DEPARTMENT OF ANIMAL GENETICS & BREEDING

Bihar Veterinary College, Patna – 14

(Bihar Animal Sciences University, Patna)

Course Breakup

Course Number – AGB 602 (2+1)
Course Title - Molecular Genetics in Animal Breeding

Sl. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	To educate about molecular techniques to identify molecular markers as an aid to selection.	2	Dr. R. K. Singh Dr. K. G. Mandal
2.	Basis concept: Genesis and importance of molecular techniques.	2	Dr. R. K. Singh Dr. K. G. Mandal
3.	Genome organization – physical and genetic map.	2	Dr. R. K. Singh Dr. K. G. Mandal
4.	Current status of genome maps of livestock.	2	Dr. R. K. Singh Dr. K. G. Mandal
5.	Molecular markers and their application; RFLP, RAPD.	2	Dr. R. K. Singh Dr. K. G. Mandal
6.	Microsatellite/Minisatellite markers.	2	Dr. R. K. Singh Dr. K. G. Mandal
7.	SNP marker.	1	Dr. R. K. Singh Dr. K. G. Mandal
8.	DNA fingerprinting.	2	Dr. R. K. Singh Dr. K. G. Mandal
9.	DNA sequencing.	2	Dr. R. K. Singh Dr. K. G. Mandal
10.	Genome sequencing.	2	Dr. R. K. Singh Dr. K. G. Mandal
11.	Genome Library.	1	Dr. R. K. Singh Dr. K. G. Mandal
12.	Polymerase Chain Reaction (PCR), its types (PCR-RFLP, AS-PCR etc.).	2	Dr. R. K. Singh Dr. K. G. Mandal
13.	Application; Trans genesis and methods of gene transfer.	2	Dr. R. K. Singh Dr. K. G. Mandal
14.	Statistical techniques for analysing molecular genetic data.	2	Dr. R. K. Singh Dr. K. G. Mandal
15.	Quantitative Trait Loci (QTL) mapping and its application in animal breeding.	2	Dr. R. K. Singh Dr. K. G. Mandal
16.	Genome scan.	2	Dr. R. K. Singh Dr. K. G. Mandal

17.	Candidate gene approach.	1	Dr. R. K. Singh Dr. K. G. Mandal
18.	Genome selection.	2	Dr. R. K. Singh Dr. K. G. Mandal
19.	Marker Assisted Selection – basis concept.	1	Dr. R. K. Singh Dr. K. G. Mandal
	PRACTICAL		
01.	Extraction and purification of genomic DNA.	2	Dr. R. K. Singh Dr. K. G. Mandal
02.	Gel electrophoresis.	2	Dr. R. K. Singh Dr. K. G. Mandal
03.	Restriction enzyme digestion of DNA and analysis.	2	Dr. R. K. Singh Dr. K. G. Mandal
04.	PCR, PCR-RFLP, PCR-SSCP.	2	Dr. R. K. Singh Dr. K. G. Mandal
05.	Bioinformatics tool for DNA sequence analysis.	2	Dr. R. K. Singh Dr. K. G. Mandal
06.	Design of primer.	2	Dr. R. K. Singh Dr. K. G. Mandal
07.	Isolation of RNA, cDNA synthesis.	2	Dr. R. K. Singh Dr. K. G. Mandal
08.	Statistical methods for analysis molecular genetic data.	2	Dr. R. K. Singh Dr. K. G. Mandal

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DEPARTMENT OF ANIMAL GENETICS & BREEDING

Bihar Veterinary College, Patna – 14

(Bihar Animal Sciences University, Patna)

Course Breakup

Course Number – AGB 603 (2+1)
Course Title – Population and Quantitative Genetics in Animal Breeding

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Individual verses population.	2	Dr. R. K. Singh Dr. K. G. Mandal
2.	Genetic Structure of population.	2	Dr. R. K. Singh Dr. K. G. Mandal
3.	Factors affecting changes in gene and genotypic frequencies and their effect on genetic structure of animal population.	2	Dr. R. K. Singh Dr. K. G. Mandal
4.	Approach to equilibrium under different situations: Viz:	1	Dr. R. K. Singh Dr. K. G. Mandal
5.	Single autosomal locus with two alleles.	1	Dr. R. K. Singh Dr. K. G. Mandal
6.	Single sex-linked locus.	1	Dr. R. K. Singh Dr. K. G. Mandal
7.	Two pairs of autosomal linked and unlinked loci.	2	Dr. R. K. Singh Dr. K. G. Mandal
8.	Small population: random genetic drift.	1	Dr. R. K. Singh Dr. K. G. Mandal
9.	Effective population size.	1	Dr. R. K. Singh Dr. K. G. Mandal
10.	Pedigreed populations.	1	Dr. R. K. Singh Dr. K. G. Mandal
11.	Regular and irregular inbreeding systems.	2	Dr. R. K. Singh Dr. K. G. Mandal
12.	Quantitative genetics-gene effects.	2	Dr. R. K. Singh Dr. K. G. Mandal
13.	Population mean an variance and its partitioning.	2	Dr. R. K. Singh Dr. K. G. Mandal
14.	Biometric relations between relatives.	2	Dr. R. K. Singh Dr. K. G. Mandal
15.	Genetic and phenotypic parameters-their methods of estimation, uses.	2	Dr. R. K. Singh Dr. K. G. Mandal
16.	Possible biases and precision.	2	Dr. R. K. Singh Dr. K. G. Mandal

17.	Scale effects and threshold traits.	2	Dr. R. K. Singh Dr. K. G. Mandal
	PRACTICAL		
01.	Problems relating to gene and genotypic frequencies under different conditions.	2	Dr. R. K. Singh Dr. K. G. Mandal
02.	Estimation orf inbreeding in regular and irregular systems.	2	Dr. R. K. Singh Dr. K. G. Mandal
03.	Estimation of effective population size.	2	Dr. R. K. Singh Dr. K. G. Mandal
04.	Computation of quantitative genetic effects.	2	Dr. R. K. Singh Dr. K. G. Mandal
05.	Estimation of variance components.	2	Dr. R. K. Singh Dr. K. G. Mandal
06.	Computation of heritability, repeatability, genetic.	2	Dr. R. K. Singh Dr. K. G. Mandal
07.	Environmental and phenotypic correlations and their standard errors.	2	Dr. R. K. Singh Dr. K. G. Mandal

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Course Breakup

Course Number – AGB 607 (2+1)
Course Title - Cattle and Buffalo Breeding

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	History of dairy cattle and buffalo breeding.	1	Dr. K. G. Mandal Dr. R. K. Singh
2.	Breeds of cattle and buffalo and their Characterisation.	2	Dr. K. G. Mandal Dr. R. K. Singh
3.	Inheritance of important economic traits.	1	Dr. K. G. Mandal Dr. R. K. Singh
4.	Recording and handling of breeding data.	1	Dr. K. G. Mandal Dr. R. K. Singh
5.	Standardization of records.	1	Dr. K. G. Mandal Dr. R. K. Singh
6.	Computation of correction factors for the adjustment of the data.	2	Dr. K. G. Mandal Dr. R. K. Singh
7.	Estimation of breeding values of the cows and bulls.	2	Dr. K. G. Mandal Dr. R. K. Singh
8.	Sire evaluation methods using single trait and multiple traits.	2	Dr. K. G. Mandal Dr. R. K. Singh
9.	Construction of sire indices.	2	Dr. K. G. Mandal Dr. R. K. Singh
10.	Sire evaluation under animal model, sire mode; and maternal grand sire model.	2	Dr. K. G. Mandal Dr. R. K. Singh
11.	Open nucleus breeding systems with MOET.	2	Dr. K. G. Mandal Dr. R. K. Singh
12.	Methods of cross breeding.	2	Dr. K. G. Mandal Dr. R. K. Singh
13.	Breeding of type.	2	Dr. K. G. Mandal Dr. R. K. Singh
14.	Milk quality and production efficiency.	2	Dr. K. G. Mandal Dr. R. K. Singh
15.	Plans for developing new breeds of dairy cattle.	2	Dr. K. G. Mandal Dr. R. K. Singh
16.	History of development of important breeds of dairy cattle.	2	Dr. K. G. Mandal Dr. R. K. Singh

17.	Considerations in the import of exotic germplasm for breeding programme.	2	Dr. K. G. Mandal Dr. R. K. Singh
18.	Role of breed associations in dairy improvement.	2	Dr. K. G. Mandal Dr. R. K. Singh
	PRACTICAL		
01.	Performance recording.	1	Dr. K. G. Mandal Dr. R. K. Singh
02.	Milk recording	1	Dr. K. G. Mandal Dr. R. K. Singh
03.	Estimation of economic traits.	1	Dr. K. G. Mandal Dr. R. K. Singh
04.	Standardization of records.	2	Dr. K. G. Mandal Dr. R. K. Singh
05.	Index cards.	1	Dr. K. G. Mandal Dr. R. K. Singh
06.	Sire evaluation.	2	Dr. K. G. Mandal Dr. R. K. Singh
07.	Comparison of latest methods.	2	Dr. K. G. Mandal Dr. R. K. Singh
08.	Computation of genetic parameters.	2	Dr. K. G. Mandal Dr. R. K. Singh
09.	Genetic gain.	1	Dr. K. G. Mandal Dr. R. K. Singh
10.	Estimation of heterosis.	1	Dr. K. G. Mandal Dr. R. K. Singh
11.	Culling and replacement.	2	Dr. K. G. Mandal Dr. R. K. Singh

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Bihar Veterinary College, Patna – 14

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Course Breakup

Course Number – AGB 608 (2+0)
Course Title - Small Farm Animal Breeding

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Breeds Economic Traits.	2	Dr. R. K. Singh Dr. K. G. Mandal
2.	Prolificacy Breeding.	1	Dr. R. K. Singh Dr. K. G. Mandal
3.	Records and standardization.	2	Dr. R. K. Singh Dr. K. G. Mandal
4.	Genetic parameters.	2	Dr. R. K. Singh Dr. K. G. Mandal
5.	Selection of males and females.	2	Dr. R. K. Singh Dr. K. G. Mandal
6.	Breeding systems.	3	Dr. R. K. Singh Dr. K. G. Mandal
7.	Development of new breeds.	2	Dr. R. K. Singh Dr. K. G. Mandal
8.	Breeding policy.	2	Dr. R. K. Singh Dr. K. G. Mandal
9.	Breeding research.	2	Dr. R. K. Singh Dr. K. G. Mandal
10.	Conservation of breeds.	2	Dr. R. K. Singh Dr. K. G. Mandal
11.	Culling and replacement- EADR.	1	Dr. R. K. Singh Dr. K. G. Mandal

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Course Breakup

Course Number – AGB 609 (2+1)
Course Title - Poultry Breeding

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Origin and history of poultry species: Chicken, turkey, duck and quail.	1	Dr. K. G. Mandal Dr. R. K. Singh
2.	Important qualitative traits in poultry including lethals.	1	Dr. K. G. Mandal Dr. R. K. Singh
3.	Economic traits of egg-type chicken and their standardization.	1	Dr. K. G. Mandal Dr. R. K. Singh
4.	Selection criteria.	1	Dr. K. G. Mandal Dr. R. K. Singh
5.	Aids to selection: index selection and Osborne index.	2	Dr. K. G. Mandal Dr. R. K. Singh
6.	Restricted selection index.	2	Dr. K. G. Mandal Dr. R. K. Singh
7.	Economic traits of meat.	1	Dr. K. G. Mandal Dr. R. K. Singh
8.	Type chicken and their standardization.	1	Dr. K. G. Mandal Dr. R. K. Singh
9.	Selection criteria and selection indices - Response to selection.	2	Dr. K. G. Mandal Dr. R. K. Singh
10.	Genetic controls – Genotype and environment.	1	Dr. K. G. Mandal Dr. R. K. Singh
11.	Interaction – Inbreeding, and its effects on production traits in egg and meat-type.	2	Dr. K. G. Mandal Dr. R. K. Singh
12.	Chicken-inbred Lines-Strain development – Crossing.	2	Dr. K. G. Mandal Dr. R. K. Singh
13.	Strain and line crosses.	2	Dr. K. G. Mandal Dr. R. K. Singh
14.	Introduction to diallel cross.	2	Dr. K. G. Mandal Dr. R. K. Singh
15.	Utilisation of heterosis and reciprocal effect.	1	Dr. K. G. Mandal Dr. R. K. Singh
16.	Reciprocal recurrent selection and recurrent selection.	1	Dr. K. G. Mandal Dr. R. K. Singh

