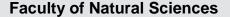# ביופיזיקה וביואינפורמטיקה מבנית (4 שש״ס, 3 נק״ז)
Structural biophysics and bioinformatics (4 hours/3 points)
231.3013

Lecturer: Prof. Mickey Kosloff (kosloff@sci.haifa.ac.il)
Teaching assistant: Anna Bakhman (annabakhman@gmail.com)
Department of Human Biology

דרישות קדם: ביוכימיה א'+ ב'.
סוג/מבנה הקורס: שעור (2 ש״ס) יום ג' 16-14 + תרגול (2 ש״ס) יום א' 18-16.
Prerequisites: Biochem A+B or equivalent courses.
Course: lectures (2h) Tuesdays 14-16 + tutorials (2h) Sundays 16-18.

חובות הקורס והערכת הסטודנטים:
חובת נוכחות בתרגולים + חובת הגשת תרגילים (30% מהציון הסופי).
מבחן או פרויקט מסכם (עבודה/הרצאה) – יקבע בהמשך (עם עדיפות לפרויקט).
שעות קבלה – בתאום מראש באימייל.

Course assessment and duties:
Mandatory attendance in tutorials + exercise submission (30% of final grade).
Exam or final project (TBD, preference to project).

Structural bioinformatics entails analysis and prediction of 3D structures of biological macromolecules such as proteins, RNA, and DNA. It includes many approaches to analyze macromolecular 3D structure such as comparisons of global 3D folds or local motifs, molecular folding and dynamics, evolution, binding interactions, drug development, and structure/function relationships – working both with experimentally solved structures and with computational models. This course will provide both **a theoretical background on structural bioinformatics** and **an extensive hands-on experience in using structural bioinformatics methods**, with a particular focus on methods that can assist and direct experimental biology/biophysics studies.

Topics include:
1. Introduction to protein structure.
2. Physical methods for determining the structure of proteins.
3. 3D structure visualization and analysis.
4. Structure comparison and superposition.
5. Protein classification and evolution.
6. Molecular maps, surface properties, conservation.
7. Structure prediction.
8. Structure-based function prediction.
9. Enzyme active sites and protein–small molecule interactions.
10. Protein dynamics.
11. Quantitative structure analysis (e.g. electrostatic calculations).

Bibliography:
1) Introduction to Proteins: Structure, Function, and Motion, 2nd Edition, Amit Kessel, Nir Ben-Tal
2) Structural Bioinformatics, 2nd Edition, Jenny Gu (Editor), Philip E. Bourne (Editor)
3) Introduction to Protein Structure, 2nd Edition, Carl Branden and John Tooze