Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: BIOL104 **Year: 2025-2026**

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

I. 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. Topics include basic chemistry and biochemistry, cell morphology, physiology and energetics and classical and molecular genetics. Laboratories are strongly quantitative and requires hands-on activity. Substantial outside preparation for lectures and laboratories is required. BIOL104 fulfills the SUNY General Education Natural Sciences Knowledge and Skills Area. BIOL105 may be taken before BIOL104. Prerequisites: ENGL100 (or prior completion of ESL 103) if required by placement testing, college prep biology and chemistry (or concurrent CHEM101); Prior or concurrent college MATH level course. 4 Cr. (3 Lec, 3 Lab.) Fall and Spring semesters.

II. Additional Course Information: o

1. This course (or BIOL101/CHEM101) is a prerequisite for BIOL201, 205, 211 and 216.
2. BIOL119 Botany may be used as a college prep biology course that allows students to take BIOL104.
3. This course can satisfy program requirements for Liberal Arts and Sciences - Math & Science, Biology A.S., Environmental Studies A. S. and an unrestricted elective in any program.
4. This course employs engaging educational practices such as group discussion, learn by doing and peer-assisted learning.
5. The SUNY supported course management system (BrightSpace) is used to post the course syllabus, outline, course and related links. Including on-line quizzes, lab manual and discussion materials. Use of other on-line course management systems are encouraged.

III. Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of data analysis or mathematical modeling as assessed by lab reports, oral presentations, poster presentations.
2. Apply scientific data, concepts, and models in one of the natural sciences as assessed by projects, practicums and/or solving case studies.
3. Demonstrate proficiency in technical lab skills to enable them to function in a laboratory setting as assessed by lab notebook documentation.

IV. Tompkins Cortland Institutional Learning Outcomes; Program Learning Outcomes; SUNY General Education Competencies and Knowledge and Skills Areas

Tompkins Cortland ILOs

Complete this section for "service" courses only (e.g., courses that are required of all students; courses that are not program specific but satisfy liberal arts requirements; or commonly used in multiple academic programs to meet non-program-specific requirements). Check only Institutional Learning Outcomes (ILOs) that are meaningfully developed and assessed in this course. For each ILO chosen, include the SLO to which it aligns.

Students will:

☐ Communicate effectively, in oral and written forms, taking into consideration audience and purpose.

☒ Apply principles and methods of scientific inquiry and quantitative reasoning appropriate to their discipline.
Students will demonstrate scientific reasoning applied to the natural world, including;

1. Describe the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of data analysis or mathematical modeling as assessed by lab reports, oral presentation, poster presentations.

2. Apply scientific data, concepts, and models in one of the natural sciences as assessed by projects, practicums and/or solving case studies.

☐ Use information, critical thinking, and the creative process to solve problems and reach conclusions.

☐ Use technology appropriate to their discipline.

☐ Describe the ways in which social, economic, or environmental sustainability depends on their own and the collective contributions of a diversity of ideas and people.

Program Learning Outcomes – N/A

Complete this section for program-specific courses (e.g., those that share the same discipline code as the academic program or satisfy requirements in related programs). List the academic program(s) here and note which Student Learning Outcomes align to specific Programmatic Learning Outcomes. Please see the MCS Instructions for more details.

Specify the Academic Program: Biotechnology Certificate
Demonstrate proficiency in technical lab skills to enable them to function in a laboratory setting as assessed by lab notebook documentation.

SUNY General Education Competencies

If this course assesses a SUNY GEN ED Competency, check all that apply and indicate which course outcome(s) address each checked item:

☐ CRITICAL THINKING & REASONING- Students will:

☐ INFORMATION LITERACY - Students will:

a. locate information effectively using tools appropriate to their need and discipline; evaluate information with an awareness of authority, validity, and bias; and demonstrate an understanding of the ethical dimensions of information use, creation, and dissemination.

Course SLO(s):

☒ SUNY GENERAL EDUCATION KNOWLEDGE AND SKILLS AREA(s): Natural Sciences
For courses that are approved to meet one (or more) of the ten SUNY General Education Knowledge and Skills Areas, indicate which area the course fulfills, and which outcome(s) are aligned with the SUNY outcomes for that area:

Course SLO(s): Students will demonstrate scientific reasoning applied to the natural world, including

- an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of data analysis or mathematical modeling as assessed by lab reports, oral presentation, poster presentations.

- application of scientific data, concepts, and models in one of the natural (or physical) sciences as assessed by projects, practicums and/or solving case studies.

☐ This course does not address any of the above Tompkins Cortland ILOs, PLOs, or SUNY General Education Competencies or Knowledge and Skills Areas.

