

Molecular Genetics (HCB 812) Credit Hrs 3(3-0)

Course Contents

Course Code: HCB-812 **Credit hours:** 3 (3+0)

Contents:

CURRENT	REVISED
<p>THE BASICS OF DNA, CHROMOSOMES, CELLS, AND DEVELOPMENT</p> <ul style="list-style-type: none"> Nucleic Acid Structure Chromosome Structure and Function Role of Chromatin Structure in Gene Control 	<p>BASICS OF DNA, CHROMOSOMES, CELLS, DEVELOPMENT AND INHERITANCE</p> <ul style="list-style-type: none"> Basic principle of nucleic acid structure and gene expression Fundamentals of cells and chromosomes Fundamentals of cell-cell interaction and immune system Aspects of early mammalian development, cell differentiation and stem cells
<p>CELLS AND CELL-CELL COMMUNICATION</p> <ul style="list-style-type: none"> Principles of Development Stem Cells and Differentiation <p>Immune System Cells: Function through Diversity</p>	
<p>GENES IN PEDIGREES AND POPULATIONS</p> <ul style="list-style-type: none"> Monogenic vs. multifactorial Inheritance Inheritance Mendelian Pedigree Patterns Complications to the Basic Mendelian Pedigree Patterns Factors Affecting Gene Frequencies 	<p>GENES IN PEDIGREES AND POPULATIONS</p> <ul style="list-style-type: none"> Monogenic vs. multifactorial Inheritance Inheritance Mendelian Pedigree Patterns Complications to the Basic Mendelian Pedigree Patterns Factors Affecting Gene Frequencies
<p>ANALYZING THE STRUCTURE AND EXPRESSION OF GENES AND GENOMES</p> <ul style="list-style-type: none"> Amplifying DNA: Cell-based DNA Cloning and PCR Analyzing the Structure and Expression of Genes and Genomes 	<p>UNDERSTANDING GENOMES</p> <ul style="list-style-type: none"> Core DNA technologies: amplifying DNA, nucleic acid hybridization and DNA sequencing Analyzing the structure and

<p>INVESTIGATING THE HUMAN GENOME AND ITS RELATIONSHIP TO OTHER GENOMES</p> <ul style="list-style-type: none"> • Organization of the Human Genome • Model Organisms, Comparative Genomics and Evolution • Human Gene Expression • Organization of the human, viral and bacterial genome • 	<p>expression of genes and genomes</p> <ul style="list-style-type: none"> • Principles of genetic manipulation of mammalian cells • Uncovering the architecture and workings of the human genome • Gene regulation and epigenome
<p>HUMAN GENETIC VARIATION AND DISEASES</p> <ul style="list-style-type: none"> • Human Genetic Variability and its Consequences • Genetic Mapping of Mendelian Characters • Mapping Genes Conferring Susceptibility to Complex Disease • Identifying Human Disease Genes and Susceptibility Factors • Methylation - From DNA, RNA and Histones to Diseases and Treatment 	<p>HUMAN GENETIC DISEASES</p> <ul style="list-style-type: none"> • Molecular pathology: connecting phenotypes to genotypes • Mapping and identifying genes for monogenic disorders • Complex disease: identifying susceptibility factors and understanding pathogenesis <p>GENETIC VARIATION BETWEEN INDIVIDUALS AND SPECIES</p> <ul style="list-style-type: none"> • Human population genetics • Comparative genomics and genome evolution
<p>APPLIED HUMAN MOLECULAR GENETICS</p> <ul style="list-style-type: none"> • Genetic Testing of Individuals • Pharmacogenetics, Personalized Medicine, and Population Screening • Genetic Manipulation of Animals for Modeling Disease • Investigating Gene Function • Genetic Approaches to Treating Disease • Gene Regulation and Human Disease 	<p>APPLIED HUMAN MOLECULAR GENETICS</p> <ul style="list-style-type: none"> • Genetic Testing of Individuals • Pharmacogenetics, Personalized Medicine, and Population Screening • Genetic Manipulation of Animals for Modeling Disease • Investigating Gene Function • Genetic Approaches to Treating Disease • Gene Regulation and Human Disease

<p>PHARMACOGENETICS, PERSONALIZED MEDICINE, AND POPULATION SCREENING</p> <ul style="list-style-type: none"> • Evaluation of clinical tests • Pharmacogenetics and pharmacogenomics • Personalized medicine: prescribing <i>the best drug</i> • Personalized medicine: testing for susceptibility to complex disease • Population screening • The new paradigm: predict and prevent? 	<p>PHARMACOGENETICS, PERSONALIZED MEDICINE, AND POPULATION SCREENING</p> <ul style="list-style-type: none"> • Evaluation of clinical tests • Pharmacogenetics and pharmacogenomics • Personalized medicine: prescribing <i>the best drug</i> • Personalized medicine: testing for susceptibility to complex disease • Population screening • The new paradigm: predict and prevent?
<p>Already teaching this module keeping in view of pandemic situation in order to teach students <i>insilico</i> methods which will helpful in their <i>Insilico</i> research.</p>	<p>EXPLORING ONLINE GENETIC SOURCES AND GENOME BROWSER</p> <ul style="list-style-type: none"> • Human Genome Project • National Centre for Biotechnology Information(NCBI) • UCSC Genome Browser • Human Mutation databases • General Biological databases <p>(Latest <i>insilico</i> contents have been added to update and improve the course.</p>
<p>Key:</p> <p>Deleted section</p> <p>Revised section</p> <p>New addition</p>	

Recommended reading, including textbooks, reference books:

- Human Molecular Genetics; Tom Strachan and Andrew P Read; 5th Edition
- Human Population Genomics; Kirk E. Lohmueller Rasmus Nielsen Editors
- Genes IX; Benjamin Lewin, 9th edition
- Principle of Genetics; D. Peter Snustad and Micheal J. Simons, 7th edition
- Genetics and Genomics and Medicine; Judith Goodship, Patrick chinnery and Tom Starchin