The Islamia University of Bahawalpur

**Chemistry Department**

**Instructors Dr. Jameel Rahman**  **MSc (4th Semester) Course: Molecular Biology**

**PURPOSE OF THE COURSE AND APPROACH TO THE SUBJECT:** This is a introductory course that deals with various aspects of molecular biology and has been designed to take students from basic principles to applied aspects of molecular biology. As many students will have a biological background the course will aim to consolidate previous knowledge to a higher level so that students will have a comprehensive understanding of theoretical molecular biology and its applied practical aspects (genetic engineering) in a variety of fields such as modern agriculture, health, and the environment. The course will start with a look at the historical background that contributed to our understanding of inheritance, the fundamental components underpinning expression of genetic information. The production of proteins and implications of break down in correct information flow. By the end of the course students will have consolidated their knowledge of molecular biology

**COURSE CONTENTS**

**Week 1+2**. Introduction: Mendel’s Laws and experimental evidence of DNA structure and DNA as hereditary material. DNA Structure (Pdf) 1 **Already covered in class.**

**Week 3 & 4**. Flow of genetic information: Gene expression. The players involved: nucleic acids and proteins, structures and functions. Structure of DNA Storage of the genetic information. Nucleus. Chromatin. Chromosomes. Packing and role of histones. The fundamental molecules involved.

[**https://www.youtube.com/watch?v=pB8h7QF8\_7Q**](https://www.youtube.com/watch?v=pB8h7QF8_7Q) **DNA packaging**

[**https://www.youtube.com/watch?v=o\_-6JXLYS-k**](https://www.youtube.com/watch?v=o_-6JXLYS-k) **The structure of DNA**

[**https://www.youtube.com/watch?v=zwibgNGe4aY**](https://www.youtube.com/watch?v=zwibgNGe4aY) **What is DNA**

[**https://www.youtube.com/watch?v=1THyMOk3WU0**](https://www.youtube.com/watch?v=1THyMOk3WU0) **RNA types**

**Week 5, 6 & 7**. Central Dogma -The flow of genetic information: (i) DNA Replication. (ii) Process of Transcription. (iii) Translation. The processes involved in transfer of genetic information.

[**https://www.youtube.com/watch?v=ePZc-71PT\_4**](https://www.youtube.com/watch?v=ePZc-71PT_4) **DNA replication Part 1**

[**https://www.youtube.com/watch?v=Dc21ml8-\_PI**](https://www.youtube.com/watch?v=Dc21ml8-_PI) **DNA replication Part II**

[**https://www.youtube.com/watch?v=bKIpDtJdK8Q**](https://www.youtube.com/watch?v=bKIpDtJdK8Q) **Transcription & Translation**

[**https://www.youtube.com/watch?v=JQIwwJqF5D0**](https://www.youtube.com/watch?v=JQIwwJqF5D0) **Transcription and mRNA processing**

[**https://www.youtube.com/watch?v=ocAAkB32Hqs**](https://www.youtube.com/watch?v=ocAAkB32Hqs) **Translation (mRNA to protein)**

**Week 7+8**. The genetic code, Regulation of gene expression &. DNA mutation and DNA repair.

[**https://www.youtube.com/watch?v=dijqYyFY1GM**](https://www.youtube.com/watch?v=dijqYyFY1GM) **The Genetic Code**

[**https://www.youtube.com/watch?v=OqRt723t33o**](https://www.youtube.com/watch?v=OqRt723t33o) **DNA and Gene regulation**

[**https://www.youtube.com/watch?v=sX6LncNjTFU**](https://www.youtube.com/watch?v=sX6LncNjTFU) **Mechanisms of DNA damage and**

**repair**

**Week 9+10**. Recombination technology and gene cloning: Requirements e.g ,Restriction Enzymes, Vector types such as bacs,cosmids, plasmids and yacs.

[**https://www.youtube.com/watch?v=U2cKywEn6KY**](https://www.youtube.com/watch?v=U2cKywEn6KY) **Restriction Enzymes**

[**https://www.youtube.com/watch?v=ZYPnkKRa5Qs**](https://www.youtube.com/watch?v=ZYPnkKRa5Qs) **Cloning Vectors**

[**https://www.youtube.com/watch?v=5ffl-0OYVQU**](https://www.youtube.com/watch?v=5ffl-0OYVQU) **DNA Cloning**

**Week 11+12+13.** Techniques in molecular biology. DNA Isolation & visualization. Gel electrophoresis. Polymerase Chain Reaction. Applications of Genetic engineering in different areas.

[**https://www.youtube.com/watch?v=ggZwQVCvVaw**](https://www.youtube.com/watch?v=ggZwQVCvVaw) **DNA isolation**

[**https://www.youtube.com/watch?v=mN5IvS96wNk**](https://www.youtube.com/watch?v=mN5IvS96wNk) **Gel Electrophoresis**

[**https://www.youtube.com/watch?v=aUBJtHwHASA**](https://www.youtube.com/watch?v=aUBJtHwHASA) **PCR**

[**https://www.youtube.com/watch?v=gqMqYYcJgz4**](https://www.youtube.com/watch?v=gqMqYYcJgz4) **Applications of Genetic engineering**

**Week 14+15**. Review/Presentations/Qizz

Week 16. FINAL TERM Examination.

**Recommended Textbooks**.

1. Robert F. Weaver, **Molecular Biology** (5th Edition) McGraw Hills Companies.

2. Lodish, H *et al* ***Molecular Cell Biology*** (8th Edition)New York: [W. H. Freeman and Co.](http://bcs.whfreeman.com/biochem5/default.asp?s=&n=&i=&v=&o=&ns=0&uid=0&rau=0)

3. Berg, J., Tymoczko, J. L., & Stryer, L (2006). ***Biochemistry.*** New York: [W. H. Freeman & Co.](http://bcs.whfreeman.com/biochem5/default.asp?s=&n=&i=&v=&o=&ns=0&uid=0&rau=0)

4. Alberts, B., Johnson, A., Lewis, J., Raff. M., Roberts. K., Walter, P. (2015). ***Molecular Biology of the Cell****.* New York: Garland Science.

5. Review and research articles for reading, for various topics will be provided during the

course.