BIOENGINEERING OF THE CELL
Course No. 336517

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Office Hours:
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Suggested Texts:
1. Boal, D., "Mechanics of the Cell", Cambridge Univ. Press, 2002
2. Howard, J., "Mechanics of Motor Proteins of the Cytoskeleton", Sinauer Assoc. 2001
3. Berg, H. C., "Random Walks in Biology", Princton Univ. Press, 1993
4. Weiss, T. F., "Cellular Biophysics – Transport (Vol. 1)", MIT Press, 1996
5. Evans, E., and Skalak, R., "Mechanics and Thermodynamics of Membranes" CRC Press, 1980.2.

Grading:
Homework (תקף): 15%
Final Exam (תקף): 85% [מועד א': 16.7.2021, מועד ב': 8.10.2021]

Course Outline: (there may be changes)

Week 1
Lecture: Introduction and Motivation
Overview of the Cell

Week 2
Lecture: Cell Mechanical forces
Viscoelastic response of small molecules
Molecular dynamics
Hookean elasticity for proteins and cells

Week 3
Lecture: Cell Adhesion Mechanics
Cell peeling model

Week 4
Lecture: Cell Adhesion Mechanics
Thermodynamic model

Week 5
Lecture: The Cell Membrane
Membrane mechanics overview

Week 6
Lecture: The Cell Membrane
Micropipette aspiration model

Week 7
Lecture: Cell Forces
Cytoskeletal dynamics

Week 8
Lecture:
Micropipette aspiration and Optical Tweezers

Week 9
Lecture: Brownian motion

Week 10
Lecture: Brownianmotion
Random walk with drift

Week 11
Lecture: Force generation and cell migration

Week 12
Lecture:
Polymerization and depolymerization models

Week 13
Lecture: Introduction to Cell Rheology
Active and passive models