

The Hebrew University of Jerusalem

Syllabus

CHIMERA Synthetic Biology Made Simple - 49678

Last update 31-07-2023

<u>HU Credits:</u> 2

Degree/Cycle: 1st degree (Bachelor)

<u>Responsible Department:</u> Enrichment Program for High School students

<u>Academic year:</u> 0

Semester: Yearly

<u>Teaching Languages:</u> Hebrew

<u>Campus:</u> E. Safra

<u>Course/Module Coordinator:</u> Shir Bahiri-Elitzur

Coordinator Email: Shirbaelitzur@gmail.com

Coordinator Office Hours:

Teaching Staff:

Ms. Shir Bahiri-Elitzur, Ms. Larissa Fine

Course/Module description:

Introduction to synthetic biology - a link between the world of biology and the worlds of mathematics, engineering, computer science and bioinformatics

Course/Module aims:

Exposure and accessibility of topics at the forefront of research in the field of synthetic biology for the younger generation

Learning outcomes - On successful completion of this module, students should be able to:

Recognizing, analyzing, researching and solving problems in the biological world using biophysical and programming tools.

Emphasis on intracellular processes, diseases related to DNA

Attendance requirements(%):

90% Mandatory attendance (up to 3 sessions can be omitted)

Teaching arrangement and method of instruction: In class

Course/Module Content:

Biological contents - enzymes, cellular theory, mitochondrion and energy transduction, the cell membrane and transfer of materials, DNA structure and its replication process, the cell cycle, and genetics, the central dogma of biologytranscription and translation processes.

Molecular methods - restriction enzymes, PCR, gel electrophoresis, plasmids, primer design, transformation, DNA sequencing

Computational biology methods - sequence alignment global and local, PSSM, Fitch algorithm (phylogenetic trees), codon usage bias indices (CAI, ENC), ribosome flow model

Advanced topics in synthetic biology - CRISPR, organs on a chip, synthetic genetic circuits, biosensors, bio-physical model of translation process, phages and ethics, vaccine research (Covid as a case study), Synthetic biology in the food industry, chosen topic of innovative research in the field

Labs - Enzymatic kinetics, genetic engineering, biosensors

Computational tools - Python workshop

Tours and guest lectures

<u>Required Reading:</u> Non

Additional Reading Material:

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 45 % Presentation / Poster Presentation / Lecture/ Seminar / Pro-seminar / Research proposal 10 % Submission assignments during the semester: Exercises / Essays / Audits / Reports

/ Forum / Simulation / others 40 % Attendance / Participation in Field Excursion 5 %

Additional information: