

**Bangabandhu Sheikh Mujibur Rahman Agricultural University**

**Course contents:**

**Department of Anatomy and Histology (ANH)**

**ANH 101: Gross Anatomy I: Course Credit: 3+1.5 (T+P)**

**Theory:**

Introduction: Definition, importance, classification of anatomy, topographic and descriptive terms. Osteology: Classification, composition, physical properties and structure of bones. Description and classification of skeleton; bones of different organs/parts of domestic animals. Arthrology (Syndesmology): Classification and structure of joints. Articulation and ligaments of different areas of body in domestic animals. Myology: Structural and functional classification of muscles. Gross study of skeletal muscles of different regions of body with their origin, insertion and action. Angiology: Gross morphology of heart and disposition of arteries, veins and lymphatics of domestic animals.

**Practical:**

Morphological study of the bones of axial and appendicular skeleton, joints and organs of circulation of domestic animals. Dissection of domestic animals to study skeletal muscles of head, neck, thorax, abdomen, pelvis, tail and limbs.

**ANH 102: General Histology and Embryology: Course Credit: 3+1.5 (T+P)**

**Theory:**

General Histology: Introduction: Definition and importance of histology and its relationship with other subjects. Cytology: Cells and their organelles, structures, composition, physical properties, characteristics, and functions. Basic tissues: Classification, locations, characteristics and function of epithelia and their modification, connective tissue and their components including blood and bone, muscular tissue and their functions. Neuron, nerve fiber and ganglions; Embryology: Fundamental concepts and scopes of embryology. Gametogenesis, fertilization, cleavage, gastrulation, and the development of foetal membranes in domestic animals and birds. Structure and types of mammalian placenta. Development of the organs of digestive, respiratory, urogenital, cardiovascular and nervous system, organs of special sense and endocrine glands. Fetal circulation and changes after birth. Teratology, teratogenesis and twinning.

**Practical:**

Microscopy, micrometry and microscope handling. Comparison of light and electron microscopy. General staining techniques and preparation of histological slides. Microscopic examination and identification of basic tissues and their components. Study of structure of mammalian ova and spermatozoa. Study of the whole mount and serial sections of mammalian/chick embryo/foetus at different stages of development Microscopic anatomy of fetal membranes and placenta.

**ANH 131: Gross Anatomy II: Course Credit: 3 +1.5 (T+P)**

**Theory:**

Splanchnology: Gross morphological and topographical study of various organs of digestive, respiratory, urogenital, lymphatic and endocrine systems, pleura and peritoneum in domestic animals. Aesthesiology: Gross morphological study of the eye, ear, nose, gustatory apparatus, hoof, horn and skin in domestic animals. Neurology: Definition, classification and structures/organs of the nervous system (brain, spinal cord, neuron, nerve, nerve trunk and nerve plexuses) of domestic animals.

**Practical:**

Outline of body cavities and study of organs of digestive, respiratory, urogenital, lymphatics, endocrine and nervous systems of domestic animals through dissection.

## **ANH 132: Systemic Histology: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Digestive system: Different segments of the alimentary tract and accessory organs. Respiratory system: Nasal passages, larynx, trachea and the lungs. Circulatory system: Heart and blood vessels, lymphatic tissues and organs. Urinary system: Kidney, ureter, urinary bladder and urethra. Genital system: Male and female genital organs. Endocrine system: Pituitary, adrenal, thyroid, parathyroid, pancreas, gonads and others endocrine organs/tissues. Integumentary system: Skin and appendages.

### **Practical:**

Examination of histological sections of the organs/parts of various systems (digestive, respiratory, circulatory, urogenital, endocrine and integumentary) of domestic animals.

## **ANH 201: Comparative Anatomy and Neuro-anatomy: Course Credit: 0+1.5 (T+P)**

### **Practical:**

**Comparative Anatomy:** Comparative study of the bones and visceral organs (digestive, respiratory, urogenital, cardiovascular and nervous system) of horse, cattle, goat, sheep, dog, cat and birds. **Neuro-anatomy:** Gross structures of central, peripheral and autonomic nervous system. Circulation, ventricles and cerebrospinal spinal fluid of the brain. Dissection and display of the nerves of head, neck, thorax, abdomen, pelvis, tail, and limbs in domestic animals.

## **ANH 361: Topographic and Surgical Anatomy: Course Credit: 0+1.5 (T+P)**

### **Practical:**

Topographic location of the organs of different systems of the body of domestic animals and birds in relation to surgery. Nerves block and their sites for various surgical interventions in domestic animals and birds. Surface anatomy of the head, neck, thorax, abdomen, pelvis, limbs, and perineal regions of domestic animals and their surgical interventions.

## **Department of Animal Breeding and Genetics (ABG)**

## **ABG 201: Animal Genetics: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Concept, history, application and branches of genetics; Different theories of inheritance, Mendel and his contribution in genetics, Mendel's laws and their modifications; Multiple alleles, coat color inheritance in rabbit, blood groups and blood protein polymorphism in animals; Linkage, its significance and types; Crossing over, its significance and types, cytological basis of crossing over; Sex determination, sex-linked inheritance, sex-influenced and sex-limited traits with their inheritance mechanisms in farm animals; Animal cell-its organelles and function, chromosomes and karyotypes of farm animals, gametogenesis and fertilization in farm animals ;Variation in chromosomal structure and number, significance of chromosomal aberration; Mutation, its classification and causes, phenotypic and genotypic effect of mutation; DNA and RNA, their structure, types and functions, plasmids and mitochondrial DNA; Replication of DNA in prokaryotes and eukaryotes, Transcription of RNA; Genetic code, protein and protein synthesis apparatus, translation and transduction; Recombinant DNA technology and its application, transgenic animals, genetically modified organisms, cloning.

### **Practical:**

Materials used for genetic study and their handling; Blood collection from jugular vein of ruminant for genetic study; Blood processing for genetic study; Study of multiple alleles blood grouping in human; Study on morphology of Drosophila; Preparation of culture media of drosophila; Study on chromosome; Study on cell division.

## **ABG 361: Animal Breeding: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Concept, history, application and branches of genetics.; Different theories of inheritance, Mendel and his contribution in genetics, Mendel's laws and their modifications; Multiple alleles, coat color inheritance in rabbit, blood groups and blood protein polymorphism in animals; Linkage, its significance and types; Crossing over, its significance and types, cytological basis of crossing over; Sex determination, sex-linked inheritance, sex-influenced and sex-limited traits with their inheritance mechanisms in farm animals; Animal cell-its organelles and function, chromosomes and karyotypes of farm animals, gametogenesis and fertilization in farm animals; Variation in chromosomal structure and number, significance of chromosomal aberration; Mutation, its classification and causes, phenotypic and genotypic effect of mutation; DNA and RNA, their structure, types and functions, plasmids and mitochondrial DNA; Replication of DNA in prokaryotes and eukaryotes, Transcription of RNA; Genetic code, protein and protein synthesis apparatus, translation and transduction; Recombinant DNA technology and its application, transgenic animals, genetically modified organisms, cloning.

