



**The Islamia University of Bahawalpur**  
**Department of Biochemistry & Biotechnology**  
**PhD Biotechnology**  
**Semester: 1st**

**Paper: Advanced Molecular Biology**

**Credit Hours: 3**

**Weekly Division of Syllabus**

<b>Week-1</b>	Mendelian inheritance, Segregation at one locus, Segregation at two loci Quantitative inheritance
<b>Week-2</b>	Nucleosomes, Higher order chromatin organization, Chromatin and chromosome function. Nucleosome modification and Gene Expression
<b>Week-3</b>	Normal chromosomes - gross morphology, Special chromosome structures, Molecular aspects of chromosome structure
<b>Week-4</b>	DNA methylation in prokaryotes, DNA methylation in eukaryotes Epigenetic gene regulation by DNA methylation in mammals
<b>Week-5</b>	The concept of the gene, Units of genetic structure and genetic function Gene-cistron relationship in prokaryotes and eukaryotes, Gene structure and architecture
<b>Week-6</b>	Gene expression, Gene regulation, Gene expression in prokaryotes and eukaryotes
<b>Week-7</b>	Conjugation, Transformation, Transduction, An overview of the genetic code, Translation, Special properties of the code
<b>Week-8</b>	Genomes, ploidy and chromosome number, Physico-chemical properties of the genome Gene structure and higher-order genome organization, Repetitive DNA Gene mapping. Genetic mapping
<b>Week-9</b>	<b>Mid Term Examination</b>
<b>Week-10</b>	Mutagenesis and replication fidelity, DNA damage: mutation and killing DNA repair, Direct reversal repair, Excision repair, Mismatch repair, Recombination repair
<b>Week-11</b>	Structural and functional consequences of mutation, Mutant alleles and the molecular basis of phenotype. The distribution of mutations and molecular evolution, Mutations in Genetic Analysis
<b>Week-12</b>	Protein primary structure, Higher order protein structure. Protein modification, Protein families, Global analysis of protein function
<b>Week-13</b>	The components of protein synthesis. The mechanism of protein synthesis. The regulation of protein synthesis

<b>Week-14</b>	Molecular cloning, Strategies for gene isolation, Characterization of cloned DNA, Expression of cloned DNA, Analysis of gene regulation
<b>Week-15</b>	Replication strategy, The cellular replisome and the enzymology of elongation Initiation of replication, Primers and priming, Termination of replication The regulation of replication
<b>Week-16</b>	Maturation of untranslated RNAs End-modification and methylation of mRNA RNA splicing RNA editing Post-processing regulation
<b>Week-17</b>	Transcriptional initiation in prokaryotes -basal and constitutive components Transcriptional initiation in eukaryotes -basal and constitutive components Transcriptional initiation - regulatory components Strategies for transcriptional regulation in bacteria and eukaryotes Transcriptional elongation and termination
<b>Week-18</b>	<b>Final Term Examination</b>

### **Recommended Books:**

- 1- Advanced Molecular Biology By Richard M. Twyman Neurobiology Division, MRC Laboratory of Molecular Biology, Hills Road, Cambridge CB2 2QH, UK
- 2- Human Molecular Genetics by TOM STRACHAN AND ANDREW READ 4<sup>th</sup> edition (2010) Garland Science Taylor & Francis Group, LLC 711 Third Avenue, 8th Floor New York.
- 3- Essential Cell Biology. By Bruce Alberts 8<sup>th</sup> Edition; Garland Publishers, New York.
- 4- Molecular Cell Biology. By Lodish et al., (2017) 9th Edition; Freeman and Company, New York. (available at [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov))