Department Of Animal Genetics and Breeding

College of veterinary science and A.H., NDUAT, Kumarganj, Faizabad (UP)

1. Faculty Position

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>Contact No.</th>
<th>Email</th>
<th>Photo</th>
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<tbody>
<tr>
<td>Dr. V. K. Singh Professor &amp; Head</td>
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<td>Dr. M. K. Verma Assistant Professor</td>
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2. Non Teaching staff:

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<tr>
<th>S. No.</th>
<th>Name of Staff Member</th>
<th>Designation</th>
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<tbody>
<tr>
<td>1</td>
<td>Sri Ajay Kumar</td>
<td>Lab. Technician</td>
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<tr>
<td>2</td>
<td>Sri Surya Narayan Singh</td>
<td>Junior Clerk</td>
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<tr>
<td>3</td>
<td>Sri Ram Bachan Verma</td>
<td>Account Clerk</td>
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3. UG Courses:

AGB -111 (Biostatistics and computer application)
AGB – 121 (Principle of Genetics and Population genetics)
AGB - 211 (Livestock and Poultry Breeding)

**BIO-STATISTICS AND COMPUTER APPLICATION**

**AGB-111 Credit Hours 2+1=3**

**THEORY**

**A. Basic Statistics:**

**B. Experimental designs:**
Completely Randomized Design (CRD.) and Randomized Block Design (R,B,D). Analysis of variance.
C. Computer application:
Computer and its components; Types of computers; Hardware, software, human ware and firm ware. Types of memories. Computer languages and their scope and limitations. Computer programming:
Data types: Constants, variables, expressions, operations, functions, flow charts, commands, simple programs and their execution- scope and limitations. Data base management system: Storage of data, filing, retrieving, reproduction. Use of computer in animal husbandry and veterinary practices.

PRACTICAL

PRINCIPLES OF ANIMAL GENETICS AND POPULATION GENETICS

AGB-121 Credit Hours: 2+1=3

THEORY
History of Genetics. Chromosome numbers and types in livestock and poultry. Mitosis, Meiosis and gametogenesis. Overview of Mendelian principles; Modified Mendelian inheritance: gene interaction; multiple alleles; lethals; sex-linked, sex limited and sex influenced traits; linkage and crossing over, Mutation, Chromosomal aberrations; Cytogenetics, Extra-chromosomal inheritance. Gene concept -classical and molecular. Population genetics: Genetic structure of population: Gene and genotypic frequency: Hardy - Weinberg law and its application; Forces {eg Mutation, migration, selection and drift} changing gene and genotypic frequencies. Quantitative genetics: Nature and properties; Values and means. Components of phenotypic and genotypic variance; Concept of genotype and environment interaction, Resemblance between relatives; Heritability, repeatability, genetic and phenotypic correlations.

PRACTICAL
Demonstration of karyotype of Farm animal species; Solving problems on inheritance of Mendelian traits. Linkage and Crossing over. Calculation of gene and genotypic frequencies, Testing a population for Hardy-Weinberg equilibrium; Calculation of effects of various forces that change gene frequencies, Computation of population mean; Estimation of heritability, repeatability, Most probable producing ability (MPPA), genetic and phenotypic correlations.

LIVESTOCK AND POULTRY BREEDING

AGB-211 Credit Hours 2+1=3

THEORY
History of Animal Breeding; Classification of breeds; Economic characters of livestock and poultry and their importance; Breeding/Selection techniques for optimal production. Selection: Response to selection and factors affecting it; Bases of selection individual, pedigree, family, sib, progeny and combined; Indirect selection; Multitrait selection. Classification of mating systems; Inbreeding and out breeding-genetic and phenotypic consequences viz., inbreeding depression and heterosis: Systems of utilization of heterosis; Selection for combining ability; Breeding methods for the improvement of dairy cattle and buffaloes {crossbreeding, sire evaluation, field progeny testing, open nucleus breeding system (ONBS)}, sheep, goat, swine and
poultry; Breed development; Conservation of germplasm, Current livestock and poultry breeding programmes in the state and country.

**PRACTICAL**

Description and measurement of economic traits of Livestock & poultry. Standardization of performance records, Computation of selection differential, generation interval and expected genetic gain; Construction of selection index; Sire indices. Measurement of inbreeding and relationship coefficients; Estimation of heterosis.

