

**221.4412 – Foundations in Molecular Evolution**  
**Semester B**

**Time:** Monday 13:15-15:00, Multipurpose Building room 223

**Instructor:** Dr. Eyal Privman ([eprivman@univ.haifa.ac.il](mailto:eprivman@univ.haifa.ac.il))

**Office Hours:** appointment by email

**Course Level:** BA+MA

**Course Type & Format:** Elective, Lecture

**Number of Hours/Credits:** 2

**Prerequisites:** Molecular Biology, Genetics

**Course Overview (Short Abstract):** Lectures will review historical and biological background of the field; gene structure, genetic code, mutations; evolutionary distance; Neutral evolution theory; phylogenetic reconstruction; inference of selection; gene duplication and loss; examples of studies of molecular evolution.

**Learning Outcomes (What are the skills, abilities, or major concepts a student is expected to acquire in this course?) – At the end of the course students will be able to:**

1. Theoretical understanding of concepts in molecular evolution
2. Theoretical understanding and practical aspects of molecular evolutionary analysis methods

**Assessment (Assessment Method and Grade Composition):**

Final exam – 100%

**Week-by-Week Content and Assignments:**

| Week # | Topic  | Assignment |
|--------|--|------------|
| 1      | What is molecular evolution?<br>Historical and biological background |            |
| 2      | DNA as a sequence: gene structure, genetic code, mutations           |            |
| 3      | Evolutionary distance and the multiple substitutions problem         |            |
| 4      | Substitution rates   |            |



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| 5  | Protein coding sequences;<br>inference of positive selection           |  |
| 6  | Phylogeny reconstruction and<br>the Neighbor Joining algorithm         |  |
| 7  | Maximum likelihood and<br>Bayesian phylogeny<br>reconstruction methods |  |
| 8  | Human evolution  |  |
| 9  | Inference of positive Darwinian<br>selection                           |  |
| 10 | Gene duplication and loss  |  |
| 11 | Gene conversion and<br>concerted evolution                             |  |
| 12 | Polyploidy   |  |
| 13 | Examples of studies of<br>molecular evolution                          |  |