17.	Industrial breeding – Artificial insemination in chicken.	1	Dr. K. G. Mandal Dr. R. K. Singh
18.	Auto sexing – Random Sample Test.	1	Dr. K. G. Mandal Dr. R. K. Singh
19.	Biochemical variants and immunogenetics of poultry.	2	Dr. K. G. Mandal Dr. R. K. Singh
20.	Use of molecular genetics in poultry breeding.	2	Dr. K. G. Mandal Dr. R. K. Singh
21.	Quantitative trait loci and marker-assisted selection.	2	Dr. K. G. Mandal Dr. R. K. Singh
22.	Conservation of poultry genetic resources.	2	Dr. K. G. Mandal Dr. R. K. Singh
	PRACTICAL		
01.	Inheritance of qualitative traits.	1	Dr. K. G. Mandal Dr. R. K. Singh
02.	Economic traits of egg-type and meat-type chicken.	2	Dr. K. G. Mandal Dr. R. K. Singh
03.	Procedures of standardization.	2	Dr. K. G. Mandal Dr. R. K. Singh
04.	Estimation of heritability correlation between various production traits.	2	Dr. K. G. Mandal Dr. R. K. Singh
05.	Inbreeding co-efficient and heterosis.	2	Dr. K. G. Mandal Dr. R. K. Singh
06.	Selection of sires and dams.	2	Dr. K. G. Mandal Dr. R. K. Singh
07.	Osborne index – Restricted selection index.	2	Dr. K. G. Mandal Dr. R. K. Singh
08.	Collection and evaluation of semen and insemination – Diallel cross.	2	Dr. K. G. Mandal Dr. R. K. Singh

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Course Breakup

Course Number – AGB 610 (1+0)
Course Title - Laboratory Animal Breeding

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Introduction to laboratory animal genetics.	1	Dr. K. G. Mandal Dr. R. K. Singh
2.	Breeding colonies of mice, rats, hamsters, guinea pigs and rabbits.	2	Dr. K. G. Mandal Dr. R. K. Singh
3.	Selection and mating methods/systems – monogamous, polygamous and others.	2	Dr. K. G. Mandal Dr. R. K. Singh
4.	Development of genetically laboratory animals.	2	Dr. K. G. Mandal Dr. R. K. Singh
5.	Rules for nomenclature, inbred strains, outbred stocks, mutant stocks, recombinant inbred strains.	2	Dr. K. G. Mandal Dr. R. K. Singh
6.	Transgenic strains, gene targeting and production of 'gene knock-out' animals.	2	Dr. K. G. Mandal Dr. R. K. Singh
7.	Genetic control and monitoring.	2	Dr. K. G. Mandal Dr. R. K. Singh
8.	Record keeping – Ethics of laboratory animal use.	2	Dr. K. G. Mandal Dr. R. K. Singh

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Course Breakup

Course Number – AGB 704 (2+1)
Course Title - Advances in Selection Methodology

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Fundamental theorem of natural selection.	1	Dr. R. K. Singh Dr. K. G. Mandal
2.	Selection in finite populations-effect on genetic structure and variance.	1	Dr. R. K. Singh Dr. K. G. Mandal
3.	Optimum designs for the estimation of genetic parameters.	2	Dr. R. K. Singh Dr. K. G. Mandal
4.	Design of selection experiments for testing selection theory.	2	Dr. R. K. Singh Dr. K. G. Mandal
5.	Methods of measurement of genetic and environment trends.	2	Dr. R. K. Singh Dr. K. G. Mandal
6.	Advances in selection indices Multistage.	2	Dr. R. K. Singh Dr. K. G. Mandal
7.	Restricted and retrospective selection indices.	2	Dr. R. K. Singh Dr. K. G. Mandal
8.	Multi-information.	2	Dr. R. K. Singh Dr. K. G. Mandal
9.	Empirical evaluation of selection theory.	2	Dr. R. K. Singh Dr. K. G. Mandal
10.	Genetic slippage limits to selection.	2	Dr. R. K. Singh Dr. K. G. Mandal
11.	Asymmetry of response.	2	Dr. R. K. Singh Dr. K. G. Mandal
12.	Selection experiments effect of selection on variance.	2	Dr. R. K. Singh Dr. K. G. Mandal
13.	Selection for threshold traits.	2	Dr. R. K. Singh Dr. K. G. Mandal
14.	Single and multiple trait best linear unbiased estimation (BLUE) and prediction (BLUP).	2	Dr. R. K. Singh Dr. K. G. Mandal
15.	Selection under single and multiple trait animal models.	2	Dr. R. K. Singh Dr. K. G. Mandal
16.	Direct and correlated response through various selection indices.	2	Dr. R. K. Singh Dr. K. G. Mandal

17.	Relationship between BLUP and selection index.	2	Dr. R. K. Singh Dr. K. G. Mandal
18.	Fundamentals of marker assisted selections.	1	Dr. R. K. Singh Dr. K. G. Mandal
	PRACTICAL		
01.	Estimation of relative economic values.	2	Dr. R. K. Singh Dr. K. G. Mandal
02.	Determination of culling levels and selection intensity.	2	Dr. R. K. Singh Dr. K. G. Mandal
03.	Construction of various indices.	2	Dr. R. K. Singh Dr. K. G. Mandal
04.	Estimation of direct and correlated response.	2	Dr. R. K. Singh Dr. K. G. Mandal
05.	QTL analysis using LDMAS & LEMAS.	3	Dr. R. K. Singh Dr. K. G. Mandal

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Course Breakup

Course Number – AGB 706 (2+0)
Course Title - Advances in Molecular Cytogenetics

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Structure of eukaryotic chromosomes.	2	Dr. K. G. Mandal Dr. R. K. Singh
2.	Evolution of karyotype.	2	Dr. K. G. Mandal Dr. R. K. Singh
3.	Various in vitro cell culture techniques.	2	Dr. K. G. Mandal Dr. R. K. Singh
4.	Cell lines and utility – Geno toxicity.	2	Dr. K. G. Mandal Dr. R. K. Singh
5.	Somatic cell genetics.	2	Dr. K. G. Mandal Dr. R. K. Singh
6.	Stem cell genetics.	2	Dr. K. G. Mandal Dr. R. K. Singh
7.	Molecular cytogenetics and gene mapping – ISH, FISH.	3	Dr. K. G. Mandal Dr. R. K. Singh
8.	Radiation hybrid mapping.	2	Dr. K. G. Mandal Dr. R. K. Singh
9.	Fibre – FISH, PRINS.	2	Dr. K. G. Mandal Dr. R. K. Singh
10.	Positional cloning – Spectral karyotyping.	2	Dr. K. G. Mandal Dr. R. K. Singh
11.	Image analysis – Chromosome walking – Chromosome painting.	2	Dr. K. G. Mandal Dr. R. K. Singh

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Course Breakup

Course Number – AGB 707 (2+1)
Course Title - Utilisation of Non-Additive Genetic Variance in Farm Animals

SI. No.	Topic to be Covered`	No. of Classes	Course Instructors
	THEORY		
1.	Heterosis – forms and genetic basis.	2	Dr. R. K. Singh Dr. K. G. Mandal
2.	Detection and estimation of non-additive genetic variance.	2	Dr. R. K. Singh Dr. K. G. Mandal
3.	Average dominance, over dominance.	2	Dr. R. K. Singh Dr. K. G. Mandal
4.	Partitioning of between cross variance.	2	Dr. R. K. Singh Dr. K. G. Mandal
5.	General combining ability.	2	Dr. R. K. Singh Dr. K. G. Mandal
6.	Specific combining ability and reciprocal effects.	2	Dr. R. K. Singh Dr. K. G. Mandal
7.	Methods of analysing diallel crosses.	2	Dr. R. K. Singh Dr. K. G. Mandal
8.	Utilization of non-additive genetic variance.	2	Dr. R. K. Singh Dr. K. G. Mandal
9.	Crossbreeding system – crossbreeding effects.	2	Dr. R. K. Singh Dr. K. G. Mandal
10.	Recurrent and reciprocal recurrent selection and their forms.	2	Dr. R. K. Singh Dr. K. G. Mandal
11.	Development of specialized sire and dam lines.	2	Dr. R. K. Singh Dr. K. G. Mandal
12.	Inbred lines and their maintenance.	2	Dr. R. K. Singh Dr. K. G. Mandal
13.	Inbreeding and hybridization.	2	Dr. R. K. Singh Dr. K. G. Mandal
	PRACTICAL		
01.	Computation of degree of dominance using NC Plans.	2	Dr. R. K. Singh Dr. K. G. Mandal
02.	Analysis of partial and complete diallel cross data.	2	Dr. R. K. Singh Dr. K. G. Mandal
03.	Estimation of crossbreeding effects.	2	Dr. R. K. Singh Dr. K. G. Mandal

04.	Estimation of genetic correlation among paternal purebred and crossbred half sibs.	2	Dr. R. K. Singh Dr. K. G. Mandal
05.	Computation of response through RS and RRS.	2	Dr. R. K. Singh Dr. K. G. Mandal

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