SCHEME OF STUDY
for
AN UNDERGRADUATE DEGREE
of
B.Sc.(Hons.) ANIMAL SCIENCE

(Contents Revised & Updated August, 2015)

FACULTY OF ANIMAL HUSBANDRY
UNIVERSITY OF AGRICULTURE, FAISALABAD-38040
PAKISTAN
UNIVERSITY OF AGRICULTURE, FAISALABAD

Scheme of Study
for
B.Sc. (Hons.) Animal Science

Semester 4

<table>
<thead>
<tr>
<th>Course No</th>
<th>Course Title</th>
<th>Credit hours</th>
<th>Course Type</th>
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<tbody>
<tr>
<td>AH-202</td>
<td>Principles of Animal Husbandry</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>AH-204</td>
<td>Fundamentals of Livestock Production</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>AH-206</td>
<td>Principles of Animal Nutrition</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>AH-208</td>
<td>Fundamentals of Animal Breeding</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>AH-210</td>
<td>Rural Poultry Farming</td>
<td>3(2-1)</td>
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*A student will opt only 2-3 courses for 5 Credit Hrs but minimum of 20 students will be required to offer a course*

Semester 5

<table>
<thead>
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<th>Credit hours</th>
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<tbody>
<tr>
<td>ABG-301</td>
<td>Principles of Heredity</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ABG-303</td>
<td>Introductory Molecular Genetics</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>LM-301</td>
<td>Management of Dairy Animals</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ANFT-301</td>
<td>Fundamentals of Animal Nutrition</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ANFT-303</td>
<td>Metabolism of Primary Nutrients</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>PS-301</td>
<td>Introduction to Poultry Science</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>PS-303</td>
<td>Incubation Principles and Hatchery Management</td>
<td>2(1-2)</td>
<td>Major</td>
</tr>
<tr>
<td>ANAT-301</td>
<td>Introduction to Veterinary Anatomy</td>
<td>3(2-1)</td>
<td>Supporting</td>
</tr>
<tr>
<td>PHYS-301</td>
<td>Introduction to Veterinary Physiology</td>
<td>3(2-1)</td>
<td>Supporting</td>
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<tr>
<th>Total</th>
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### Semester 6

<table>
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<th>Course No</th>
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<tbody>
<tr>
<td>ABG-302</td>
<td>Introductory Population Genetics</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ABG-304</td>
<td>Principles of Animal Breeding</td>
<td>2(2-1)</td>
<td>Major</td>
</tr>
<tr>
<td>LM-302</td>
<td>Range Livestock Production</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>LM-304</td>
<td>Principles of Small Ruminant Production</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ANFT-302</td>
<td>Minerals and Vitamins in Nutrition</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ANFT-304</td>
<td>Nutrient Requirements of Farm Animals</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>PS-302</td>
<td>Poultry Farm Management</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>PS-304</td>
<td>Poultry Housing and Equipments</td>
<td>2(1-1)</td>
<td>Major</td>
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<tr>
<td>MED-302</td>
<td>Introduction to Farm Animal Health</td>
<td>3(2-1)</td>
<td>Supporting</td>
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<td><strong>Total</strong></td>
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### Semester 7

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<tbody>
<tr>
<td>ABG-401</td>
<td>Selection for Economic Traits in Farm Animals</td>
<td>2(1-1)</td>
<td>Major</td>
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<tr>
<td>LM-401</td>
<td>Principles of Milk Production</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>ANFT-403</td>
<td>Principles of Poultry Nutrition</td>
<td>2(1-1)</td>
<td>Major</td>
</tr>
<tr>
<td>PS-403</td>
<td>Poultry Hygiene and Disease Prevention</td>
<td>2(1-1)</td>
<td>Major</td>
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<td></td>
<td><strong>Sub Total:</strong></td>
<td><strong>8</strong></td>
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**List of Elective Courses**

(Students will take any four courses from the given list)

<table>
<thead>
<tr>
<th>Course No</th>
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<th>Credit hours</th>
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<tbody>
<tr>
<td>ABG-403</td>
<td>Animal Breeding Practices</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>ABG-405</td>
<td>Beef Breeding</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>ABG-407</td>
<td>Dairy Animal Breeding</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>ABG-409</td>
<td>International Animal Breeding</td>
<td>3(3-0)</td>
<td>Elective</td>
</tr>
<tr>
<td>LM-403</td>
<td>Principles of Meat Production</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>LM-405</td>
<td>Draught Animal Production</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>LM-407</td>
<td>Behavior and welfare of Farm Animals</td>
<td>3(3-0)</td>
<td>Elective</td>
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<tr>
<td>ANFT-401</td>
<td>Feeding of Farm Animals</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>ANFT-405</td>
<td>Feed Evaluation, Formulation and Processing Technology</td>
<td>3(2-1)</td>
<td>Elective</td>
</tr>
<tr>
<td>Course No</td>
<td>Course Title</td>
<td>Credit hours</td>
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<tr>
<td>PS-401</td>
<td>Poultry Feeding Practices</td>
<td>3(2-1) Elective</td>
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<tr>
<td>AR-401</td>
<td>Physiology of Reproduction</td>
<td>3(2-1) Elective</td>
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Sub Total: 12
Total: 20

