National University of Engineering (UNI)
School of Computer Science
Syllabus 2026-I

1. COURSE

BI101FCCS. Biology (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	BI101FCCS. Biology
2.2 Semester	:	6^{th} Semester
2.3 Credits	:	4
2.4 Horas	:	2 HT; 4 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Biology, the science of life, provides a foundational framework for interdisciplinary fields such as bioinformatics, computational biology, and biologically inspired artificial intelligence. This course offers an introduction to the essential concepts of biology, ranging from the cell to evolution, with particular emphasis on computational applications and perspectives.

5. GOALS

- Develop an understanding of the fundamental principles of cellular and molecular biology.
- Examine the core processes of life, including DNA replication, transcription, and translation.
- Recognize the intersections between biology and computing in fields such as bioinformatics.
- Acquire the ability to analyze biological data using both qualitative and quantitative approaches.
- Cultivate interdisciplinary thinking that bridges biology and computer science.

6. COMPETENCES

1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions. (Assessment)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (Usage)

AG-C01) The Professional and the World: Analyzes and evaluates the impact of solutions to complex computing problems on the sustainable development of society. (Usage)

AG-C07) Computing Knowledge: Applies appropriate knowledge of mathematics, science, and computing. (Assessment)

AG-C12) Applies computer science theory and software development fundamentals to produce computer-based solutions. (Usage)

7. TOPICS

Unit 1: Introduction to Biology and Life (6 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Characteristics of living organisms and definitions of life. • Levels of biological organization (from molecules to ecosystems). • The scientific method in biological research. • Computational models of living systems.	• Articulate the defining characteristics of living organisms. [Familiarizarse (*Familiarity*)] • Identify and distinguish the levels of biological organization. [Usar (*Usage*)] • Apply the scientific method within a biological context. [Evaluar (*Assessment*)] • Explain computational models of ecosystems. [Usar (*Usage*)]
Readings : [Urr+17], [Rav+17]	

Unit 2: The Chemistry of Life (6 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Atoms, molecules, and chemical bonding. • Major classes of biomolecules: proteins, carbohydrates, lipids, nucleic acids. • Parallels with data structures in computer science. • DNA sequences as computational representations.	• Identify the major classes of biomolecules and describe their functions. [Familiarizarse (*Familiarity*)] • Explain relationships between biological structures and computational data structures. [Usar (*Usage*)] • Analyze biological sequences from a computational perspective. [Evaluar (*Assessment*)]
Readings : [Urr+17], [Rav+17]	

Unit 3: Cell Structure and Function (8 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Prokaryotic and eukaryotic cell types. • Cellular organelles and their functions. • Membrane structure and transport mechanisms. • Biological networks and computational modeling.	• Compare and contrast prokaryotic and eukaryotic cells. [Familiarizarse (*Familiarity*)] • Describe the structure and function of key organelles. [Usar (*Usage*)] • Explain mechanisms of membrane transport. [Evaluar (*Assessment*)] • Introduce biological networks and approaches to their computational modeling. [Usar (*Usage*)]
Readings : [Urr+17], [Rav+17]	

Unit 4: Metabolism and Energy (6 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Photosynthesis and cellular respiration. • Enzymes and biological catalysis. • Analogies with optimization algorithms. • Energy efficiency in biological and computational systems.	• Explain the processes of photosynthesis and cellular respiration. [Familiarizarse (*Familiarity*)] • Describe the role of enzymes in metabolism. [Usar (*Usage*)] • Draw parallels between biological and computational approaches to energy efficiency. [Evaluar (*Assessment*)]
Readings : [Urr+17], [Rav+17]	

Unit 5: Fundamentals of Genetics (8 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• DNA: structure and replication. • RNA: transcription and translation. • Principles of Mendelian inheritance. • Applications in genetic algorithms.	• Describe the structure and replication of DNA. [Familiarizarse (*Familiarity*)] • Explain the processes of transcription and translation. [Usar (*Usage*)] • Demonstrate understanding of Mendelian inheritance. [Evaluar (*Assessment*)] • Apply genetic principles to computational algorithms. [Usar (*Usage*)]
Readings : [Urr+17], [Rav+17]	

Unit 6: Evolution and Biological Diversity (6 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Theory of evolution by natural selection. • Evidence supporting evolutionary theory. • Biodiversity and systems of biological classification. • Computational simulations of evolutionary processes.	• Explain the theory of evolution by natural selection. [Familiarizarse (*Familiarity*)] • Describe key lines of evidence supporting evolution. [Usar (*Usage*)] • Analyze mechanisms of evolutionary change. [Evaluar (*Assessment*)] • Apply evolutionary concepts through computational simulations. [Usar (*Usage*)]
Readings : [Urr+17], [Rav+17]	

Unit 7: Ecology: Principles and Applications (8 hours)	
Competences Expected: 1,AG-C07	
Topics	**Learning Outcomes**
• Interactions among organisms. • Biogeochemical cycles. • Population dynamics. • Computational modeling of ecological systems.	• Describe fundamental ecological interactions. [Familiarizarse (*Familiarity*)] • Explain the role of biogeochemical cycles. [Usar (*Usage*)] • Analyze population dynamics. [Evaluar (*Assessment*)] • Employ computational modeling in addressing ecological problems. [Usar (*Usage*)]
Readings : [Urr+17], [Rav+17]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[Rav+17] Peter H. Raven et al. *Biology*. McGraw-Hill Education, 2017.

[Urr+17] Lisa A. Urry et al. *Campbell Biology*. Pearson, 2017.