

Required Materials
For complete material(s) information, refer to https://bookstore.butlercc.edu

Butler-Assessed Outcomes
The intention is for the student to be able to
1. Apply basic biological concepts to understand the causes and treatments of genetic disorders, diseases and cancer.
2. Apply the scientific process to describing the results of an experiment done during lab.
3. Evaluate his/her current behavior as it applies to maintaining a positive healthy life style.

Learning PACT Skills that will be developed and documented in this course
Through involvement in this course, the student will develop ability in the following PACT Skills area(s):

Analytical Thinking Skills
- Critical thinking - Through a written paper, the student will demonstrate analysis of causal situation of a particular disease or cancer and evaluate the associated risks and treatments.
- Critical thinking - Through a written report organized like a publishable paper, the student will apply the scientific process to a biologic query.

Communication Skills
- Creation and delivery of messages - Through an oral presentation to the class, the student will present a summary of research on a particular disease or cancer.

Personal Development Skills
- Personal management - Through a series of self-assessment surveys, the student will evaluate his/her ability to maintain a positive personal health.

Major Summative Assessment Task(s)
These Butler-assessed Outcome(s) and Learning PACT skill(s) will be demonstrated by
1. Writing a critical analysis of the cause and treatment of a specific disease or cancer (A skill), shared with the class through an oral presentation (C skill).
2. Analyzing a series of self-assessments of personal health practices and projecting
steps toward improved health outcomes (P skill).
3. Documenting a sustained understanding of the principles of biology though a semester-end, standardized, comprehensive assessment (A skill).

Skills or Competencies
These actions are essential to achieve the course outcomes:
1. Explain scientific process as applied to the acquisition, analysis and interpretation of data and general principles of biology.
2. Examine cell structure and function.
3. Explain basic chemistry principles of inorganic and organic molecules, and their relationship to cell respiration, photosynthesis and protein synthesis.
4. Explore principles of genetics and the genetic basis of life, and how they relate to diseases and medical disorders.
5. Explain the structure and functions of maintenance systems including: digestive, cardiovascular, respiratory, muscular-skeletal, nervous, urinary and immune.
6. Describe the process of evolution and the evolutionary basis of living organisms.
7. Explore principles of ecology and the inter-relationship between organisms and their environment.

Learning Units
I. Scientific process
   A. Describe the traits/characteristics of all living organisms
   B. List and Identify levels of biological organization
   C. Identify levels of classification: Domain and Kingdom levels, the taxonomy hierarchy of living organisms
   D. Examine the species level of classification
   E. Describe the steps of the scientific process and the purpose of each
   F. Identify the control, independent and dependent variables in an experiment along with the control group, experimental group and the mean
   G. Apply the scientific method to a lab and various theoretical situations
   H. Write a lab report which includes a graph, mean and standard deviation and that follows the scientific process
   I. Describe the role of antibodies, antibiotics and vaccinations
   J. Proper use and focus of a microscope using a prepared slides

II. Cells
   A. Describe the major components of the cell theory (structural, functional and developmental)
   B. Compare prokaryotic unicellular eukaryotes, and eukaryotic plant and animal cells
   C. Identify the following cellular parts: cell wall, cell membrane, nucleus, nucleolus, centriole, ribosome, endoplasmic (smooth and rough), Golgi body, mitochondrion, chloroplast (thylakoid and stroma), flagella, cilia and describe the major function of each
   D. Describe the difference between diffusion and active transport using various solutions where differences in concentrations affect the direction of movement
   E. Diagram and label the double phospholipid structure of the cell membrane
   F. Compare polar versus non-polar molecules
G. Describe the roles of the double phospholipid membrane and of certain protein molecules in transporting substances into and out of the cell
H. Compare diffusion, active transport, endocytosis, phagocytosis, pinocytosis and exocytosis as it relates to cellular secretion
I. Identify sub-cellular components of cell types: prokaryote bacteria, eukaryotic animal and plant cells.
J. Identify viruses as non-cellular, their components, and how they relate to the cells they infect
K. Identify protozoan and pond water cells and organisms and their roles in ponds
L. Contrast viral and bacterial microorganisms
M. Describe the roles of cell division in life cycle of organisms
N. Prepare a wet mount slide
O. Estimate the size of cells using the microscope field of view

