

Biology 112: Principles of Biology

American College of Thessaloniki

Fall 2019

Instructors: Andreas Anestis, Ph.D., Georgia Tsoulfa, Ph.D.

Office: Bissell Library Basement, 019. Phone: 2310 398 343, e-mail: aanestis@act.edu, gtsoulfa@act.edu

Office hours (tutoring offered – USE IT!): Section K: Monday, 11.00-12.00. Section L: Monday, 13.00-14.00. Section M: Friday, 11.00-12.00. Also on other day and time, after appointment.

CLASS SCHEDULE

Section K: Monday, Friday, 10.00-11.00, Tuesday, Thursday, 10.00-12.00. Classroom: 207

Section L: Monday, Friday, 12.00-13.00, Tuesday, Thursday, 12.00-14.00. Classroom: 201

Section M: Monday, Friday, 15.00-16.00, Tuesday, Thursday, 15.00-17.00. Classroom: 207

Text: OpenStax Biology, 2nd edition. This is an open access e-textbook.

Resources: Course material (presentations, tutorials etc.) will be uploaded in the course management system **Moodle**. Access to ACT's Learning Management System *Moodle* is required for this class. Students will use Moodle to obtain updates to the syllabus and for course activities, quizzes, email and grades. *Lack of Internet access will not be an excuse for missed assignments.* To access Moodle go to <http://moodle.act.edu> in any browser. Communication is asynchronous, meaning that a student can go online any time to receive information.

Course Description & Organization

This course is designed to introduce the basic principles of modern biology, the framework within which new discoveries are interpreted, and the relations among various branches of biological research. *The goal* of this course is to provide first-year college students with a firm grasp of the major concepts underlying biological processes. Students who are interested in careers in biological sciences, biomedical sciences, and biotechnology should find that the course provides a firm grasp on an understanding of the concepts that will serve them well in their academic track that lies ahead.

The materials covered include the structural and functional aspects at the molecular and cellular level of the following: cell structure and function, cell organelles, cellular reproduction, cellular respiration, photosynthetic pathways, Mendelian inheritance, DNA structure, replication, gene structure, gene function and expression/control, evolution.

Teaching & Learning Strategies

The course involves five hours of class contact per week for a total of 11 weeks (Sep 23 - Dec 6). Lectures, practical work, class discussions, presentations, and directed study are used for teaching the course. Active learning will be the main mode of presenting new material during each lecture: in short, anything that you will do in the classroom other than merely passively listening to lectures. This includes everything from listening practices which will help you absorb what you hear to short written exercises in which you will apply the lecture material, homeworks, reviews, special sessions and quizzes to assist you along the learning process.

Course Objectives

- 1) Introduce students to major structures and functions of the cells.
- 2) Demonstrate the ability of the cells to carry on biochemical processes which are essential in maintaining order.
- 3) Discuss and explain the principles of genetics as they relate to the structure and function of the genes.
- 4) Appreciate that biological processes are manifested in diverge ways in health and disease and their knowledge and understanding take on greater significance in everyday life more than ever before.

Learning Outcomes

On successful completion of the course, students will be able to:

- 1) Explain the process and philosophical basis of scientific inquiry. Discuss and recognize the power and the limitations of the methods used by modern day biologists. To recognize the power and limitation of scientific method in answering questions related to biological phenomena.
- 2) Describe and explain the relationship between structure and function in biological systems.
- 3) Describe the basic principles of concepts related to energy, conversion enzymes and metabolic pathways in living organisms.
- 4) Describe the importance of maintaining homeostasis in living systems using the pH regulation.
- 5) Describe the differences and distinguish between eukaryotic and prokaryotic cells.
- 6) Explain the basic structure and function of carbohydrates, lipids, proteins, and nucleic acids.
- 7) Discuss the structure of the cell membrane and the different types of its permeability to biological molecules.
- 8) Describe redox reactions and explain the role of enzymes in biochemical pathways and their regulation.

- 9) Generalize between aerobic and anaerobic respiration mechanisms in living things and the production of energy.
- 10) Describe photosynthetic pathways and identify similarities in overall organization with respiratory pathways.
- 11) Describe and illustrate the differences between mitosis and meiosis.
- 12) Explain cell cycle and recognize its importance in cancer.
- 13) Explain the processes in Mendelian genetics and apply them in chromosomal inheritance
- 14) Explain the processes of DNA replication, transcription, translation and gene regulation.
- 15) Employ basic laboratory techniques used by modern biologists. Analyse biological samples, identify structural differences, solve problems, illustrate biological processes, and organize and depict data in a meaningful way.
- 16) Explain the fundamental principles of the evolutionary theory.

Class attendance and absences policy

Your regular classroom attendance is expected. Attendance will be taken in some lecture periods by passing around a signature sheet. Your signature is the only proof of your attendance. It is your responsibility to know whether a sheet was passed out on a given day and to sign it. Large amounts of material will be presented during each lecture and it will be difficult for a student to keep up if classes are missed. Make sure you come in class or lab on time.

Students are expected to attend and participate in all of their courses throughout the term, including the first week. Those who fail to do so may be administratively withdrawn from individual courses of the College. **This may affect the students' scholarship and financial aid eligibility.**

A student is considered to have successfully attended a course **if s/he has attended 75% of the course lectures**. Thus, for the particular course, the maximum number of absences stands at **11 hours**. This policy applies to all ACT students, degree-seeking and Study Abroad. **Please note that absences are counted on an hourly basis.** Absences due to participation in school-related trips and activities may count toward this limit.

Make-up exams will not be allowed (except in cases of family tragedy, serious illness or other serious situations as determined by the course instructor. A note from student health or physician is required if you miss the exam due to illness).

Quizzes: If you are absent during a quiz, your quiz grade is zero (0). You are not allowed to make up a quiz.

Evaluation Criteria

Criterion	Points (%)
2 Quizzes Quizzes will cover lectures and other material presented in class (readings, notes, movies, video clips, and class discussions).	10%
Final Exam One final, cumulative exam.	40%
Mid-terms One mid-term exam during the semester.	20%
Homeworks Five homeworks during the semester	10%
Flipped classroom Details will be given by the instructor during the first week of classes	10%
Group presentations Details will be given by the instructors during the first week of classes	10%
TOTAL	100%

The grade of this course corresponds to 80% of the total grade, and the other 20% comes from the Laboratory Course grade.

Grades will be assigned according to the following criteria:

Grade Description	% points	US Letter Grade	US point grade
Excellent	95-100	A	4.0
Very Good (high)	90-94	A-	3.67
Very Good (low)	85-89	B+	3.33
Good (high)	80-84	B	3.0
Good (low)	75-79	B-	2.67
Satisfactory (high)	70-74	C+	2.33
Satisfactory (low)	65-69	C	2.0
Fail	0-64	F	0

Extra credits: No extra credit is available for students who wish to raise their grade. Focus on doing the work assigned at the best of your abilities.

Weekly Lecture Schedule

WK Nr	WEEK STARTS	DAY	TOPICS	READINGS	EXAMS	ASSIGNMENTS
1	Sep 23	Mo 23	Class Overview. Introduction.	chapter 1		
		Tu 24	Practising biology. The scientific method	chapter 1		
		Th 26	Scientific method - applications			Projects groups formation due. Announcement of topics!!!
		Th 26	Atoms, molecules.	chapter 2		
		Fr 27	Water. Aqueous solutions	chapter 2		
2	Oct	Mo 30	Organic molecules I	chapter 3		
		Tu 01	LAB SESSION			
		Tu 01	LAB SESSION			
		Th 03	Flipped Classroom I: Proteins	chapter 3 (3.4)		
		Th 03	Biochemistry revision			Homework # 1 out
		Fr 04	General features of cells I	chapter 4		
3	Oct 07	Mo 07	General features of cells II	chapter 4		
		Tu 08	Membrane structure and transport	chapter 5		
		Tu 08	Group project I			
		Th 10	Flipped classroom II: Energy and metabolism, Enzymes	chapter 6 (6.1, 6.5)		
		Th 10	Quiz #1 revision			
		Fr 11	QUIZ #1 (weeks 1-3)		QUIZ #1 (weeks 1-3)	
4	Oct 14	Mo 14	Cellular respiration I	chapter 7		
		Tu 15	LAB SESSION			
		Tu 15	LAB SESSION			
		Th 17	Cellular respiration II	chapter 7		
		Th 17	Flipped classroom III: Connection of metabolic pathways / Regulation of cellular respiration	chapter 7 (7.6, 7.7)		Homework # 1 due. Homework # 2 out.
		Fr 18	Photosynthesis I	chapter 8		
5	Oct 21	Mo 21	Photosynthesis II	chapter 8		
		Tu 22	Cell communication. Cell cycle.	chapters 9 & 10		
		Tu 22	Group Project II			

		Th 24	Nucleic acid structure. DNA replication	chapter 14		
		Th 24	Flipped classroom IV: DNA - Historical Basis of Modern Understanding	14.1		
		Fr 25	Fall Break	Fall Break	Fall Break	Fall Break
The schedule of weeks 6 and 7 may be subjected to changes. Follow the announcements on moodle for more details						
6	Oct 29	Mo 28	Fall Break	Fall Break	Fall Break	Fall Break
		Tu 29	Transcription	chapter 15		Homework # 2 due. Homework # 3 out.
		Tu 29	RNA processing, protein synthesis. Group Project III	chapter 15 (15.4, 15.5)		
		Th 31	Gene regulation	chapter 16		
		Th 31	Gene regulation	chapter 16		
	Nov	Fr 01	Intro to Cell Cycle	chapter 10		
7	Nov 04	Mo 04	Midterms Revision			
		Tu 05	MIDTERMS (WEEKS 1-5)	MIDTERMS (WEEKS 1-5)	MIDTERMS (WEEKS 1-5)	
		Tu 05	Mitosis	chapter 10		
		Th 07	Meiosis	chapter 11		
		Th 07	Mutations, DNA repair, cancer	chapters 14, 16 (14.6, 16.7)		
		Fr 08	Simple patterns of inheritance	chapter 12		
8	Nov 11	Mo 11	Complex patterns of inheritance	chapter 12		
		Tu 12	LAB SESSION			
		Tu 12	LAB SESSION			
		Th 14	Exercises on inheritance	chapter 12		Homework # 3 due. Homework # 4 out.
		Th 14	Flipped Classroom V: Chromosomal theory - Genetic linkage	chapter 13 (13.1)		
		Fr 15	Chromosomal basis of inherited disorders	chapter 14		
9	Nov 18	Mo 18	Genetics of bacteria and viruses	lesson slides		
		Tu 19	LAB SESSION			
		Tu 19	LAB SESSION. Group project IV			
		Th 21	Flipped classroom VI: Biotechnology	chapter 17 (17.1)		

		Th 21	Virtual bio-lab session and case studies			
		Fr 22	Genomics	chapter 17		
10	Nov 26	Mo 25	Cancer genetics case study			
		Tu 26	LAB SESSION			
		Tu 26	LAB SESSION			
		Th 28	QUIZ#2 (weeks 7-9)		QUIZ#2 (weeks 7-9)	Homework # 4 due. Homework # 5 out.
		Th 28	Debate on bioethics			
		Fr 29	Flipped classroom VII: Genomics and proteomics	chapter 17 (17.5)		
11	Dec 02	Mo 02	Introduction to evolution I	chapter 18		
		Tu 03	Group project V			
		Tu 03	Speciation	chapter 18		
		Th 05	In class - Group papers peer evaluation			Homework # 5 due. All HWs HARD DEADLINE
		Th 05	Course Revision - Preparation for the Finals			
		Fr 06	Course Revision - Preparation for the Finals			
12	Dec 09		FINALS	FINALS	FINALS	FINALS

Biology 112: Principles of Biology - Laboratory

Fall 2019

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A laboratory section accompanies Biology 112. **The grade of the Principles of Biology Laboratory Course corresponds to 20% of the total grade.**

SCHEDULE:

Section K: Tuesday, 10.00 -12.00, on weeks 2, 4, 8, 9, 10, Biology Laboratory, Compton Hall

Section L: Tuesday, 12.00 -14.00, on weeks 2, 4, 8, 9, 10, Biology Laboratory, Compton Hall

Section M: Tuesday, 14.00 -16.00, on weeks 2, 4, 8, 9, 10, Biology Laboratory, Compton Hall

Prerequisites: Biology 112 lecture

Readings: Materials provided by the instructors.

Description & Organization of the lab

Lab sessions allow students to participate in two types of activities:

- a) Demonstration labs, intended to demonstrate materials already presented in class. They include the participation of students in simulation, demonstration of biological processes, investigating scientific literature and analysing scientific data.
- b) Experimental labs, which are designed to investigate biological processes based on the scientific method.

Both types of labs result in a lab homework structured around specific criteria.

Evaluation Criteria

Criterion	Points
Lab quizzes	40%
Final Lab Exams	60%
TOTAL	100%

Lab Schedule

WK Nr	WEEK STARTS	DAY	TOPICS	CLASSROOM	READING MATERIAL	EXAMS / ASSIGNMENTS
1	Sep 23		<i>no labs</i>			
2	Sep 30	Oct 01	Microscopy: basic principles and applications.	Compton Hall - Biology Lab	notes provided by the instructor	
3	Oct 07		<i>no labs</i>			
4	Oct 14	Oct 15	1. Spectrophotometry: Principles and applications. 2. Diffusion and osmosis	Compton Hall - Biology Lab	notes provided by the instructor	
5	Oct 21		<i>no labs</i>			
6	Oct 28		<i>no labs</i>			
7	Nov 04		<i>no labs</i>			
8	Nov 11	Nov 12	DNA damage and mutations	Compton Hall - Biology Lab	notes provided by the instructor	Lab Quiz # 1 (Microscopy, Spectrophotometry, Diffusion - Osmosis)
9	Nov 18	Nov 19	1. DNA extraction. 2. Blood typing	Compton Hall - Biology Lab	notes provided by the instructor	
10	Nov 25	Nov 26	Electrophoresis - basic principles	Compton Hall - Biology Lab	notes provided by the instructor	Lab Quiz # 2 (DNA mutations, DNA extraction, blood typing)
11	Dec 02		<i>no labs</i>			
12	Dec 09		FINAL EXAMS		FINAL EXAMS	FINAL EXAMS

College-wide Policy on Academic Integrity

All academic divisions at ACT, both undergraduate and graduate, will apply the following policy on academic integrity:

“A student committing an act of Academic Dishonesty in a given course will receive an F (0 percentage points) in the assignment where the academic infraction took place. If a student commits an act of Academic Dishonesty for a second time in the same course, this student will receive a failing grade in that course. The individual faculty is responsible for enforcing the policy in a conscientious manner, for reporting all cases to the Academic Standards & Performance Committee (AS&PC) for record-keeping and for informing the affected students of their right to appeal the faculty’s decision to the AS&PC. Faculty must also insert the college’s policy on Academic Integrity in their course syllabi.”