

Syllabus for M.Phil in Human Genetics

HG-601 Paper-I Research Methodology in Human Genetics

Unit-1: Chromosome Analysis

Karyotyping, Automated Scanning System, Software studies, FISH, m-FISH, Different types of probes in FISH and its application, Staining Methods, Inverted microscope and its application.

Unit-2: Molecular Analysis

PCR, RT-PCR and its application, DNA sequencing-Manual and Automated, Microarray techniques, quantification and qualitative techniques and application.

Unit-3: Bioinformatics

Genomics: Meiotic recombination and cytogenetic Maps, Chromosome Painting, Physical mapping of Genome, Data collection and interpretation, Mapping Databases, Sequence Database, Mapping of Whole genome, Ethical, Legal and Social Issues, Synthetic Genome.

Proteomics: Proteomics and protein function, 2D PAGE, Isotope coded affinity tags (ICAT), Determination the function of a protein - Phylogenic profile methods, Method of correlated gene neighbour, Analysis of fusion, Protein-Protein interaction, Protein Array.

Unit-4: Population Genetics

Gene and Gene frequencies – Methods of measuring Genotype frequencies, Hardy Weinberg Law, Variation in Population, DNA sequencing polymorphism, Changes in Gene frequencies in population.

HG-602 Paper-II Clinical Genetics

Unit-1 Chromosomal Anomalies

Microdeletion, Congenital anomalies, Chromosome marker (specific) Syndromes, X-linked mental retardation, Androgen insensitivity Syndrome, Infertility, Y-chromosome microdeletion.

Unit-2 Metabolic Disorders

Inborn errors of purine metabolism (Lesch-Nyhan Disease, Hyperuricemia in other HGPRT variants, PRPP synthetase abnormalities, Adenosine deaminase deficiency, Purine nucleoside phosphorylase deficiency, Xanthinuria)

Disorders of Amino acid metabolism, Disorders of carbohydrate metabolism, Disorders of lipid metabolism.

Unit-3 Endocrine Abnormalities and Clinical Testing

Congenital Adrenal Hyperplasia, Thyroid-Hyperthyroidism and Hypothyroidism, Enzyme deficiency disorders, Pseudohypoadosteronism, Pseudohypothyroidism, Testicular Feminization.

Testing in clinical genetics: Biochemical techniques (enzymes and hormones), tissue biopsy (reproductive, muscular etc), Physical examination, IQ test.

Unit-4 Cancer and Immunogenetics

Oncogenes, Tumor suppressive genes, Molecular genetics of cancer, Autoimmune disorders, Immune deficiency syndrome- Chemistry, symptoms, therapy, HIV, H1N1.

HG-603 Paper-III Nanotechnology and Stem cell Biology

Unit-1 Basics of Nanotechnology

Introduction of Nanosciences and Nanotechnology, Types of Nanostructures, Synthesis of Nanostructural materials, Bionanotechnology, DNA nanotechnology, Protein based Nanostructures, Nanobiosensors for Biological Labelling and Cellular Imaging, Biosynthesis of Nanoparticle, Microbial Nanoparticle production.

Unit-2 Nanomedicines and its Importance

Nanoparticles surface modification, Bioconjugation, Antibodies, Cell-Specific targeting and controlled drug release, Multi-functional Nanoparticles for Drug Delivery, Targeting through angiogenesis, Targeting organ or Tumor types, Tumor-specific targeting: Breast cancer, Liver, Targeting Tumor vasculature for Imaging, Delivery of specific anticancer agents: such as Paclitaxel, Doxorubicin, 5-Fluorouracil etc., Recent advances in Biomedical Nanotechnology.

Unit-3 Introduction to Stem cell Biology

Introduction to Stem cell Biology, Types Characteristics, Isolation, and Maintenance, Application with recent perspective, Methodology, Cultures.

Unit-4 Advances in Stem cell Biology

Regeneration medicines and stem cells, Stem cell and Epigenetics, Stem cell and Disease therapy, Stem cell and Immunomodulation, Stem cell and Genetics, Stem cell and Drug Discovery, Stem cell and Nanotechnology, Stem cell and Dentistry, Stem cell and Gamete Production.

HG-604 INTERNAL PAPER

It includes Seminars, Assignments etc.

Suggested Reference Books:

1. Human Cytogenetics: Constitutional Analysis, D E Rooney, 3rd edition.
2. Inborn Metabolic Diseases: Diagnosis and Treatment, Walter, 4th edition.
3. Medical Biochemistry, Baynes and Dominiczak, 2005
4. Chromosome, Sumner, 1990
5. Human cytogenetics: A practical approach (Vol. I & II), Rooney and Czepulkowski, 1992
6. Bioinformatics: Methods and protocols, Misner & Krawetz, 2000
7. Recent Advances in Bioinformatics, Khan & Kanum, 2001
8. Emery's Elements of medical genetics, Mueller and Young, 1998
9. Medical Instrumentation and their applications & design – Webster.
10. Clinical Biochemistry: Clinical and Metabolic Aspects, 2nd Edition, Marshall and Bangert, Churchill, 2008.
11. Medical Biochemistry by Baynes and Dominiczak, 2nd Edition, 2005.
12. Basic and Clinical Endocrinology by Greenspan et al., 1983, ELBS, Singapore.
13. Endocrinology by De Groot Vol I, II & III, 2nd Edition, Saunders Publications, 1989.
14. Essentials Endocrinology by Laycock and Wise, 2nd Edition, ELBS, Singapore, 1981.
15. Immunology, 6th Edition by Kubly, Freeman Publications.
16. Cellular and molecular immunology by Abbas et al., 6th Edition, 2007, Elsevier Publications.
17. Elements of Immunology by Khan 2009, Dorling Kindsley, Delhi.
18. Clinical Cancer Genetics, Risk counseling and management ,Kenneth-Liss, Wiley-Liss,1998
19. Principles of cancer Genetics ,Fred Bung ,Springer,2008
20. Molecular Biology of Cancer, Lauren Pecorino, Oxford Uni. Press,2008
21. Nanotechnology, Niemeger CM & CA. MIRLCIU,2004
22. Bionanotechnology, D.S. Goodsell, 2004
23. Advanced Nanotechnology (I&II), S. K. Prasad, 2008
24. The Potential of Stem cells: An Inventory, Nikolaus Knoepffler, 2007