University of Management & Technology
School of Science
Department of Life Science

BT-643 Advanced Molecular Genetics

Lecture Schedule	Thursday, 6:30-9:30 PM	**Semester**	Spring 2021
Pre-requisite	---	**Credit Hours**	3
Instructor	Dr. Mureed Hussain	**Contact**	Mureed.hussain@umt.edu.pk
Office	Adjacent 2S-46	**Office Hours**	See office window
Course Description	Molecular Genetics is an extensive and diverse field of endeavor. It is responsible for determining how intricate biological systems work; from the coding potential of DNA through to the regulated activity of proteins and large protein complexes. This research helps geneticists to develop new methods for treating genetic diseases and disorders.		
Expected Outcomes	After studying this courses, participants will be able to: 1. Understand inheritance, gene expression, gene function and effect on phenotype and disease. 2. Role of genes, cells and environment in the development of cancer. 3. Genetic testing, gene counseling and treatment of genetic disorders.		
Textbook(s)	1. Genetics: A Molecular Approach Book by T. A Brown, 2012, Taylor and Francis Group 2. Human Molecular Genetics, Tom Strachan and Andrew Read, Third Edition 3rd Edition. Medicine & Health Science Books		
Grading Policy	• Quizzes 15% • Assignment 10% • Mid-term exam 25% • Final Exam 50%		

Course Schedule

Week	Lecture #	TOPICS
1	1	Genes, Alleles, Chromosomes, Single gene inheritance, Principle of Segregation, Principle of independent assortment,
2	1	Beyond Mendel's Principle of independent assortment, Lethal alleles, Multiple alleles, incomplete dominance, co-dominance
3	1	Epistasis, Penetrance, Expressivity, Pleiotropy, Phenocopy, Genetic heterogeneity and genetic disorders
4	1	Linkage and crossing over Mitochondrial genes and diseases, maternal inheritance of mitochondrial genes and disease severity
5	1	From Linkage to Genome-Wide Associations, SNPs association with the diseases, haplotyping,
6	1	Organelles Genes, Gene transfer in Bacteria,
7	1	Non-Mendelian Inheritance of Chloroplasts and Mitochondria
8	1	Cancer genetics, cancer genes and genome, cellular pathways in cancer
9	1	Midterm Exam
10	1	Driver and Passenger Mutations, oncogenes,
11	1	Gene expression profiling, determining gene expression in health and disease conditions
12	1	Monitoring gene function, Gene silencing and genome editing,
13	1	Genetic counseling, Genetic testing

14	1	Treating genetic diseases
15	1	Modern perspective in Molecular Genetics

Course Contents:
Single gene inheritance, Inheritance beyond Mendel's Law, Lethal alleles, Multiple alleles, incomplete dominance, co-dominance, Epistasis, Penetrance, Expressivity, Pleiotropy, Phenocopy, Genetic heterogeneity, Mitochondrial genes and diseases. Linkage and crossing over, From Linkage to Genome-Wide Associations, Organelles Genes, Gene transfer in Bacteria, Non-Mendelian Inheritance of Chloroplasts and Mitochondria, Cancer genetics, cancer genes and genome, Driver and Passenger Mutations, oncogenes, Gene expression profiling, Monitoring gene function, Gene silencing and genome editing, Genetic counseling, Genetic testing, Treating genetic diseases,