



**BIOL 1111: Biology I  
COURSE SYLLABUS**

**Lecture – Wednesday/Thursday  
Fall Semester 2015**

**Semester:** Fall 2015

**Course Title:** Biology I

**Course Number:** BIOL 1111

**Credit Hours/ Minutes:** 3 / 2250

**Class Location:** RMTC 842

**Class Meets:** 11:00-12:15 WR

**CRN:** 20353

**Instructor:** Erica Harrison

**Email address:** [eharrison@gmail.com](mailto:eharrison@gmail.com)

**Office Location:** Room #840 (RMTC Bldg.)

**Office hours:** 7-12, 2-4 M; 7:30-8:30 T,W,R

**Phone:** TBA

**Fax Number:** 912-538-3106

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**REQUIRED TEXTS:**

<sup>1</sup> Biology, Mader/Windelspecht, 12<sup>th</sup> Edition, ISBN-13: 978-0073525501 ISBN-10: 0073525502

<sup>2</sup> Lab Manual for Biology, Mader, 12<sup>th</sup> Edition, ISBN-13: 978-0077479718 ISBN-10: 0077479718

**REQUIRED SUPPLIES & SOFTWARE:**

Ink pens, highlighter, and any other supplies deemed necessary by instructor.

**COURSE DESCRIPTION:**

Provides an introduction to basic biological concepts with a focus on living cells. Topics include chemical principles related to cells, cell structure and function, energy and metabolism, cell division, protein synthesis, genetics, and biotechnology.

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**MAJOR COURSE COMPETENCIES:**

1. Organization and Chemical Basis of Life
2. Cell Structure and Function
3. Metabolism
4. Cell Division
5. Protein Synthesis
6. Central Dogma of Biology
7. Genetics
8. Biotechnology
9. Evolutionary concepts

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**Pre-requisite:** Regular admission

**Co-requisites:** BIOL 111L

## **COURSE OUTLINE**

### **Chapter 1:**

After reading this chapter and attending class, the student should be able to:

1. List the characteristics of life.
3. Distinguish between prokaryotic and eukaryotic cells.
4. List the six kingdoms of life and distinguish among them.
5. Outline the scientific method.

### **Chapter 2:**

After reading this chapter and attending class, the student should be able to:

1. Define element.
2. State four elements essential to life that make up 96% of living matter.
3. Describe the structure of an atom.
4. Define and distinguish among atomic number, mass number, atomic weight, and valence.
5. Given the atomic number and mass number of an atom, determine the number of neutrons.
6. Define electronegativity and explain how it influences the formation of chemical bonds
7. Distinguish among nonpolar covalent, polar covalent and ionic bonds.
8. Describe the formation of a hydrogen bond and explain how it differs from a covalent or ionic bond.
9. Explain why weak bonds are important to living organisms.
10. Explain the relationship between the polar nature of water and its ability to form hydrogen bonds.
11. Describe the biological significance of the cohesiveness of water.
12. Explain the basis for the pH scale.
13. Explain how acids and bases directly or indirectly affect the hydrogen ion concentration of a solution.

### **Chapter 3:**

After reading this chapter and attending class, the student should be able to:

1. Recognize the major functional groups, and describe the chemical properties of organic molecules in which they occur.
2. List the four major classes of biomolecules.
3. Describe how covalent linkages are formed and broken in organic polymers.
4. Describe the unique properties, building block molecules and biological importance of the three important of lipids: fats, phospholipids and steroids.
5. Distinguish between a saturated and unsaturated fat, and list some unique emergent properties that are a consequence of these structural differences.
6. Describe the characteristics that distinguish proteins from the other major classes of macromolecules, and explain the biologically important functions of this group.
7. Identify a peptide bond and explain how it is formed.
8. Explain what determines protein conformation and why it is important.
9. Define denaturation and explain how proteins may be denatured.
10. Summarize the functions of nucleic acids.
11. List the major components of a nucleotide, and describe how these monomers are linked together to form a nucleic acid.
12. Briefly describe the three-dimensional structure of DNA.

#### **Chapter 4:**

After reading this chapter and attending class, the student should be able to:

1. Describe the anatomy of Prokaryotes.
2. Describe the structure and function of the Eukaryotic nucleus, and briefly explain how the nucleus controls protein synthesis in the cytoplasm.
3. Describe the structure and function of a eukaryotic ribosome.
4. List the components of the *endomembrane system*, describe their structures and functions and summarize the relationships among them.
5. Explain how impaired lysosomal function causes the symptoms of storage diseases.
6. Describe the types of vacuoles and explain how their functions differ.
7. Describe the structure of a *mitochondrion* and explain the importance of compartmentalization in mitochondrial function.

#### **Chapter 5:**

After reading this chapter and attending class, the student should be able to:

1. Describe the function of the plasma membrane.
2. Describe the fluid properties of the cell membrane and explain how membrane fluidity is influenced by membrane composition.
3. Explain how hydrophobic interactions determine membrane structure and function.
4. Define diffusion; explain what causes it and why it is a spontaneous process.
5. Define osmosis and predict the direction of water movement based upon differences in solute concentration.
6. Explain how active transport differs from diffusion.

#### **Chapter 6:**

After reading this chapter and attending class, the student should be able to:

1. Distinguish between exergonic and endergonic reactions.
2. Describe the function of ATP in the cell.
3. Explain how ATP performs cellular work.
4. Describe the function of enzymes in biological systems.
5. Explain the relationship between enzyme structure and enzyme specificity.
6. Explain the *induced fit* model of enzyme function and describe the catalytic cycle of an enzyme.
7. Explain how substrate concentration affects rate of an enzyme-controlled reaction.
8. Explain how enzyme activity can be regulated or controlled by environmental conditions, cofactors, enzyme inhibitors and allosteric regulators.

#### **Chapter 7:**

After reading this chapter and attending class, the student should be able to:

1. Distinguish between photosynthetic autotrophs and chemosynthetic autotrophs.
2. Describe the location and structure of the chloroplast.
3. Write a summary equation for photosynthesis.
4. Explain what happens when chlorophyll II or accessory pigments absorb photons.
5. List the components of a photosystem and explain their function.
6. Trace electron flow through photosystems II and I.
7. Compare cyclic and noncyclic electron flow and explain the relationship between these components of the light reactions.
8. Describe the role of ATP and NADPH in the Calvin cycle.

## Chapter 8:

After reading this chapter and attending class, the student should be able to:

1. Describe the overall summary equation for cellular respiration.
2. Distinguish between substrate-level phosphorylation and oxidative phosphorylation.
3. Define oxidation and reduction.
4. Describe the structure of coenzymes and explain how they function in redox reactions.
5. Describe the role of ATP in coupled reactions.
6. Write a summary equation for glycolysis and describe where it occurs in the cell.
7. Describe where pyruvate is oxidized to acetyl CoA, what molecules are produced and how it links glycolysis to the Krebs cycle.
8. Describe the location, molecules in and molecules out for the Krebs cycle.
9. Describe the process of chemiosmosis.
10. Explain how membrane structure is related to membrane function in chemiosmosis.
11. Describe the fate of pyruvate in the absence of oxygen.
12. Explain why fermentation is necessary.
13. Distinguish between aerobic and anaerobic metabolism.
14. Explain how ATP production is controlled by the cell and what role the allosteric enzyme, phosphofructokinase, plays in this process.

## Chapter 9:

After reading this chapter and attending class, the student should be able to:

1. Describe the structural organization of the genome.
2. Overview the major events of cell division that enable the genome of one cell to be passed on to two daughter cells.
3. List the phases of the cell cycle and describe the sequence of events that occurs during each phase.
4. List the phases of mitosis and describe the events characteristic of each phase.
5. Recognize the phases of mitosis from diagrams or micrographs.
6. Compare cytokinesis in animals and plants.
7. Describe the roles of checkpoints, cyclin, Cdk, and MPF, in the cell-cycle control system.
8. Describe the internal and external factors which influence the cell-cycle control system.
9. Explain how abnormal cell division of cancerous cells differs from normal cell division.

## Chapter 10:

After reading this chapter and attending class, the student should be able to:

1. Distinguish between asexual and sexual reproduction.
2. Diagram the human life cycle and indicate where in the human body that mitosis and meiosis occur; which cells are the result of meiosis and mitosis; and which cells are haploid.
3. List the phases of meiosis I and meiosis II and describe the events characteristic of each phase.
4. Recognize the phases of meiosis from diagrams or micrographs.
5. Describe the process of synapsis during prophase I, and explain how genetic recombination occurs.

6. Describe key differences between mitosis and meiosis; explain how the result of meiosis differs from that of mitosis.
7. List the sources of genetic variation.

### **Chapter 11:**

After reading this chapter and attending class, the student should be able to:

1. List several features of Mendel's methods that contributed to his success.
2. State, in their own words, Mendel's law of segregation.
3. Use a Punnett square to predict the results of a monohybrid cross and state the phenotypic and genotypic ratios of the F<sub>2</sub> generation.
4. Distinguish between genotype and phenotype; heterozygous and homozygous; dominant and recessive.
5. Explain how a testcross can be used to determine if a dominant phenotype is homozygous or heterozygous.
6. Use a Punnett square to predict the results of a dihybrid cross and state the phenotypic and genotypic ratios of the F<sub>2</sub> generation.
7. Explain how the phenotypic expression of the heterozygote is affected by complete dominance, incomplete dominance and codominance.
8. Describe the inheritance of the ABO blood system and explain why the I<sup>A</sup> and I<sup>B</sup> alleles are said to be *codominant*.
9. Define and give examples of pleiotropy.
10. Give a simple family pedigree, deduce the genotypes for some of the family members.
11. Describe the inheritance and expression of cystic fibrosis, Tay-Sachs disease, and sickle-cell disease.
12. Explain how a lethal recessive gene can be maintained in a population.

### **Chapter: 12**

After reading this chapter and attending class, the student should be able to:

1. List the three components of a nucleotide.
2. Distinguish between deoxyribose and ribose.
3. List the nitrogen bases found in DNA and distinguish between pyrimidine and purine.
4. Explain the "base-pairing rule" and describe its significance.
5. Describe the structure of DNA and explain what kind of chemical bond connects the nucleotides of each strand and what type of bond holds the two strands together.
6. Explain, in their own words, semiconservative replication and describe the Meselson-Stahl experiment.
7. Describe the process of DNA replication and explain the role of helicase, single strand binding protein, DNA polymerase, ligase and primase.
8. Explain the Central Dogma (transcription, translation, protein modification)

### **Chapter: 13**

After reading this chapter and attending class, the student should be able to:

1. Explain Prokaryotic gene regulation and use the example of the *Lac* operon
2. List the four ways Eukaryotic gene regulation occurs
3. Explain how a gene mutation occurs

### **Chapter: 14**

After reading this chapter and attending class, the student should be able to:

1. Explain the two methods of DNA cloning
2. List the benefits of biotechnology
3. Explain gene therapy and genomics

## Chapter 15-18:

After reading this chapter and attending class, the student should be able to:

1. Write the general Hardy-Weinberg equation and use it to calculate allele and genotype frequencies
2. List the conditions a population must meet in order to maintain Hardy-Weinberg equilibrium
3. Explain how genetic drift, mutation, nonrandom mating and natural selection can cause micro evolution
4. Distinguish between the bottleneck effect and the founder effect
5. Distinguish between prezygotic and postzygotic isolating mechanisms
6. Explain how an atheistic world view can impact how data can be interpreted.
7. Define sympatric speciation and explain how polyploidy can cause reproductive isolation
8. Explain the difference between microevolution and macroevolution
9. Compare and contrast various models of creation
10. Explain the importance of the fossil record to the study of evolution

### **GENERAL EDUCATION CORE COMPETENCIES (GCC)**

Southeastern Technical College has identified the following general education core competencies that graduates will attain:

- a) The ability to utilize standard written English.
- b) The ability to solve practical mathematical problems.
- c) The ability to read, analyze, and interpret information.
- d) The ability to effectively utilize basic computer skills.

All students pursuing a degree, a diploma, or a Technical Certificate of Credit with a General Education component will be required to pass the General Education Competency Exams prior to graduation.

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### **STUDENT RESPONSIBILITIES/REQUIREMENTS**

In order to be successful in this class, each student should study a minimum of 2 hours per day. Before arriving to class, the student should come to class prepared by reading the assigned chapters, learning the bold faced vocabulary terms for each assigned chapter, and answering the study questions for each chapter. Failure to comply with these suggestions will make it impossible to understand the lecture material and will result in unsuccessfulness in the course. This course contains a lot of information and you must keep up on a daily basis.

**Students are responsible for the policies and procedures in the STC E-Catalog. During an examination, students are required to place all textbooks and personal property on the floor or counter located in the back or to the side of the classroom. Students are to be seated with an empty seat between each student. No talking is allowed once the test begins. Students found with their cell phone or any other personal communication device during the test will be considered cheating and be given a zero for the test. This includes taking a phone out after the student has completed an exam but other students are still testing.**

Students are expected to exhibit professional behavior at all times. Each student must show respect and concern for fellow students and for the instructor. Insubordination will not be tolerated, and disciplinary measures will be enacted. No cell phones or pagers are allowed to be turned on or operated in the classroom. Personal phone calls must be handled after class. Watches with alarms should not be programmed to sound during class.

