ADD ON COURSE 2022-23		
CLINICAL MOLECULAR GENETICS		
Duration: 30 Hours	**Department of Zoology**	**Course code: ZO-CMG**

Course Description:

This course provides an in-depth examination of the principles, techniques, and applications of molecular genetics in clinical settings. Students will learn about the genetic basis of human diseases, molecular diagnostic methods, genetic counselling, and ethical considerations in genetic testing. Through lectures, case studies, and laboratory exercises, students will gain practical skills in genetic analysis and interpretation for clinical diagnosis and management.

Course Objectives:

1. Understand the principles and techniques of molecular genetics.
2. Learn about the genetic basis of human diseases and disorders.
3. Gain proficiency in molecular diagnostic methods for genetic testing.
4. Explore the role of genetic counselling in clinical practice.

Module 1:	**07 Hours**

Introduction to Clinical Molecular Genetics: Definition and scope of clinical molecular genetics, Historical perspectives and milestones, Regulatory frameworks and quality assurance in genetic testing

Human Genome Structure and Variation: Structure and organization of the human genome, Types of genetic variation (SNPs, CNVs, indels), Genome-wide association studies (GWAS) and genetic linkage analysis

Genetic Basis of Disease: Mendelian inheritance patterns (autosomal dominant, autosomal recessive, X-linked), Complex traits and multifactorial inheritance, Role of genetic mutations in disease pathogenesis.

Module 2:	**07 Hours**

Genetic Testing and Screening: Preconception and prenatal genetic testing, New-born screening programs, Predictive testing for hereditary diseases

Genetic Counselling: Principles and objectives of genetic counselling, Genetic counselling process and communication skills, Psychosocial aspects and ethical dilemmas in genetic counselling

Module 3:	**08 Hours**

Pharmaco genetics and Personalized Medicine: Role of genetic variability in drug response, Pharmaco genetic testing and applications, Challenges and opportunities in personalized medicine

Ethical, Legal, and Social Implications (ELSI): Informed consent and patient autonomy, Genetic privacy and confidentiality, Genetic discrimination and social justice issues

Module 4:	**08 Hours**

Genetic Testing Quality Assurance: Laboratory accreditation and certification, Quality control and assurance measures, Proficiency testing and external quality assessment

Emerging Technologies in Clinical Genetics: Genome editing technologies (CRISPR/Cas9), Liquid biopsy and circulating tumor DNA analysis, Application of artificial intelligence in genetic diagnostics

Textbook:

1. "Principles of Molecular Diagnostics and Personalized Cancer Medicine" by Daisuke Nonaka and Koichi Hirata
2. "Emery and Rimoin's Principles and Practice of Medical Genetics and Genomics" edited by Reed E. Pyeritz, Bruce R. Korf, and Wayne W. Grody