

**Department of Biosciences**  
**Jamia Millia Islamia, New Delhi**

**Course Structure of PhD (Biosciences)**  
**(w.e.f. 2020)**

Sl. No.	Papers	P/Wk	Credits	Internal Assessment	End semester Exam	Presentation	Total Marks
<b>Compulsory Papers</b>							
I	Annotated Bibliography (PHDBS-005)	4	4	25	-	75	100
II	Research Methodology (PHDBS-004)	4	4	25	75	-	100
<b>Optional Papers (Any Two)</b>							
I	Advances in Biosciences – I (PHDBS-001)	4	4	25	75	-	100
II	Advances in Biosciences – II (PHDBS-002)	4	4	25	75	-	100
III	Advances in Biosciences III (PHDBS-003)	4	4	25	75	-	100
<b>Total</b>			<b>16</b>				<b>400</b>

**(PHDBS-004)**  
**RESEARCH METHODOLOGY**

**Lectures: 60**

**Unit I. Separation and Isolation**

Principles of chromatography, Performance parameters in chromatography, Modes of chromatography, high Performance liquid chromatography, Fast protein liquid chromatography, Perfusion chromatography, Ultracentrifugation (velocity and buoyant).

Principles of Electrophoresis, Non –denaturing and Denaturing electrophoresis, Isoelectric focusing, 2-D SDS PAGE, Agarose gel Electrophoresis, Immunoelectrophoresis, Electrophotting Procedures (Western, Northern and Southern Blot).

**Unit II. Spectroscopic Techniques**

Basic principles and applications of Absorption and Fluorescence Spectroscopy, Circular Dichroism and ORD, Infra –red and UV Spectroscopy, NMR Spectroscopy, X ray crystallography and Mass spectroscopy.

**Unit III. Biostatistics**

Measure of central tendency, Measure of Variability, standard deviation (SDVC) and coefficient of variation (CV), Probability laws of probability Binomial Probability, Poissons's Distribution. Test of Hypothesis, types of error, Level of Significance, confidence interval, test of significance, Chi square test, F&T test, Correlation and regression.

**Unit IV. Bioinformatics**

DNA and Protein sequence analysis tools, BLAST, FASTA, Primer design tools, Protein visualization tools, ORF finder, Biological Database, EMBL, DDBJ, Pub med, PDB etc. Bioinformatics Resources on internet

**(PHDBS-001)**  
**ADVANCES IN BIOSCIENCES – 1**

**Lectures: 60**

**Unit I**

Internal organization of the Nucleus, Chromosomal Territories, Gene potentiation, euchromatin co-transcription and regulation; the nuclear envelop and mechanism of transport of RNA and proteins between nucleus and cytoplasm: Molecular Structure of gene and functional rearrangement in chorosomal DNA. Cell cycle and its regulation.

**Unit II**

Antibiotics, classification of antibiotics, Modes of action; Inhibition of bacterial cell wall synthesis, Inhibition of DNA and RNA biosynthesis, inhibition of protein synthesis, Antimetabolites. Drug resistance, Resistance mechanisms: inactivation by microbial enzymes, Modification of target site, Reduction in permeability, exclusion from the cell, Over production of a target metabolite, Genetics of resistance. Spontaneous mutations, Gene transfer. Gene deletion. Prevention and control of drug resistance.

**Unit III**

Medically important fungi – Structure and functions, diagnosis and characteristics, fungal classification: Phylum Zygomycota, Ascomycota, Deuteromycota, fungal diseases: systemic (Histoplasmosis, Blastomycosis and Coccidioidomycosis), subcutaneous ( Maduromycosis, Chromoblastomycosis, Sporotrichosis), cutaneous, superficial, Opportunistic ( Candidosis, Aspergillosis, Zygomycosis), Virulence factors, Host –Fungi Interaction: Infection process, Antifungal agents and targets for antifungal therapy mechanisms of antifungal resistance.

**Unit IV**

Principles and mechanisms of toxicology, Genetic and development toxicology, toxic effect of metals, solvents and vapors, Air Pollution, Ecotoxicology, Food Toxicology and metabolism of xenobiotics, Forensic and Occupational toxicology. Toxicological assessments through invitro (MTT/LDH) method Bacterial mutation test (Ames Test), (In vivo mammalian mutation Test)

**(PHDBS-002)**  
**ADVANCES IN BIOSCIENCES –II**

**Lectures: 60**

**Unit I**

Molecular basis of gene mutation and diseases, repair of DNA-damage photo reactivation, excision, post replication and SOS repair mechanisms, base excision, nucleotide excision repair, repair of DNA damage in higher organisms. mutational analysis through PCR.

**Unit II**

Classification of genetic diseases in human, Chromosomal single, gene disorders, multifactorial diseases. Diagnostics techniques of different genetics diseases. Prenatal diagnosing of genetics disorders. Gene therapy and its future prospects.

**Unit III**

Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis therapeutic interventions of uncontrolled cell growth, epigenetic and cancer.

**Unit IV**

Autoimmune responses , Response to alloantigens and transplant rejection, self tolerance and its loss, Tumor associated and Tumor specific transplantation antigens, extrinsic regulation of unwanted immune response, using immune response to fight infections and tumors. Effector molecule cytokines and their role in therapeutics, monoclonal antibody, hybridoma technique, ELISA and RIA.

**(PHDBS-003)**  
**ADVANCE IN BIOSCIENCES -III**

**Lectures: 60**

**Unit I**

Photo systems I & II, mechanism of quantum capture and energy transfer system, Electron Transport system in mitochondria, oxidative phosphorylation, Biotic and Abiotic plant stresses. General tissue culture techniques, totipotency , roles of tissue culture techniques in haploid and triploid production.

**Unit II**

History of Plant Virology, Transmission of plant viruses: insect, nematodes and seed mediated, mechanical transmission. Movement of plant viruses: cell to cell movement, long –distance movement. Identification of Plant viruses based on symptomatology, serology and nucleic acid. Control of plant viruses: breeding for resistance, virus elimination through tissue culture, transgenic resistance.

**Unit III**

Economic importance of cyanobacteria and Algae: Natural pigments, Restriction enzyme, Bioplastic, Biofertilizer, Medicine Aquaculture Food, feed and bioremediation etc.

**Unit IV**

Shikimate, hydroxycinnamate and phenylpropanoid pathways. Hydroxycoumarins, hydroxybenzoates, flavonoids, lignins. Tannins and quinines. General pathway of terpenoid biosynthesis, monoterpenoids, sesquiterpenoids, di-, tri- and poly-terpenoids, carotenoids. Non-protein amino acids, amines, cyanogenic glycosides and glycosides and glucosinolates, alkaloids.