**Semester 8**

<table>
<thead>
<tr>
<th>Course No</th>
<th>Course Title</th>
<th>Credit hours</th>
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<tbody>
<tr>
<td>AH-412</td>
<td>Internship</td>
<td>8(0-8)</td>
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Total: 8

Semester 1-4 (17+18+19+20) = 74
Semester 5-8 (20+19+20+8) = 67

Total Credit hrs = 141
UNIVERSITY OF AGRICULTURE, FAISALABAD

Curriculum for
B.Sc. (Hons.) Animal Science

Dept of Animal Breeding and Genetics

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>2(1-1)</td>
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<tr>
<td>ABG-302</td>
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<td>2(1-1)</td>
</tr>
<tr>
<td>ABG-304</td>
<td>Principles of Animal Breeding</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>ABG-401</td>
<td>Selection for Economic Traits in Farm Animals</td>
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<td>Animal Breeding Practices</td>
<td>3(2-1)</td>
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<td>Beef Breeding</td>
<td>3(2-1)</td>
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<td>ABG-407</td>
<td>Dairy Animal Breeding</td>
<td>3(2-1)</td>
</tr>
<tr>
<td>ABG-409</td>
<td>International Animal</td>
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</table>

Dept of Livestock Management

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>LM-301</td>
<td>Introductory Livestock Management</td>
<td>3(2-1)</td>
</tr>
<tr>
<td>LM-303</td>
<td>Management of Dairy Animals</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>LM-302</td>
<td>Range Livestock Production</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>LM-304</td>
<td>Principles of Small Ruminant Production</td>
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<td>3(2-1)</td>
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<tr>
<td>LM-407</td>
<td>Behavior and welfare of Farm Animals</td>
<td>3(3-0)</td>
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</table>
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<thead>
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<tbody>
<tr>
<td>ANFT-301</td>
<td>Fundamentals of Animal Nutrition</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>ANFT-303</td>
<td>Metabolism of Primary Nutrients</td>
<td>2(1-1)</td>
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<td>ANFT-302</td>
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<td>Feeding of Farm Animals</td>
<td>3(2-1)</td>
</tr>
<tr>
<td>ANFT-405</td>
<td>Feed Evaluation, Formulation and Processing Technology</td>
<td>3(2-1)</td>
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### Department of Poultry Science

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>PS-301</td>
<td>Introduction to Poultry Science</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>PS-303</td>
<td>Incubation Principles and Hatchery Management</td>
<td>2(2-1)</td>
</tr>
<tr>
<td>PS-302</td>
<td>Poultry Farm Management</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>PS-304</td>
<td>Poultry Housing and Equipments</td>
<td>2(1-1)</td>
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<tr>
<td>PS-403</td>
<td>Poultry Hygiene and Disease Prevention</td>
<td>2(1-1)</td>
</tr>
<tr>
<td>PS-401</td>
<td>Poultry Feeding Practices</td>
<td>3(2-1)</td>
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### Department of ABG, LM, PS & IAN&FT

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>AH-412</td>
<td>Internship</td>
<td>10(0-10)</td>
</tr>
</tbody>
</table>
Theory:

Genetics: historical development and scope; Genetic basis of inheritance: cell and cell division, gametogenesis; Mendelism: basic terminology, Mendel's laws, monohybrid and polyhybrid crosses; Probability: concept and laws of probability; Chi-square test and its applications; Modified segregation ratios; Multiple allelomorphism; Genetics of sex: sex determining mechanisms, sex linkage and its variation; Polygenic inheritance, Pleiotropy, Linkage, crossing over and chromosomal mapping; Extranuclear inheritance.

Practical:

Microscopic studies on animal cells undergoing mitosis and meiosis. Numerical problems on topics discussed in theory.

Books Recommended:

Theory:

Biochemical basis of heredity: the nature of genetic material, nucleic acids, structure of DNA and RNA; DNA replication, transcription, and translation; Protein synthesis and its regulation. Developmental aspects of genetic control: gene expression and cell differentiation; Control of gene expression in eukaryotes; Genetic basis of immune response: components of immune system, immune response, genetic diversity in immune system; Mutations: gene mutations and their types, variation in chromosome structure and number; Genetic engineering: basic concepts of recombinant DNA technology, gene cloning and manipulation, application and future.

Practical:

Demonstration of various cytogenetic techniques, karyotyping and banding, DNA extraction and gel electrophoresis.

Books Recommended:
Theory:

Gene and genotypic frequency; Hardy-Weinberg law: forces affecting gene frequency and composition of population, effective population size; Quantitative characters and their inheritance; Biometrical concepts in population genetics: measures of central tendency and dispersion for quantitative traits; Basic theorems of additivity of variance, regression and correlation concepts; Nature and causes of variation in quantitative traits, partitioning of hereditary variance; Concepts of heritability and repeatability and methods of their estimation; Genetic and phenotypic correlations; Genetic basis and causes of variation.

