Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: BIOL 104 **Year: 2020-2021**

Course Title: General Biology I **Credit Hours: 4**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

This is one of two semesters of an introductory level biology sequence designed for students who plan to transfer to an upper level program in science, environmental science, medicine, or a science-related field. Students who are interested in a rigorous study of biology may also enroll. Topics include basic chemistry and biochemistry, cell morphology, physiology and energetics; and classical and molecular genetics. Laboratories are strongly quantitative. Substantial outside preparation for lectures and laboratories is required. BIOL 104 fulfills the SUNY General Education Natural Sciences requirement. Students may not apply credit for both BIOL 101 and BIOL 104 toward their degree. Prerequisites: High School biology and chemistry with minimum Regents exam grades of 80% within the past five years or BIOL 101; prior completion or concurrent enrollment in ENGL 100, MATH 095 or MATH 098, and RDNG 116 if required by placement testing;. 4 Cr. (3 Lec., 3 Lab.) Fall and spring semesters.

Course Context/Audience

This course fulfills the SUNY General Education requirement in the natural sciences. It is a prerequisite for BIOL 105, and may be used as a prerequisite for BIOL 201, 205, 211 and 216. It will satisfy program requirements for a science, laboratory science, science/math, or an unrestricted elective. The BIOL 104 and BIOL 105 course sequence is strongly recommended for students in the Environmental Studies program and planning to transfer into life science programs.

Basic Skills/Entry Level Expectations

Writing: WC College level writing skills are required. See course co-requisites or pre-requisites.

Math: M3 MATH 095 or MATH 098 if required by placement testing.

Reading: R4 Before taking this course, students must satisfactorily complete RDNG 116 or have assessment indicating that no reading course was required.

Other: The ability to take well organized notes during class lectures; to work in groups during lecture and laboratory sessions; to follow oral and written directions; and to read textbook material that contains a large amount of technical vocabulary to interpret complex diagrams and flowcharts.

Course Goals

This course covers the following core concepts:

Chemistry: Knowledge of basic chemistry and organic chemistry is necessary to understand the emergent levels of biological organization based on chemical interactions between macromolecules (carbohydrates, proteins, lipids, and nucleic acids).

Cell Biology: Knowledge of the organization of prokaryotic or eukaryotic cells is necessary to understand how unique structures perform specific functions to sustain the basic unit of life and interact in multicellular organisms.

Biochemistry: Knowledge of how the cell obtains nutrients and converts them into energy via cellular metabolism is necessary to understand living systems.

Genetics: Knowledge about the flow of genetic information (DNA>RNA>protein) to produce the molecules required for metabolic activities is required to understand how it is passed on through generations contributing to evolution via Mendelian and non-Mendelian mechanisms.

Scientific Method: Knowledge of the scientific method is required to understand and explain the natural world and critically evaluate new discoveries.

Course Objectives/Topics

Objective/Topic	% Course
The student will be able to list the major themes around which the study of biology is constructed.	5%
The student will be able to use simple chemical formulas and equations to describe important metabolic functions.	5%
The student will be able to describe the four classes of organic compounds important to organisms. For each, students should be able to write structural formulae of monomers and polymers, describe synthesis and hydrolysis reactions, and explain how each is used in the cell.	10%
The student will be able to describe how the First and Second Laws of Thermodynamics relate to basic metabolic functions.	5%
The student will be able to explain the structure and function of enzymes, their role in controlling metabolic pathways, and the causes and consequences of protein denaturation.	10%
The student will be able to differentiate between prokaryotic and eukaryotic cells in terms of their structure and function.	5%
The student will be able to list the important organelles associated with eukaryotic cells (including plant and animal cells), and state the function of each.	5%
The student will be able to describe cellular respiration pathways in a typical eukaryotic cell, and relate this process to everyday life phenomena such as breathing, eating, and exercising.	10%
The student will be able to describe the photosynthetic pathway in C-3 and C-4 plants, relate this pathway to ecological adaptations of plants, and relate this pathway to structures of the plant such as stomata, lenticels, vascular tissue, etc. Students should also be able to describe the importance of photosynthesis in the context of producers and consumers.	10%
The student will be able to diagram and describe the cell cycle, and differentiate mitosis and meiosis.	10%
The student will be able to predict the outcomes of genetic crosses using the laws of Classical Genetics.	10%
The student will be able to describe how the discovery of chromosomes, genes and DNA has expanded the understanding of Mendel's work in classical genetics.	5%
The student will be able to diagram and explain how DNA replicates and how RNA translation leads to protein expression and how the cell regulates protein expression at several levels.	5%
The student will be able to explain the relationship between an organism's phenotype and genotype, and explain the consequences of mutation as it relates to development and evolution.	5%
The student will understand the scientific method including hypothesis testing/experimental design, and quantitative analysis of data.	Throughout