### **Practical:**

Materials used for genetic study and their handling; Blood collection from jugular vein of ruminant for genetic study; Blood processing for genetic study; Study of multiple alleles blood grouping in human; Study on morphology of Drosophila; Preparation of culture media of drosophila; Study on chromosome; Study on cell division;

## **Department of Animal Science and Nutrition (ASN)**

## **ASN 101: General Animal Science: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Introduction: Definition and scope of animal science, zoological classification of common farm and domesticated animals. Domestication and geographical distribution of farm animals, contribution of livestock and poultry, present situation of livestock, Economic impacts of livestock on farming system of Bangladesh, Integrated farming system; Glossary of animal science: Common scientific terms used in livestock and poultry based on age, sex and purposes; different types of animal derived products; Breeds of livestock: Common breeds of different livestock and their important characteristics; Livestock Feeding: Definitions, Classification of feed stuff, Essential feed nutrients and their function in animal body. Feed scarcity and straw treatment, Feeding system of livestock. Classification of animal based on digestive system and feeding behavior, feed resources of livestock and poultry; Housing of livestock: Definition and objectives of housing, site selection for livestock farms. Type and systems of housing for livestock and poultry; Livestock products and by-products: Definition, composition and food value of different livestock products and by-products. Classification of different types of animal by-products and their uses; Psychology and behavior of animal: Definition, types of behavior in domestic animals, causes of behavioral response in animals. Normal and abnormal behavior of animals. Common vices of domesticated animals and their remedies; Ecology and adaptation: Definition and branches of ecology, relationship of ecology with other disciplines. Adaptation of farm animals, stages and distribution of adaptation, factors responsible for the adaptation of farm animals. Effect of climate on animals, acclimatization of exotic animals in Bangladesh;

### **Practical:**

Animal behavior, psychology, approaching and handling of animal; Identification of different body points of animal; Casting and restraining of animal; Shearing and clipping of animal; Grooming, washing, bedding and clothing of animal; Dehorning and disbudding of animal; Visit of different livestock and poultry species and breeds, and farms; Castration of animal; Live weight determination and marking of animal; Dentition and aging of animal.

## **ASN 102: Fodder Production: Course Credit: 2+1.5 (T+P)**

### **Theory:**

**Introduction:** Definition of feeds, fodder and allied terms, classification and importance of fodder and forage; **Fodder production guidelines:** Suitability of different fodder crops in different parts of Bangladesh, production technology of different fodder crops; **Composition of plant and animal body:** General composition of plant and animal body, comparison between plants and animals, factors that affect the chemical composition of the forage; **Pasture and pasture management:** Definition of pasture, importance and classification of pasture, characteristics of a good pasture, management of pasture land and feasibility of pasturing in Bangladesh; **Poisonous plants:** Predisposing factors and characteristic symptoms of plant poisoning, some common poisonous plants, the prevention procedure and management of plant poisoned animal; **Management of land for better fodder production:** Definition and classify of soil and soil component, relationship between soil P<sup>H</sup> and nutrient availability, problem of soil and its correction; **Conservation of fodder crops:** Importance of fodder crops conservation, methods of conservation, silage and hay: preparation, advantages, methods, crops suitable for silage and hay making, stage of harvesting, factors affecting the nutritive value, nutrients losses during silage and hay making, types of silo pits, characteristics of a good silo, use of additives during ensiling and changes occurs during silage and hay making, haylage.

### **Practical:**

Explore agricultural elements and its importance for fodder production; Select appropriate fodder for livestock; Select appropriate feeds for livestock; Estimation of manure and fertilizers for fodder production; Planning of fodder production; Cultivation procedure of legumes fodders; Cultivation procedure of non-legumes fodders; Preparation of hay; Preparation of silage; Observation of different fodder production activities.

## **ASN 161: Draught and Meat Animal Production and Management: Course Credit: 2+1.5 (T+P)**

### **Theory:**

**Introduction:** Definition, draught animals, choice of species, popular draught animals. History, domestication and geographical distribution of different draught animals, Importance and problems of draught and meat animal production in Bangladesh; **Draught animal management:** Contribution/Importance of draft animal, production system, problems of draft animal production in Bangladesh. Different breeds of draught animals and their characteristics. Selection and judging of draught animals. Housing and feeding of draught animals. Adaptation and effect of environment on draught animal production. Planning and evaluation of small scale and commercial draft animal farm, Common diseases of draft animal and their preventive measure; **Buffalo management:** National and international perspective of buffalo. Contribution/Importance of buffalo, production system, problems of buffalo production in Bangladesh. Different breeds of buffalo and their characteristics. Selection and judging of buffalo. Housing and feeding of buffalo. Adaptation and effect of environment on buffalo production. Planning and evaluation of small scale and commercial buffalo farm, Common diseases of buffaloes and their preventive measure; **Beef cattle production and management:** Terminology related to beef cattle, Beef cattle production systems. Prospects and problems of beef cattle enterprise. Judging and selection of beef cattle, Housing and feeding of beef cattle. Beef fattening program. Planning of small scale and commercial beef farm. Common diseases of beef cattle and their preventive measures; **Sheep and goat management:** Sheep and goat breeds and their characteristics. Housing of sheep and goat. Management of sheep and goat for reproduction. Common diseases of sheep and goat and their preventive measure.

### **Practical:**

Different management practices of buffaloes and draught animals; Care and management of draught animals; Judging and selection of draught and beef cattle; Judging and selection of buffaloes; Record keeping of buffaloes and draught animals; Training of draught animals; Ration formulation for sheep and goat; Planning of small scale goat and sheep farming in semi-intensive system; Survey of small scale beef fattening program and sheep and goat production system.

## **ASN 231: Wildlife, Zoo, Aquatic and Companion Animal Management: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Introduction to wildlife: Concepts and terminologies related to wildlife, importance of wildlife. Status of wildlife in the world and Bangladesh. Zoogeographical regions and wildlife distribution in Bangladesh; habitat requirements of wild animals; causes of extinction of wild animals. Wildlife ecology and environment; Wildlife management: Zoological classification of common wild animals; salient features of selected wild animals; feeds and feeding, restraint, housing and other management of wild animals. Transportation of wild animals. Management of wild animals and birds in the zoo, safari park and national park under natural habitation; Management of laboratory animals: Definition of lab. Animals; general concepts about laboratory animals; classification of lab. animals; salient features of common lab animals; different housing, their requirements and specifications for lab. animals; feeding and management practices of selected lab. Animals; Zoo and zoo animal management: History of zoo; purposes of zoo establishment; role of zoo and zoo education for conservation of wildlife; classification of zoo animals. Management of zoo; different housing, their requirements and specifications for zoo animals; feeds and feeding of zoo animals; restraint and management of zoo animals; staff position of a zoo; precautions at zoo; Conservation of wildlife and biodiversity: Wildlife conservation and biodiversity. Wildlife conservation program in developing countries, threatened species of animals and birds in Bangladesh. Zoo education for the conservation of wildlife. Strategies to conserve wild animals and biodiversity. Wildlife conservation laws and treaties. Wildlife conservation societies and organizations; Planning and development of wildlife habitats: Establishment of national parks, implementation of conservation law. Regulation of wildlife services, research and education, zoo and conservation biology. Principles and management for conservation of endangered species. Planning and development for establishment of zoo and safari park; Breeding and reproduction of wildlife: General concepts related to breeding and reproduction of wildlife. Physiological and environmental factors related to breeding and reproduction of wildlife, zoo, aquatic and companion animal. Breeding and reproductive behavior of wild animals and birds in the forest, especially in the Sundarbans mangrove forest; Preventive measures for common diseases: Common diseases of wildlife, zoo, aquatic and companion animal. Preventive measures and health care of wildlife, zoo, aquatic and companion animals; Management of aquatic animals: Definition of aquatic animals; classification of aquatic animals; categories of aquatic animals available at zoo; salient features of common aquatic animals; different housing, their requirements and specifications for aquatic animals; feeding and management practices of aquatic animals. Climate change and aquatic animals; Companion animal management: Companion animal and their types. Companion animal management and handling program around the world. Companion animal training. Implementation of the companion animal management law, regulation, wildlife services, research and education. Impact of companion animal on human health and psychology. Environmental effects of companion animals.

