

COLLEGE OF FISHERIES, KISHANGANJ
BIHAR ANIMAL SCIENCES UNIVERSITY, PATNA

Lecture plan for course FGB 502 (Population and Quantitative Genetics)
Credit – 4(2+2) Batch- 2025 Semester- 1st

Sl. No.	Topic	No. of classes
THEORY		
1.	Historical developments; Review of basic concepts of genetics and statistics; Scope and applications.	2
2.	Biometrical techniques: Introduction to matrix algebra, Determinants, ANOVA, regression, and correlations; basic concepts of General Linear Mixed Models (GLMM).	3
3.	Definition of population, Individual vs. population, quantitative vs. qualitative characters.	2
4.	Genetic structure of random mating populations. Polygenic inheritance: Limitation of single gene model.	2
5.	Polygenes and major genes; Polygenic model-importance and limitations; Polygenic segregation and linkage.	2
6.	Hardy -Weinberg principles; Test, application and properties of equilibrium populations – Systematic and dispersive forces changing gene and genotype frequencies,	2
7.	Concept of Mutation, Balance between mutation and selection; genetic bottleneck; Genetic drift, Drift equilibrium, Effect on population structure –Intensity of selection, Fisher's theorem of natural selection; Wahlund effect	3
8.	Coefficient of genetic differentiation – FST, RST, QST, GST - their relative merits and demerits, Genetic similarity, distance and population divergence.	2
9.	Null alleles – Path coefficient; theory, analysis and applications –Basis of relationships; Independent and correlated causes –Idealized population and its properties.	2
10.	Effective population size. Concept of inbreeding- Calculating coefficient of kinship, Relationship, Inbreeding and Population size; Types and Methods of estimation and consequences-Change of mean and variance –Mechanisms of evolution and speciation; Delineation of species and/or stocks.	2
11.	Quantitative variation: Gene effects; Mode of inheritance and continuous variation; Population mean; Components of phenotypic value, Genotypic value, Average effect of gene and Gene substitution Estimation, tools for population genetic parameters – Variance component estimation with complex pedigree –Genetic parameters.	3
12.	Heritability- Concept of heritability, Effective heritability, Different methods of estimation, Variance of heritability, Properties and applications of heritability; Repeatability, Maternal effects;	2
13.	Correlation between traits- Composition of genetic and Phenotypic covariance genetic, Phenotypic and Environment correlations and their standard errors, Concept of co-heritability	2
14.	Breeding value: Biometrical relationship among relatives; Estimating fixed factors and predicting random effects-BLUE and BLUP; Models for EBV –Selection: Aids and methods; genetic gain and correlated response; Recurrent and reciprocal recurrent selection Heterosis; Theories and estimation	3
15.	Combining ability-GCA, SCA; Utilization of non-additive genetic variance –Genomics and Phenomics	2
Total number of classes (Theory)		34
PRACTICAL		
1	Statistical exercises (mean, variance, covariance)	3
2	Correlation and regression analysis	3
3	ANOVA in genetic studies	3
4	Gene & genotype frequency estimation	2
5	Hardy–Weinberg equilibrium problems	3

6	Sex-linked equilibrium exercises	2
7	Estimation of Effective population size	3
8	Estimation of Inbreeding coefficient	2
9	Estimation of Heritability	3
10	Estimation of Repeatability	2
11	Relationship matrix construction	2
12	Estimation of EBV, BLUE, BLUP	3
13	Estimation of Genetic Gain	3
Total number of classes (Practical)		34
Total number of classes(Theory+ Practical)		68

(Dr. S. O. Khairnar)