Name of the module: Metabolomics for biomedical studies

Number of module: 240.2.0013

BGU Credits:
ECTS credits:
Academic year: 2024
Semester: fall semester
Hours of instruction: 26
Location of instruction: IKI, building 51
Language of instruction: English
Cycle:
Position: Department of life sciences, Department of chemistry, Department of Earth and environmental studies, Department of agricultural and biotechnology, Department of biomedical engineering, Department of medical laboratory science
Field of Education: Metabolomics
Responsible department: IKI Nanocenter

General prerequisites: Intermediate level of English, Basic knowledge of chemistry and biochemistry, Basic knowledge of cell biology
Grading scale: 0-100

Aims of the module: An introduction to metabolomics, including basic principles of mass-spectrometry and chromatography, experiment design and data analysis.
Objectives of the module: (1) introduce metabolomics as a scientific discipline and its place in systematic biological studies, (2) familiarize with the main technological approaches in metabolomics (chromatography, mass-spectrometry) and their key principles, (3) present theoretical principles of experiment design and sample preparation to the specific field of metabolomics, (4) introduce main mathematical concepts for the analysis of multivariate metabolomics data.

Learning outcomes of the module: On successful completion of the course, the student should be able to:
1. Design a metabolomics experiment.
2. Understand a process of chromatography-mass spectrometry data acquisition.
3. Understand a basic analysis of explanatory metabolomics data.
4. Interpret the results of the analysis in the context of a whole study.

Attendance regulation:
75% of lectures.

Teaching arrangement and method of instruction: Lectures on campus. Invitation of guest lecturers is planned.

Lecturer: Dr. Albert Batushansky
Contact details: Building 51, room 229
Office phone: 06-64- 69679
Email: albertbat@bgu.ac.il
Office hours: TBD

Module evaluation: at the end of the semester the students will evaluate the class in order to draw conclusions for improvement, and for the university's internal needs.

Confirmation:

Last update:

Assessment:
how the students will be assessed in the module

Activity in class/attendance 20%

Median test (multiple choice) 40%

Short presentation at the class (5-10 min) or Final report (5 A4 pages max) – depends on the number of attenders – 40%

Work and assignments:

In-class lectures

In-class test

Home preparation for a short presentation/final report

Time required for individual work: in addition to attendance in class, the students are expected to do their assignment and individual work: up to 5 hours

Module Content\ schedule and outlines:

Lectures:	Hours
Introduction to metabolomics	2
Introduction to metabolism	2
Methods of chromatography and its role in metabolomics	4
Basics of mass-spectrometry and spectra interpretation	4
Metabolomics experiment design	2
Metabolic data analysis concepts	4
Median test	2
Demonstration of metabolomics equipment and software	2
In-class presentations of Final report preparation	4

Required reading: recommended but not mandated:

1. Lisec, J., Schauer, N., Kopka, J. et al. Gas chromatography mass spectrometry–based metabolite profiling in plants. Nat Protoc 1, 387–396 (2006). https://doi.org/10.1038/nprot.2006.59

2. Thomas, S.N., French, D., Jannetto, P.J. et al. Liquid chromatography–tandem mass spectrometry for clinical diagnostics. Nat Rev Methods Primers 2, 96 (2022). https://doi.org/10.1038/s43586-022-00175-x

3. Pang, Z., Zhou, G., Ewald, J. et al. Using MetaboAnalyst 5.0 for LC–HRMS spectra processing, multi-omics integration and covariate adjustment of global metabolomics data. Nat Protoc 17, 1735–1761 (2022). https://doi.org/10.1038/s41596-022-00710-w

*** All learning material will be available to the students on the module's website (high-learn)/ library/ electronic documents available to BGU students.**