HORRY GEORGETOWN TECHNICAL COLLEGE

INSTRUCTIONAL PACKAGE

BIO 101
Biological Sciences I

Effective Term
Fall 2022/Spring 2023/Summer 2023

INSTRUCTIONAL PACKAGE

Part I: Course Information

Effective Term: 2022-2023

COURSE PREFIX: BIO 101 COURSE TITLE: Biological Sciences I

CONTACT HOURS: 3-3 CREDIT HOURS: 4

RATIONALE FOR THE COURSE:
BIO 101 is the first course in a sequence that introduces students to concepts in Biology and helps relate this information to real-world applications. This course is intended for students pursuing more advanced scientific courses and through guided classroom and laboratory experiences, students will develop a deeper appreciation of the biological world.

COURSE DESCRIPTION:
This course is a study of the scientific method, basic biochemistry, cell structure and function, cell physiology, cell reproduction and development, Mendelian genetics, population genetics, natural selection, evolution, and ecology. This course is transferable to public senior institutions as part of the South Carolina Commission on Higher Education Statewide Articulation Agreement.

PREREQUISITES/CO-REQUISITES:
(New ACCUPLACER Reading Comp 250 and New ACCUPLACER Sentence Skills 250) or SAT Critical Reading 480 or (ACT Reading 19 or ACT English 19) or (Multiple Measures English 1) or (Writing Sample ENG101 1 or WS ENG101 with Lab 1 or Writing Sample ENG155 1) or (Credit level ENG 101 Minimum Grade of C or Credit level ENG 101 Minimum Grade of TC or Credit level ENG 155 Minimum Grade of C or Credit level ENG 155 Minimum Grade of TC))

*__Online/Hybrid__ courses require students to complete the DLi Orientation Video prior to enrolling in an online course.

REQUIRED MATERIALS:
Please visit the BOOKSTORE online site for most current textbook information.

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

ADDITIONAL REQUIREMENTS:
A Connect access code from McGraw Hill is a required component of this course.

For Hybrid/Online Students Only: Each student will be required to view an orientation PowerPoint

presentation during the first week of class. This presentation can be found on the course homepage in D2L under News. After viewing the presentation, all online students must complete the orientation quiz, which can be found under the dropdown assignment menu. A student will not be considered officially enrolled in the course until the presentation has been viewed and the quiz completed with a 100% score. Any submitted work from the student including discussion posts, assignments, etc. will not be given a grade until the presentation has been viewed and the quiz has been submitted. Failure to view the presentation and take the quiz before midnight on the last day to add/drop classes will result in the student being automatically dropped from the course.

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's student portal for course materials.
myHGTC and college email access.

STUDENT IDENTIFICATION VERIFICATION

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

NETIQUETTE: is the term commonly used to refer to conventions adopted by Internet users on the web, mailing lists, public forums, and in live chat focused on online communications etiquette. For more information regarding Netiquette expectations for distance learning courses, please visit Online Netiquette.

ACADEMIC DISHONESTY:

All forms of academic dishonesty, as outlined in the Student Code in the HGTC catalog, will NOT be tolerated and will result in disciplinary action. Anyone caught cheating or committing plagiarism (Defined in the code as: "The appropriation of any other person's work and the unacknowledged incorporation of that work in one's own work offered for credit") will be given a grade of a zero for that assignment and reported to the Senior VP of Academic Affairs, in accordance with the student handbook. A second offense will result in the student being withdrawn from the course with a "WF" and charges being filed with the Chief Student Services Officer.

Part II: Student Learning Outcomes

COURSE LEARNING OUTCOMES and ASSESSMENTS*:

Lecture Student Learning Outcomes:

Chapter 1: The Study of Life
Summarize the steps of the scientific method.
Identify and describe the properties of life.
Explain the relationship between the process of natural selection and evolutionary change.
Describe the levels of organization among living things.

Chapter 2: The Chemical Foundation of Life
Define matter and elements.
Describe the interrelationship between protons, neutrons, and electrons.
Compare the ways in which electrons can be donated or shared between atoms.
Explain the ways in which naturally occurring elements combine to create molecules, cells, tissues, organ systems, and organisms.
Describe the properties of water that are critical to maintaining life.
Explain why water is an excellent solvent.
Provide examples of water's cohesive and adhesive properties.
Discuss the role of acids, bases, and buffers in homeostasis.
Explain why carbon is important for life.
Describe the role of functional groups in biological molecules.

Chapter 3: Biological Macromolecules
Understand macromolecule synthesis.
Explain dehydration (or condensation) and hydrolysis reactions.
Discuss the role of carbohydrates in cells and in the extracellular materials of animals and plants.
Explain carbohydrate classifications.
List common monosaccharides, disaccharides, and polysaccharides.
Describe the four major types of lipids.
Explain the role of fats in storing energy.
Differentiate between saturated and unsaturated fatty acids.
Describe phospholipids and their role in cells.
Define the basic structure of a steroid and some steroid functions.
Describe the functions proteins perform in the cell and in tissues.
Discuss the relationship between amino acids and proteins.
Explain the four levels of protein organization.
Describe the ways in which protein shape and function are linked.
Describe nucleic acids' structure and define the two types of nucleic acids.
Explain DNA's structure and role.
Explain RNA's structure and roles.

Chapter 4: The Cell
Describe the role of cells in organisms.
Compare and contrast light microscopy and electron microscopy.
Summarize cell theory.
Name examples of prokaryotic and eukaryotic organisms.
Compare and contrast prokaryotic and eukaryotic cells.
Describe the relative sizes of different cells.
Explain why cells must be small.

Describe the structure of eukaryotic cells.
Compare animal cells with plant cells.
State the role of the plasma membrane.
Summarize the functions of the major cell organelles.
List the components of the endomembrane system.
Recognize the relationship between the endomembrane system and its functions.
Describe the cytoskeleton.
Compare the roles of microfilaments, intermediate filaments, and microtubules.
Compare and contrast cilia and flagella.
Summarize the differences among the components of prokaryotic cells, animal cells, and plant cells.
Describe the extracellular matrix.
List examples of the ways that plant cells and animal cells communicate with adjacent cells.
Summarize the roles of tight junctions, desmosomes, gap junctions, and plasmodesmata.

Chapter 5: The Structure and Function of Plasma Membranes
Understand the cell membrane fluid mosaic model.
Describe phospholipid, protein, and carbohydrate functions in membranes.
Discuss membrane fluidity.
Explain why and how passive transport occurs.
Understand the osmosis and diffusion processes.
Define tonicity and its relevance to passive transport osmosis.
Understand how electrochemical gradients affect ions.
Distinguish between primary active transport and secondary active transport.
Describe endocytosis, including phagocytosis, pinocytosis, and receptor-mediated endocytosis.
Understand the process of exocytosis.

Chapter 6: Metabolism
Explain metabolic pathways and describe the two major types (anabolic and catabolic).
Discuss how chemical reactions play a role in energy transfer.
Define “energy”.
Explain the difference between kinetic and potential energy.
Discuss the concepts of free energy and activation energy.
Describe endergonic and exergonic reactions.
Discuss the concept of entropy.
Explain the first and second laws of thermodynamics.
Explain ATP's role as the cellular energy currency.
Describe how energy releases through ATP hydrolysis.
Describe the role of enzymes in metabolic pathways.
Explain how enzymes function as molecular catalysts.
Discuss enzyme regulation by various factors including competitive inhibition, non-competitive inhibition, allosteric inhibition, cofactors and coenzymes, feedback inhibition, and enzyme compartmentalization.

Chapter 7 - Cellular Respiration
Discuss the importance of electrons in the transfer of energy in living systems through redox reactions.
Explain how ATP is used by cells as an energy source.
Describe the overall result in terms of molecules produced during the chemical breakdown of glucose by

glycolysis.
Compare the output of glycolysis in terms of ATP molecules and NADH molecules produced.
Describe how pyruvate, the product of glycolysis, is prepared for entry into the citric acid cycle.
Explain how the reactions of the citric acid cycle produce ATP, NADH, $FADH_2$, and CO_2.
Describe how electrons move through the electron transport chain and explain what happens to their energy levels during this process.
Explain how a proton (H^+) gradient is established and maintained by the electron transport chain.
Determine how the events of glycolysis, the oxidation of pyruvate, and the citric acid cycle provide the electrons needed for the events of the electron transport chain.
Discuss the fundamental difference between anaerobic cellular respiration and fermentation.
Describe the type of fermentation that readily occurs in animal cells and the conditions that initiate that fermentation.
Describe alcohol fermentation.
Compare and contrast the efficiency of aerobic and anaerobic cellular respiration pathways with regards to the amount of ATP produced per molecule of glucose.
Discuss the ways in which carbohydrate metabolic pathways, glycolysis, and the citric acid cycle interrelate with protein and lipid metabolic pathways.

Chapter 8: Photosynthesis
Explain the significance of photosynthesis to other living organisms.
Describe the main structures involved in photosynthesis.
Identify the substrates and products of photosynthesis.
Explain how plants absorb energy from sunlight.
Describe short and long wavelengths of light.
Describe how and where the light reactions of photosynthesis take place within a plant.
Describe the Calvin cycle.
Define carbon fixation.
Explain how photosynthesis works in the energy cycle of all living organisms.

Chapter 10: Cell Reproduction
Describe the structure of prokaryotic and eukaryotic genomes.
Distinguish between chromosomes, genes, and traits.
Describe the mechanisms of chromosome compaction.
Describe the three stages of interphase.
Discuss the behavior of chromosomes during karyokinesis/mitosis.
Explain how the cytoplasmic content is divided during cytokinesis.
Define the quiescent G_0 phase.
Understand how the cell cycle is controlled by mechanisms that are both internal and external to the cell.
Explain how the three internal "control checkpoints" occur at the end of G_1, at the G_2/M transition, and during metaphase.
Describe the molecules that control the cell cycle through positive and negative regulation.
Describe how cancer is caused by uncontrolled cell growth.
Understand how proto-oncogenes are normal cell genes that, when mutated, become oncogenes.
Describe how tumor suppressor's function.
Explain how mutant tumor suppressors cause cancer.

Describe the process of binary fission in prokaryotes.

Chapter 11: Meiosis and Sexual Reproduction

Describe the behavior of chromosomes during meiosis, and the differences between the first and second meiotic divisions.
Describe the cellular events that take place during meiosis.
Explain the differences between meiosis and mitosis.
Explain the mechanisms within the meiotic process that produce genetic variation among the haploid gametes.
Identify variation among offspring as a potential evolutionary advantage of sexual reproduction.
Describe the three different life-cycle types among sexually reproducing multicellular organisms.

Chapter 12: Mendel's Experiments and Heredity

Describe the scientific reasons for the success of Mendel's experimental work.
Describe the expected outcomes of monohybrid crosses involving dominant and recessive alleles.
Apply the sum and product rules to calculate probabilities.
Explain the relationship between genotypes and phenotypes in dominant and recessive gene systems.
Develop a Punnett square to calculate the expected proportions of genotypes and phenotypes in a monohybrid cross.
Explain the purpose and methods of a test cross.
Identify non-Mendelian inheritance patterns such as incomplete dominance, codominance, recessive lethals, multiple alleles, and sex linkage.
Explain Mendel's law of segregation and independent assortment in terms of genetics and the events of meiosis.
Explain the effect of linkage and recombination on gamete genotypes.
Explain the phenotypic outcomes of epistatic effects between genes.

Chapter 13: Modern Understandings of Inheritance

Discuss Sutton's Chromosomal Theory of Inheritance.
Describe genetic linkage.
Explain the process of homologous recombination or crossing over.
Describe how a karyogram is created.
Explain how nondisjunction leads to disorders in chromosome number.
Compare disorders that aneuploidy causes.
Describe how errors in chromosome structure occur through inversions and translocations.

