Institute of Zoology
Faculty of Life Sciences
University of the Punjab, Lahore

Course Outline

Programme	BS Zoology	Course Code	ZOOL-309	Credit Hours	2
Course Title	**Genetics-I**				

Course Introduction

Classical Genetics deals with the basic principles of heredity and the mechanisms by which traits are passed from one generation to the next. The course covers a wide array of genetic concepts, including multiple alleles, gene interaction, genetic analysis, pedigree analysis chromosome structure and karyotyping, chromosomal aberrations, meiotic mechanisms, dosage compensation, sex determination, Sex-linked traits, somatic mutation and human genetics

Learning Outcomes

On the completion of the course, the students will:

- **Able** to define terms of genetics and apply concepts of modern transmission
- **Identify** and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes.
- **Solve** transmission genetics problems, make accurate predictions about inheritance of genetic traits, and map the locations of genes.
- **Identify** the human traits and genetic diseases
- **Able** to predict inheritance of genetic disorders from cousin marriages

Course Content		Assignments/Readings
Week 1	**Unit-1 (Classical Genetics)** • Introduction, scope and importance, Forward and Reverse genetics • The basic principles of Inheritance (Mendelism): Monohybrid and Dihybrid crosses (Definition - characteristics criss-cross inheritance).	
Week 2	• Multiple Alleles: blood groups and coat color in rabbits. • Genetic basis of ABO and Rh blood groups	
Week 3	• Blood transfusion, Rh incompatibility and Erythroblastosis Foetalis.	
Week 4	*Unit-II (Chromosomal Basis of Inheritance)* • Chromosomal Theory of Inheritance • Epistasis	
Week 5	• Lethal Alleles and lethality • Pleiotropic genes and pleiotropism	
Week 6	**Unit-III (Sex Determination and Sex Linkage)** • Normal human chromosome complement; Karyotyping. • Sex determination in animals (Honey bee, Drosophila)	
Week 7	• Sex determination in Human, Intersex (Androgen insensitivity syndrome, De La Chapelle syndrome, Swyer syndrome) • Sex linked (Hemophilia, muscular dystrophy, color blindness), sex influenced and sex limited traits,	
Week 8	**Unit-IV (Pedigree analysis)** • Concept and importance of Pedigree • Pedigree analysis using pedigree charts	
Week 9	• Prenatal Diagnosis: Amniocentesis and choriovillus sampling - Ultrasound scanning and Fetoscopy. Genetic counselling, Eugenics and Euthenics	

Week 10	**Unit-5 (Chromosomal Aberrations)** • Euploidy, types of euploidy, applications of polyploidy • Aneuploidy, Basis of aneuploidy (non-disjuction), types of aneuploidy with examples (Klinefelters syndrome, and Turners syndrome, Down syndrome and Edwards syndrome, cat eye syndrome).	
Week 11	• Structural changes, insertion, deletion (Cri du chat syndrome), duplication, Inversion and translocation	
Week 12	**Unit-6 Chromosome mapping/Gene mapping** • Linkage • Crossing over	
Week 13	• Construction of gene map • Determination of recombination frequency between two genes • Calculation of Interference	
Week 14	**Unit-7 (Human Genetics)** • Single and Multifactorial Disorders: • Autosomal anomalies, Pseudoautosomal genes,	
Week 15	• Single gene disorders: Gene mutation and disorders; Autosomal single gene disorders (Sickle cell anemia, Brachydactyly; Inborn errors of metabolism such as Phenylketonuria, alkaptonuria).	
Week 16	• Complex Inheritance Patterns, Polygenic traits- Cleft lip and cleft palate	

Textbooks and Reading Material

Books Recommended:

1. Snustad, D.P., Simmons, M.J. 2003. Principles of Genetics. 3rd Ed., John Wiley and Sons Ins. New York, USA.
2. Tamarin, R.H. 2001.Principles of Genetics. 7th Ed., WCB publishers USA.
3. Lewin, B. 2013. GENE-VIII. Oxford University Press. UK.
4. Gardener, E.J., Simmons, M.J., Snustad, D.P. 1991. Principles of Genetics. John Wiley and Sons Ins. New York, USA.
5. Strickberger, M.W. 2015. Genetics. McMillan, New York. USA.(9780024181206)
6. PRINCIPALS OF GENETICS Gardner E.J., Simmons M.J. and Snistad
7. A.P. (Latest available Addition)
8. Reference Books. Concepts of Genetics By Klug, W.S and Cummings M.R.
9. Willium S. Klug, 2014. Concept of Genetics, ISBN-11: 978-0321948915
10. Lewin's Gene XI BY Jocelyn E.Krebs et al. 2013, isbn-13:978-1449659851,ISBN-10:1449659853
11. 10. Gene- XI by Lewin's,2013,ISBN:978-1449659851
12. Concepts of genetics 11th edition, William S.Klug,2014,ISBN-13:978- 0321948915

Teaching Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments: Types and Number with Calendar

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance