

Undergraduate Program in Anthropology

Genomic Diversity in Human Populations

Semester VI

Paper No- 16

Marks: 150 (Theory = 75; Internal Assessment = 25; Practical / Project = 50)

Theory

Unit I: Structure, Function and Inheritance of the human genome

1. Gene
2. Structure of DNA
3. Non-coding region of DNA
4. Replication
5. Gene expression
6. Mutation, DNA repair and recombination

Unit II: Genomic Variation

1. Genomic Polymorphisms (SNPs, VNTR, CNVs, etc)
2. Haplotypes and Haplogroups
3. Genotype-phenotype correlations
4. Epigenetics

Unit III: Genome Projects

1. Human Genome Project
2. Human genome diversity project
3. HapMap Project
4. 1000 genomes project
5. Indian Genome Diversity Project

Unit IV: Genomic Diversity & Human Evolution

1. Peopling of the Indian Subcontinent: Evidence from mtDNA and Y-chromosome
2. Evolutionary genetics

3. Molecular evolution
4. DNA sequence variation and human origins

Practical

1. Blood Collection, transportation and storage in field
2. DNA Extraction from whole blood
3. DNA Quantification
4. Aliquoting and sample preparation
5. Electrophoresis
6. Gel Documentation

Readings

1. Bamshad et al. (2001). Genetic Evidence on the Origins of Indian Caste Populations. *Genome Res.* 11: 994-1004; [Unit V]
2. Cavalli-Sforza L.L. (2005) The Human Genome Diversity Project: past, present and future. *Nat Rev Genet.* 2005 Apr; 6(4):333-40. [Unit III]
3. Cavalli-Sforza LL and Bodmer WF (1971) *The Genetics of Human Populations*. W. H. Freeman and Company, 1971.
4. David N. Cooper , Hildegard Kehrer-Sawatzki (2008). *Handbook of Human Molecular Evolution*. John Wiley & Sons, volume-2
5. Jeremy W Dale and Malcom von Schantz, John (2002). *From Genes to Genomes: Concepts and Applications of DNA Technology*, JohnWiley & Sons,)
6. Jobling M.A., Hurls, M. and Tyler-Smith, C (2004). *Human Evolutionary Genetics: Origins, Peoples & Disease*. GS. NY [Unit I (Chapter-2), Unit II (Chapter-3, 4 and 13), Unit V (Chapter-5, 8 and 9)]
7. Klug WS, Cummings MR, Spencer CA and Palladino MA (2012). *Concepts of Genetics*, 10th Ed., Pearson Education, Inc.
8. Nei M., and S. Kumar (2000) *Molecular Evolution and Phylogenetics*. Oxford University Press, Oxford.
9. Russell P.J. (2010). *Genetics: A Molecular Approach*. Benjamin Cummings San Francisco,USA
10. Snustad D. Pand, Simmons, M.J (2006) *Principles of Genetics*. Fourth Edition, John Wiley & Sons USA [Unit V (Chapter-25)]
11. Strachan T, Read A.P. (2004) *Human Molecular Genetics*. Garland Science/Taylor & Francis Group [Unit I (Chapter-1), Unit II (Chapter-15), Unit IV (Chapter-12.5)]
12. The 1000 Genomes Project Consortium. A map of human genome variation from population-scale sequencing. *Nature* 2010, 467, 1061-1073 [Unit III]

13. The Indian Genome Variation database (IGVdb): a project overview. *Human genetics*, 2005, DOI 10.1007/s00439-005-0009-9 [Unit III]
14. The International HapMap Consortium. *The International HapMap Project. Nature* 426, 789-796. 2003. [Unit III]
15. Vogel F and Motulsky AG (1996) *Human Genetics*. Springer, 3rd revised edition [Unit III]