III. Introduction to chemistry
A. Define these basic terms: atom, atomic number, atomic mass, element, ion, isotope and molecule
B. Use the periodic table to identify the elements found in a living system
C. Recognize energy levels, electron capacities of an energy level and how stability of atoms is determined
D. Define and recognize examples of different types of bonds: ionic, covalent, polar covalent and hydrogen
E. Describe the structure of water molecule, list properties of water and discuss pH, acids and bases
F. Compare organic and inorganic compounds
G. Recognize the following functional groups: hydroxyl, methyl, ketone, aldehyde, carboxyl, amino and phosphate
H. Examine and recognize organic molecules found in living systems and the function of such molecules: carbohydrates, proteins and lipids
I. Calculate the energy from food
J. Identify sugars, fats and proteins using standard chemical tests
K. Discuss the importance of enzymes in cellular activities
L. Describe the digestive system in terms of organs involved with functions and the effects of chemical enzyme digestion on foods
M. Compare the nutritional and caloric values of various foods: sugars, fats and proteins

IV. Genetics
A. Compare the structure of nucleotides in RNA and DNA
B. Define the roles of nucleolus, ribosomes, codon, anticodon, amino acid, protein, messenger RNA, transfer RNA and ribosome
C. Describe the major events that occur during transcription and translation of protein synthesis
D. Describe the roles of mitosis and meiosis to the life cycle Describe the major events that occur during the stages of the cell cycle mitosis: G1, G2, S, Mitosis and Cytokinesis
E. Describe the structure and activities of chromosomes
F. Recognize chromosomes of a karyotype and indicate sex and presence of
V. Maintenance
A. Describe oxidation-reduction reactions
B. Describe the ATP-ADP cycle
C. Discuss the importance of enzymes in cellular activities
D. Describe the overall chemical reaction for cellular respiration: outline the major events of glycolysis, Kreb’s cycle and electron transport system
E. Describe the events of anaerobic and aerobic cellular respiration
F. Recognize the following: lungs, trachea, larynx, pharynx and alveolus
G. Describe the general functions of the respiratory system
H. Describe animal tissue types and organ systems
I. Identify the central and peripheral nervous system, structure of a neuron, and the actions and mediators of the sympathetic and parasympathetic systems
J. Describe the location, structure and function of the heart’s four chambers, valves and cardio-pulmonary blood vessels
K. Describe the parts of the heart and the pathway of blood through the heart and the body
L. Describe the structure and function of blood vessels
M. Describe the relationship between heart action and blood pressure
N. Describe the effect of the autonomic nervous system on the heart
O. Describe how cardiovascular disease develops
P. Describe how exercise may affect cardio-vascular disease risk factors
Q. Describe the organs of the urinary system
R. Explain the function of the immune system: lymphoid organs, inflammatory reaction, specific diseases, vaccines, active immunity and passive immunity
S. Describe the basis of blood types
T. Describe the role of white blood cells

VI. Evolution
A. Describe and apply the concept of adaptation
B. Identify the following: skull, vertebral column, pectoral and pelvic girdles, limbs, pectoralis major, quadriceps femoris, external oblique, rectus abdominus, biceps brachii, triceps brachii, rectus femoris, gastrocnemius and deltoid
B. Compare the fixed and evolving species models
C. Identify the major requirements for natural selection process to occur
D. Define an adaptation and how it evolves
E. Describe how changes in gene frequencies at the population level can lead to evolution
F. Describe what a species represents in terms of population genetics and how speciation occurs
VII. Ecology
A. Describe the importance of the laws of thermodynamics to energy flow in living cells
B. Understand the flow of energy through an ecosystem; pathway of energy flow, energy utilization by living systems and energy loss in an ecosystem
C. Describe the overall chemical reaction for photosynthesis: visible light, structure of chloroplast, light-dependent and light-independent reactions and products of PGAL
D. Compare photosynthesis and cellular respiration in terms of reactants, products, processes and relationship to the ecosystem
E. Compare population, community, ecosystem, biosphere, producer, consumer, decomposer and habitat
F. Interpret population growth curves, survivorship curves, fertility curve and age structure diagrams with emphasis on humans
G. Describe components and interactions of an ecosystem: biotic and abiotic
H. Describe ecological interactions: food chains, food webs, types of competition, and symbiotic relationships
I. Outline the following biogeochemical cycles and identify human influence on the cycle: water, carbon, nitrogen, and phosphorous
J. Distinguish biomes on the basis of rainfall, temperature, organisms and productivity
K. Outline the causes of global climate change, depletion of forest, ozone depletion, air pollution, water pollution, solid waste accumulation and resource depletion
L. Recognize the environmental impact humans have on planet Earth

Learning Activities
Learning activities will be assigned to assist the student to achieve the course concepts, practice of critical thinking skills applied to lab experiments and study guide exercises, and application of scientific process. These activities may be either face-to-face or online.

Grade Determination
The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: quizzes, exams, lab reports, lab exercises, written and oral reports, comprehensive exam and other methods of evaluation employed at the discretion of the instructor.