

İzmir Institute of Technology
Faculty of
Science
MOLECULAR BIOLOGY AND
GENETICS

MBG405 CURRENT TECHNIQUES IN MOLECULAR BIOLOGY

Objectives of the Course:

To enable students to understand the mechanisms of cutting-edge techniques used in molecular biology, To ensure that students comprehend the latest developments in the field of biology and provide case studies to examine, To enable students to gain skills in using latest techniques in molecular biology.

Teaching Methods and Techniques:

This course is to familiarize students with state of the art technologies in molecular biology

Recommended or Required Reading

Resources Class handouts and Scientific articles (Ders notları ve bilimsel makaleler)

Course Schedule:

Week Topics

- 1 Cell culture
- 2 Applications of iPSCs, stem cells, and organoids
- 3 Principles of gene manipulation and gene transfer techniques
- 4 Genome editing (Knock-out, Knock-in, Site-directed mutagenesis)
- 5 Applications of CRISPR systems
- 6 DNA sequence analysis methods (Sanger sequencing, NGS, DNA microarrays, Fluorescence in-situ hybridization)
- 7 Gene expression and transcriptome analysis (qPCR, expression microarrays, RNA-seq)
- 8 Epigenetics, gene silencing, and siRNA systems
- 9 Protein purification, immunoprecipitation, and immunostaining (articles)
- 10 Proteomics, metabolomics, and mass spectrometry
- 11 Flow cytometry
- 12 Protein-protein interactions
- 13 Analysis of DNA-protein and RNA-protein interactions
- 14 Research Proposal Presentations
- 15 Final Exam

Course Learning Outcomes:

- C01 Ability to use the latest techniques in molecular biology.
- C02 Ability to prepare and report on a research project, individually and as a group.
- C03 Ability to evaluate scientific publications.
- C04 Gain skills in understanding the latest technologies in the field of molecular biology.
- C05 Gain abilities that contribute to professional development.
- C06 Ability to take responsibility in professional and scientific work.

Program Learning Outcomes:

- P01 Ability to explain and discuss how processes are integrated at the molecular level and understand the structures and functions of macromolecules in cells.
- P02 Ability to design experiments, make measurements, and generate, visualize, and analyze data.
- P03 Acquire knowledge and understanding of methods in molecular biology and genetics.
- P04 Gain laboratory skills and use relevant instrumentation.
- P05 Critically evaluate scientific studies.
- P06 Ability to access relevant databases and literature in the field of molecular biology and genetics.
- P07 Ability to work in teams and solve problems as a group.
- P08 Capability for self-directed and lifelong learning.
- P09 Ability to communicate effectively, both orally and in writing.
- P10 Ability to evaluate the ethical implications of research methods and their outcomes.
- P11 Ability to integrate data from human and social sciences into natural sciences and develop interdisciplinary approaches.
- P12 Apply sustainable development goals to problem-solving and research in the life sciences.

| Assessment Methods and Criteria | | |
|--|-----------------|------------|
| In-Term Studies | Quantity | |
| Midterm exams | 2 | %40 |
| Homeworks | 2 | %10 |
| Attendance | 1 | %5 |
| Research Proposal | 1 | %15 |
| Final examination | 1 | %30 |
| Total | | 100 |