**No EATING/DRINKING IS ALLOWED IN LAB OR CLASSROOMS!!!**

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**STC ATTENDANCE PROCEDURE:**

It is essential that educational programs maintain requirements and standards necessary for successful employment of its graduates in business and industry. In view of the intensive nature of the educational programs, it is necessary for every student to be present and on time every day for all classes.

Attendance is counted from the first scheduled class meeting of each semester. To receive credit for a course a student must attend at least 90% of the scheduled instructional time. All work missed due to tardiness or absences must be made up at the convenience of the instructor. Any student attending less than the required scheduled instructional time as noted on each syllabus will receive a "W" for the course if removed from the course on or before midterm.

**Definitions*****Scheduled Instructional Time***

Scheduled instructional time is explained by the instructor during the course orientation as listed on the course syllabus. The scheduled time will be maintained until all work is completed or until the end of the course.

***Tardy or Early Departure***

Tardy means arriving after the scheduled time for instruction to begin. Early departure means leaving before the end of the scheduled time. **Three (3) tardies or early departures equal one (1) absence for the course involved.**

**SPECIFIC ABSENCES:** Provisions for Instructional Time missed because of documented absences due to jury duty, military duty, court duty, or required job training will be made at the discretion of the instructor.

**Special Needs:** Students with documented special needs may be provided with an individualized Instructional Plan with specifications for scheduled instructional time. It is the student's responsibility to inform the ADA Coordinator as students and instructors are required to have documented evidence prior to receiving or allowing special accommodations. See STC Catalog and Student Handbook, Student Affairs section for further information regarding special needs.

**Special Needs Addendum:** Students with disabilities who believe that they may need accommodations in this class based on the impact of a disability are encouraged to contact Jan Brantley, Room 1208 Swainsboro Campus, 478-289-2274, or Helen Thomas, Room 108 Vidalia Campus, 912-538-3126, to coordinate reasonable accommodations.

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**ACADEMIC DISHONESTY POLICY:** The STC Academic Dishonesty Policy states All forms of academic dishonesty, including but not limited to cheating on tests, plagiarism, collusion, and falsification of information, will call for discipline. The entire policy/procedures will be discussed with you by the instructor. The policy can also be found in the STC Catalog and Student Handbook.

**Procedure for Academic Misconduct**

The procedure for dealing with academic misconduct and dishonesty is as follows:

**--First Offense--**

Student will be assigned a grade of "0" for the test or assignment. Instructor keeps a record in course/program files and notes as first offense. The instructor will notify the student's program advisor, academic dean, and the Registrar at the student's home campus. The Registrar will input the incident into Banner for tracking purposes.

### **--Second Offense--**

Student is given a grade of "WF" for the course in which offense occurs. The instructor will notify the student's program advisor, academic dean, and the Registrar at the student's home campus indicating a "WF" has been issued as a result of second offense. The Registrar will input the incident into Banner for tracking purposes.

### **--Third Offense--**

Student is given a grade of "WF" for the course in which the offense occurs. The instructor will notify the student's program advisor, academic dean, and the Registrar at the student's home campus indicating a "WF" has been issued as a result of second offense. The Vice President for Student Affairs, or designee, will notify the student of suspension from college for a specified period of time. The Registrar will input the incident into Banner for tracking purposes.

## **EVALUATION PROCEDURES**

A comprehensive final examination will be given at the end of the semester. There will be no make-up exam for the final examination. Failure to take the final examination on the specified date will result in a grade of zero. The final exam will include all chapters covered. A total of 100 points may be earned on the final examination. The Final exam will account for 30% of the final course grade.

**Assignments:** Students are required to read each chapter and complete a course outline/chapter summary AND the chapter quiz at the end of each chapter. Chapter summary should be typed (2-3 pages, single lined) and turned in EACH WEEK. Answers for chapter quizzes should be submitted on last page of chapter summary. Do not submit answers to chapter quizzes on separate sheet. You will also be required to turn in a research assignment during the semester with guidelines to follow. These assignments will account for 10% of your grade.

**Group Project/Presentation:** Students will work in small groups (2-3 people/group) and give an educational presentation on a topic related to chapters we will cover in this course. List of topics to choose from along with guidelines for arrangement, content, requirements, and rubric for presentations are provided on STC's "M" drive. Presentations should be at least 15-20 minutes long, and you are strongly encouraged to use any materials/media that will enhance your presentation. Please include visual aid for each presentation. Each member in the group should have equal participation in the research process, presentation, and discussion. Group Project/Presentation will account for 10% of your final grade.

