

# SYLLABUS FOR ENTRANCE TEST – 2023

## POSTGRADUATE DIPLOMA PROGRAM IN GENETIC COUNSELLING

**Unit 1: Heredity and variation:** Mendel's Laws, Incomplete dominance, Co-dominance, Penetrance and Expressivity, Pleiotropism, Phenocopy, Epistasis, Multiple Allelism, Pseudoallelism, Inheritance of quantitative traits, Sex determination in Humans. Pedigree analysis, X-linked inheritance, Y-linked inheritance, Chromosome morphology, Linkage and crossing over, Sex linked inheritance – haemophilia & colorblindness, Variation in chromosome number and structure, Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndrome.

**Unit II : Biochemistry :** Biomolecules; carbohydrates, proteins, lipids and nucleic acids: Glycolytic Pathway, TCA Cycle Oxidative Phosphorylation, Photophosphorylation, Electron Transport Chain, Glyoxylate Cycle, Pentose Phosphate Pathway, Gluconeogenesis, Fatty acid Metabolism -  $\beta$  - Oxidation of fatty acids. Enzyme kinetics; cofactors, Catalytic RNA, Activate substrate, catalytic efficiency, enzyme regulation, allosteric and cooperative interactions, Factors affecting the rate of the reaction, Michaelis-Menton equation.

**UNIT III: Health and Disease:** Parasites causing human diseases (Malaria, Filariasis, Typhoid, Pneumonia, common cold, ameobiasis) Basic concept of Immunology; Acquired and Innate Immunity, Cells involved in immunity, Organs of the immune system- Types, structure and function of Immunoglobulin, organization of immunoglobulin genes, HLA complex- Structure of MHC class I and class II molecules, HLA typing in organ transplantation, Antigen processing and presentation, B-cells and T cell mediated immune response, Hypersensitivity and Auto-immunity; vaccines; cancer and HIV.

**UNIT IV: Molecular Biology :** DNA and RNA as genetic material, Structure of DNA & RNA. Packaging of DNA, Replication of DNA, Central Dogma; Transcription, Genetic Code, Translation; Gene Expression and Regulation; Human genome project; DNA fingerprinting, r-DNA Technology; Restriction endonucleases, cloning and expression vectors, genomic and cDNA libraries, Blotting and Hybridization techniques, DNA sequencing, PCR technology.

**UNIT V: Biostatistics:** Sampling techniques, Methods of Measures of central tendency and dispersion, Graphic representation of the data, Probability and probability distributions, Test of significance, Correlation and regression.

**UNIT VI:** Chromosomal disorders, Chromosomal instability syndromes, Gene controlled diseases, Identification of disease genes, Molecular basis of human diseases - Pathogenic mutations, Gain of function mutations, Loss of function mutations, Gene Dosage Effect, Genomic Imprinting, Dynamic Mutations, Mitochondrial diseases, Prenatal diagnosis – invasive and Non invasive methods, Diagnosis using DNA/RNA/protein based diagnosis, Therapy- Gene, stem cell, tissue engineering, Nanomedicine, Gene products in medicine.

**UNIT VII: Methods In Biology:** Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods. Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing gels. RFLP, RAPD and AFLP techniques. ELISA, RIA, western blot, immunoprecipitation, fluocytometry and immunofluorescence microscopy, FISH. Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy. X-ray diffraction and NMR, Microscopy, ECG, PET, MRI, fMRI, CAT.

**UNIT VIII: Clinical Psychology** - introduction – nature & scope, criteria of abnormality & models of abnormal behaviour; causes- stress and coping stratagies, anxiety disorders, somatoform disorders, dissociative disorders, psycho physiological disorder & health psychology. Psychological disorders-introduction to developmental disorders, cardiovascular disorders – hypertension – asthma therapies, eating disorders & sleeping disorders, ageing and psychological disorders, development disorders in adolescent & childhood Therapies: biological therapies drug therapy-electro convulsive therapy, psycho surgery, non biological therapies-brainwave therapy, cognitive therapy levels of prevention-primary prevention, secondary prevention, tertiary prevention.