Practical:


Books Recommended:

Theory:

Selection: natural and artificial selection, methods of selection; tandem method, independent culling level and selection index. Kinds of selection: mass selection, selection based on multiple records or lifetime average, pedigree selection, progeny testing, family selection; Selection for single and multiple traits: correlated response, genetic effects of selection, methods of assessing genetic progress; Various systems of breeding: random mating; inbreeding and its effects on small and large populations; line-breeding for increased prepotency; outbreeding; outcrossing, crossbreeding, grading up, phenotypic assortative matings. Development of inbred lines; lethal genes; selection for best combining abilities; reciprocal recurrent selection; Breeding for threshold characters.

Practical:


Books Recommended:

Theory:

Traits of economic importance in farm animals; selection of dairy heifers and bulls; use of standardized records; relative economic values, breeding values and selection indices; crossbreeding for milk and meat production; Traits of economic importance in poultry and their improvement: formation of breeding stock for layers and broilers; development of dual purpose birds and rural poultry. National breeding policy for improvement and conservation of livestock. Review of the animal breeding practices used by the developed countries. Future breeding plans for genetic improvement of farm animals in different agro-ecological zones of Pakistan. Emerging bio-technologies for increasing animal productivity.

Practical:


Books Recommended:

Theory:

Role of animal breeding in livestock production; Opportunities for breeding and improvement of farm animals in Pakistan; National breeding policy for improvement and conservation of livestock; Constraints in improving the productivity of livestock under traditional breeding systems; Review of the breeding practices used by the developed countries for increasing the performance of farm animals; Future breeding plans for improvement of farm animals for increasing productivity in different agro-ecological zones of Pakistan; Selection as a tool for genetic improvement; Selection protocols for different recording setups; Crossbreeding for dairy and meat animals; Emerging breeding technologies for increasing animal productivity.

Practical:

Computation of various productive and reproductive traits in different farm animals from the available records. Genetic gains and breeding value estimation. Project preparation on specific topics. Use of internet tools /databases on documentation of animal genetic resources.

Books Recommended:

Theory:

Beef breeds of the world: tropical breeds; indigenous resources for beef production; Fundamentals of genetic selection; traits of economic importance; genetic control and correlations; performance recording and testing; breeding plans: crossbreeding and breed complementarity’s; implementation of beef improvement programs, use of biotechnologies; beef breeding and genomics; development of new beef breed; Policy options for beef breeding in Pakistan.

Practical:

Numerical related to estimation of breeding values, genetic gains and animal selection, Visit of livestock farms.

Books Recommended:
Theory:

Dairy breeds of cattle and buffaloes; Economic traits and their genetic control; Selection and breeding for milk, fat and other economic traits; Pure vs crossbreeding; Breeding value estimation; optimizing genetic progress; Performance recording and selection/culling decisions; Understanding sire summaries; Application of biotechnologies in cattle improvement; Application of genomics; Documentation and conservation of indigenous breeds.

Practical:

Exercises in cattle and buffalo characterization, data recording, animal evaluation, interpretation of sire summaries.

Books Recommended:

Theory:

The state of the world’s animal genetic resources; Animal genetic resources of Pakistan and south east Asia; International efforts for the conservation and development of animal genetic resources; Biological, political, social and economic factors affecting international animal breeding; Implication of biotechnology in animal breeding; Development of new breeds; Importance of Traditional knowledge in animal breeding; Opportunities for breeding and improvement of farm animals in various regions of the world; Intellectual property rights (IPR); Documentaries of animal genetic resources.

Books Recommended:

Theory

Scope and importance of the dairy industry of Pakistan; characteristics of local, exotic and crossbred dairy animals; principles of profitable dairy production; buffalo and cow as major dairy animals; camel as a dairy animal; selection of dairy animals; establishing a dairy enterprise; raising replacement stock; management of sire, pregnant and lactating animals; significance of dry buffalo/cow therapy; thermal stress and buffalo/cow performance; feeding for economical milk production; an ideal udder; defects of udder; plans and specifications for dairy buildings and equipment; record keeping; dairy herd improvement associations; dairy system models; modern trends in dairy industry; buying and selling guide; prophylactic measures; common ailments.

Practical

Demonstration of characteristics of an ideal dairy animal; judging, selection and use of score cards; body condition scoring; weaning practices; care, handling and feeding of calves; milking practice (hand/machine milking); identification of dairy breeds; design and layout plans for dairy buildings; demonstration of dehorning/disbudding, castration, extra teat removal, teat dipping, hoof trimming, etc; dry cow/buffalo management; planning for year round fodder availability; fodder preservation practices; preparing feasibility reports; use of computer for record keeping; visit to dairy farms and shows.

Books Recommended

Theory

Introduction to ranges; basic concepts and terminology; range statistics; ecological zones of world/Pakistan; soil, plant and animal relationship; various range animals; range management policy; vegetation manipulation and other tools for improvement; important range and cultivated grasses; trees and shrubs as animal feed; grazing management systems and supplementary feeding; grazing capacity and stocking rates; effect of climate on animals and vegetation; shelter on ranges and fence types; wild animals; poisonous plants, their hazards and prophylactic measures on ranges.

Practical

Identification of various range grasses, trees, shrubs and cultivated forages; preservation/mounting of important range grass samples; determining range carrying capacity and forage production, animal units and stocking rates; animal take off rate; visit to rangelands.

Books Recommended

Principles of Small Ruminant Production

Theory

Domestication, scope of small ruminant industry in Pakistan; share in national economy; world distribution; feeding, breeding, selection, kidding/lambing, rearing and housing; nursing orphan kids/lambs; systems of production; sheep and goat as meat and dairy animals; systems of production; measures for increased production; establishing commercial flocks; economics of sheep and goat production; preparing feasibility reports; characteristics and utility of wool, hair/mohair; shearing and handling wool/hair; sheep and goats on ranges; transportation and marketing; slaughter and flaying; showing of sheep/goats; keeping flock healthy; common ailments.

Practical

Identification of different sheep and goat breeds; judging for milk, meat and wool/hair production; farm practices such as castration, hoof trimming, condition scoring; feeding lambs/kids, identification, docking, drenching, dipping and spraying; dentition; use of marking harness, housing plans, shearing and handling; grading and sorting wool; studying characteristics of hair, wool and mohair in the lab; flaying and skin preservation; various farm records; practical prophylactic measures; shepherd calendar; visit to sheep and goat farms.

Books Recommended:

Theory

Structure and functions of mammary gland; blood and nerve supply to the udder; mammmogenesis, lactogenesis and galactopoises; synthesis of milk; milk ejection- neural and hormonal component; milking methods; factors affecting milk production and composition; measure to increase milk production; common malpractices used in milk production; physical and chemical properties of milk; hygienic milk production; collection and transportation, processing and marketing of milk; dairy products; milk ordinance, milk borne diseases.

Practical

Milking practice; hand versus machine milking; milk let down and its inhibition; removal of residual milk; milking time hygiene, screening tests, macro and micro structure of udder; analysis of milk; cleaning and sanitizing of barns and equipment; visit to milk processing plants.

Books Recommended

Theory

Development of meat industry in Pakistan; important mutton, beef and dual purpose breeds; meat terminology; systems of meat animal production; breeding and feeding management; veal and dairy beef; species-wise off take rate; carcass evaluation; cuts and meat grades; feed additives for enhanced growth and fattening; growth rate and fattening potential of indigenous livestock breeds; factors affecting carcass and meat quality; pre-slaughter handling of meat animals; post slaughter changes in carcass; spoilage of meat; hygienic meat production, storage and preservation; buffalo and camel as beef animals; marketing of meat animals and meat; economics of meat production; meat by-products; feasibility reports; modern abattoirs.

Practical

Body conformation of beef/meat animals; dressing percentage; carcass composition and cuts; judging meat animals; condition scoring of meat animals; preparing animals for slaughter house; scoring carcass conformation and fatness; humane handling and animal welfare; slaughterhouse management; practical tips for housing and feeding of meat animals; visit to slaughterhouses and feed lots; designing modern slaughterhouses.

Books Recommended

Theory

Contribution of draught animals to agriculture and national economy; draught animal vs. mechanical power; types and breeds of draught animals; selection, housing; management and feeding during work and rest; work performance and energetics; comparative efficiency of draught animals; types of harnesses and equipments; ailments of draught animals, their welfare and prospects in Pakistan.

Practical

Breaking and training of draught animals; measuring draught power and efficiency; use of different types of harnesses; examination and certification of draught animals for soundness.

Books Recommended

Behavior and Welfare of Farm Animals

**Theory**

Basic terminology of behavior and welfare; development of behavior, basic concepts; why to study behavior; behavioral profiles of farm animals (dairy animals, small ruminants, equines and camels); types of animal behavior; communication; hormones and behavior; behavior in relation to training, handling, feeding, transport and slaughter of animals; animal well-being (the ultimate goal); rights of animals (legal and moral); eliminating all sorts of stress.

**Practical**

Methods of assessing behavior; demonstration about five freedoms; observing territoriality, social behavior including courtship, mate guarding, mate choice and play behavior; determining flight and fight zones in various species; observing aggressive, sexual and eliminative behavior and observing cases of undue stress on account of beating, exposure to severe hot and cold weather, carelessness in feeding, overcrowding, overloading, underfeeding and overworking by lame, emaciated and diseased animals, then writing report based on these observations.

**Books Recommended**

Theory
History, scope and development of science of nutrition; basic terms used in animal nutrition; feed resources and their classification; plant animal relationship; digestive organs and processes in different species of animals; absorption of nutrients in different species; voluntary feed intake; essential nutrients: their classification and functions; water: its importance and effects of deprivation; factors affecting water balance in animal body; nutrition in relation to body maintenance; growth and production.

Practical
Parts of digestive system in ruminant and monogastric animals; Identification of feeds through visual and microscopic methods; Physical characteristics of common feeds; Procurement of feed samples and their preparation; Introduction to feed analysis scheme.

Books Recommended
Theory
Metabolic functions of water; metabolism of carbohydrates, classification, digestion, absorption and utilization in monogastric and ruminant animals; glycolysis; lactic acid and volatile fatty acid fermentation, citric acid cycle, pentose phosphate pathway, gluconeogenesis; glycogenesis and glycogenolysis; metabolism of lipids; classification, digestion, absorption, and utilization in monogastric and ruminant animals; beta oxidation of fatty acids; fate of glycero1 with respect of fat synthesis, glucose/glycogen syntheses and its oxidation; storage of fat; catabolism of fat and ketosis; metabolism of proteins, classification, digestion, absorption and utilization in monogastric and ruminant animals; essential and non-essential amino acids, protein quality; fate of absorbed amino acids; transamination; deamination; deamidation; transmethylation; decarboxylation and interconversion of amino acids; utilization of non-protein nitrogenous compounds in ruminants

Practical
Proximate analysis of feeds and feed ingredients; determination of dry matter, crude protein, ether extract, crude fiber and total ash; acid detergent fibre (ADF) and neutral detergent fibre (NDF) analysis

Books Recommended
Theory
Historical perspective of minerals and vitamins; essential mineral elements and their distribution in living body; classification and their functions; interrelationship and deficiency of calcium, phosphorus, magnesium, sodium, potassium, chlorine, iron, copper, cobalt, manganese, iodine, molybdenum, fluorine, zinc and selenium; relationship of minerals with dietary components and mineral toxicity; vitamin: classification, chemical structure and function of vitamin A, D, E, K, C, and B-complex, deficiencies, hypervitaminosis; interrelationship among vitamins and other nutrients; different sources of minerals and vitamins.

Practical
Preparation of feed samples for mineral and vitamin analysis; Demonstration of analytical techniques for mineral and vitamin analysis.

Books Recommended
Theory
Feeding standards, history, usefulness and limitations; nutrient requirements of cattle, buffaloes, sheep, goats, camels and horses for maintenance, growth, production and reproduction; measurement of body needs, digestibility and balance trials; factors affecting digestibility and balance of nutrients; respiratory quotients; partitioning of nutrients in the body; factors governing energy; protein; minerals and vitamins needs of farm animals; concept of rumen bypass nutrients.

Practical
Determination of nutrient digestibility and nitrogen balance; Determination of energy value of feedstuffs; demonstration of in sacco technique.

Books Recommended
ANFT-403       Principles of Poultry Nutrition       2(1-1)

Theory
Sources and classification of nutrients and their functions; digestion and absorption of nutrients; metabolism of water, carbohydrates, protein and fats; hormonal control of metabolism; nutritional diseases caused by vitamins and minerals deficiencies; feed additives, antibiotics, coccidiostats, antioxidants, probiotics, enzymes, metabolic antagonistics and incompatibilities in mixed feed, stability, availability, vitamin, antagonists, amino acids, antimetabolites, goitrogens; drug toxicities; toxic substances in poultry feed; optimum levels of essential nutrients in poultry rations; amino acids and energy ratio in poultry rations; nutrients requirements of commercial layers, broilers, breeders, quails, ducks and turkeys.

Practical
Composition of feedstuffs used in poultry rations; characteristics of poultry rations; formulation of rations for broilers, layers and breeders, quails, ducks, and turkeys; introduction to computer ration formulation; economics of poultry rations; visits to feed mills and poultry farms

Books Recommended
ANFT-401 Feeding of Farm Animals

Theory

Feed resources and feeding practices in rural, peri-urban and urban livestock farming; feeding management of dairy animals in different physiological stages; concept of forage, concentrate ratios in feeding allowances; forages, nutrient composition, conservation and system of utilization; drought feeding; treatment of low quality roughages; rumen development and feeding of young calves; feeding practices of small ruminants; nutritional management of grazing livestock; utilization of non-conventional feed resources; principles of feed supplementation; feeding problems and nutritional disorders.

Practical

Principles of balanced ration; formulation of least cost balanced rations for different classes of farm animals; planning and demonstration of feeding trials; treatment of crop residues.

Books Recommended


Theory

Techniques for estimating nutritive value of feedstuffs and their validity; in vivo and laboratory techniques; factors affecting the nutritive value of feeds; measures of protein quality for monogastric; protein efficiency ratio, gross protein value; the essential amino acid index; protein evaluation systems for ruminants; natural toxicants of feeds and detoxification; feeding systems for livestock and poultry; raw feed material handling and storage; mixing, processing and storage of finished feed; quality control in feed processing; forms of feeds and least cost ration formulation for ruminant livestock; equine, pets and poultry; feedstuff laws and regulations.

Practical

Use of computer for least cost feed formulation for various classes of livestock and poultry; availability pattern of feedstuffs in local market and their price structures; manufacturing of wholesome feed; demonstration of feeding trials for estimating feed efficiency; visit of feed mills.

Books Recommended

Theory:

Importance of poultry science; classification of world poultry; poultry breeds and their characteristics; strains for egg and meat production; incubation methods; principles of poultry housing; equipments used in poultry production; poultry feeding and its significance; selection and culling in poultry; waste management; rural poultry production; bio-security measures; record keeping.