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
Students will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions. ➢ consider analytically the viewpoints of self and others.	This lab science course relies heavily on the scientific method to observe, propose a question, and formulate a testable hypothesis. Require students to develop testable hypotheses on basic lab or Inquiry-based lab projects. Aside from lecture, students must read and comprehend relatively complex concepts that encompass all living systems. Exam questions should focus on application and evaluation type thinking skills (not rote memorization) of content. Group work should encompass problem sets with alternative answers. Students must apply 'textbook' knowledge toward solving complex questions or address current issues relative to living systems, based on the scientific method and/or principles of scientific inquiry. Have students work in groups to solve complex problem sets on lecture content relative to everyday aspects of life (health, environment, science and technology). Students work in groups during lab and must explain, implement and interpret a course of action to complete the activity. Encourage students to offer and accept critique of each other's interpretation of directions and results. Use peer evaluations for Group work to provide feedback on one's ability to interact within a group. Students will conduct their own research and/or participate in field and/or laboratory activities. These activities will require the application of class concepts as well as the analysis and evaluation of quantitative data.
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
➢ Students will begin to understand how their lives are shaped by the complex world in which they live. ➢ Students will understand that their actions have social, economic and environmental consequences.	From a scientific perspective the complex interactions among energy and chemical cycles, and living systems are covered, including the role scientific discovery plays in helping the layperson understand the complex world. In context of each chapter expand on the emergent properties of biologic systems, beginning with basic chemistry progressing to the role of DNA in the evolutionary process. The students learn how scientific discovery has changed man's outlook on life and led to societal changes impacting psychology, sociology, religion and philosophy. Discuss current societal issues in light of scientific concepts the layperson does not fully comprehend. Bring to light that disagreement among the scientific community is the norm before data is accepted as fact. Science and technology are the engines that drive economic development. The career choices they make will have an impact on their community. Discuss existing and emerging industries that revolve around each new scientific discovery. How they contribute to increased standards of living and/or quality of life.

	Students learn that science is also responsible for addressing the impact of new technologic innovations and correcting unforeseen consequences of previous applications. When pertinent to chapter concepts bring into discussion modern technologic applications with resulting environmental impact, and propose possible attempts at remediating the problem(s).

Instructional Methods
Lectures and laboratory exercises form the core of this course. Additionally, the instructor may wish to include structured discussion sessions, student presentations, and/or original student research.

Methods of Assessment/Evaluation

Method	% Course Grade
2-3 hourly examinations covering several chapters	20 - 30%
A cumulative final examination covering all core concepts	20 - 30%
Laboratory reports or other evaluation of work completed in the lab	20 - 30%
Student papers, experimental research, or quiz material	20-40%
Attendance and participation (optional)	0 - 10%

Text(s)
Biology, N.A. Campbell and J.B. Reece, editor; B Wilbur, Benjamin/Cummings Publishing Company, latest edition.

Campbell Biology in Focus, Urry, Cain, Wasserman, Minorsky, Jackson and Reece. Latest edition Pearson Education Inc

Laboratory Manual for Biology 104, Morris. C., Tompkins Cortland Community College, current edition.

Bibliography
Principles of Biochemistry, Lehninger, A.L., Nelson, D.L., and Cox, M.M., 3rd edition, 1999 Worth Publishing, New York.

Science, American Association for the Advancement of Science, Washington, DC (monthly periodical)

Nature, Nature Publishing Group, (weekly periodical)

Other Learning Resources

Audiovisual
No resources specified

Electronic
Access to publishers Mastering Biology and/or CD-ROM distributed with recommended text book for supplemental learning material.

BIOLINK http://www.bio-link.org/index.htm

Other
A course management site such as ANGEL should be used to post the course syllabus, outline, course materials and related links. Including on-line quizzes and discussion material.