### **Practical:**

Identification of different species of herbivore zoo animals; Identification of different species of carnivore zoo animals; Identification of different species of reptiles; Identification of different species of birds; Identification of different species of small mammals; Psychology and behavior of common wildlife, zoo, aquatic and companion animals; Restraining and handling of wildlife, zoo, aquatic and companion animals; Planning and management of zoo, safari park, laboratory units and natural habitats; Visiting different zoo for demonstration of management, feeding, breeding and disease prevention; Visiting different safari park, national park and forest to demonstrate habitats of wildlife.

**Field Trip:** Visiting the Zoo and Safari park for acquiring practical knowledge.

## **ASN 261: Ruminant Nutrition, Feeds and Feeding: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Terminology of nutrition, history and gradual expansion of the field of nutrition, classification of nutrients, functions, deficiencies and sources; Physiology and microbiology of rumen ; Fetal development establishment of rumen microbes, microbial population rumen environment, establishment of rumen microbe's types and nutrient requirements by rumen microbes; Digestive systems of different ruminants; Organs of digestion classification of digestion digestive physiology of ruminants, microbial digestion of fibre, bulk importance of bulk digestion absorption and metabolism of CHO's proteins fats minerals and vitamins; Evaluation of feeds; Importance and methods of feed evaluation chemical/proximate analysis digestibility trials evaluation of protein quality in ruminant; Feeding standard; Definition feeding standard development of feeding standard prospects of developing feeding agenda in Bangladesh; balanced ration and feeding of livestock; Formulation of ration for different types of ruminants feeding of livestock during scarcity periods; Anti- nutritional factors in animal feedstuffs; Substances depressing digestion or metabolism of proteins reducing the solubility or interfering with the utilization of minerals inactivating the certain vitamins cyanogen's moulds and mycotoxins in animals' feeds ;Feed technology, storage and quality control of feedstuffs; Processing of grains, compound livestock feed manufactures and feed industry in Bangladesh.

### **Practical:**

Identification of animal feedstuffs; Study on the safety rules in the laboratory; and sampling principles and procedures; Preparation of solutions for chemical analysis; Determination of dry matter (DM) and total ash; Determination of crude protein (CP); Determination of crude fibre (CF); Determination of crude fat/ ether extract (EE); Ration formulation for ruminants. Digestibility / metabolic trials with animals. Visit to livestock farms and feed mill.

## **ASN 331: Non-Ruminant Nutrition, Feeds & Feeding: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Introduction to non-ruminant animals and their feeding behavior, terminology related to non-ruminants' animals; Digestion, absorption and metabolism of micro and macro nutrients; Terms related to energy expression and measurements, applicability of different energy system, calculation of energy requirements of avian and other non-ruminants' animal; Amino acid and their essentiality, measurement of availability, methods for evaluating protein quality in a feedstuff, estimation of protein requirements in non- ruminants' animal; Essential fatty acid, Oxidation, cholesterol or fat as an energy source, synthesis of fatty acid and glycerol; Characteristics, physiological function, deficiency symptoms, sources of vitamin and mineral, composition of vitamin mineral mixture; Interaction among the nutrients, nutrition and feeding, nutrient requirements, diet formulation and feeding methods of non-ruminants' animal.

### **Practical:**

Introduction to the feed of non-ruminants; Ration formulation and preparation for different non ruminant animals; Preparation of vitamin mineral mixture; Introduction of laboratory instruments for analysis of feedstuff; Calculation of TDN; Laboratory animal diets; Digestibility trial on domestic rabbits; Management of rabbit and guinea pig; Management of domestic horse; Survey of feed markets

## **ASN 361: Meat and Wool Technology and Livestock Waste Management: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Introduction and terminology: Description of the prospect, potentials and problems of meat industry in Bangladesh. Terminologies related to meat science, wool technology and waste management; Nutritive value of meat: Define and explain meat, different types of meat and meat cuts. Nutritive value of meat. Chemical composition of meat from different species. Exploring the factors that are actually associated with nutritive value of meat; Quality of meat and meat products: Describing the categories of processed meat and meat products; factors affecting quantity and quality of meat. Differentiate the different quality and safety aspects of meat and meat products, such as pH, rigor mortis and water holding capacity. Eating quality of meat and meat products; The growth and body composition of animal tissue: Explanation of the animal growth phenomena. Classification of the growth curve of different animal species. Description of the animal growth

process. Different types of muscles and their function; Slaughtering and processing of meat animal: Definition and types of slaughtering. Stunning of livestock and poultry. Pre-and post-slaughter care and management of animals. Explanation about slaughtering and processing method of meat animal; Slaughterhouse byproducts: Importance of slaughterhouse byproducts. Illustrating the principles and methods of slaughterhouse byproducts management. Multidimensional use of slaughterhouse byproducts. Importance of hides and skins, processing of hides and skins to prepare leather and leather goods; Meat preservation and spoilage: Importance of meat preservation, principles of meat preservation. Illustration of the methods of meat preservation. Definition of meat spoilage, spoilage phenomena, biochemical and physiological changes of meat and meat products during storage, such as meat pH, meat microbiology, enzyme and other substances. Quality and safety aspects of meat and meat products during storage; Wool Technology: Definition and explanation of glossary of wool, different types of wool. Classification of wool and properties of wool. Factors affecting quality of wool. Animal health and wool quality. Wool Technology: Assessment of the wool quality. Collection and processing of wool to produce yarn, and yarn to fabric or finishing products; Animal waste management: Definition of animal waste and its composition. Importance of animal waste and its management. Impact of animal waste management on animal and human health. Definition and benefits of biogas and compost. Science of composting and factors affecting the composting process. Biochemical and microbial phenomena during biogas production. Animal waste management: Biogas plant management. Establishment of biogas plant. Types of biogas plant and their management. Explanation of the process of bio digestion and factors affecting biogas production. Description of the different methods for compost making with their advantages and disadvantages. Use of biogas slurry.

**Practical:**

Study on pre-slaughter care of animals; Study on methods of stunning of animals; Study on methods of slaughtering of animals; Study on identification of meat of different species; Study on demonstration of different meat cuts and their qualitative characteristics; Study on calculation of dressing percentage, carcass weight and meat yield; Study on characteristics of wool; Study on animal waste management; Visit of meat market, slaughterhouse and meat processing plant; Visit of different waste management practices, biogas plant, and wool processing.

**Department of Dairy and Poultry Science (DPS)**

**DPS 131: General Poultry Science: Course Credit: 2+1.5 (T+P)**

**Theory:**

Scope and importance of Poultry and Poultry industry in BD; Origin, domestication of poultry species; Terminology and classification of Poultry; Breed and its characteristics; Housing, feeds and feeding: nutritional quality, ration; Eggs: types and composition, Incubator and Incubation of poultry; Brooding and rearing.

**Practical:**

Handling of poultry, Identification of poultry breeds; External body parts and internal organs; Identification of feed ingredients and farm equipment's; Identification of feathers; Visit to commercial poultry farm.

**DPS 161: General Dairy Science: Course Credit: 2+1.5 (T+P)**

**Theory:**

Introduction to dairy science, Evolution of dairy industry, Milk marketing channel in Bangladesh, Dairy animal's behavior and comfort, Site selection for dairy farm and fodder land, Classification of dairy feedstuffs, Food value and importance of milk, colostrum and Milk products.

**Practical:**

Introduction to BSMRAU dairy Farm, Identification of common feedstuffs for dairy cattle, Cow comfort index, rumination, Observation of Dairy animals' behavior: locomotion score, gait and posture, Identification of Manure score, Identification of Rumen fill score, Identification of Body Condition score, Acquaintance with milk and milk products.

## **DPS 201: Poultry Production and Management: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Problems and prospect of duck, geese, pigeon, Guinea fowl, turkey and quail rearing in Bangladesh; Profitable poultry production; Site selection and construction of poultry farm; Feeding methods and standard; Forms of feed; Nutrient requirements and formulation of ration for chicken, duck and quail; Layer and broiler strains; Layer and broiler management; Formation, structure and nutritive value of an egg; Persistency of egg production; Factors affecting egg production; Storing, grading, packaging, and preservation of egg; Integration of duck and fish production.

### **Practical:**

Identification of different breeds, varieties and strains of chicken, ducks, pigeons and quail; Selection and culling of breeding stocks; Design of a poultry farm; Preparation of brooder house; Debeaking of chicken; Formulation of ration for poultry species; Meat yield of chicken and duck, Farm planning of chicken and duck.

**Field Trip:** Visiting the poultry farm for acquiring knowledge.

## **DPS 261: Dairy Animal Production & Management: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Advanced studies on breeds, Dairy Farm Operation, Dairy Housing, Dairy Farm Management, Milk synthesis and Milking, Farm Planning.

### **Practical:**

Acquaintance with different breeds of dairy animals, Dairy farm plan and layout for successful dairy operation, Housing of dairy animals, Routine work practices in dairy farm, Judging and selection of dairy animals, Condition scoring, Record keeping practices in dairy farm, Different methods of milking, Tests for detecting abnormal milk and mastitis.

## **DPS 331: Dairy and Poultry Product Technology: Course Credit: 2+1.5 (T+P)**

### **Dairy Products Technology:**

#### **Theory:**

Market Milk, Milk Processing, Milk Products, Quality and safety tests of milk and milk products.

#### **Practical:**

Routine Platform Test of Milk, Determination of Acidity and Fat in Milk, Determination of Total Solids (TS) and Ash in Milk, Parts of cream separator; Separation of cream by modern centrifugal cream separator, Manufacture of Dahi/Yoghurt, Manufacture of butter, butter milk and ghee.

### **Poultry Product Technology:**

#### **Theory:**

Importance of poultry products technology; Egg technology: Physicochemical changes of preserved eggs, Usage of egg as food and nonfood; Preparation of different egg recipes; Meat technology: Pre-slaughter factors affect poultry meat quality; processing and cut-up parts of broiler; Preservation and storage techniques for poultry meat and meat products; Manufacturing of meat products; Nutritional value of meat, meat safety and Hazard analysis and critical control Point (HACCP).

#### **Practical:**

Preparation of mayonnaise, pudding, nuggets, meat ball, chicken soup, kebab and sausages; Demonstration of broiler processing and cut up parts; Visit to broiler processing plant.



## **DPS 401: Breeder Farm Management and Hatchery Operation: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Why breeder farm? Types of breeder farms, Statistics of breeder farms in Bangladesh; Concepts of pure line; commercial breeding programs to produce hybrids, selection and culling of parent stock, Parent stock management; Bio-security measurements; Litter management; Prevention and control of common diseases; Vaccination for parent stock; Disposal of dead birds, manure and litter materials; Hatching egg production; Hatchery operation: Economics of hatchery; Site selection for hatchery; design and construction of hatchery; sanitation measurements; Incubator and incubation of egg; selection of hatching eggs; Sexing, delivery and transportation of day-old chicks

### **Practical:**

Selection and culling of breeding stock; Merit of good and poor layer; Selection of hatching eggs; Design and construction of hatchery; Sanitation of incubator and hatchery building; Fumigation of hatchery; Hatching of eggs using natural and artificial incubator; Candling of eggs; Sexing and delivery of day-old chicks; Visit to commercial hatchery.

## **Dept. of Gynecology, Obstetrics and Reproductive Health (GOR)**

## **GOR 401: Gynecology and Reproductive Biotechnology: Course Credit: 3+1.5**

### **Theory:**

Introduction and definition of common terms; Anatomy and Physiology of Female reproduction; Hormones in Female Reproduction; Puberty and estrous cycle; Breeding soundness examination of female animals; Etiology, diagnosis, treatment, management and economic importance of infertility, subfertility and sterility; Factors affecting reproduction – seasonality, nutrition, stress, environment, management, suckling and diseases; Genetic and acquired anomalies of reproductive tract and fetal development; Diagnosis, treatment and prevention of Mastitis. Lactation and artificial induction of lactation. **Reproductive Biotechnology:** Embryo transfer technology: selection of donors and recipients; Synchronization, super-ovulation, surgical and non-surgical collection of embryos and evaluation of embryos; Cryopreservation of embryos, transfer of embryos to donors; *In vitro* fertilization, *in vitro* maturation, micromanipulation of embryos; Sexing of sperm and embryos; Transgenic animals. Chimeras; Stem cell biotechnology

### **Practical:**

Clinical examination of female genitalia in slaughter house specimens; Comparative anatomy of female reproductive tracts; Evaluation of female animals for breeding soundness; Per-rectal palpation of female genital organs; Estrus detection in cattle and buffaloes; Fern pattern of cervical mucus and exfoliated vaginal cytology; Techniques of intrauterine therapy; External and per-rectal pregnancy diagnosis in cattle and buffaloes; Demonstration of reproductive pathological conditions using museum/slaughter house specimens; Use of ultrasound / RIA / ELISA in gynecology; Synchronization of estrus and ovulation in farm animals; Synchronization of estrus in donors and recipients, super ovulation, surgical and nonsurgical collection and transfer of embryos; Collection of oocytes from slaughter house genitalia. *In vitro* maturation, *in vitro* fertilization and cryopreservation of embryos; Sexing of embryos.