Practical:

Description and demonstration of different poultry breeds; body parts of chicken, structure of an egg; demonstration of incubators; poultry housing types; selection and culling techniques; dead bird disposal pit; visits to commercial poultry farms.

Books Recommended:

Theory:

History, development and scope of hatchery industry in Pakistan; collection, handling, selection, fumigation, storage and transport of hatching eggs; seasonal hatching; incubation methods; types of incubators and incubation requirements; role of computer in modern hatchery operations; setting and candling of eggs; daily changes in embryonic development during incubation, physical act of hatching; factors influencing fertility, hatchability and quality of chicks; taking off hatch; hatchery services; hatchery sanitation and waste disposal; trouble shooting during incubation; incubation records.

Practical:

Planning and designing of hatchery; practices regarding collection, selection, cleaning, fumigation and storage of hatching eggs; demonstration of parts of incubators; setting and candling of hatching eggs; handling of incubators; disinfection and fumigation of incubators; observing daily changes during embryonic development; sexing, grading, detoeing, and dubbing of day old chicks; examining malposition of embryo; dead embryo and dead in shell; estimation of fertility and hatchability. Trouble tracing chart of the chick embryo; feasibility report of hatchery, visits to commercial hatcheries.

Books Recommended:
Theory:

Preparation for receiving day old chicks; brooding requirements and management of chicks; rearing of young stock; shifting and housing of pullets; cage vs. floor management; raising broilers, layers and breeders; management of quails, ducks, geese, peafowl, ostrich and turkeys; feeding practices for broilers, layers and breeders; light management; causes of poor performance of layer and breeder flocks; managerial practices to boost egg and meat production; management of flock during hot and cold climates; cannibalism, vices and their remedies in poultry; induced moulting of spent layers and breeders; trouble shooting in poultry farms; poultry welfare; poultry waste disposal; characteristics of an ideal poultry farm manager; cost benefit ratio of different poultry enterprises; significance of record keeping; use of computers in record keeping.

Practical:

Demonstration and handling of various types of brooders; vaccination, medication, beak trimming and detoeing techniques; remedies for different vices in poultry; application of induced moulting techniques; preparation of birds for transportation; computerized record keeping at farms, feasibility report of 1000 broiler, layer and breeder flocks.

Books Recommended:

PS-304  Poultry Housing and Equipments  2(1-1)

**Theory:**

Importance and purpose of poultry housing; poultry housing systems; types and styles of poultry houses; selection of site and location of poultry house; construction of poultry farm buildings; light, gas and water fittings in poultry houses; heating and cooling systems; role of house design, insulation, ventilation in environment control housing; opens-sided and environmentally controlled housing; brooding, rearing and laying house equipments; feeding and watering systems; automation in housing, equipments and effective climatic control in poultry houses; feasibility report of poultry housing.

**Practical:**

Basic principles for site selection and poultry house construction. Demonstration of poultry farm buildings; designing of farm buildings; poultry house insulation materials; demonstration and operation of poultry farm equipments; automatic feeding and watering systems and its trouble shooting, poultry housing practices. Visit to poultry farms.

**Books Recommended:**

Theory:

Importance of poultry hygiene and disease prevention; terms related to poultry diseases; disinfectants and their application; cleaning and disinfection of poultry houses and equipments; fumigation and its importance; prophylactic measures against bacterial, viral, parasitic and mycotic diseases; nutritional disorders and their prevention; bio-security measures; significance of drinking water in relation to diseases; practices to control vertically and horizontally transmitted diseases.

Practical:

Poultry carcass inspection; blood and carcass specimen collection and dispatch to diagnostic laboratory; vaccines and vaccination; disinfectants, medicines and vaccines available in market; common practices for bio-security measures; dead bird disposal; visit to poultry disease diagnostic laboratory.

Books Recommended:

Theory:

Importance of poultry feeding, principles of poultry feeding; common feedstuffs used in poultry rations; poultry feed formulation; feeding methods and their advantages; forms of feed; feed and water quality in relation to performance of chickens; factors affecting quality of feeds; measures to avoid feed toxicity; manual versus automatic feeding systems; feed and water space requirements; poultry feed additives; storage of poultry feed to maintain quality; types of poultry diets; poultry feeding strategies during hot and cold climate; measures to avoid wastage of feed.

Practical:

Different feeding methods; feeding practices; evaluation of poultry feed by gross examination; storage of commercial feed at farm; mixing of feed additives in poultry feed; home feed mixing; economics of home feed mixing; visit to commercial feed mill and environment controlled poultry houses.

Books Recommended:

ANAT-301  Introduction to Veterinary Anatomy  3(2-1)

Theory:

Anatomical terminology; classification and functions of skeleton; muscular and nervous system; skeletal muscles and their function; muscle contraction; levers; neurons; receptors; the reflex arc; digestive system; the mouth, teeth, tongue, salivary glands, pharynx, oesophagus, ruminant and non-ruminant, stomach, intestines, pancreas. liver and spleen; the peritoneum; respiratory system: the nostrils, nasal cavity, pharynx, larynx and trachea; pleura and lungs; urinary system: the kidneys, ureters, urinary bladder and urethra; genital system: male genital organs including scrotum, testes, spermatic cord, vesiculae seminales, prostate, uterus masculinus, bulbourethra glands and the penis; female genital organs including ovaries, fallopian tubes, uterus, vagina, vulva and mammary glands; endocrine glands, hypophysis cerebri, epiphysis cerebri, thyroid, parathyroid, adrenal, pancreas, ovary and testes; angiology study of heart, pericardium and major arteries and veins; superficial lymph glands; anesthesiology: study of sense organs and the common integument.

