



The Goodman
Faculty of Life Sciences
Bar-Ilan University

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Molecular Biology and Genetic Engineering part II

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Academic year: 2021-2022 Semester: A Hours/credits: 2 hours / 1 credits

Mandatory

Prerequisites: Molecular Biology and Genetic Engineering part I

Open to third year undergraduate student

Course Overview – Short abstract:

The first part of the course focuses on DNA structure, organization of the genome and structure of the chromatin, regulation of gene expression, genetic engineering and genome editing. In the second part of the course, we will introduce state-of-the-art genomic and high throughput screen approaches including CRISPR, open reading frame (ORF) and small molecules screens. We will explain how those screens are designed and utilized to characterize the function of genes in health and disease.

We will also learn about Omics including transcriptomics, single-cell RNAseq and proteomics. We will end with regulation of protein synthesis and degradation regulation.

Learning outcomes – short descriptions

The course has 2 main goals:

- a. Introducing basic and up to date molecular mechanisms of genome organization, regulation of gene expression and advanced tools in genome editing.
- b. Presentation of genome wide approached for the study of functional analysis of genes.

Assessment: exam (100% of the grade)

Week-by-Week content, assignments and reading

Lesson #	Subject	
1	Genome organization and epigenetics-1	
2	Genome organization and epigenetics-2	
3	How cells read their genome	
4	Advanced aspects of gene regulation in mammalian cells	
5	CRISPR genome editing	
6	Measuring CRISPR efficiency and specificity	
7	Epigenetic editing and beyond	
8	Genome wide screens-1	
9	Genome wide screens-2	
10	Omics I- Genomics	
11	Omics II- Transcriptomics including single cell RNA sequencing	
12	Omics III- Ribosome display and Proteomics	
13	Control of protein expression- synthesis regulation	
14	Control of protein expression- degradation regulation	

Bibliography:

Molecular Biology of the Cell, Alberts et al. Sixth Edition