



# HUMAN MOLECULAR GENETICS

**PROF. S GANESH**

Department of Bioengineering  
IIT Kanpur

**TYPE OF COURSE** : Rerun | Elective | UG / PG

**COURSE DURATION** : 4 weeks (24 Jan' 22 - 18 Feb' 22)

**EXAM DATE** : 27 Mar 2022

**PRE-REQUISITES** : Participants are expected to have at least class 12 level understanding in genetics.

**INTENDED AUDIENCE** : Students interested in pursuing research in human molecular genetics. Medical students and practicing clinicians interested in understanding the principles and complexities of human genetics. Students interested in careers in genetic counselling and DNA diagnostics. Scientists working in public health service, counselling centres, and diagnostic laboratories.

**INDUSTRIES APPLICABLE TO** : Medical and pharma companies, paramedic clinical centers, educational institutes, and hospitals.

**COURSE OUTLINE :**

This is an introductory course designed primarily for students in the undergraduate or masters programs interested in biomedical research, genetic counseling, medicine, and clinical genetics. This course is expected to introduce rapid advancements in our understanding of the role of human genome in health and disease. We would introduce key concepts of inheritance of human traits, pedigree analysis, and chromosome organization. Molecular biology tools used for understanding the genome, gene structure and gene mutations, gene mapping and gene cloning strategies will also be covered. Objectives and outcome of human genome project and the HapMap project will also be discussed at the end.

**ABOUT INSTRUCTOR :**

Prof. S. Ganesh teaches biology, genetics and genomics at IIT Kanpur. His research interests include human molecular genetics and neuroscience. He works on genetic forms of neurodegenerative disorders in humans to understand their genetics and disease mechanisms, and to develop therapeutics. He has been serving on the editorial boards of journals, and offers courses on professional and scientific communication at IIT Kanpur.

**COURSE PLAN :**

- Week 1:** Fundamentals of central dogma (DNA, RNA and proteins; mutations), Chromosome structure and function(organization; structure-function relationship; chromosome abnormalities).
- Week 2:** Genes in pedigree (Mendelian pedigree patterns, complications to pedigree patterns), DNA cloning and hybridization techniques (vector based cloning; nuclei acid hybridizations; PCR-based DNA analyses)
- Week 3:** Mutation and instability of human DNA (mutation and polymorphism; pathogenic mutations, repeat expansions), Molecular pathology (types of mutations; animal models for human disease)
- Week 4:** Identifying human disease genes (functional cloning versus positional cloning; mutation screening), Complex diseases; The Human Genome and HapMap projects