SEMESTER-IV

COURSE NO.	COURSE TITLE	CREDIT HOURS
VAN-221	Veterinary Splanchnology & Applied Anatomy	1+1=2
VPB-221	Veterinary Physiology-III (Endocrinology, Reproduction Growth Environmental Physiology)	3+1=4
VPA-221	Veterinary Entomology & Acarology	1+1=2
VPA-222	Veterinary Protozoology	2+1=3
VMC-221	Veterinary Immunology and Serology	1+1=2
VPP-221	Systemic Veterinary Pathology	2+1=3
LPM-221	Commercial Poultry Production and Hatchery Management	1+1=2
LPM-222	Livestock Production Management-III (Regional interest)	1+1=2
LFP-221	Livestock Farm Practice (Non-Credit)	0+1=1
Total Credits		12+9=21

VAN-221: VETERINARY SPLANCHNOLOGY AND APPLIED ANATOMY

Credit Hours 1+1=2

THEORY

Gross morphological and topographical study of various organs of digestive, respiratory, urinary, male and female reproductive, lymphatic and endocrine systems, Pleura and Peritoneum in Ox Buffalo as type and their comparison with that of Sheep/Goat, Pig, Horse, Dog and Fowl.

Different Terminology used in applied Anatomy. Palpable Anatomical body structures and their use in health and disease.

PRACTICAL

Demonstration and description of palpable anatomical structures on the body surface of live animal (head, neck, thorax, pectoral bones, pelvic bones, limbs). Outline of body cavities and study of organs of digestive, respiratory, urinary, reproductive, lymphatic and endocrine systems of Ox /Buffalo and their comparative anatomy in other species. Pleural and peritoneal reflections. Comparative topographic anatomy in live animals. Nerve blocks and their sites.

Applied anatomy of sites for thoraco-centesis, auscultation, abdominocentesis. rumenotomy, laparotomy, splenectomy, enterotorny, palpation of anatomical structures in the abdominal and perineal regions. Radiographic visualisation of gross anatomical features of various regions of the body. (Note: Computer simulation model studies shall be used for better understanding of the subject.)

REFERENCE BOOKS

- 1. The Anatomy of the Domestic Animals-R. Nile, A. Schummer, E. Seiferle.
- 2. The Anatomy of the Domestic Animals-Septimus Sisson
- 3. Clinical Dissection Guide for Large Animals Horse and Large Ruminants- Georghe M. Contantinescu, Ileana A. Contantinescu
- 4. Primary Veterinary Anatomy- R.K. Ghosh.
- 5. Text Book of Veterinary Histology-H. Dieter Dellmann.
- 6. Atlas of Histology-Victor P. Eroschenko.
- 7. Human Embryology- Inderbir Singh.
- 8. Essentials of Veterinary Embryology-R. K. Ghosh.
- 9. Medical Embryology-Jan Langman
- 10. The Embryology of Domestic animals, developmental Mechanisms and Malformations-Drew M. Noden, Alexander Delahunta.
- 11. Developmental Biology-Scott F. Gilbert.
- 12. A colour Atlas of Avian Anatomy-J. Mc Lelland.
- 13. A colour Atlas of the Buffalo Anatomy-H. P. Singh & K. S. Roy, ICAR Publication.
- 14. A colour Atlas of Clinical Anatomy of the Dog & Cat-J. S. Boyd.
- 15. A colour Atlas of basic Histology-Irwin Berman.
- 16. A colour Atlas of Veterinary Anatomy of the Ruminants-Raymond, R. Ashdown, Stanley done.
- 17. Applied Veterinary Anatomy-Alexander De Lahunta, Robert E. Habel.
- 18. Applied Anatomy of the Domestic Animals-P. A. Ommer, K. R. Harshan.
- 19. Applied Veterinary Histology-William J. Banks.
- 20. Colour Atlas of Veterinary Histology-William J. Bacha, Jr. Linda M. Bacha.
- 21. Histology- A Text and atlas-Michael, H. Ross. Gordon I. Kaye, Wojciech Pawlina.
- 22. Atlas of Feline Anatomy for Veterinarians-Hudson/ Hamilton.
- 23. Veterinary Neuro Anatomy and clinical Neurology-De. Lahunta.
- 24. Histological & Histochimical Methods- Theory & Practice-J. A. Kiernan.
- 25. Anatomy and Physiology of Farm Animals-R. D. Frandson, W. Leewilke, Anna Dee Fails.
- 26. Text book of Veterinary Anatomy-Dyce . sack. Wensing
- 27. Comparative anatomy of the Vetebrates-George C. Kent.
- 28. Miller's Anatomy of the Dog
- 29. A colour atlas of Anatomy of small laboratory animals-P. popesko, V. rajtova, J. Horak.
- 30. Comparative Veterinary Histology-Elizabeth Aughey, Fredric L. Frye.
- 31. A Practical guide to Vertebrate Mechanics-Christopher Mc Gowan, Julian Mulock.
- 32. A Comparative Methids approach to the Study of Oocytes and Embryos-Joel. Richter.
- 33. Text book of Anatomy and Physiology-Anthony and Kolthoff.
- 34. Reproduction in Farm Animals-E. S. E. Hafez, B. Hafez.
- 35. Veterinary Obsterics and Genital diseases-Stephen J. Roberts.
- 36. Veterinary Surgical Techniques-Amresh kumar
- 37. Congenital Malformations in Laboratory and Farm Animals-Kalman T. Szabo.
- 38. Vertebrate Embryology- Robert S. McEWEN.
- 39. Essentials of bovine Anatomy-K. M. Dyce and C. J. Wensing.

THEORY

Hormone cell interaction, sub-cellular mechanisms-metabolism of hormones-methods of study of endocrine system; Receptors- mechanism of regulation; Chemistry of hypothalamo -hypophyseal hormones, target organ, pineal, thyroid, thymus, pancreas, adrenal, prostaglandins, hormones of calcium metabolism, disorders, rennin-angiotensin system, atrial natriuretic factors, erythropoietin, GI hormones, pheromones.

Genetic & endocrine control of gonadal development modification of gonadotrophin release, ovarian functions, follicular development dynamics, endocrine and receptor profiles, sexual receptivity, ovarian cycle, post partum ovarian activity, ovum transport, capacitation, fertilization, reproductive cycles in farm animals- hormones present in the biological fluids during pregnancy and their uses for the diagnosis of pregnancy -maternal foetal placental participation in pregnancy & parturition, immunology of gestation, preparturient endocrine events.

Spermatogenic cycle and wave- function of Sertoli cell-leydig cell- semen -composition-evaluation; Testosterone - function and regulation - cryptorchidism. Puberty -photoperiod- uses of androgens, progestogens, estrogens.

Functional and metabolic organization of mammary glands -structure and development; effect of estrogens and progesterone; hormonal control of mammary growth; lactogenesis and galctogenesis; biosynthesis of milk constituents- secretion of milk, mastitis and metabolism, prolactin and mammary tumours.-lactation cycle.

Biochemical and genetic determinants of growth, regulation of growth, metabolic and hormone interactions, factors affecting efficiency of growth and production in ruminants and single stomach animals. Growth in meat producing animals & birds, growth curves. Recombinant gene transfer technologies for growth manipulation- advantages and limitations. Protein deposition in animals and poultry.

Heat balance, heat tolerance, hypothermia, hyperthermia, thermo-regulation in farm animals, role of skin, responses of animals to heat and cold, fever, body temperature and hibernation. Temperature regulation in birds.

Climatology -various parameters and their importance. Effect of different environmental variables like temperature, humidity, light, radiation, altitude on animal performance. Acclimation, acclimatization -general adaptive syndrome. Clinical effect on endocrine -reproductive function, circadian rhythm.

Neurophysiology of behaviour, types of behaviour, communication, Learning and memory, behavioural plasticity.

PRACTICAL

Oestrus and phases of oestrous cycle in animals (vaginal mucus). Behavioural signs of oestrus. Bio-assay for trophic hormone. Demonstration of hormone estimation. Rectal palpation of reproductive organs. Sperm motility, sperm concentration - live and dead -abnormal sperm count. Measurement of growth in various species. Measuring surface area of animals. Health parameters of animals-body temperature, pulse, respiration and heart rate. Measurement of animal environmental conditions. Behaviour of animals- mating behaviour, milking behaviour, feeding behaviour (live/videographic/computer simulated demonstration)

REFERENCE BOOKS

- 1. Dukes Physiology of Domestic Animals Edited by Melvin J Swenson.
- 2. Text book of Medical Physiology Arthur C. Guyton.
- 3. Veterinary Endocrinology & Reproduction by Mc. Donald.
- 4. Reproduction in Farm Animals by E.S.E. Hafez.
- 5. Adaptation in Domestic animals E.S.E. Hafez and B. Hafez.