## **GOR 431: Andrology and Artificial Insemination: Course Credit: 2+1.5 (T+P)**

### **Theory:**

Scope of Andrology and Artificial Insemination (AI) in Veterinary Medicine; Functional anatomy and physiology of male reproduction; Spermatogenesis, semen formation and related abnormalities; Clinical examination of males for breeding soundness evaluation; Semen collection, evaluation, processing, preservation and clinical practice of AI; Clinical management of fertility of male animals; Infertility and uterine infections due to faulty AI; Veterinary management of semen borne and AI-related diseases; Recording and clinical analysis of reproductive and AI parameters; Diseases of male reproduction; Health management of AI stud males; Computer application and hormone assays for the veterinary control of AI field services.

**Practical:**

Clinical examination of stud males; Collection, evaluation, processing and freezing of semen; Practice of artificial insemination; Clinical practice of the evaluation of bull station and semen laboratory to certify semen to be used at AI; Path morphological examination of fresh and preserved semen; Collection of seminal fluid for microbiological examination; Preparation of teaser bulls; Operative techniques for the corrections of injuries and affections of male reproductive system.

**Field trip:** Visiting the bull station, Bangladesh cattle development and dairy farm, saver, Dhaka for practical knowledge.

**GOR 461: Reproductive Immunology and Obstetrics: Course Credit: 3+1.5 (T+P)****Theory:**

General principle of immune responses, Mucosal immunity of the reproductive tract, Immunopathology of reproduction, Altered susceptibility to infection in pregnancy, Protection of the fetus against rejection, Passive transfer of immunity from mother to offspring, Effect of gonadal hormones on immune function, Immunoregulation of fertility, Immunology of infertility, Defense/tolerance against spermatozoa, Placenta as an immune organ, Immunity in pregnancy, Immunopathology of placenta, Protection of fetus and neonate against infection, Immune related disorders in pregnancy; Sensitization to seminal fluid and spermatozoa, Immunologic factors related to male fertilization failure. Autoimmune orchitis, Immunological castration. Vaccination to maximize fertility.

**Practical:**

Pelvimetry of different species of farm animals; Demonstration of different types of placenta; Use of obstetrical instruments; Epidural and other obstetrical anaesthesia; Manipulation of fetal malpresentation in phantom boxes; Handling of prolapse of genitalia- application of vulvar sutures; Fetotomy, caesarean section, post-operative care and management of obstetrical cases; Demonstration of ovariohysterectomy and cesarean operation; Laparoscopy and ultrasonography of female reproductive organs; Immunoassays (Radioimmunoassays, Enzyme-linked Immunosorbent Assay, Enzyme immunoassays) in reproductive endocrinology.

**GOR 462: Theriogenology of Wildlife, Zoo, Aquatic and Companion Animals: Course Credit: 2 +1.5 (T+P)****Theory:**

Female reproduction and endocrinology of wildlife, birds and companion animals; Puberty and estrous cycle of wildlife, birds and companion animals; Physiology of mother and fetus during pregnancy. Management of pregnant animals. Methods of pregnancy diagnosis; Abortion. Teratology. Congenital and acquired abnormalities causing reproductive inefficiencies; Initiation and mechanism of parturition, induced parturition, care and management of newborn and dam; Manipulative delivery in companion animals; Injuries and diseases incidental to pregnancy and parturition. Retention of placenta. Utero-vaginal prolapse, Post-partum reproduction and uterine infections; Female reproductive health management of wild zoo and companion animals; Vaccination to maximize fertility in companion animals; Conservation of wildlife, zoo, birds and companion animals using reproductive biotechnology.

**Practical:**

Diagnosis and treatment of genital diseases of male and female animals at the clinics; Treatment of gynaecological and infertility related cases at the clinics and field conditions; Practice of reproductive health management, mastitis diagnosis, treatment and udder health management of different wild and companion animals; Operative techniques of female reproductive system of different wild and companion animals; Clinical and laboratory practice on pregnancy diagnosis of different wild and companion animals; Demonstration on fetotomy and cesarean operation of different wild and companion animals; Laparoscopy and ultrasonography of female reproductive organs of different wild and companion animals; Reproductive biotechnology tools and conservation of different wild and companion animals.

**Field trip:** Visiting the Zoo and safari Park for practical knowledge.

## **GOR 501: Theriogenology (Clinics): Course Credit: 0+2 (T+P)**

### **Practical**

Diagnosis and treatment of genital diseases of male and female animals at the clinics; Treatment of gynaecia-obstetrical and infertility related cases at the clinics and field conditions; On farm practice of reproductive health management, mastitis diagnosis, treatment and udder health management; Operative techniques of female reproductive system; Clinical and laboratory practice on pregnancy diagnosis; Demonstration on fetotomy and cesarean operation; Laparoscopy and ultrasonography of female reproductive organs.

## **Department of Medicine (MED)**

## **MED 361: General Medicine: Credit Hours: 3+1.5 (T+P)**

### **Theory:**

Definition, aim, objective, scope and history of clinical veterinary medicine and its relationship with other field and laboratory disciplines. Concepts of health and disease. Causes of disease (direct and indirect, biological and non-biological causes). Definition of common clinical terms. Diagnostic terms – definition and scope; Introduction to different techniques/methods (general and special) of clinical examination of animals, history taking, examination of the environment and examination of the animal. General examination – distant and close examination, physical examination of body regions and systems, Animal restraint – objective and methods of restraint. Clinical signs – Definition, classification, methods of detection and identification of clinical signs of diseases of different organ-systems of animals. Interpretation of significant clinical findings for diagnosis. Physical examination findings of clinical specimens; B. Diagnosis and treatment: Definition and types of diagnosis, principles of diagnosis, principles and basis of different types of diagnosis. Methods and steps of diagnosis. Indications and limitations of field and laboratory diagnosis; General principles of treatment, definition and scope of different types of treatment, factors of consideration in the treatment of food and non-food animals. Principles of selection of drugs and determination of dose, route, frequency and duration of treatment. Alternative medicine used in clinical and population veterinary practices; General systemic states – Disturbances of appetite, food intake and nutritional status-ill thrift, pica; stress, septicemia, hypothermia, hyperthermia, fever, toxemia, shock. Dehydration, electrolyte and acid-base imbalance.

### **Practical:**

Maintenance of records of everything done in the practical sessions in a practical note book to be checked and signed by teacher(s) concern; Introduction: Scope of veterinary hospital and clinical practice, requirements and responsibility of veterinary clinician; Methods of animal restraint: General and regional; Demonstration of clinical instruments: Diagnostic (including animal restraint) and therapeutic instruments; Demonstration of general (including modified forms) and special physical examination techniques used in different organ-systems of domestic animals (healthy); Handling of clinical cases: General principles and procedures of clinical/physical examination in domestic animals. Demonstration of condition of distant inspection and physical examination; General principles and procedure of clinical history taking and distant inspection. Demonstration of demeanor and physical condition of animals; Clinical investigation of disease in individual sick animals: Clinical history taking, demonstration of methods and procedures of detection, identification and interpretation of clinical findings in making presumptive diagnosis, prognosis and clinical advice. Procedure of filling up of clinical investigation record forms; Clinical specimens: Demonstration of the methods of collection, physical examination, preservation and dispatch of specimens (feces, urine, blood, rumen fluid, abomasal fluid, milk, skin scrapings, plasma, serum, swabs, smears etc) to the laboratory; Demonstration of the methods of administration of drugs: External and internal; Transfusion techniques: Clinical practice on fluid and electrolyte, and blood transfusion in farm animals; Demonstration of drugs, dispensing and prescription writing: Principles and procedures.

