

# BSE 312A: Cell and Molecular Biology Lab

## Credits: 1-0-6-0 = 9

### Objective:

The lab course provides hands on practice on the essential aspects of microbiology, molecular biology and genetics. Each section will cover several experiments fundamental to these essential areas. Exposure to such experiments will provide the students with the practical knowledge on important aspects which can be essential in their future research projects. The course will have one lecture hour and six lab hours per week.

**Course Content: as mentioned below**

### Lab-wise break up

Topic	No. of Labs/lectures
<b>Microbiology:</b> Introduction to sterilization techniques and certain equipment used for sterilization or maintenance of a sterile environment e.g. the autoclave and the laminar flow hood. Learning the basic principles of making solutions used for microbiological and molecular biological experiments, such as buffers, medium for microbial culture etc. Measurement of pH and introduction to the pH meter. Learning how to make liquid and solid medium for microbial culture and the various techniques for growing microbial cultures in liquid and solid medium. Learning the principles and application of a basic staining technique to identify bacterial subtypes e.g. Gram staining. Collection of soil samples and water samples from different locations on campus for identification and quantification of bacteria in these samples through Gram staining and other techniques using McConkey's medium and Triple-sugar iron medium. Learning the basic principles of light microscopy and the observation of bacterial cells under a compound microscope.	15
<b>Molecular Biology:</b> Learning the basic principles about plasmid vectors and the use of antibiotic selection for growing bacterial cultures containing plasmid vectors. Learning the methods of determining the efficiency of cloning of desired DNA fragment in a plasmid vector through blue-white selection. Learning the principles of and generating chemical competent bacterial cells for transformation with plasmid DNA. Measuring the efficiency of transformation in the chemical competent bacterial cells. Isolation of plasmid DNA from bacterial cells after transformation. Restriction digestion of plasmid DNA. Learning the principles of and using gel electrophoresis to determine size of DNA fragments in sample. Learning about the technology for amplification of DNA sequences through the polymerase chain reaction (PCR). Using PCR to specifically amplify a piece of DNA and subsequent detection of amplification through gel-electrophoresis.	12
<b>Genetics:</b> Learning about the use of <i>Drosophila melanogaster</i> as a model system for genetic studies. Learning about the life cycle of this model organism and the study of adult mutant phenotypes. Learning basic genetics techniques such as setting up a dihybrid cross. Learning about sex-linkage and how to set up a cross to demonstrate it. Learning various techniques necessary for carrying out molecular-genetic analysis of flies e.g. preparation of polytene chromosomes, dissection of salivary glands and wing imaginal discs from larvae and dissection of adult body parts etc. Learning the principles of the powerful UAS-GAL4 system for driving tissue specific expression of reporter genes and the detection of the reporter (LacZ) expression in the tissue of interest.	15
<b>Total Labs/lectures</b>	<b>42</b>

**Instructor:** Dr. Bushra Ateeq ([bushra@iitk.ac.in](mailto:bushra@iitk.ac.in))

**Lab Assistants:** Mr. Neeraj Pandey ([npandey@iitk.ac.in](mailto:npandey@iitk.ac.in)) and Ms. Arushi ([arushic@iitk.ac.in](mailto:arushic@iitk.ac.in)).

**Student TAs:** Mr. Shivansh Nigam ([shivans@iitk.ac.in](mailto:shivans@iitk.ac.in)); Mr. Vipul Bhatia ([vipul@iitk.ac.in](mailto:vipul@iitk.ac.in));  
Ms. Nishat Manzar ([nishat@iitk.ac.in](mailto:nishat@iitk.ac.in)).

**Class Room:** New UG lab in Tutorial Block.

**Timings:** Wednesday & Thursday: LAB 14:00-17:00; Thursday: 17:00-18:00 Discussion/Lecture.

**Course Organization:** All Notices for the course will be sent by email to the course email list.

**Exams and Quizzes:** There will be one mid-semester examination of two hours and, an end-semester examination of three hours. Both exams will be held during the prescribed examination period as per DOAA time table. There may be one-or-two quizzes of twenty minutes each.

**Weightage for the grades:**

Mid-Sem Exam: 30%
End-Sem Exam: 40%
Quizzes: 10%
Comprehensive Viva & Attendance: 10%
Maintaining proper Lab Records: 10%

**Attendance:** 100% attendance is compulsory. Any student who is granted leave by the Convener, DUGC also must inform the instructor regarding his/her absence.

**Recommended text books:** This being a UG lab course there is no prescribed text. However, the following books could be consulted:

Molecular Cell Biology, by Lodish et al (5<sup>th</sup> edition or recent), W.H. Freeman and Company, New York  
Molecular Biology of the Cell, by Alberts et al (4<sup>th</sup> edition or later), Garland Sciences, New York