Course Unit Descriptor

Study Programme: Bachelor of Science in Biology

Course Unit Title: Molecular Evolution

Course Unit Code: OB057

Name of Lecturer(s): Dr Jasmina Ludoški

Type and Level of Studies: Bachelor Academic Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

The Molecular evolution course introduces the students to the dynamics of evolutionary change at the molecular level, the driving forces behind the evolutionary process, novel evolutionary phenomena revealed by molecular data, the effects of various molecular mechanisms on the structure of genes and genomes, and the methodology involved in the statistical analysis of molecular data from an evolutionary perspective. The course provides basic knowledge of evolutionary change in nucleotide sequences, molecular phylogenetics (methods and examples), rates and patterns of nucleotide substitution, molecular clocks and DNA polymorphism in populations.

Learning Outcomes:

This course is designed to provide the student with a basic knowledge of factors and mechanisms of molecular evolution.

Syllabus:

Theory

Dynamics of genes in populations: Genetic polymorphism, Roles of mutation and selection in molecular evolution, Codominant, dominant, recessive and overdominant mode of selection; DNA and amino acid sequence evolution: Models of nucleotide substitution, DNA sequence divergence; Rates and patterns of nucleotide substitution, Nonrandom usage of synonymous codons, Molecular clock; Molecular phylogenetics: Phylogenetic trees, Types of data, Methods of tree reconstruction, Gene trees and species trees; Reticulate evolution and phylogenetic networks; Divergent evolution of duplicated genes, Concerted evolution, Molecular tinkering; Evolution by transposition, Horizontal gene transfer; Gene organisation and evolution.

Practice

Alignment of nucleotide and amino acid sequence, Divergence between DNA sequences, Estimating the number of nucleotide substitutions between sequences: noncoding sequences, protein-coding sequences, amino acid sequences; Nonuniform rates of nucleotide changes; Molecular phylogenetics: tree construction, topological comparisons, assessing tree reliability.

Required Reading:

1. Graur, D. (2016) Molecular and genome evolution. Sinauer Associates, Inc. Pub. USA

2. Milankov, V. (2007) Biološka evolucija. Prirodno-matematički fakultet, Novi Sad.

3. scientific papers

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 2

Teaching Methods: video beam, oral presentation, study of scientific papers			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	
Practical work		oral exam	70
Preliminary exam(s)		…….	
Seminar(s)	30		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			