VPA-221: VETERINARY ENTOMOLOGY AND ACAROLOGY

Credit Hours 1+1=2

THEORY

General description of insecta and arachnida affecting domestic animals and birds. Arthropoda as direct/indirect parasites. Classification, Life Cycle and vector potentiality in relation to disease transmission, pathogenesis and control of following arthropods affecting animals and birds.

The biting midges (Culicoides), buffalo gnats /Black fly, (Simulium), sandflies (Phlebotomus). The mosquitoes (Culex, Anopheles and Aedes). Horse fly (Tabanus), Musca,

Stomoxys, Sarcophaga, Warbles (Hypoderma) and bots (Gasterophilus), Nasal bot (Oestrus ovis), Myiasis, Wingless flies (Hippobosca, Melophagus), bugs, lice (Haematopinus, Linognathus, Trichodectus, Damalinia, Menopon, Lipeurus, Menacanthus (Poultry lice). Fleas (Pulex, Ctenocephalides, Echidnophaga, Xenopsylla). Arachnids (Ticks and mites of Veterinary importance. Soft tick (Argasidae), (Argas, Onirthodorus and Otobius).

Hard ticks (Boophilus, Hyalomma, Rhipicephalus, Haemaphysalis, Amblyomma, Ixodes), Mites (Demodex, Sarcoptes, Psoroptes, Notoedreus, Chorioptes). Anti-tick immunoprophylaxis Damages to hide and skins due to ectoparasitic infestation.

PRACTICAL

Demonstration of the type representatives of various groups of insects, ticks and mites through charts, specimen and mounted slides - Demonstration of different characters of Insecta and Arachnida (Ticks and mites). Procedure for diagnosis of arthropod infestation to hides and skin. Demonstration of enteric myiasis, Procedures for the collection, fixation, preservation and mounting of arthropod parasites.

REFERENCE BOOKS

- 1. Helminths, Arthropods & Protozoa of Domesticated Animals E.J.L. Soulsby.
- 2. Veterinary Parasitology G.M. Urquhart et. al.
- 3. A Text Book of Veterinary Parasitology B.B. Bhatia, K.M.L. Pathak. & D.P.Banerjee
- 4. Manual of Veterinary Entomology & Acarology S.K. Gupta & Rajindra Kumar
- 5. Veterinary Ectoparasites: Biology, Pathology & Control-Richard Wall & David Shearer

THEORY

Introduction and general description to protozoa and their development. Differentiation from protophyta, bacteria and rickettsia, Classification. Life cycle in relation to transmission, pathogenesis, diagnosis and control of protozoa of veterinary importance.

Kala azar (visceral) and cutaneous leishmaniasis, Animal trypanosomosis (Surra), trypanosomosis (due to African *Trypanosoma*) in cattle and man.

Bovine and avian trichomonosis, black head in turkeys (*Histomonas*), Bovine amoebae (*Entamoeba*) and Batantidium, Giardia sp, Coccidia and coccidiosis of poultry and animals. Cryptosporidiosis, Cyst forming coccidian (*Toxoplasma*, *Sarcocystis*), *Neospora* (*Neospora caninum*). Malaria parasite of animals and poultry (*Plasmodium* and *Haemoproteus*), Piroplasmosis (*Babesia*), Theilerosis (*Theileria*), Recent developments in protozoan vaccines for field use. International regulations for control of different protozoan diseases.

PRACTICAL

Examination of faecal materials for identification of intestinal protozoa, coccidian and flagellates. Preparation of blood smears, their staining and examination of slides for haemoprotozoan parasites. Methods of collection, fixation, preservation and mounting of protozoan parasites. Identification of representative slides of protozoan parasites.

REFERENCE BOOKS

- 1. Helminths, Arthropods & Protozoa of Domesticated Animals E.J.L. Soulsby.
- 2. Veterinary Parasitology G.M. Urquhart et. al.
- 3. A Text Book of Veterinary Parasitology -B.B. Bhatia, K.M.L. Pathak & D.P. Banerjee
- 4. Text Book of Veterinary Protozoology B.B. Bhatia
- 5. Protozoa and Protozoan diseases of Domestic Livestock B.B. Bhatia & H.L. Shah

VMC-221: VETERINARY IMMUNOLOGY AND SEROLOGY

Credit Hours 1+1=2

THEORY

Concepts in Veterinary and Medical Immunology. Immune system: organs, tissues and cells.

Types of immunity. Development of humoral and cellular immune responses.

Antigens: definition, specificity, types and factors affecting immunogenicity, blood group antigens. Antibodies: Structure, properties and function of different classes of immunoglobulins, Site, mechanism and theories of antibody production, Monoclonal antibodies.

Major histocompatibility complex, Complement system; Cytokines: Major types and functions. Serological reactions: Agglutination, precipitation, haemagglutination; Phagocytosis, opsonic index, cytolysis; Complement fixation, neutralization, toxin and antitoxin reaction, immunofluorescence; Hypersensitivity: classification and mechanism of induction. Autoimmunity and immunotolerance. Immunisation of animals. Biologicals: Role of conventional and modem vaccines in immunoprophylaxis. Adjuvants. Quality control of biologicals.

PRACTICAL

Preparation of antigen, Raising of antisera, Concentration of Immunoglobulins, Agglutination (plate, tube). Precipitation {Agar gel precipitation test (AGPT), Crossed immunoelectrophoresis (CIE), Rocket Immunoelectrophoresis (RIE), Indirect agglutination (Latex co-agglutination, Passive haemagglutination (PHA), Reversed passive haemagglutrnarion (RPHA)}, Haemagglutination, Complement fixation test, immunoperoxkJase test (IPT), Fluorescent antibody technique (FAT), Enzyme linked immunosorbent assay (ELISA), Cell mediated immune (CMI) response. Veterinary biologicals (visits and appraisal).

REFERENCE BOOKS

- 1. Veterinary Immunology 7th ed. Tizard
- 2. Immunology Janus Kuby
- 3. Immunology Ivan Roitt

VPP-221: SYSTEMIC VETERINARY PATHOLOGY

Credit Hours 2+1=3

THEORY

Pathological changes including neoplasms in non-infectious disease conditions affecting Digestive System (mouth, pharynx, salivary glands, oesophagus, stomach, intestines, liver, gall bladder, pancreas), Respiratory System (nasal cavity, larynx, bronchi, trachea, lungs and pleura), Musculoskeletal System (muscle, bone, joints, ligaments, tendons), Cardio-vascular System (pericardium, myocardium, epicardium, arteries, veins), Haematopoietic System (bone marrow), Lymphoid System (lymph nodes, vessels and spleen), Urinary System (kidneys, ureter, bladder and urethra), Reproductive System (male and female genital organs), Nervous System (brain, spinal cord and peripheral nervous system), Endocrine System (adrenal, thyroid, thymus, pituitary, parathyroid and pancreas). Skin and Appendages (hoof and horn), Ear and Eye.

PRACTICAL

Post-mortem examination of large and small animals, recording of gross lesions and compiling the postmortem report (including vetero-legal cases), despatch of morbid material in vetero-legal cases, study of gross specimens and histopathological slides pertaining to systemic pathology. Collection and examination of clinico-pathological specimens (blood, urine, body fluids, etc.) for diagnosis of systemic affections.

LPM -221: COMMERCIAL POULTRY PRODUCTION AND HATCHERY MANAGEMENT

Credit hours 1+1=2

THEORY

HOUSING - Location of poultry. Types of poultry houses. Different types of rearing-advantages and disadvantages. Space requirement for different age groups under different rearing systems. Environmentally controlled housing. BROODING MANAGEMENT-Brooding: Types of brooders; preparation of shed to receive chicks; importance of environment (temperature, humidity and ventilation). Feeding and vaccination in early stage of chicks.

REARING AND MANAGEMENT- Care and management of growing, laying/broiler birds of both breeders and commercial categories of poultry. Battery cage management different types and sizes. Poultry judging.

LITTER MANAGEMENT- Litter materials, litter-borne diseases and control; potential for poultry litter used as fertilizers; recycling for livestock feeding and power generation; Special management care in adverse weather conditions/ stress; summer management modification of housing light reflectors; insulators, sprinklers, loggers and other methods; dietary modification to minimize heat stress; special management during rainy and winter season; other stress management- vices in poultry and its remedial measures.

WATER MANAGEMENT- Standard for drinking water in terms of total solids. pH, minerals levels, sanitizers and water sanitations, diseases spread through water contamination-prevention.