## **STATEMENT OF NON-DISCRIMINATION**

Southeastern Technical College does not discriminate on the basis of race, color, creed, national or ethnic origin, gender, religion, disability, age, disabled veteran, veteran of Vietnam Era or citizenship status, (except in those special circumstances permitted or mandated by law). This school is in compliance with Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color, or national origin; with the provisions of Title IX of the Educational Amendments of 1972, which prohibits discrimination on the basis of gender; with the provisions of Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination on the basis of handicap; and with the American with Disabilities Act (ADA).

**GRIEVANCE PROCEDURES:** Grievance procedures can be found in the Catalog and Handbook located on STC's website.

**ACCESS TO TECHNOLOGY:** For information regarding Angel, the Information Delivery System (IDS), Student Owl Mail, and BannerWeb, please see the IT Department link on STC's website at

<http://www.southeasterntech.edu>.

**GRADING SCALE:**

Grading Scale:

A	Excellent	100 – 90
B	Good	89 – 80
C	Satisfactory	79 – 70
D	Poor	69 – 60
F	Failing	59 - 0

**Each Students final grade for the course will be calculated in the following manner...**

(Chapter Tests.) .....x0.50 = \_\_\_\_\_  
(Learning Objective Assignments).x 0.10 = +\_\_\_\_\_   
(Group Presentation).....x 0.10 = +\_\_\_\_\_   
(Comprehensive Final).....x 0.30 = +\_\_\_\_\_

**GRADING COMPONENTS:**

Chapter Tests	50%
Assignments	10%
Group Presentation	10%
Comprehensive Final Exam	30%

**TCSG GUARANTEE/WARRANTY STATEMENT:**

The Technical College System of Georgia guarantees employer that graduates of State Technical Colleges shall possess skills and knowledge as prescribed by State Curriculum Standards. Should any graduate employee within two years of graduation be deemed lacking in said skills, that student shall be retrained in any State Technical College at no charge for instructional costs to either the student or the employer.

## BIOL 1111 **Lecture Lesson Plan (Wednesday/Thursday)**

**\*Subject to change at the Instructors discretion\***

<b>Date</b>	<b>Lecture Chapter(s) &amp; Content</b>	<b>Tests (Chapters)/Assignments due</b>
8/17	Intro to Course, Syllabus, Outline, Regulation, etc.	<ul style="list-style-type: none"> <li>Read Chapters before coming to Lecture and complete Chapter Assignments.</li> </ul>
8/19	1: A View of Life	
8/24	1& 2: Basic Chemistry	
8/26	2: Basic Chemistry	
8/31	<b>Exam 1</b> 3: The Chemistry of Organic Molecules	<b>Ch 1-2 Exam</b>
9/2	3& 4: Cell Structure and Function	
9/7	<b>Holiday</b>	
9/9	4: Cell Structure and Function	
9/14	<b>Exam 2</b> 5: Membrane Structure and Function	<b>Ch 3-4 Exam</b>
9/16	5 & 6: Metabolism: Energy and Enzymes	
9/21	6: Metabolism: Energy and Enzymes	
9/23	<b>Exam 3</b> 8: Cellular Respiration	<b>Ch 5-6 Exam</b>
9/28	8 & 7: Photosynthesis	
9/30	7: Photosynthesis	
10/5	<b>Exam 4</b> 9: Cell Cycle and Reproduction	<b>Ch 7-8 Exam</b>
10/7	9 & 10: Meiosis and Sexual Reproduction	
10/12	<b>Holiday</b>	
10/14	10: Meiosis and Sexual Reproduction	
10/19	<b>Exam 5</b> 11: Mendelian Inheritance	<b>Chapter 9-10 Exam</b>
10/21	11 & 12: Molecular Biology of the Gene	
10/26	12: Molecular Biology of the Gene	
10/28	<b>Exam 6</b> 13: Regulation of Gene Expression	<b>Chapter 11-12 Exam</b>

11/2	13 & 14: Biotechnology	
11/4	14: Biotechnology	
11/9	<b>Exam 7</b> 15-18: Evolution	<b>Ch 13-14 Exam</b>
11/11	15-18: Evolution	
11/16	15-18: Evolution	
11/18	<b>Exam 8</b>	<b>Chapter 15-18 Exam</b>
11/23	<b>Holiday</b>	
11/25	<b>Holiday</b>	
11/30	Group Presentations	
12/2	Final Exam Review	
12/7	<b>**Finals week: Lecture and Lab finals are both cumulative**</b>	
12/9		