

SEMESTER- II

COURSE NO.	COURSE TITLE	CREDIT HOURS
VAN-121	Veterinary Gross Anatomy-II (Myology, Neurology, Angiology & Aesthesiology)	2+2=4
VPB-121	Veterinary Physiology-II (Neuromuscular, Digestive & Respiratory Systems)	2+1=3
VPB-122	Veterinary Intermediary Metabolism	2+1=3
LPM-121	Fodder Production & Grassland Management	1+1=2
LPM-122	Livestock Production Management-II (Monogastric and Laboratory Animals)	1+1=2
AGB-121	Principles of Animal Genetics and Population Genetics	2+1=3
ANN-121	Applied Animal Nutrition-I (Ruminants)	2+1=3
Total Credits		12+8=20

VAN -121: VETERINARY GROSS ANATOMY-II (Myology, Neurology, Angiology and Aesthesiology)

Credit Hours: 2+2=4

THEORY

Myology: Structural and functional classification of muscles. Gross study of skeletal muscles of head, neck, thorax, abdomen, pelvis, tail, fore limb and hind limb with their origin, insertion and action and their structural and functional importance from clinical and production point of view in Ox / Buffalo as a type species. Comparative study of muscles in other domestic animals.

Neurology: Study of central, peripheral and autonomic nervous system Gross study of meninges, brain, spinal cord, cranial and spiral nerves and their functional importance from clinical and production point of view. Gross morphology and disposition of the nerves of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb in Ox / Buffalo as a type and comparative study in other domestic animals. **Angiology:** Gross morphology of heart and disposition of arteries, veins and lymphatic of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb in Ox / Buffalo as type and comparison with that of Sheep / Goat, Pig, Horse, Dog and Fowl. Their importance from clinical and production point of view. **Anesthesiology:** Gross morphological study of the eye, ear, nose, hoof, horn and skin in Ox / Buffalo. Their functional importance and comparative study in other domestic animals Computer simulation for dissection and study of body parts. (Note: The general outline of muscular, circulatory and nervous system be taken up in the beginning of this course to be followed by gross disposition of group of muscles, arteries, veins and lymphatics simultaneously region-wise.)

PRACTICAL

Demonstration of embalming of the carcass and preservation. Dissection/computer simulation models for dissection and demonstration of body parts. Dissection of muscles of all body regions of Ox/ Buffalo, their location, functional role in the body and comparison with other species. Study of brain and spinal cord in different domestic animals. Study of heart and major blood vessels in different species of animals Area of auscultation of heart. Dissection of Wood vessels, lymphatics and nerves of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb in Ox / Buffalo and comparative study in other domestic animals. Demonstration of palpable Lymph nodes of the body. Study of the sites of cornual, auriculo palpebral, peterson's, infraorbital, radial, ulnar, median, paravertebral, epidural, pudendal, perineal and tibial nerve blocks and their clinical importance. Dissection for study of eye, ear, nose, hoof and horn.

VPB-121 VETERINARY PHYSIOLOGY –II (Neuromuscular, Digestive and Respiratory systems)

Credit Hours: 2+1 =3

THEORY

Muscle Physiology- basic muscle unit characteristic-electrical phenomenon in muscle cell -Membrane potential ionic basis of resting membrane potential, muscle action potential, excitation and propagation of impulse characteristics- latent period refractive ness, threshold level-all & none characteristics - contractile mechanism- excitation -contraction coupling-neuro-muscular transmission, types of muscle contraction, phenomenon of fatigue, rigor mortis.

Organization of nervous system- Mechanism of information processing, hierarchical control. Major functional system- sensory, consciousness, emotion, motor and visceral control and basic functional unit - neuron structure, type- functional characteristics of sub-units of neuron. Membrane potential- ionic basis of resting membrane potential (RMP) nerve action potential, excitation and propagation of impulse characteristics- latent period -refractive ness, threshold level-all & none characteristics. Degeneration and regeneration of nerve fibre. Synaptic and junctional transmission.

Functions of nervous system-reflexes-control of posture and movements, autonomic nervous system and visceral control. Neurotransmitter wakefulness, sleep cycle. Higher function of neurons system -learning memory. Familiarization with common equipments used in neurophysiology (oscilloscope, electroencephalography, machine stimulators etc).

Sense organs and receptors physiology of special senses - EYE: functional morphology, nourishment and protection neural pathway, receptors - optics, ocular muscles and movements, photochemistry, eye defects and eye examinations (as an aid to clinical evaluation). **EAR:** Physiology of hearing and common hearing impairment. Vestibule apparatus. Physiology of Olfaction and Taste.

Morphological characteristic of monogastric and poly gastric digestive system. Prehension, rumination; daefecation, vomition; regulation of secretory function of saliva, stomach, intestine, pancreas; bile secretion; hunger, appetite control, developmental aspects of digestion; luminous, membranous and microbial digestion in rumen and intestine; permeability characteristics of intestine, forces governing absorption, control intestinal transport of electrolyte and water, enzymatic digestion in monogastric and fermentative digestion in rumen, modification of toxic substances in rumen. Digestion in birds.

Functional morphology of respiratory apparatus. Mechanics of breathing. Transport of blood gases, foetal and neonatal oxygen transport, dissociation curves, pressures, recoil tendency, elasticity, surfactants, pleural liquid, compliance, exchanges of gases in lungs and tissues, neural and chemical regulation of breathing, diffusion, perfusion, hypoxia. Frictional resistance to air flow, airways smooth muscle contraction, respiratory muscle work, panting, adaptation of respiration during muscles exercise high attitude hypoxia, Non-respiratory lung functions. Respiration in birds.

PRACTICAL

Counting of rumen motility, estimation of volatile fatty acids and ammonia in rumen. Bacterial and protozoa count *in-vitro* action of proteolytic enzymes - pepsin and trypsin.

Experimental physiology. Pithing of frog, preparation of nerve muscle-Recording of twitch response, effect of single stimulus- effect of heat and cold. Fatigue - summation, tetanus. Recording of respiration, spirometry. Recording of volume and capacities in different physiological states including determination of vital capacities Recording of rumen / intestinal movements (Demonstration)

REFERENCE BOOKS

1. Dukes Physiology of Domestic animals - Edited by Melvin J Swenson.
2. Review of Medical Physiology - William Ganong.
3. Text book of Medical Physiology - Arthur C. Guyton.

VPB-122 VETERINARY INTERMEDIARY METABOLISM

Credit Hours 2+1=3

THEORY

Enzymes: Definition and classification, EC numbering of enzymes. Coenzymes, cofactors & iso-enzymes. Properties: Protein nature, enzyme-substrate complex formation, modern concept of the active center of enzyme. Specificity of enzyme action: Substrate specificity, group specificity, stereo or optical specificity. Factors influencing enzyme action: Effects of temperature, pH, concentration of substrate and enzyme. Enzyme units: International Units, katal, turnover number & specific activity. Enzyme inhibition: Competitive, non-competitive, uncompetitive inhibition & suicidal inhibition. Allosteric enzymes. Biological oxidation: Enzymes and coenzymes involved in oxidation and reduction viz. Oxidoreductases, oxidases, oxygenases, dehydrogenases, hydroperoxidases & cytochromes. Respiratory chain/ electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain. Carbohydrate metabolism: Glycolysis, Krebs' cycle, glyoxylate cycle, HMP shunt, gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, hormonal control of carbohydrate metabolism & regulation of blood sugar Bioenergetics of carbohydrate metabolism Lipid metabolism: Beta oxidation of fatty acids, ketone body formation, biosyntheses of fatty acids, triacylglycerol, phospholipids & Apoprotein metabolism. Bioenergetics of lipid metabolism.

Protein metabolism: Biosynthesis and degradation. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle

Nucleic acids: Metabolism of purines and pyrimidines. DNA & RNA biosynthesis. Integration of metabolism. Metabolic functions of macro and micro nutrients, Metabolic functions of lipid and water soluble vitamins. Uses of isotopes in metabolic studies.

PRACTICAL

Effect of pH and temperature on enzyme activity. Estimation of normal / abnormal constituents of urine. Electrophoretic separation of proteins. Paper chromatography. Estimation of bilirubin, blood glucose, electrolytes and other metabolic intermediaries in blood (colorimetry/ spectrophotometry/ flame photometry).

LPM -121: FODDER PRODUCTION AND GRASSLAND MANAGEMENT

Credit Hours 1+1=2

THEORY

Importance of grasslands and fodders in-livestock production. Agronomical practices for production of leguminous and non-leguminous fodders in different seasons. Soil and water conservation and irrigation drainage for fodder production. Farm, power and agro-energy. Farm machinery and equipment Harvesting and post harvest techniques "for fodder preservation. Storage of feeds and fodders. Scarcity fodders. Feed and fodder management for individual animals. Fodder production for small units through inter cropping or back yard cultivation. Recycling of animals washings and wastes in fodder production.

PRACTICAL

Visit to the fodder farm. Familiarisation with the various types of fodder crops utilised in the state and the samples of fodder in India. Fodder cropping routines - familiarisation. Collection, preservation and storage of feed and fodder; possible damages/loss and methods to prevent them. Cost calculations of fodder production. Familiarisations with the back yard fodder cropping and intercropping of fodder.

Livestock waste utilisation and recycling. Calculation on the economic aspects of fodder cropping and procurement of feed.

REFERENCE BOOKS

1. Pathak, N.N. and Jakhmola, R.C. Forages and Livestock Production
2. Chatterjee, B.N. and Das, P.K. Forage Crop Production
3. Reddy, D.V. Fodder Production and Grassland Management for Veterinarians
4. I.C.A.R. Handbook of Agriculture
5. Merkel, J. Managing Livestock Wastes
6. Wiseman, Finch and Samuel. Crop Husbandry including Grassland
7. Sastry, N.S.R. Thomas, C.K. and Singh, R.A. Livestock Production Management
8. Humphreys, L.R. Tropical Forages
9. I.C.A.R. Grasses and Legumes
10. Ranjan, S.K. Animal Nutrition in the Tropics

THEORY

Introduction and scope of swine farming in the country. Demography of swine population. Breeds and their role in economy. Management of different categories of swine for optimal production: breeding and pregnant sows; sows at farrowing and after farrowing: pig-Ms, growing stock, lactating sows, feed lot stock. Mating technique in swine. Housing of swine. Swine feeds and feeding. Economics of pig fanning. Equine population of India. Horses, donkeys and mules and their utility. Identification of breeds of horses. Dentition and ageing of horses. Handling, restraining, care and routine management of equines including grooming, saddling and exercise. Stable and Its management Feeding routine for horse, donkeys and mules. Vices of horses. Care of stallion. Mating of Horses broodmare and its care. Foaling and care of newborn. Breeding mules. Care of race horses and preparing horses for show. Doping and its detection. Visit to races, polo, horse show.

Importance of laboratory animal breeding care and housing standards of mice, rats and guinea pigs. General considerations on feeding and breeding of laboratory animals. Prophylactic measures for commonly occurring laboratory animal diseases. Concept of production of specific pathogen free (SPF) and germ free laboratory animals.

Scope of rabbit farming in the country, breeds and their distributions In India and abroad. Limitation of rabbit animal production. Selection, care, and management of breeding stock for commercial purpose. Identification. Care and management of landing animals and kindling. Care of new born, growing stock. Harvesting of products. Breeding and selection techniques for optimal production. Feeds and feeding for rabbit production- Housing of rabbit Shearing/slaughtering and preservation of products. Diseases and parasite control, hygienic care. Disposal, utilization and recycling of wastes etc. Economic aspects of rabbit production, accounting their expenditure, income, etc. Manpower- requirements and personnel/labour management Preparing projects for micro (backyard) mini, and major rabbit farms.

PRACTICAL

Identification of Indian and exotic breeds of swine; handling of swine; Routine inspection . Identification of diseases, examination and control of parasites, vaccination, Identification of pregnant animals. Care during pregnancy, isolation and care of farrowing sows, care of pig lings, Castration, culling, tooth cutting. Calculation of profits and preparation of feasibility reports and projects for piggery. Layout plans of swine houses; routine operations of swine farms. Marketing of swine. Feeding of swines. Preparation of swines for show and judging. Identification of body parts and handling of laboratory animals. Housing system and space requirements for laboratory animals. Weighing, sexing and weaning of laboratory animals. Marking for identification of laboratory animals for purpose of their individual recording. Computation and compounding of balanced diet for laboratory animal mainly Mice, Rats, Guinea -pigs and Rabbits. Feeding schedule of laboratory animals for high breeding efficiency. Maintenance of breeding records of laboratory animals. Prophylactic measures against common disease of lab animate. Hygienic care and control of parasites (routines). Visit to the University Rabbitary. Handling and restraint Body parts. Identification of breeds. Judging. Feeds and feeding. Housing requirement and equipment Farrowing. Care of newly born young ones-tagging, tattooing for identification. Shearing. Dressing of carcass. Horse riding: walking, trotting, cantering and galloping. Preparation of equines for show and judging. Layout plans for stables.

REFERENCE BOOKS

1. Sastry, N.S.R. and Thomas, C.K. (2005)-Livestock Production Management 4th Ed.
2. Anderson, R.S. and Edney, A.T.B (1991)-Practical Animal Handling
3. Warren, M.D. (2002)Small Animal Care and Management, 2nd Ed. Poole. T. (1994)The UFAW Handbook on the Care and Management of Laboratory Animals, 6th Ed.
4. Lebas, F; Coudert, P; Rouvier, R and Rochambean, H. (1986). The Rabbit -Husbandry, Health and Production
5. Brega, J. (1996)The Horse - Breeding and Young Stock
6. Fielding, D. Tropical Agriculturist - Rabbits
7. Wolfenson. S and Lloyd, M. (1994)Handbook of Laboratory Animal Management and Welfare
8. Holness. D.H. (1993)The Tropical Agriculturist - Pigs
9. Sharda, D.P.(2005)Swine Production

AGB-121: PRINCIPLES OF ANIMAL GENETICS AND POPULATION GENETICS**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.

REFERENCE BOOKS

1. Genetics by Monroe W. Strickberger
2. Principles of Geneetics by Gardner/Simmons/Snustad
3. Introduction to Quantitative Genetics by D.S. Falconer
4. Concepts f Genetics by Klug and Cummings
5. Textbook of Population Genetics (Volume I and Volume II) by Sukhvir Singh Tomar
6. Textbook of Animal Breeding by S.S.Tomar

THEORY

Importance of scientific feeding. Feeding experiments. Digestion and metabolism trial. Norms adopted in conducting digestion trial. Measurement of digestibility. Factors affecting digestibility of a feed. Feeding standards, their uses and significance, merit and demerits of various feeding standards with reference to ruminants. Nutrient requirements of livestock-energy and protein requirement for maintenance and production. Methods adopted for arriving at energy and protein requirements for maintenance and production in terms of growth, reproduction, milk, meat, wool and work. Balanced ration and its characteristics. General principles of computation of rations. Formulation of rations and feeding of dairy cattle and buffaloes during different phases of growth, development and production (neonate, young, mature, pregnant, lactating and dry animals; breeding bull and working animals). Formulation of ration and feeding of sheep and goat during different phases of growth, development and production (milk, meat and wool). Use of NPN compound for ruminants.

PRACTICAL

Demonstration of conducting digestion trial in ruminants. Calculation of nutritive value of different feed stuffs in terms of digestible crude protein (DCP), total digestible nutrient (TDN), Nitrogen retention (NR) and starch equivalent (SE). Calculation of requirements of nutrients in terms of DCP, TDN and metabolisable energy (ME) for maintenance, growth, and other types of production like meat, milk, wool, reproduction and work. Formulation of rations for different categories of livestock under different conditions. Demonstration of the methods for improving the nutritive quality of straws and other crop residues. Formulation of rations for feeding of livestock during scarcity periods. Visit to feed factories.