BI 211 : PRINCIPLES OF BIOLOGY

Transcript title
Principles of Biology

Credits
5

Grading mode
Standard letter grades

Total contact hours
70

Lecture hours
40

Lab hours
30

Prerequisites
WR 065 or WR 121 or minimum placement Wr/Comm Level 7.

Prerequisites with concurrency
CH 104 or CH 221.

Course Description
Introduces basic principles common to all living organisms. Emphasizes the relationship between structure and function at the molecular and cellular levels of life. Emphasizes the structure of macromolecules that make up the cell. Explores the evolution of cellular morphology and the chemical processes of cellular function. Explores the genetic basis of evolution and how genetic information flows from DNA to RNA and from RNA to proteins. Designed for majors in the life sciences. BI 211 must be taken before BI 212 and BI 213. Living animals (insects) will be studied and processed in this class.

Course learning outcomes
1. Predict how a molecule's movement is affected by its thermal energy, size, electrochemical gradient, and biochemical properties.
2. Describe and relate anabolic (photosynthesis) and catabolic (respiration and fermentation) pathways emphasizing the transformation of energy and matter.
3. Describe the building blocks and synthesis of the major classes of biomolecules and the contribution of their three-dimensional structure to their functions.
4. Articulate how cells store, use, and transmit genomic information.
5. Describe how genetic variability is produced and inherited in organisms.
6. Trace the flow of information from allele to phenotype.
7. Describe how phenotypic differences can affect fitness of organisms and their representation in future populations.
8. Generate questions, construct testable hypotheses, and perform scientifically valid experiments.
9. Collect, represent, and analyze data drawing valid conclusions based upon quantitative analysis and biological mechanisms.

Content outline
1. Major Themes in biology (evolution, cell theory, structural and functional relationships)
2. Scientific Process (Scientific method, generation of questions, formal hypothesis, variable identification and experimental design, data collection, data representation and analysis, communication of findings)
3. Structure and behavior of atoms and molecules. Chemistry of water, properties of water allowing life to exist on our planet. Chemistry of carbon and how properties of carbon contribute to the formation of organic molecules that make up living organisms.
4. Chemical Evolution and the building blocks of macromolecules. Polymers and polymerization.
5. Protein structure, folding and diseases related to protein misfolding.
6. Enzymes, importance of structure to enzyme function. Enzymes and chemical reactions. Effects of enzymes on endergonic and exergonic chemical reactions.
7. Structure and chemistry of carbohydrates. Functions of carbohydrates in the cell and examples.
8. DNA structure and function (including DNA extraction). DNA replication, mutation, and repair (including PCR).
9. The structure and chemistry of Lipids. Functions of lipids in cells. Cell membrane structure, composition and functions. Diffusion, electrical and chemical gradients, membrane transport.
10. The first prokaryotic cells. Porkaryotic cell structure with examples. Diversity and importance of prokaryotes in biological systems.
11. The first eukaryotic cells. Eukaryotic cell structure and compartmentalization. Diversity and importance of protists in biological systems.
12. Metabolic chemical reactions (anabolic and catabolic cellular reactions). Cellular respiration and photosynthesis.
13. The cell cycle and mitosis. Regulation of cell division. How cancer develops.
14. Evolution of sexual reproduction and meiosis. How meiosis contributes of genetic diversity in offspring.
15. Transmission Genetics. Simple gene inheritance. Mendel's laws and Punnett squares. Complex inheritance patterns (Non-Mendelian genetics).
16. Gene Expression: How genetic information flows from genotype to phenotype. Transcription and transcript processing. The genetic code and Translation. How mutation affects gene expression.
17. Gene regulation in the cell. Genes are regulated at different levels of gene expression.

Required materials
Requires textbook, access to a scientific calculator (that does power functions/ logarithms), access to a computer, and access to a printer to print out weekly lab materials.

General education/Related instruction lists

- Science Lab