BIOSECURITY- Proactive measures to minimize entry of infections in farm premises-farm fencing, disinfectant pits, personnel management restriction of movement etc. Poultry welfare and behaviour.

FEEDING- digestive system and digestion in chicken. Classification, selection of common feed ingredients and their nutrient composition. Nutrient requirement for different age groups. Feed formulations, economics of feed formulation-cost/, unit nutrient Feeding systems and feeding management economization of poultry feeding. Feed restriction, separate male feeding, non-nutrient feed additives including herbal bio-enhancers; anti-nutritional factors and toxins.

HEALTH CARE- Common poultry diseases: bacterial, viral, fungal, parasitic and nutritional deficiencies. Vaccination schedule for commercial layers and broilers: factors that govern vaccination schedule; vaccination principles type, methods, pre and post vaccination care. Medication: Types of administration-general principles and precautions with emphasis on administering medication through water and feed; commonly used drugs in poultry diseases. Disinfection: Types of disinfectants; mode of action; recommended procedure; precaution and handling.

ECONOMICS- Economics of layer and broiler production; Projects reports layer in different systems of rearing. Projects reports for broilers.-Feasibility studies on poultry rearing- in context of small units and their profitability. Designer meat and egg production. Export/import of poultry and poultry products.

BREEDER FLOCK MANAGEMENT- Layer and broiler breeder flock management housing

& space requirements. Different stage of management during life cycle; Light management during growing and laying period, Artificial insemination. Feeding: Feed restriction, separate male feeding. Nutrient requirement of layer and broiler breeders of different age groups. Healthcare: vaccination of breeder flock; difference between vaccination schedule of broilers and commercial birds. Common diseases of breeders (Infectious and metabolic disorders)-prevention. Fertility disorder- etiology, diagnosis and corrective measures. Selection and culling of breeder flocks. Economic parameters on returns from breeders- for example saleable chick/hen/production cycle etc.

HATCHERY PRACTICES - Management principles of incubation. Factors affecting fertility and hatchability. selection, care and incubation of hatching eggs. Fumigation; sanitation and hatchery hygiene. Disposal of hatchery waste; Sexing, grading, packing and dispatch of day old chicks. Economics of hatchery business; Trouble shooting hatch failure: importance of hatchery records, break even analysis of unhatched eggs. Biosecurity in the hatchery. Computer applications for hatchery management

PRACTICAL

Male and female reproductive system. Artificial insemination. Selection of breeder flock. Working of hatchery Incubation requirement; incubators working, care. Hatchery layout and equipments. Handing of eggs prior and during incubation. Candling. Fumigation. Project reports of setting up a hatchery. Hatchery records and maintenance. Exposure to commercial broiler and layer farms-different system of housing. Demonstration of litter and cage rearing systems. Feed equipments and maintenance; hammer mill, mixture, pellet mill-types, principle of working, comparison of different types, premix preparations, quality control of raw materials. Feed mill operation. Demonstration of different types of feeder, waterer, fogger, sprinklers etc. Maintenance of farm records. Medication-demonstration of routinely employed methods of administration. Vaccination practice in general and demonstration of different roots of administration in particular.

Credit Hours: 1+1=2

REFERENCE BOOKS (LPM 211 and LPM 221)

- 1. Scanes, C.G.; Brant, G and Ensminger, M.E. (2004) Poultry Science, 4th Ed.
- 2. Sreenivasaiah, P.V. (2006)Scientific Poultry Production a unique encyclopedia, 3rd Ed.
- 3. Jull, M.A. (2003)Successful Poultry Management
- 4. Sainsbury, D. (1984)Poultry Health and Management
- 5. Roberts, V. (2003)British Poultry Standards
- 6. Leeson, S and Summers, J.D. (1993)Commercial Poultry Production
- 7. North, M.O and Bell, D.D. (1990)Commercial Chicken Production Manual, 4th Ed.
- 8. Murd, L.M. (2003) Modern Poultry Farming
- 9. Leeson, S and Summers, J.D. (1993)Commercial Poultry Nutrition
- 10. Johari, D.C.and Hussain, K.Q. (1996)Commercial Broiler Production

LPM- 222 :LIVESTOCK PRODUCTION MANAGEMENT (REGIONAL INTEREST)

Course Contents to be developed by the University/Veterinary College on the basis of regional interest.