4. Post Graduate Courses

**AGB 611 MOLECULAR GENETICS IN ANIMAL BREEDING 2+1**

**Theory**

UNIT I Basic concept: Genesis and importance of molecular techniques; Genome organization–physical and genetic map, current status of genome maps of livestock

UNIT II Molecular markers and their application; RFLP, RAPD, Microsatellite/Minisatellite markers, SNP marker, DNA fingerprinting

UNIT III DNA sequencing, Genome sequencing, Genomic Library, Polymerase Chain Reaction (PCR), its types (PCR-RFLP, AS-PCR etc.) and applications; Transgenesis and methods of gene transfer

UNIT IV Statistical techniques for analyzing molecular genetic data, Quantitative Trait Loci (QTL) mapping and its application in animal breeding, Genome scan, Candidate gene approach, Genomic selection, Marker Assisted Selection- basic concept

**Practical**

Extraction and purification of genomic DNA, Gel electrophoresis, Restriction enzyme digestion of DNA and analysis, PCR, PCR-RFLP, PCR-SSCP, Bioinformatics tool for DNA sequence analysis, Design of primer, Isolation of RNA, cDNA synthesis, Statistical methods for analyzing molecular genetic data.

**AGB 612 POPULATION AND QUANTITATIVE GENETICS IN ANIMAL BREEDING 2+1**

**Theory**

UNIT I Individual verses population. Genetic Structure of population. Factors affecting changes in gene and genotypic frequencies and their effect on genetic structure of animal populations. Approach to equilibrium under different situations: Viz: Single autosomal locus with two alleles, single sex-linked locus, two pairs of autosomal linked and unlinked loci;

UNIT II Small population: random genetic drift, effective population size, pedigreed populations, regular and irregular inbreeding systems.

UNIT III Quantitative genetics-gene effects, population mean and variance and its partitioning, biometric relations between relatives.

UNIT IV Genetic and phenotypic parameters-their methods of estimation, uses, possible biases and precision. Scale effects and threshold traits.

**Practical**

AGB 613 BIOMETRICAL TECHNIQUES IN ANIMAL BREEDING 3+1

Theory
UNIT I Review of basic concepts in statistical inference and balanced experimental designs. Nature of structure of animal breeding data and sources of variation.
UNIT II Introduction to matrix algebra, types of matrices and matrix operations. Determinants and their properties, methods of finding inverse of a matrix and their application
UNIT IV Linear models in animal breeding, Methods of analysis of unbalanced animal breeding data. Adjustment of data. Data base management and use of software packages in animal breeding.

Practical
Matrix applications, determinant and inverse of matrices; Building of models for various types of data: Estimation of variance components; Least squares method for analysis of research data; Collection, compilation, coding, transformation and analysis of animal breeding data by using above bio metrical techniques with computer application.

AGB 614 CONSERVATION OF ANIMAL GENETIC RESOURCES 2+0

Theory
UNIT I Domestic Animal Diversity in India, its origin, history and utilization. Present status and flow of Animal Genetic Resources and its contribution to livelihood security. Methodology for genotypic characterization of livestock and poultry breeds through systematic surveys. Fodder availability; management of breed; physical, biochemical and performance traits and uniqueness of animals of a breed; social, cultural and economic aspects of their owners/communities rearing the breed.
UNIT II Methodology for molecular genetic characterization, diversity analysis and relationship among the breeds. Concept of conservation, in-situ and ex-situ (invivo and in-vitro); models of conservation; prioritization of breeds for conservation. National and international strategies for conservation of Animal Genetic Resources.
UNIT III Status, opportunities and challenges in conservation of AnGR. IPR issues pertaining to animal genetic resources/animal products or by-products. Registration of livestock breeds and protection of livestock owner’s rights in India.

AGB 615 SMALL FARM ANIMAL BREEDING 2+0

Theory
UNIT I Breeds–Economic traits–Prolificacy-Breeding records and standardization.
UNIT II Genetic parameters – Selection of males and females – Breeding systems. Development of new breeds.
UNIT III Breeding policy – Breeding research – Conservation of breeds.
UNIT IV Culling and replacement – EADR.

AGB 621 ANIMAL CYTOGENETICS AND IMMUNOGENETICS 2+1

**Theory**
UNIT I Development in animal cytogenetics and immunogenetics of farm animals. Immunoglobulins and their types: antigen-antibody interactions, Immune response, ELISA.
UNIT II Major histocompatibility complex; genetics of biochemical variants and their applications; Ir-genes and concepts of disease resistance including major genes; hybridoma and its significance; concept of immuno-fertility, BoLA, BuLA, TLRs, Interleukins.
UNIT III Chromatin structure of eukaryotes; chromosome number and morphology in farm animals banding and karyotyping; chromosomal and genetic syndromes, DNA packing in chromosomes, Z+B DNA, FISH chromosome painting and PRINS. RH Panel Mapping.
UNIT IV Mutation and assays of mutagenesis; sister chromatid exchanges; recombinant DNA technique and its application in animal improvement programme.

**Practical**
Polymorphism of haemoglobin, transferrins, enzymes/proteins; preparation of monovalent blood reagent-isoimmunization, titre testing and absorption of polyvalent serum; identification of bar bodies; in vitro and in vivo preparation of somatic metaphase chromosomes; screening of chromosomal abnormalities; microphotography and karyotyping; banding procedures for comparing the chromosomal complement, FISH and PRINS.

AGB 622 SELECTION METHODS AND BREEDING SYSTEMS 2+1

**Theory**
UNIT I Type of selection and their genetic consequences. Response to selection and its prediction and improvement of response to selection.
UNIT III Selection of several traits. Evaluation of short term and long term selection experiments viz: bidirectional selection and asymmetry of response, selection plateaux and limit.

**Practical**

AGB 623 CATTLE AND BUFFALO BREEDING 2+1
Theory
UNIT I History of dairy cattle and buffalo breeding. Breeds of cattle and buffallo and their Characterisation. Inheritance of important economic traits. Recording and handling of breeding data. Standardization of records. Computation of correction factors for the adjustment of the data. Estimation of breeding values of the cows and bulls.
UNIT II Sire evaluation methods using single trait and multiple traits: construction of Sire indices, Sire evaluation under animal model, sire mode; and maternal grand sire model. Open nucleus breeding systems with MOET.
UNIT IV Considerations in the import of exotic germplasm for breeding cattle in the tropics. Appraisal of buffalo and cattle breeding programme. Role of breed associations in dairy improvement.

Practical

AGB 624 POULTRY BREEDING 2+1
Theory
UNIT I
Origin and history of poultry species: Chicken, turkey, duck and quail – Important qualitative traits in poultry including lethals – Economic traits of egg-type chicken and their standardization – Selection criteria – Aids to selection: Index selection and Osborne index – Restricted selection index – Economic traits of meat – type chicken and their standardization.
UNIT III Industrial breeding – Artificial insemination in chicken – Autosexing – Random Sample Test.
UNIT IV Biochemical variants and immunogenetics of poultry – Use of molecular genetics in poultry breeding – Quantitative trait loci and marker-assisted selection – Conservation of poultry genetic resources
Practical Inheritance of qualitative traits – Economic traits of egg-type and meat-type chicken – Procedures of standardization – Estimations of heritability, correlation between various production traits, inbreeding co-efficient and heterosis – Selection of sires and dams – Osborne index – Restricted selection index – Collection and evaluation of semen and insemination – Diallel cross.

AGB 625 LABORATORY ANIMAL BREEDING 1+0
Theory
UNIT I
Introduction to laboratory animal genetics – Breeding colonies of mice, rats, hamsters, guinea pigs and rabbits.
UNIT II Selection and Mating methods/systems – monogamous, polygamous and others.
UNIT III Development of genetically controlled laboratory animals – Rules for nomenclature, inbred strains, outbred stocks, mutant stocks, recombinant inbred strains, transgenic strains, gene targeting and production of ‘gene knock-out’ animals.
UNIT IV Genetic control and monitoring – Record keeping – Ethics of laboratory animal use.

5. Practical Manual Prepared: (02)
   - AGB – 111 (Biostatistics and Computer Application)
   - AGB – 121 (principles of Animal Genetics and Population Genetics)
   - AGB – 211 (Livestock and Poultry Breeding)

6. Post Graduation study and research in the field of Animal Breeding.