V. Essential Topics/Themes

1. **Chemistry and Cells**: Knowledge of basic chemistry and organic chemistry necessary to uderstand the **-** emergent levels of biological organization.
2. Carbon and Molecular Diversity- chemical interactions between macromolecules specifically carbohydrates, proteins, lipids, and nucleic acids.
3. **Cell Biology**: Knowledge of the organization differences between prokaryotic and eukaryotic cells is necessary to understand how unique structures (cytoskeleton) perform specific functions to sustain the basic unit of life and interact in multicellular organisms.
4. Membrane Transport and Cell Signaling- including membranes and transport across, diffusion, osmosis, and cell signaling pathways.
5. **Introduction to Metabolism/Biochemistry**: Knowledge of how the cell obtains nutrients and converts them into ATP energy via thermodynamics and free energy
6. Cellular Fermentation & Cellular Respiration- cellular metabolism including aerobic, anaerobic and fermentation pathways necessary to understand living systems.
7. **Photosynthesis**- including physics of light, structure and function of chloroplast, Calvin cycles (C4 vs CAM plants).
8. Cell Cycle (Mitosis)- stages of cell cycle and mitosis**,** chromatids, kinetochore, cytokinesis, binary fission, cancer.
9. Sexual Life Cycle (Meiosis)- haploid vs diploid, genetic diversity and nondisjunction during meiosis.
10. **Mendelian Genetics**: How it is passed on through generations contributing to evolution via d) Mendelian and e) non-Mendelian mechanisms.
11. Chromosome & Molecular Basis of Inheritance- Knowledge about the flow of genetic information to produce the molecules required for metabolic activities including structure and replication
12. Gene Expression and Regulation- Gene to protein via expression of DNA transcription to RNA translation into protein.
13. Gene Regulation- Control mechanisms and effect of mutations on expression. Biotechnology and RNAi
14. **Development, Stem Cells and Cancer**-including role of molecular biology in stem cells/cancer and infectious disease.
15. **Scientific Method and Laboratory Experience**: Knowledge of the scientific method is required to understand and explain the natural world and critically evaluate new discoveries.

16. Viruses, Genomes and their Evolution- bioinformatics, phylogeny, homeobox genes, multigene families.

VI. Methods of Assessment/Evaluation

Method	% Course Grade
1. Unit exams, covering several chapters; the last unit exam (or final) should be comprehensive and incorporate questions relating to all core concepts	20 - 30%
2. Chapter quizzes and/or reflective synopsis reports	20-30%
3. Laboratory reports or other evaluation of work completed in the lab (Includes assessment material for SLO 1, 2 and 3)	25 - 30%
4. Student papers, experimental research, or quiz material	10 - 20%
5. Attendance and participation	5 - 10%

VII. Texts – ☐ Required ☒ Recommended ☒ Used for more than one course (list courses) BIOL105

High school instructors may consult with staff in the CollegeNow office for additional information and guidance.

	OER
1. Biology. N.A. Campbell and J.B. Reece, editor; B Wilbur, Benjamin. Cummings Publishing Company. Latest edition w/in 5yrs. including Advanced Placement editions.	☐
2. Campbell Biology in Focus. Urry, Cain, Wasserman, Minorsky, Jackson and Reece. Pearson Education Inc. Latest edition w/in 5yrs.	☐
3. Department approved science-major college level textbooks	☐
4. *College Laboratory Manual, Pearson Custom Library* or similar department approved manuals.	

Editions listed are current as of date of syllabus. More recent editions may be used.

VIII. Bibliography of Supplemental Materials

1.

Editions listed are current as of date of syllabus. More recent editions may be used.

IX. Other Learning Resources

Audiovisual: video (YuJa) on lab notebook documentation of data

Electronic:

- Access to publishers Mastering Biology and/or materials distributed with recommended textbook for supplemental learning material.
- **https://www.youtube.com/**

Other: The SUNY supported course management system (BrightSpace) is used to post the course syllabus, outline, course materials and related links. Including on-line quizzes, lab manual and discussion materials. Use of other on-line course management systems are encouraged.

***Credit/Contact Hour Relationship**: The State University of New York, like most of American higher education, has adopted a variant of the traditional "Carnegie Unit" as a measure of academic credit. This unit is known in the State University by the familiar term, "semester credit hour," and is the primary academic measure by which progress toward a degree is gauged. In the interest of accurate academic measurement and cross campus comparability, the*

following definitions and practices apply in controlling the relationship between contact and credit hours. A semester credit hour is normally granted for satisfactory completion of one 50-minute session of classroom instruction per week for a semester of not less than fifteen weeks. This basic measure may be adjusted proportionately to reflect modified academic calendars and formats of study. Semester credit hours are granted for various types of instruction.(SUNY Memorandum to Presidents, Vol. 76 #8, 1976)

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 academic adjustments. All course materials are available in alternate formats upon request.*

Academic Integrity: *Every student at Tompkins Cortland Community College is expected to act in an academically honest fashion in all aspects of their academic work: in writing papers and reports, in taking examinations, in performing laboratory experiments and reporting the results, in clinical and cooperative learning experiences, and in attending to paperwork such as registration forms.*
Any written work submitted by a student must be their own. If the student uses the words or ideas of someone else, they must cite the source by such means as a footnote. Our guiding principle is that any honest evaluation of a student's performance must be based on that student's work. Any action taken by a student that would result in misrepresentation of someone else's work or actions as the student's own — such as cheating on a test, submitting for credit a paper written by another person, or forging an advisor's signature — is intellectually dishonest and deserving of censure.
Several degree programs offer student learning opportunities (such as internships, field work, and clinical experiences) outside the standard classroom setting. As part of the learning process, students must understand and engage in conduct that adheres to principles guiding employment within the professional workplace. These behaviors include, but are not limited to, academic integrity, accountability, reliability, respect, use of appropriate language and dress, civility, professional ethics, honesty, and trustworthiness. Disciplinary action may be initiated for inappropriate conduct occurring while participating in any course-related project or event.