Practicals

Identification of the various bones, Ligaments, tendons and their attachment to the bones of different domestic animals; form, structure and topographical study of various organs located in the thoracic, abdominal and pelvic cavities of different domestic animals.

Books Recommended:

Theory:

Introduction: Intracellular organization and physiology; body fluids, blood, lymph, cerebrospinal fluid, synovial fluid. Blood circulation and cardiovascular system: physiological properties and cellular and chemical constituents of blood, blood coagulation, blood groups and their importance in livestock; the conduction system of the heart; regulation of cardiac output, regulation of the heart and blood vessels; regional circulation and pulmonary circulation; respiratory system: mechanism of respiration, types of breathing, air volumes and capacities exchange of gases, control of respiration, artificial respiration; digestive system: ingestion of food by various animals, mastication, salivation and deglutition, functions of saliva; simple stomach digestion: gastro-intestinal motility, secretions and functions, liver and pancreatic secretion and functions. Digestion in the ruminant stomach; rumination, fermentation, functions of omasum and abomasum, absorption from stomach and intestines; water balance and excretion: electrolytes, physiology of the kidney and physiology of the skin; endocrine glands and their secretions and functions; physiology of lactation; nervous system; spinal cord and brain functions, autonomic nervous system.

Practicals

Introduction of various laboratory instruments; collection of blood in different species of animals and use of anticoagulants; measurements of normal pulse, respiration and rectal temperature; hematological experiments; determination of blood groups; determination of blood pressure; determination of various lung capacities & volumes; urine examination for normal constituents; microscopic examination of urine; test for saliva; dissection for location of endocrine glands in rat and chicken; visit to university farm for observation on prehension; mastication and rumination of domestic animals; observation on the stomach of buffalo, cattle and camel.

Books Recommended

MED-302  Introduction to Farm Animal Health  3(2-1)

Theory:

Concept of farm animal medicine/herd medicine; methods of prevention and control of diseases in farm animals; recognition of systemic disorders and introduction to bacterial, viral, fungal, parasitic and metabolic disorders in farm animals; biosecurity on farms; systemic disorders: chocking, indigestion, impaction, colic, typany, pneumonia and mange etc. bacterial diseases: mastitis, hemorrhagic septicemia, black leg, salmonellosis, tuberculosis, paratuberculosis brucellosis, actinobacillosis, actinomycosis, malignant oedema, mycoplasmosis, q-fever and bovine farcy; viral diseases: ephemeral fever, foot and mouth disease, rinder pest bovine viral diarrhea, bovine malignant catarrh, infectious bovine rhinotracheitis, blue tongue, bovine spongiform encephalopathy, fungal diseases: ring worm, aspergillosis, histoplasmosis, dermatophilosis, candidiasis, deg-nala disease and mycotoxicosis; parasitic diseases: coccidiosis, babesiosis, and theileriosis, diseases caused by nematodes, cestodes, trematodes and arthropodes. metabolic disorders and deficiency diseases: parturient haemoglobinuria, milk fever, transit tetany, lactation tetany, hypomagnasemic tetany, ketosis, vitamins and mineral deficiencies/imbalances; poultry: gumboro, ND, pullorum, CRD etc.

Practical:

Vaccination and deworming schedule for farm animals; mastitis microbiology, sensitivity profiling, evaluation of mastitis treatment formulations and teat dips; screening tests of mastitis; evaluation of milking machine; microbiological examination of milk and other dairy products for potential human health pathogens, diagnostic techniques for brucellosis, glanders, tuberculosis, toxoplasmosis, hydatidosis etc; detection of antibiotic residues in milk and other dairy products; manual and computerized farm records.

Books Recommended:

Theory:

Physiology of female reproduction: puberty and breeding season in farm animals; hormones of hypothalamus, pituitary, placenta, ovaries and uterus; oestrous cycle, oogenesis, ovulation, fertilization, gestation and parturition; involution of uterus and post-partum ovarian activity; methods of heat detection and pregnancy diagnosis. Reproductive efficiency parameters; factors affecting the reproductive efficiency of farm animals; physiology of male reproduction: puberty in farm animals; hormone of the testes; spermatogenesis; methods of semen collection; physical characteristics of the semen of farm animals; artificial insemination.

Practical:

Functional anatomy of male and female reproductive system; in vitro palpation of female reproductive organs for anatomical and morphological study; observation of oestral activity; breeding soundness examination of the bull: physical examination of the bull; preparation of artificial vagina; semen collection and evaluation.