Chapter 14: DNA Structure and Function

Explain transformation of DNA.
Describe the key experiments that helped identify that DNA is the genetic material.
State and explain Chargaff's rules.
Describe the structure of DNA.
Explain the Sanger method of DNA sequencing.
Discuss the similarities and differences between eukaryotic and prokaryotic DNA.
Explain how the structure of DNA reveals the replication process.
Describe the Meselson and Stahl experiments.
Explain the process of DNA replication in prokaryotes.

Discuss the role of different enzymes and proteins in supporting this process.
Discuss the similarities and differences between DNA replication in eukaryotes and prokaryotes.
State the role of telomerase in DNA replication.
Discuss the different types of mutations in DNA.
Explain DNA repair mechanisms.

Chapter 15: Genes and Proteins
Explain the "central dogma" of DNA-protein synthesis.
Describe the genetic code and how the nucleotide sequence prescribes the amino acid and the protein sequence.
List the different steps in prokaryotic transcription.
Discuss the role of promoters in prokaryotic transcription.
Describe how and when transcription is terminated.
List the steps in eukaryotic transcription.
Discuss the role of RNA polymerases in transcription.
Explain the significance of transcription factors.
Describe the different steps in RNA processing.
Understand the significance of exons, introns, and splicing for mRNAs.
Describe the different steps in protein synthesis.
Discuss the role of ribosomes in protein synthesis.

Chapter 16: Gene Expression
Discuss why every cell does not express all its genes all of the time.
Describe how prokaryotic gene regulation occurs at the transcriptional level.
Discuss how eukaryotic gene regulation occurs at the epigenetic, transcriptional, post-transcriptional, translational, and post-translational levels.
Describe the steps involved in prokaryotic gene regulation.
Explain the roles of activators, inducers, and repressors in gene regulation.
Explain how chromatin remodeling controls transcriptional access.
Describe how access to DNA is controlled by histone modification.
Describe how DNA methylation is related to epigenetic gene changes.
Discuss the role of transcription factors in gene regulation.
Explain how enhancers and repressors regulate gene expression.
Understand RNA splicing and explain its role in regulating gene expression.
Describe the importance of RNA stability in gene regulation.
Understand the process of translation and discuss its key factors.
Describe how the initiation complex controls translation.
Explain the different ways in which the post-translational control of gene expression takes place.
Describe how changes to gene expression can cause cancer.
Explain how changes to gene expression at different levels can disrupt the cell cycle.
Discuss how understanding regulation of gene expression can lead to better drug design.

Chapter 17: Biotechnology and Genomics
Describe gel electrophoresis.
Explain molecular and reproductive cloning.
Describe biotechnology uses in medicine and agriculture.

Define genomics.
Describe genetic and physical maps.
Describe genomic mapping methods.
Describe three types of sequencing.
Define whole-genome sequencing.
Explain pharmacogenomics.
Define polygenic.
Explain systems biology.
Describe a proteome.
Define protein signature.

Lab Student Learning Outcomes:
Learning outcomes for the lab portion of this course are the Objectives given for each lab in the manual and can be found at the start of each lab. They include hands-on items such as identification of lab equipment, models, and specimens on slides, and the use of microscopes and lab equipment. In addition, students will be required to design and carry out scientific investigations, collect data and draw conclusions resulting in the submission of lab reports.

Students – please refer to the Instructor's Course Information sheet for specific information on assessments and due dates.

Part III: Grading and Assessment

EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS*

Students' performance will be assessed and the weight associated with the various measures/artifacts are listed below.

EVALUATION*

Lecture	75%
Lab	25%
	100%

Students, for the specific number and type of evaluations, please refer to the Instructor's Course Information Sheet.

GRADING SYSTEM:

Please note the College adheres to a 10 point grading scale A = 100 – 90, B = 89- 80, C = 79 – 70, D = 69 – 60, F = 59 and below.

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the academic calendar for deadlines for add/drop. You must attend at least one meeting of all of your classes during that period. If you do not,

you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the Instructor Course Information Sheet.**

For online and hybrid courses, check your Instructor's Course Information Sheet for any required on-site meeting times. Please note, instructors may require tests to be taken at approved testing sites, if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

Lecture Attendance:

The allowed number of absences for a MW or TR class is as follows: four (4) absences are allowed for lecture, regardless of reason. For a lecture class that meets once a week, the allowed number of absences is two (2). When a student surpasses the allowed number of absences, the student will be withdrawn automatically from the course with a W or a WF. Remember, an absence is an absence, no matter if it is excused or not!

Lab Attendance:

Students are allowed two (2) lab absences for a lab that meets weekly. When a student surpasses the allowed number of absences, the student will be withdrawn automatically from the course with a W or a WF.

Online/Hybrid Attendance:

Students enrolled in distance learning courses (hybrid and online) are required to maintain contact with the instructor on a regular basis to be counted as "in attendance" for the course. All distance learning students must participate weekly in an academic activity in order to demonstrate course participation. For an online lecture, the allowed number of absences is two weekly lecture absences. For an online lab, the allowed number of absences is two weekly lab absences. Students showing no activity in the course for more than two weeks (these weeks do not need to be consecutive) will be withdrawn due to lack of attendance.

Lab Attendance for Hybrid Courses:

Students in hybrid classes in which labs meet weekly, are allowed two (2) lab absences. Students in hybrid labs that only meet 5 or 6 times during the semester, must attend all lab sessions for its entirety. When a student surpasses the allowed number of absences, the student will be dropped automatically from the course with a W or a WF.

Part V: Student Resources

THE STUDENT SUCCESS AND TUTORING CENTER (SSTC):

The SSTC offers to all students the following **free** resources:

1. **Academic tutors** for most subject areas, **Writing Center support**, and **college success skills**.
2. Online **tutoring** and academic support resources.
3. Professional and interpersonal communication **coaching** in the EPIC Labs.

Visit the Student Success & Tutoring Center website for more information. To schedule tutoring, contact the SSTC at sstc@hgtc.edu or self-schedule in the Penji iOS/Android app or at www.penjiapp.com. Email sstc@hgtc.edu or call SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455, or go to the Online Resource Center to access on-demand resources.

STUDENT INFORMATION CENTER: TECH Central

TECH Central offers to all students the following free resources:

1. **Getting around HGTC**: General information and guidance for enrollment, financial aid, registration, and payment plan support!
2. Use the Online Resource Center (ORC) including Office 365 support, password resets, and username information.
3. **In-person workshops, online tutorials and more services** are available in Desire2Learn, Student Portal, Degree Works, and Office 365.
4. **Chat with our staff on TECH Talk**, our live chat service. TECH Talk can be accessed on the student portal and on TECH Central's website, or by texting questions to (843) 375-8552.

Visit the Tech Central website for more information. Live Chat and Center locations are posted on the website. Or please call (843) 349 – TECH (8324), Option #1.

STUDENT TESTING:

(If course is offered in multiple format include this section, delete if only F2F sections are offered.)
Testing in an **online/hybrid** course may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms

Further more tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through our online proctoring service. To find out more about proctoring services, please visit the Online Testing section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

DISABILITY SERVICES:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to HGTC's Accessibility and Disability Service webpage. The Accessibility and Disability staff will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

STATEMENT OF EQUAL OPPORTUNITY/NON-DISCRIMINATION STATEMENT:

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

TITLE IX REQUIREMENTS:

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college's Chief Student Services Officer, campus law enforcement, or with the college's Title IX Coordinator, or designee.

> *Faculty and Staff are required to report incidents to the Title IX Coordinators when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

INQUIRIES REGARDING THE NON-DISCRIMINATION/TITLE IX POLICIES:

Student and prospective student inquiries concerning Section 504, Title II, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.

Dr. Melissa Batten, VP Student Affairs
Title IX Coordinator
Building 1100, Room 107A, Conway Campus
PO Box 261966, Conway, SC 29528-6066
843-349-5228

Melissa.Batten@hgtc.edu

Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.

Jacquelyne Snyder, VP Human Resources
EEO and Title IX Coordinator
Building 200, Room 212A, Conway Campus
PO Box 261966, Conway, SC 29528-6066
843-349-5212
Jacquelyne.Snyder@hgtc.edu