



Faculty of Engineering and Natural Sciences
Introduction to Molecular Biology
BIO301

Spring 2024

Instructor: Nur Mustafaoglu

Email: nur.mustafaoglu@sabanciuniv.edu

Website: <http://mustafaoglulab.com/>

TAs:

- Gulin Baran, Email: gulinbaran@sabanciuniv.edu
- Gizem Çelebi Torabfam, Email: gizemcelebi@sabanciuniv.edu
- Gülşah Sevimli, Email: gulsahsevimli@sabanciuniv.edu
- Sümeyra Nuran Özmen, Email: sumeyra.ozmen@sabanciuniv.edu
- Ahmet Baki Şahin, Email: ahmet.sahin@sabanciuniv.edu

Course Address:

| | | |
|---------------------|----------|-----------------------|
| 14:40 am - 16:30 am | Tuesday | FENS G029 |
| 12:40 am – 13:30 pm | Thursday | FENS G029 |
| 16:40 am – 19:30 pm | Thursday | FENS G049/G050 |

Office Hours: by appointment!

Please make sure to schedule an appointment with the instructor and/or TAs prior the meeting.

Objectives:

This course is designed as two parts: i) lectures having the objectives of understanding concepts in molecular biology and gene regulation, ii) experimental lab sessions having the objectives of experiencing molecular cloning techniques to produce a particular gene product.

This lecture provides introductory information about the flow of information in living things at the molecular level. Starting from genomic information, structure of DNA, RNA, and protein, packaging to chromosomes, topics such as following will be discussed in the lecture 1) DNA replication, repair and recombination, 2) RNA transcription and modification, and 3) protein translation, folding and modification.

At the end of this course, the students will be able to:

- Demonstrate an understanding on DNA, RNA, and protein structures and their relationships
- Discuss the structure and function of proteins including the roles of individual amino acids in protein folding charge, acid/base properties, and protein-protein interactions.
- Discuss chromatin structure and how it can be modified to affect gene expression.
- Explain the mechanisms of DNA replication and repair, RNA synthesis and processing, and protein synthesis.
- Describe how gene expression is regulated at the transcriptional and post-transcriptional level.
- Demonstrate the ability to effectively communicate and work collaboratively with peers in the small group setting to successfully address problems sets in molecular cell biology and genetics.

Course Materials:

Main Book:

- Molecular Biology of the Gene, Seventh Edition, Pearson
J. D. Watson, T. A. Baker, S. P. Bell, A. Gann, M. Levine, R. Losick
ISBN-13: 9780321762436

Additional Sources:

- Molecular Biology Principles of Genome Function

N. Craig, R. Green, C. Greider, G. Storz, C. Wolberger, O. Cohen-Fix
 ISBN-13: 978-0199658572

- Molecular Biology of the Cell
 B. Alberts, A. D. Johnson, J. Lewis, D. Morgan, M. Raff, K. Roberts, P. Walter
 ISBN-13: 978-0815344322
- Review articles
- Research articles

Weekly Plan (dates are tentative)

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|---------------|------------|---|----------------------------|
| Week 1 | 20/02/2024 | Course Introduction | |
| | 22/02/2024 | Nucleic Acids Convey Genetic Information | <u>Reading:</u> Chapter 2 |
| Week 2 | 27/02/2024 | The Structure of DNA | <u>Reading:</u> Chapter 4 |
| | 29/02/2024 | The Structure and Versatility of RNA | <u>Reading:</u> Chapter 5 |
| Week 3 | 05/03/2024 | The Structure of Proteins | <u>Reading:</u> Chapter 6 |
| | 07/03/2024 | | |
| Week 4 | 12/03/2024 | Genome Structure, Chromatin, and the Nucleosome | <u>Reading:</u> Chapter 7 |
| | 14/03/2024 | | |
| Week 5 | 19/03/2024 | The Replication of DNA | <u>Reading:</u> Chapter 8 |
| | 21/03/2024 | | |
| Week 6 | 26/03/2024 | Midterm 1: Weeks 1-5 | |
| | 28/03/2024 | Recent Technologies on DNA, RNA, Protein | |
| Week 7 | 02/04/2024 | The Mutability and Repair of DNA | <u>Reading:</u> Chapter 10 |
| | 04/04/2024 | | |
| 08-12/04/2024 | | <i>Spring Break</i> | |
| Week 8 | 16/04/2024 | Homologous Recombination at the Molecular Level | <u>Reading:</u> Chapter 11 |
| | 18/04/2024 | Site Specific Recombination and Transposition of DNA | <u>Reading:</u> Chapter 12 |
| Week 9 | 23/04/2024 | <i>National Holiday (Ulusal Egemenlik ve Çocuk Bayramı)</i> | |
| | 25/04/2024 | Site Specific Recombination and Transposition of DNA | <u>Reading:</u> Chapter 12 |
| Week 10 | 30/04/2024 | Mechanisms of Transcription | <u>Reading:</u> Chapter 13 |
| | 02/05/2024 | | |
| Week 11 | 07/05/2024 | Exon Shuffling and RNA Splicing | <u>Reading:</u> Chapter 14 |
| | 09/05/2024 | | |
| Week 12 | 14/05/2024 | Midterm 2: Weeks 7-11 | |
| | 16/05/2024 | <i>No Class</i> | |
| Week 13 | 21/05/2024 | Translation | <u>Reading:</u> Chapter 15 |
| | 23/05/2024 | | |
| Week 14 | 28/05/2024 | The Genetic Code | <u>Reading:</u> Chapter 16 |
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Labs: Additional syllabus will be provided for the lab sections separately

Reading: Chapter 7: Techniques of Molecular Biology

Grading Policy:

Homework (15%): There will be 3 homework assignments throughout semester

- Homework due dates will be announced for each homework.
- Late assignments: later than the due date will not be accepted; students' grade will be 0 for that assignment.

Midterms (2x10%): There will be two midterms:

Midterm 1: Students will be responsible for the material of week 1-5

Midterm 2: Students will be responsible for the material of week 6-11

Final (30%): Students will be responsible for the whole material of the course.

In class performance (5%):

- There will be short questions during the lecture
- Timing of the questions can be different in each lecture
- At the end of the course, in class scores for each student individually will be ranked from highest to lowest, and only the highest half of the scores will be counted for the final score.
- Students' participant to the courses are important

Lab Quizzes (5%):

- There will be short questions before each lab section
- Students will be expected to be in the lab on time
- Students will be expected to read the lab manuals before coming to the lab

Lab Reports (25%):

- Students will be expected to write lab reports; more instructions will be provided during the lab sessions
- Late submissions: 10% late penalty will be implemented for up to 6 days. Lab reports summited 6 days later than the due date will not be accepted; students' grade will be 0 for that assignment.

- Tentative grade levels:

| Highest | Lowest | Letter |
|----------|---------|--------|
| 100.00 % | 93.00 % | A |
| 92.99 % | 87.00 % | A- |
| 86.99 % | 83.00 % | B+ |
| 82.99 % | 77.00 % | B |
| 76.99 % | 73.00 % | B- |
| 72.99 % | 67.00 % | C+ |
| 66.99 % | 63.00 % | C |
| 62.99 % | 57.00 % | C- |
| 56.99 % | 53.00 % | D+ |
| 52.99 % | 50.00 % | D |
| 49.99 % | 0.00 % | F |

Exam Policy:

- Exams may include multiple choice, fill-in-the-blank, problem solving, or short answers.
- All exams will be closed book and held in class.
- For exams you will only require a pencil and a calculator.
- Phones are not allowed and must be turned off.
- If you leave during an exam, you will not be allowed back in
- Late arriving students will not be allowed after the first student finishes the exam and leaves.

Grade disputes

- Students will have one week after the return of an exam or an assignment to challenge a grade for any question with a written note providing an explanation.
- Failure to challenge the grade within this period indicates a willingness to accept the grade as is.
- The challenge should consist of a written description of why the answer is correct based on other published material that you cite.

Academic Honesty:

- All students must follow the university guidelines of academic integrity.
<https://www.sabanciuniv.edu/en/academic-integrity-statement>
- A strict zero-tolerance policy for cheating will be enforced.