Books Recommended:

Supporting course for B.Sc. (Hons.) Agricultural Sciences (2\textsuperscript{nd} Semester)

&

Elective Courses for B.Sc. (Hons.) Agricultural Sciences (4\textsuperscript{th} Semester)
Theory:

Introduction to genetics; basic concepts and role in animal breeding; breeds of livestock; breeds of milch; draught and dual-purpose cattle; breeds of buffaloes, breeds of sheep and goats; breeding: reproductive cycle, age at puberty, breeding season, gestation, fertility and sterility and artificial breeding; systems of breeding; principles of selection, biotechnological techniques in animal breeding and genetics; importance of livestock; zoological classification; livestock population and products; common terminology; brief review of principles of livestock management; farm records; livestock housing; gross composition of milk of various species; milk products; transportation and welfare of farm animals; basic terms in animal nutrition; common feeds and their classification; feeding standards, their evaluation, usefulness and limitations, nutrients and their functions, rumen micro flora and factors affecting digestion of cellulose and urea in ruminants, basic principles of feeding dry, milking and pregnant animals; poultry industry and its importance; classes, breeds, and varieties of poultry and their characteristics; selection, care and storage of hatching eggs; types of incubators and incubation requirements; types of brooders and brooding requirements; broiler management; layer management; housing at id equipment for poultry birds.

Practical:

Demonstration and identification of various breeds of livestock; male and female reproductive organs; exercises on topics related to breeding and selection; body points of animals; identification and application of various management tools; handling and restraining of animals; grooming and cleaning of animals; various housing plans, milk quality analyses; identification of feed samples: formulation of balanced ration for sheep, goats, cattle and buffaloes; visit to livestock shows/farms; demonstration of different poultry breeds, selection of hatching, eggs; handling of incubators and brooders, handling of various farm equipments, various managemental practices at poultry farm.

Books recommended:


AH-202 Principles of Animal Husbandry 3(2-1)

Theory:

Introduction, present status and future scope of poultry industry; introduction to housing and equipments; incubation practices; principles of poultry management; principles of diseases prevention; record keeping; introduction to animal breeding; phenotype and its components; genetic variation in farm animals; traits of economic importance in farm animals; genetics improvement, breeding systems, forces that change gene frequency; genetic parameters, heritability, repeatability, correlations, selection strategies for different traits of economic importance; modern developments in animal breeding.

Practical:

Demonstration of poultry farm practices; cleaning and disinfections of poultry farm and incubators; manual vs automatic feeding; beak trimming; fumigation; bio-security measures; problems related with the topics covered in theory part of ABG.

Books Recommended:

Theory

Taxonomic classification of domestic animals; types and breeds of farm animals; livestock and their products; measures to increase milk and meat production; housing of farms animals; economics of livestock farming; judging and selection, hygienic milk production; livestock production systems; animals welfare; prophylactic measures.

Practical

Recognizing various breeds of farm animals; identification; feeding practices; vaccination; shearing, deworming; record keeping.

Books Recommended

AH-206 Introduction to Animal Nutrition 3(2-1)

Theory:
Importance of nutrition in livestock and poultry production; basic concepts of animal nutrition; feed resources and their utilization; soil plant animal relationship; digestive systems, digestion and absorption of nutrients in different classes of livestock and poultry; factors affecting nutrient intake in livestock and poultry; factors affecting water needs in animal body; anti nutritional factors in feed ingredients.

Practical
Identification of feed ingredients through visual and microscopic methods; physical characteristics of common feeds; feed ingredients and feed storage practices under farm conditions; introduction to different components of feed mills; conservation of forage

Books Recommended
Theory:

History of animal genetics; animal genetic resources of Pakistan; role of animal breeding in livestock production; biometrical concepts for assessing variation and association among traits; Quantitative characters and their inheritance in different species; breeds and their keepers, breeding methods for sustainable use of animal genetic resources; Opportunities for breeding and improvement of farm animals in Pakistan; Conservation of animal genetic resources: scope, techniques and problems; Biotechnologies in animal breeding.

Practical:

Exercises on biometrical concepts related to measures of central tendency, measures of dispersions and association among traits at phenotypic and genetic level.

Books Recommended:

Theory:
Status of rural poultry production in Pakistan; significance and scope of rural poultry farming; desi vs commercial poultry products; consumer attitudes; choosing right rural breed / strain for meat and egg production; housing and equipments; natural incubation; incubation requirements for small incubators; characteristics of broody hen; selection of hatching eggs; nest preparation; management during incubation; management during brooding, growing and laying; selection of feed ingredients; feed formulation for rural poultry farming; feeding and watering practices; vaccination, medication and parasitic control; impact of season on performance of rural poultry; record keeping; marketing of rural poultry and its products; measures to improve rural poultry production.

Practical:
Demonstration of suitable breeds for rural poultry production; types of houses and equipments; selection of a good broody hen; nest preparation for natural incubation; collection, selection, cleaning, grading and storage of hatching eggs; care of hen and eggs during incubation process; feeding and watering practices; management during brooding, rearing and production; selection and culling techniques; differentiation between laying and a non laying hen; vaccination and medication; preparation and handling of small incubators; feasibility report for 100 rural poultry birds; visit to government poultry farms.

Books Recommended: