

**SCHOOL OF HEALTH AND SCIENCES**

**SYLLABUS**

<b>TITLE:</b>	Biology and Society
<b>CODE:</b>	BIO 109
<b>PREREQUISITE:</b>	N/A
<b>CREDITS:</b>	3 credits   45 contact hours   1 term

**DESCRIPTION**

In this course, we will discuss the importance of scientific knowledge for the analysis and understanding of new discoveries and their applications to personal and collective life. Also, the principles that govern the nature of science, its methodology and the reliability of the knowledge it produces are discussed. It starts from Biology as a science that studies life, which characterizes it and the risks that threaten the balance systems of the individual and of the ecosystems. It provides the future professional with a broad, comprehensive, and reliable perspective of the importance of supporting their positions with arguments of scientific validity. The course consists of lectures and class discussions, integrating hands-on experiences related to the topics covered. This course is aimed to students who do not have Biology-related classes in their study program for their general training.

**JUSTIFICATION**

New scientific knowledge is generated every day as a result of the great expansion in research and development of technology in recent years. Scientific knowledge translates into new options for individuals and their environment and survival as a species. The knowledge gained about the material of life, DNA, allows us to better understand its behavior, which, in turn, has opened a world of new possibilities through the application of genetic engineering technologies. This has led to the emergence of new controversies such as the genetic manipulation of much of the food we consume, the use of embryonic stem cells for therapeutic purposes, and the application of various assisted reproduction options. It is essential that in their integral development, students learn to cultivate their

intellect and that through the application of inquisitive processes inherent to the nature of science, they will be able to apply them in the search for answers to problems of their daily life. New knowledge and new technologies and their applications lead to the emergence of situations of an ethical nature that require people with greater critical capacity while contributing to the enrichment of their cultural values and the conservation and better use of their natural resources.

## **COMPETENCES**

The course develops the following competences in students:

- **Critical questioning**
- **Research and exploration**
- **Communication**

## **OBJECTIVES**

After completion of the course, students will be able to:

1. Apply the inquisitive processes inherent to the nature of science in the solution of scientific and contemporary problems.
2. Understand and explain the impact of urban techno-development on human beings and nature, in order to stimulate a personal and social attitude of responsibility and commitment.
3. Know the model of the DNA molecule structure, its operation and how genetic engineering allows its manipulation.
4. Determine the role and importance of genetic material by analyzing the life cycle in animals.
5. Critically evaluate the ethical implications of the manipulation of genetic material.
6. Analyze the expression of genetic material in the determination of some characteristics in humans.
7. Critically analyze the influence of biotechnology on the quality of life in society and its impact on ecosystems.

## **CONTENTS**

- I. Introduction
  - A. Scientific thought in modern Biology
    1. Nature of science

- a. The inquiry process
      - b. Scientific methodology
    - 2. Case analysis
      - a. Flies in dairy farm
        - 1) Application of the inquiry process
        - 2) The mechanism of natural selection in the evolution of species
      - b. Other cases
  - B. Diversity of Life
    - 1. Characteristics of life
    - 2. Systematics
      - a. Domains
        - 1) Eukaryotes
        - 2) Prokaryotes
          - a) Archaeobacteria
          - b) Eubacteria
      - b. Kingdoms
    - 3. Viruses
- II. Biotechnology
  - A. The DNA molecule
    - 1. Structure
    - 2. Function and importance - genes / genome
    - 3. Chromosomes
  - B. DNA and the Life Cycle of Animals
    - 1. Importance of the processes of fertilization, mitosis, and meiosis
  - C. Genetic engineering
    - 1. Applications in agriculture
    - 2. Biomedical applications
  - D. Assisted reproduction
    - 1. IVF
    - 2. Surrogate mothers
    - 3. Gamete donation
  - E. Human Genome Project

