(Master of Science - Home Science) (Foods and Nutrition)
(M.Sc. - H.Sc.) (Foods and Nutrition) Semester (II)

Course Code	PH02EFDN53	Title of the Course	Human Genetics
Total Credits of the Course	04	Hours per Week	04

Course Objective:	1. To understand the basic concepts of genetics and inheritance, chromosomal aberrations, associated genetic disorders, mutations and the related human diseases

Course Content		
Unit	Description	Weightage (%)
1.	Transmission of Genes – Segregation and Independent Assortment Mendel's laws of inheritance, homozygous, heterozygous, dominant and recessive genes, basic principles of inheritance (segregation and independent assortment), the probability of inheritance of particular genes or traits, "independent" and "dependent" events Modes of inheritance and pedigrees: To construct a pedigree from the given information, to calculate the likelihood of a genetic event based on a pedigree to determine which mode of inheritance is most likely based on the information in a pedigree	23
2.	Variations and Extensions of Mendel's laws: How multiple alleles for a single gene results in multiple distinguishable traits (rather than two for two alleles), alleles with different relationships besides simple recessiveness or dominance, why a given genotype does not always result in the same phenotype, comparison of inheritance of the mitochondrial genome with the nuclear genome, contrasting the inheritance of linked genes with unlinked genes Linkage, crossing over and chromosome mapping linkage, sex determination and sex linkage Sexual development and dosage compensation, How "phenotypic" sex is different from "gonadal" sex, outward sexual characteristics can be mismatched with genetic sex (the sex chromosomes), dosage compensation and the basic mechanism of how it works in humans, to compare the impact of dosage compensation on individuals with sex chromosomal abnormalities	22
3.	Molecular Genetics: The "central dogma" of genetic information transfer, the relationship between chromosomes, genes and DNA to	23

	distinguish between the theories for how DNA replication might work, and explain how it works, process of transcription and its utility, processing of mRNA transcripts before translation, to demonstrate how we know the "code" is non-overlapping and redundant, to interpret how mutations might affect protein structure	
4.	Mutations: Recognize different kinds of mutations (frameshift, insertions, deletions, point mutations), and predict their effect on amino acid sequence and protein structure, to predict the likelihood of a region of DNA incurring a mutation, examples of how DNA can be mutated, why are most of us relatively normal despite the fact that mutations occur in our DNA	16
5.	Applications of DNA technology: Basic idea of PCR, and how/why it is used, working of gel electrophoresis and interpretation data from a gel. Palindromic restriction enzyme sites, why restriction enzymes are used, significance of variable regions in DNA, STR, how STRs can be used in DNA fingerprint analysis Biochemical Genetics**:** Inborn errors of metabolism: (Molecular and biochemical pathways in phenyl ketonuria, alkaptonuria, Maple syrup urine disease, albinism, mucopolysaccharidosis, lipidosis and glycogen storage disorders), human mitochondrial syndromes Pharmacogenetics: Definition, drug metabolism, genetic variation	16

Teaching-Learning Methodology	Classroom lectures (Blackboard/Power Point Presentations), Discussion on recent updates with related examples

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Obtain an in-depth understanding of the concepts and scientific methods of modern genetics as it applies to humans.

2.	Understand the genetics of human biology and disease.
3.	Develop conceptual skills to address questions in genetics research and clinical practice.

Suggested References:	
Sr. No.	References
1.	Singh, B.D. (2004). *Fundamentals of Genetics*. (3rd Edition). Kalyani Publishers.
2.	Gupta, P.K. *Genetics.* Rastogi Publications, Meerut, India. ISBN: 81-7133-842-9.
3.	Gardener, E. J., Simmons, M. J. & Snustad, D. P. *Principles of Genetics*. (8^{th} Edition). John Wiley & Sons, New York. ISBN: 9971-51-346-3.
4.	Bhatnagar, S.M. (1999). *Essentials of Human Genetics.* (4th Edition). Orient Longman. ISBN: 81-250-1426-8.

On-line resources to be used if available as reference material
https://epgp.inflibnet.ac.in/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602567/
https://www.tandfonline.com/doi/full/10.1080/07315724.2019.1582980
https://www.karger.com/Article/Fulltext/327772
https://www.intechopen.com/online-first/nutrigenomics-an-interface-of-gene-diet-disease-interaction

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