

## COURSE OUTLINE SUMMER 2021

<b>Course:</b>	Biology
<b>Course Code:</b>	SBI101
<b>Times &amp; Location:</b>	On-line
<b>Instructor:</b>	Philippe D'Onofrio, PhD
<b>E-mail:</b>	pdonofrio@ccnm.edu, philippe.donofrio@gmail.com

### Required Texts:

Goodenough, Judith, McGuire, Betty. Biology of Humans; Concepts, Applications and Issues. San Francisco, 2016, Sixth Edition.

### Recommended Texts and other readings:

Any first year university or introductory biology or physiology text will prove to be a useful reference. Selected PowerPoint slides from lectures, supplementary resources, and assignments will be weekly posted in Moodle.

### Course Description:

Human Biology (SBI101) is a 3-credit, 7 week introductory course that will provide students with a solid core foundation in basic and applied human biology. Through on-line self-study modules, tutorials, quizzes, exercises, and assignments, students will learn to use relevant terminology and concepts in a biological context. The course will emphasize the molecular and cellular basis of life, biochemical processes, cellular structure and function.

Students will have complete weekly on-line self-study modules and will interact online with the course instructor one evening a week in an on-line tutorial session. Students are expected to be prepared for these tutorial sessions (i.e. have completed the on-line modules).

The application of biology fundamentals to naturopathic medicine is integrated throughout the course, providing students with a unique opportunity to learn biology within the context of naturopathic medicine.

### **Prerequisites:**

There are no prerequisites required for this course.

### **Course Format:**

The course is delivered in a **blended learning style** which combines online self-study modules with weekly live interactive **online tutorial sessions from 7:30 p.m. - 9 p.m. EST** (one evening per week) with the course instructor. The passing grade is 60%, and **evaluations/assessments** will consist of **online tutorial participation (5%), one quiz per module (10%), one assignment (5%), one midterm test (30%), and a final exam (50%)**. Both the midterm test and the final exam are delivered via Examity and invigilated via Zoom by the CCNM.

### **Course Outcomes:**

This course is designed to:

- A core foundation for their knowledge of cellular and molecular biology
- The basis for applying biological concepts to the human body
- Use the relevant vocabulary and concepts correctly in a biological and clinical context
- Acquire an understanding of the known mechanisms by which the cells and organisms function and achieve homeostasis
- Challenge and engage the student where he/she may independently work to enrich their learning.
- Equip students with the necessary knowledge to enter the ND program. Where applicable, apply human biology to Naturopathic principles.

**Evaluation:**

<b>Evaluation Type</b>	<b>Percent</b>	<b>Test date/Due date</b>
<b>Quizzes</b>	10	Two quizzes per module/week
<b>Assignment</b>	5	June 22, 2020
<b>Tutorials</b>	5	Weekly
<b>Midterm Test</b>	30	May 25, 2020 (Modules 1 – 6)
<b>Final Exam</b>	50	June 22, 2020 (Modules 1 – 10)

Plagiarism and cheating are academic offenses and will be treated seriously by the College. Students should refer to the College's policies on academic misconduct posted on in the Academic Calendar.

**Biology (SBI101) Schedule**

<b>Module</b>	<b>Topics</b>	<b>Activities</b>	<b>Due Date</b>	<b>Resources</b>
1	Humans in the World of Biology	Quiz 1		Chapter 1 and 23
2	Chemistry Comes to Life	Quiz 2		Chapter 2
3	The Cell	Quiz 3		Chapter 3
4	Chromosomes and Cell Division	Quiz 4		Chapter 19
5	Genetics and Human Inheritance	Quiz 5		Chapter 20
6	DNA and Biotechnology	Quiz 6		Chapter 21
7	Body Organization and Homeostasis	Quiz 7		Chapter 4
8	The Skeletal System	Quiz 8		Chapter 5
9	The Muscular System	Quiz 9		Chapter 6

**The Academic Department reserves the right to make schedule changes.**

## **Biology (SBI100) Learning Outcomes**

### **Module 1: Humans in the World of Biology (Chapter 1 and 23)**

#### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- List the characteristics of life.
- Describe how evolutionary relationships are reflected in modern systems of classification.
- Define and give examples of the following groups of organisms: population, community, ecosystem, and biosphere.
- Design an experiment with a control and experimental group that follows the scientific method.
- Write five questions one might ask to use the critical-thinking approach to decision making.
- Describe the Earth as a closed system with energy as the only input.
- Explain how primary and secondary succession can lead to a climax community.
- Differentiate between producers and consumers; food chains and food webs; and herbivores, omnivores, carnivores, and decomposers.

- Explain how energy and biomass pyramids are used to depict energy flow and the accumulation of pollutants in food.
- Trace the cycling of water, carbon, nitrogen, and phosphorus through living and nonliving systems and then describe the impact humans can have on these biogeochemical cycles.

## **Module 2: Chemistry Comes to Life (Chapter 2)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Describe the characteristics of the subatomic particles (protons, neutrons, and electrons) and explain the structure of an isotope.
- Differentiate between covalent, ionic, and hydrogen bonds in terms of strength and the actions of the electrons.
- List the unique properties of water that make it valuable to biological systems.
- Predict what happens when an acid or a base is added to water.
- Define pH, explain the range of the pH scale, and tell which values indicate acid and which values indicate base.
- Describe the structure of a polymer, including its formation through dehydration synthesis and its breakdown through hydrolysis.
- Describe the structure and biological purpose of carbohydrates, lipids, proteins, and nucleotides and give an example of each.
- Describe ATP as the energy currency of the cell.

### **Module 3: The Cell (Chapter 3)**

#### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Compare prokaryotic and eukaryotic cells.
- Relate the surface-to-volume ratio to maximum cell size.
- Provide examples that show the relationship between the structure and function of a cell.
- Explain how the structure of the plasma membrane regulates the movement of materials in and out of the cell.
- Describe the function and structural features of each of the following organelles: nucleus, endoplasmic reticulum, Golgi complex, lysosomes, and mitochondria.
- Compare the structure and function of the three fibers that make up the cytoskeleton.
- Summarize the efficiency of cellular respiration and fermentation as methods to harvest cellular energy from the food we eat.

### **Module 4: Chromosomes and Cell Division (Chapter 19)**

#### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Compare the role of meiosis and mitosis in the cell cycle.

- Differentiate between chromosomes and genes, autosomes and sex chromosomes, and diploid and haploid cells.
- Draw the cell cycle, label each phase of mitosis and interphase, and describe the events and significance of each phase.
- List the events of interphase, prophase, metaphase, anaphase, and telophase as completed in mitosis.
- Define cytokinesis and explain its role in cell division.
- Explain the diagnostic uses of karyotypes.
- Diagram and describe how haploid cells result from meiosis and highlight the opportunities for crossing over and the independent assortment of chromosomes.
- Describe how nondisjunction results in an abnormal number of chromosomes in the daughter cells resulting in Down, Turner, and Klinefelter syndromes.

Focus on: Stem Cells

Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Define stem cells and explain how they are different from other cells.
- Differentiate the characteristics of adult, umbilical cord, placental, and embryonic stem cells.
- Describe possible therapeutic uses of stem cells.

**Module 5: Genetics and Human Inheritance (Chapter 20)**

## Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Define, give an example, and use the terms homozygous, heterozygous, dominant, recessive, genotype, phenotype, pleiotropy, multiple alleles, and polygenic.
- Explain the relationship between the dominant and recessive alleles in cases of complete dominance, codominance, incomplete dominance, and sex-linked inheritance patterns.
- Use a Punnett square to show inheritance patterns.
- Describe how chromosome deletions and duplications affect the production of proteins and then describe common genetic disorders in humans and their causes.
- Compare the methods and advantages of prenatal, newborn, and adult genetic testing.

## **Module 6: DNA and Biotechnology (Chapter 21)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Draw the structure of a DNA molecule and explain why complementary base pairing ensures reliable replication of the genetic code.
- Describe the purpose and mechanism of DNA expression.



- Compare the structure and function of DNA and RNA and then describe the details of protein synthesis including transcription, translation, and the genetic code.
- Differentiate between chromosomal and point mutations.
- Describe the various types of point mutations and their relative impact on protein synthesis.
- Explain the mechanisms used to control gene activity.
- List the steps involved in making recombinant DNA and then describe the value of genetic engineering and give examples of how it has been applied to plant, animal, and environmental science.
- Describe the purpose and value of the Human Genome Project, microarray analysis, and comparing the genomes of different species.

Focus on: Cancer

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Differentiate between a benign and malignant tumor and describe the stages of development of cancer.
- Describe how the normal mechanisms that regulate cell growth and apoptosis are altered in cancerous cells.
- Explain what is meant by the term multiple mutations.
- Describe the cancer stem cell hypothesis.
- Describe common causes of cancer, including viruses, chemicals, and radiation.
- List lifestyle habits that reduce the risk of cancer.

- Describe methods used to screen for and diagnose cancer.
- Compare the following methods of cancer treatment: surgery, radiation, chemotherapy, immunotherapy, inhibition of blood vessel formation, and gene therapy.

## **Module 7: Body Organization and Homeostasis (Chapter 4)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Develop a table to show the function and location of epithelial, connective, muscle, and nervous tissue.
- Describe the three types of cell junctions.
- Identify the major body cavities and list the organs and systems they house.
- List the four types of membranes, their locations, and their functions.
- Relate the structure of the skin to its ability to carry out the various functions.
- Define homeostasis and explain its importance to life.
- Describe and exemplify a negative feedback system.

## **Module 8: The Skeletal System (Chapter 5)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- List the functions of bone.
- Compare the structure of compact and spongy bone.
- Explain the process of bone growth and development, including the influence of hormones.
- Describe how bones heal after a fracture or break.
- Explain what is meant by the continual remodeling of bone.
- List the components of the axial skeleton.
- List the components of the appendicular skeleton.
- Compare the three types of joints in terms of structure and motion.

## **Module 9: The Muscular System (Chapter 6)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- State the four traits common to all muscles.
- Demonstrate and explain the movement of antagonistic muscles.
- Explain muscle contraction at the molecular level of the actin and myosin filaments.
- Differentiate between a single muscle twitch, summation, tetanus, and fatigue.
- List the sources of ATP for muscle contraction and describe in detail where and how the ATP is generated.

- Compare and contrast slow-twitch and fast-twitch muscles, including where they are located in the body and when they are utilized in different physical activities.
- Describe the best way to build muscle endurance and the requirements for building larger muscle mass.

## **Module 10: Neurons: The Matter of the Mind (Chapter 7)**

### Learning Objectives

After reading the textbook and studying the material in this chapter, the student should be able to:

- Differentiate between a neuron and neuroglial cells.
- Explain the role each of the following plays in the conduction of a nerve impulse: cell body, dendrite, axon, myelin sheath, Schwann cell, and node of Ranvier.
- Describe how a nerve cell maintains a resting potential using the sodium-potassium pump and changes that occur as an action potential moves along the axon.
- Summarize the events that occur at the synapse as an impulse is transmitted from one neuron to the next.