- F. Biotechnology and eugenics
- G. Bioethics and reflections on ethical dilemmas
- III. Basic principles of genetics
  - A. Patterns of inheritance applied to inheritance in humans
    - 1. Mendelian
    - 2. Post-Mendelian
      - a. Polygenes
      - b. Multiple alleles
      - c. Codominance
  - B. Genetic abnormalities in humans
    - 1. Chromosomal
    - 2. Mutations
- IV. Ecology and Environmental Problems
  - A. Ecosystems
    - 1. Energy flow in ecosystems
      - a. Food chains
    - 2. Circulation of nutrients in ecosystems
    - 3. Terrestrial and aquatic ecosystems in Puerto Rico
      - a. “Bosque Estatal de Piñones”
  - B. Conservation of the environment
    - 1. Greenhouse effect and global warming
    - 2. Acid rain
    - 3. Desertification
    - 4. Environmental problems in Puerto Rico
      - a. Energy
      - b. Water quality
      - c. Solid waste
  - C. Environmental ethics

## **METHODOLOGY**

The following strategies from the active learning methodology are recommended:

- Inquiry method
- Guiding questions

- Case studies
- Problem-based learning
- Collaborative learning
- Field trip
- Forums
- Construction of concept maps
- Analysis questions

## EVALUATION

Participation	10%
Partial assignments	40%
Oral presentations	20%
Final project or exam	25%
Immersion experience	5%
<b>Total</b>	<hr/> 100%

## LEARNING ASSESSMENT

The institutional assessment rubric is applied to the course's core activity.

## BIBLIOGRAPHY

### TEXTBOOK

Audesirk, T., Audesirk, G., & Byer, B. (2017). *Biología: La vida en la tierra* (10<sup>th</sup> ed.). Pearson.

### REFERENCES

Campbell, N., Simon, E., Dickey, J., Hogan, K., & Reece, J. (2019). *Campbell Essential Biology* (6<sup>th</sup> ed.). Pearson.

Freeman, S., Allison, L., Black, M., Podgorski, Quillin, K., Carmichael, J., & Taylor, E. (2019). *Biological Science* (7<sup>th</sup> ed.). Pearson.

Simon, E., (2019). *Biology: The Core* (3<sup>rd</sup> ed.). Pearson.

Solomon, E., Martin, C., Berg, L., & Martin, D. (2018). *Biology* (11<sup>th</sup> ed.). Cengage Learning.

#### ELECTRONIC RESOURCES

Fridovich-Keil, J. L. (2023, August 22). Human Genome Project. *Encyclopedia Britannica*. <https://www.britannica.com/event/Human-Genome-Project>

Likens, G. E., Butler, T. J. (2019, March 19). Acid rain. *Encyclopedia Britannica*.  
<https://www.britannica.com/science/acid-rain>

The Editors of Encyclopedia Britannica. (2023, August 17). Ecosystem. *Encyclopedia Britannica*. <https://www.britannica.com/science/ecosystem>

The Editors of Encyclopedia Britannica. (2023, October 17). DNA. *Encyclopedia Britannica*. <https://www.britannica.com/science/DNA>

Winchester, A. (2023, October 10). Genetics. *Encyclopedia Britannica*.  
<https://www.britannica.com/science/genetics>

For more information resources related to the course's topics, access the library's webpage <http://biblioteca.sagrado.edu/>

#### REASONABLE ACCOMMODATION

For detailed information on the process and required documentation you should visit the corresponding office. To ensure equal conditions, in compliance with the ADA Act (1990) and the Rehabilitation Act (1973), as amended, any student in need of reasonable accommodation or special assistance must complete the process established by the Vice Presidency for Academic Affairs.

## **ACADEMIC INTEGRITY**

This policy applies to all students enrolled at Universidad del Sagrado Corazón to take courses with or without academic credit. A lack of academic integrity is any act or omission that does not demonstrate the honesty, transparency, and responsibility that should characterize all academic activity. Any student who fails to comply with the Honesty, Fraud, and Plagiarism Policy is exposed to the following sanctions: receive a grade of zero in the evaluation and / or repetition of the assignment in the seminar, a grade of F (\*) in the seminar, suspension, or expulsion as established in the Academic Integrity Policy effective in November 2022.

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