## **MED 401: Farm Animal Medicine: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Determinants of non-infectious diseases and other performance problems in cattle, buffaloes and horses. Etiology, pathogenesis, clinical findings, clinical pathology, diagnosis, prognosis, treatment and control of specific non-infectious diseases such as production and nutritional deficiency diseases, diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in cattle; Determinants of infectious diseases in cattle, buffaloes and horses. Etiology, epidemiology, pathogenesis, clinical findings, diagnosis, prognosis, treatment and control of specific infectious diseases associated with biological agents such as bacteria, virus, Mycoplasma, Chlamydia, Rickettsia, algae, fungi, protozoa, helminthes and arthropod parasites in cattle, buffaloes and horses; Determinants of specific diseases of goats and sheep. Etiology, epidemiology, pathogenesis, clinical findings, diagnosis, prognosis, treatment and control of specific infectious diseases associated with biological agents such as bacteria, virus, Mycoplasma, Chlamydia, Rickettsia, algae, fungi, protozoa, helminthes and arthropod parasites; Specific non-infectious diseases including production and nutritional deficiency diseases, diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in goats and sheep.

### **Practical:**

Clinical investigation of various diseases and performance problems and their management; Handling of clinical cases: Clinical/physical examination, non-laboratory presumptive diagnosis, prognosis and conservative treatment of special diseases and clinical advice for restoration of health in individual sick farm animals (domestic ruminants, swines and horses); Collection, physical examination, preservation and dispatch of clinical specimens to respective laboratories of the FVMAS, BSMRAU; Recording of at least 30 clinical cases with post-treatment evaluation and interpretation in a note book (approved format by the Department concern) to be checked and signed by teacher(s) concern; Farm visit.

## **MED 431: Epidemiology and Preventive Medicine: Course Credit: 3+1.5 (T+P)**

### **Theory:**

A. Principles and Methods of Epidemiology and Ecology: Definition, objectives, uses, history and basic concepts of epidemiology. Definition of common; epidemiologic and population medicine terms. Causation of disease in population– multi-factorial theory of disease, Evan’s postulates, necessary and sufficient causes; Determinants of diseases – demographic, animal production and manage mental, environmental and pathogen factors. Temporal patterns of disease occurrence and trends. Veterinary ecology – principles and methods, mode of transmission of infection and disease process in population, infection dynamics; Measurements of health and disease in population – morbidity, mortality rate, case fatality rate, attack rate, prevalence, incidence rate, measurement of productivity. Descriptive epidemiology – survey, surveillance and monitoring of health and disease. Explanatory epidemiology and ecology – principles and methods of observational and experimental studies, analysis and demonstration of association and identification of risk factors. Epidemiologic investigation of sporadic, endemic, epidemic and pandemic diseases. Principles of risk analysis, assessment and management. Livestock development programs – planning, execution and evaluation; B. Preventive Veterinary Medicine: Introduction- Definition, aim, objectives of preventive veterinary medicine. Principles and methods of disease prevention and control. Planning, execution and evaluation of disease management programs in population: management of risk factors, biosecurity, hygienic measures, vaccination, prophylaxis, early diagnosis and treatment, disease control. Disease emergencies – nature and potential consequence, emergency preparedness, reporting and information systems. Management of important diseases of the animals – prevention, control, eradication and elimination with particular reference to List A, List B (TAD) and List C diseases; List A diseases: Mastitis, salmonellosis, colibacillosis, clostridial diseases, parasitic, metabolic and nutritional diseases; List B diseases (Transboundary Animal Diseases, TAD): Foot and mouth disease, PPR, rinderpest, sheep and goat pox, contagious bovine pleuropneumonia, hog cholera, swine fever, swine vesicular disease, vesicular stomatitis, lumpy skin disease, blue tongue, rift valley fever, african horse sickness; List C diseases: Anthrax, dermatophilosis, hemorrhagic septicemia, babesiosis, theileriosis, rabies, Johnne’s disease, tuberculosis, brucellosis, leptospirosis, campylobacteriosis, infectious bovine rhinotracheitis, anaplasmosis, screw-worm diseases heartwater, enzootic bovine leukosis, bovine spongiform encephalopathy (Summary of List B diseases in cattle of international trade significance); Animal health maintenance – general principles, significance of optimum

animal health in optimum production in national and international livestock trade perspectives. General production medicine - general principles, mathematical techniques used in production medicine, record systems and herd monitoring, culling and improvement. Special production medicine - herd health management programs, environmental, disease and dietary management of food animals: dairy cattle, calves and replacement heifers, meat cattle, goat, sheep and swine herds.

### **Practical:**

**Epidemiology:** Epidemiologic explanatory variables: Identification and procedure of measurement in population. Development of questionnaires for various epidemiologic studies, surveys, surveillance and monitoring, Pre-testing of questionnaires in population, methods of collection of data. Statistical analysis of data: Demonstration of association and identification of risk factors. Epidemiologic response variables and properties of diagnostic tests: Procedure of computation. Epidemiologic data management and presenting numerical data, Measurement of population impact and transmission of disease: Procedure of computation. Diagnostic testing for identification of disease process and subclinical disease; Collection and analysis of ecologic data: Demonstration of ecological risk factors of disease in environment of the population of animals and birds. **Preventive Medicine:** Development of questionnaires, collection of disease and health data from population. Statistical analysis for identification of risk factors. Epidemiologic methods of health and disease management: Demonstration of risk factors in population and management. Demonstration of biosecurity, disease security, hygienic and sanitary measures. Disease management programs in population: Vaccination and disease control programs planning, execution and evaluation. Early diagnosis and treatment of disease in population; Herd health programs: Planning, execution, evaluation and extension of strategies.

### **MED 432: Avian Medicine: Course Credit: 3+1.5 (T+P)**

#### **Theory:**

A. Clinical Poultry Medicine: Importance of health and disease management in poultry production; Principles of presumptive diagnosis of disease in poultry population – holistic and clinical field data; Source of infection; Clinical signs of poultry diseases – definition, classification, meanings and interpretation for presumptive diagnosis of diseases. Important general and special poultry diseases (listed below) – definition, causes, pathophysiology, pathogenesis, clinical characteristics (signalment, anamnesis, nature of onset, clinical signs, course and severity, physical findings of specimens), mass diagnosis, mass treatment and prognosis: B. (a) Preventive Poultry Medicine: Objectives and significance of preventive poultry medicine in subsistence and commercial poultry production of Bangladesh; concepts of biosecurity, disease security and flock immunity; Holistic characteristics (frequency, distribution, ecology, temporal patterns and trends, risk factors, economic impact) and management (prevention, control and eradication of important general and special diseases (listed below) in subsistence and commercial poultry populations of Bangladesh; handling of disease outbreaks; disinfection and vaccination in disease control; (b) Production Poultry Medicine: General poultry production medicine – General principles of flock health, mathematical techniques used in flock health management, record systems and flock monitoring, culling and improvement. Special poultry production medicine – planning and evaluation of poultry flock health management programs (environmental, disease and dietary management) for commercial layer, broiler, cockerel and quails, subsistence chickens and ducks; hatchery and hatching eggs management; **Poultry Diseases:** General Diseases: Crop impaction, enteritis, stunted chick disease, bumble foot, round heart disease, endocarditis, nephrosis and gout, egg bound, abnormal eggs, egg peritonitis, false layer, internal layer; Infectious diseases: Avian streptococcosis, avian staphylococcosis, avian salmonellosis, avian cholera, anatipestifer infection, Infectious coryza, avian colibacillosis, avian clostridiosis (botulism, ulcerative enteritis, necrotic enteritis, gangrenous dermatitis), tuberculosis, avian mycoplasmosis, avian chlamydiosis, avian pox, Newcastle disease, infectious bronchitis, infectious laryngotracheitis, Marek's disease, lymphoid leukosis, egg drop syndrome, infectious bursal disease, chicken infectious anemia, avian influenza, hydropericardium-hepatitis syndrome, duck plague, duck virus hepatitis, aspergillosis, candidiasis, thrush; Parasitic diseases: Nematode, cestode and trematode infections, avian coccidiosis, histomoniasis, trichomoniasis, leucocytozoonosis, avian malaria, hemoprotozoan infections, cryptosporidiosis, external parasitic infestations (flea, lice, tick, mite infestations); Metabolic, nutritional, chemical and physical diseases: Protein, carbohydrate, fat, vitamin and mineral deficiency diseases. arsenic, calcium, copper, lead, nitrate, bicarbonate, sodium chloride, potassium permanganate, organic insecticides, chlorinated hydrocarbons and organophosphorus poisoning, mycotoxicoses, ascites and edema, heat stress, ammonia blindness, cannibalism,

egg eating, smothering, cage layer fatigue, acute death syndrome in broiler; Hatchery and egg-borne diseases, diseases of public health significance.

### **Practical:**

Demonstration of clinical signs of poultry diseases in population level; Clinical specimens: Methods of collection, physical examination, preservation and dispatch of specimens to the laboratory. Methods of mass diagnosis using clinical and holistic field data of disease in population; Methods of administration of drugs in mass treatment, and vaccination; Epidemiologic investigation of disease: Development of questionnaires for collection of data on poultry population characteristics and transmission of disease using principles and methods of descriptive and explanatory epidemiologic studies; Procedure of measurement of poultry health and disease variables; Statistical analysis of data, demonstration of association and identification of risk factors of poultry health and disease. Methods of management of risk factors in subsistence and commercial poultry flocks; Vaccination and disease control programs in subsistence and commercial poultry flocks: Planning, execution and evaluation of the programs, preparation of vaccination schedule; Demonstration of materials used in preventive and control measures and methods of administration in poultry; Development of questionnaires for collection of health and production data from subsistence and commercial poultry flocks; Procedure of measurement of poultry health and production variables and collection of data. Analysis of data to determine shortfalls and demonstration of shortfalls, Principles and procedure of eliminating shortfalls in commercial flocks; Profit oriented flock health program: Planning, execution and evaluation for various commodities of poultry-layer, broiler, chicks, cockerel, etc; Field trips to public and private poultry farms for practical exposure.

**MED 461: Wildlife, Zoo, Aquatic and Companion Animal Medicine:** Course Credit: 3+1.5 (T+P)

### **Theory:**

A. Zoo and Laboratory Animal Medicine: Introduction, history and scope of Wildlife, Zoo, Aquatic and Companion Animal Medicine. Requirements for zoo veterinarians, Definition of related terms. Epidemiological significance of zoological gardens; Animal status in different zoo in Bangladesh, ethology (behavior) and stress in zoo animals and birds; Restraint - different methods and adverse effects of restraint; Principles of diagnosis of diseases of zoo and laboratory animals - dispatch of samples to the laboratory and laboratory methods of diagnosis; Health management of different zoo and laboratory animals; Classification, biological characteristics, feeds and feeding, restraint and handling and important diseases of common species of zoo animals and birds of the following orders, Aves, Reptiles and mammals (Marsupialia, Edentata, Chiroptera, Non-human primates, Lagomorpha, Rodentia, Carnivora, Proboscidea, Perissodactyla and Artiodactylia); Principles of nutrition and nutritional deficiency diseases in zoo animals and birds with their treatment and prevention. Zoonotic diseases of zoo and laboratory animals and birds and their prevention and control. B. Small Animal Medicine: Definition, causes, pathophysiology, pathogenesis, clinical characteristics (signalment, anamnesis, nature of onset, clinical signs, course and severity, physical findings of specimens), presumptive diagnosis, prognosis, conservative treatment and nature of response and clinical advice on the following important general and special diseases of pet dogs and cats in Bangladesh; General diseases: General systemic states- Hyperthermia, hypothermia, toxemia, weakness, syncope, obesity, cachexia; Digestive disorders-anorexia, inappetance, polyphagia, ptyalism, vomiting, diarrhea, constipation, dysentery, gastroenteritis; Respiratory disorders – sneezing, nasal discharge, coughing, tachypnea, dyspnea; Urogenital disorders – Genital discharges, polyuria, polydipsia, urinary incontinence, urine retention, discolourtion of urine, proteinuria; Cardiovascular disorders-Abnormal heart sounds and pulse, hypotension, hypertension. Hemopoietic disorder – Anemia, polycythemia, cyanosis, jaundice, epistaxis, hemoptysis; Neurological disorders–Shivering, trembling, ataxia, paresis, coma, stupor, seizures, abnormal behavior; Endocrine and musculoskeletal disorder—Acromegaly, diabetes, hypothyroidism, lameness, swollen joint; Diseases of eye and ear; Skin diseases: alopecia, pruritus, skin lesions, erosive and ulcerative dermatitis; Special diseases: Viral diseases: Canine distemper, Canine hepatitis, Rabies, Canine parvovirus and Coronavirus infection, Feline panleukopenia, Kennel cough, Feline leukemia, Feline infectious anemia, Feline rhinotracheitis; Bacterial diseases: Salmonellosis, Campylobacteriosis, Tuberculosis, Pseudotuberculosis, Brucellosis, Leptospirosis, Actinomycosis, Tetanus, Botulism, Tyzzer's Disease, Tularemia, Borreliosis, Lyme Disease, Streptococcosis, Cat Scratch Disease, Bubonic Plague; Fungal diseases: Dermatophytosis, Candidiasis, Moniliasis, Histoplasmosis, Cryptococcosis, Aspergillosis. Parasitic diseases: Protozoan diseases – Coccidiosis,

Cryptosporidiosis, Amebiasis, Giardiasis, Toxoplasmosis, Babesiosis, Trypanosomiasis, Leishmaniasis, Sarcocystosis; Helminth diseases – Heartworm disease, Ascariasis, Hookworm disease, Strongyloidosis, Tapeworm disease, Whipworm Disease, Giant Kidneyworm Disease, Esophageal And Stomach worm Disease, Trichinellosis; External parasitic infestation – Lice, Tick, Flea and Mite infestations; Non-infectious diseases: Nutritional deficiency diseases, b) Diseases caused by physical and chemical agents, immunological disorders and cancer.

**Practical:**

Requirement of zoo veterinarians. Methods of restraining of zoo and laboratory animals and birds. Demonstration of drugs and vaccines used in zoo and laboratory animals with their dose and route of administration. Methods of clinical examination, collection and dispatch of specimens to the laboratory for confirmation of diagnosis and treatment of sick zoo and laboratory animals and birds. Requirements and planning for establishing an ideal zoological garden and laboratory animal house. Preparations of a note book everything done in the practical classes. Provision for funds and transport for practical classes in zoological garden in Dhaka zoo and students should prepare and submit the report on practical classes held in zoo during final examination; Small Animal Medicine: Introduction and requirements of small animal clinic and responsibilities of the small animal practitioners; Methods of restraining of dogs, cats and zoo and laboratory animals and birds; Methods of clinical diagnosis of diseases of dogs and cats- History taking, distant inspection and physical techniques, clinical examination of different body regions and different systems and organs of small animals; Methods of laboratory diagnosis-collection, physical examination, preservation and shipment of stools, urine, blood, skin scrapings, smears, swabs and edematous fluid. Diagnostic imaging techniques; Demonstration and dispensing of drugs and their doses, route of administration, duration of treatment and adverse drug reactions in dogs and cats; Recording of clinical cases of dogs and cats and their prescription writing, post-treatment evaluation and interpretation; Field trips to the Central Veterinary Hospital, Dhaka and other private small animal clinic for practical classes.

**MED 501: Metabolic and Nutritional Diseases of Farm Animals: Course Credit: 2+0 (T+P)**

**Theory:**

Metabolic diseases: Definition of metabolic and production diseases and their differences, Common metabolic profile test, differential diagnosis of common causes of recumbency in parturient adult cattle, Milk fever, downer cow syndrome, bovine ketosis, pregnancy toxemia, fat cow syndrome, acute hypokalemia in cattle, neonatal hypoglycemia, grass tetany, lactation tetany, hypophosphataemia, post-parturient hemoglobinuria, azoturia; Nutritional diseases: Protein-energy deficiency diseases, vitamin-mineral deficiency diseases (vitamin A, D, E, B, calcium, phosphorus, magnesium, cobalt, copper, iodine, iron, manganese, zinc, selenium deficiency diseases), rickets, osteomalacia, osteodystrophia fibrosa; Diseases caused by chemicals, poisons, toxins: Organophosphorus and carbamates poisoning, chlorinated hydrocarbon poisoning, nitrate and nitrite poisoning, hydrocyanic acid poisoning, arsenic and lead poisoning, urea poisoning, oxalate poisoning, poisoning by anthelmintics, snake bite, bee stings, tick paralysis; Diseases caused by physical agents: Environmental pollutants and noises, Radiation injuries, Brisket disease. Lightning stroke and electrocution, Bush fire injury, Fleece rot, burns and scalds, yoke gall. Dermatoses due to physical agents related to ploughing and transportation. Management and temperament of the animals due to thorny fruits and grass seed injuries; Diseases caused by hypersensitivity reactions: Iso-immune hemolytic anemia, purpura hemorrhagica, Laminitis, Allergic dermatitis, Milk allergy, Bovine atopic rhinitis; Diseases caused by inheritance of undesirable characters: Chromosomal anomalies, Metabolic defects, Inherited diseases of the different systems and organs; Diseases of uncertain etiology.

**MED 502: Forensic Medicine, Jurisprudence and Animal Welfare: Course Credit: 3+0 (T+P)**

**Theory:**

A. Forensic Medicine, Jurisprudence: Introduction and definition of Veterinary Forensic Medicine and Jurisprudence; aims, scope, uses and branches of forensic medicine; difference between forensic medicine and jurisprudence; legal system – criminal courts and powers; vetero-legal wounds – classification and description of vetero-legal wounds, differences of different wounds, determination of age of injury, vetero-legal

importance of wound healing; common frauds in the sale of livestock and its products; Common offences against animals – bestiality, maiming, mischiefs and mischievous killing (poisoning, slaughtering, violence, starvation, strangulation and drowning); causes of sudden death; accidental deaths – lightning stroke and electrocution; Examination of live and dead animals in criminal cases and submission of vetero-legal specimens; Vetero-legal report writing; Vetero-legal evidence – hints for giving evidence and witness; Veterinary legislations – The Cattle-Trespass Act 1871, The cattle (prevention of trespass) ordinance 1959, The Poisons Act 1919, The cruelty to animals act 1920, The society for the prevention of cruelty to animals ordinance 1962, The Bangladesh Animal Diseases Act 2005, The Bangladesh Animal and Animal Products Quarantine Act 2005, The Fish Feed and Animal Feed Act 2010, The Animal Slaughter (Restriction) and Meat Control Act 2011, The Wildlife (conservation and security) act 2012. Organization of veterinary service in Bangladesh (BVC) – nature and scope of veterinary services; Professional conduct, professional malpractices, liability, veterinary ethics, animal insurance; B. Animal welfare: Introduction: Definition, objectives, concepts, indications and public perceptions. Causes of welfare problems of the following animals: Draught and farm animals, pet and entertainment animals, laboratory, wild and captive animals, pet birds and poultry. Control of animal welfare problems-Animal welfare regulations.

**MED 503: Medicine (Clinics):** Course Credit: **0+2** (T+P)

**Practical:**

Handling of clinical cases: Clinical/physical examination, non-laboratory field-based presumptive diagnosis, prognosis and conservative treatment of both general and special diseases and clinical advice for restoration of health in individual sick animals and birds attended at Veterinary Teaching Hospital of BSMRAU; Collection, physical examination and dispatch of specimens to the laboratory; Preparation of a note book which will include a) recording of 30 clinical cases with post-treatment evaluation and interpretation (approved format prescribed by the department concern). The note book is to be checked and signed by teacher(s) concern.

**Department of Microbiology and Public Health (MPH)**

**MPH 101: Animal Hygiene and Bio-security:** Course Credit: **2+1.5** (T+P)

**Theory:**

Introduction: Definition of hygiene, health, disease. Classification of hygiene. Importance of animal hygiene and its scope in health and production. Influence of environment on health; Soil: Definition, soil and disease. Sanitary improvement and sanitation of soil; Air and ventilation: Definition. Hygienic importance and effect of ventilation on animal health. Types of ventilation; Water: Sources of water, hygienic requirements of water, water contamination, water purification and examination of water; Sanitation: Definition, importance, drainage and sewerage system, disposal of waste, disposal of carcasses; Prevention and control of diseases: Hygienic measures for the prevention and control of infectious disease, isolation, quarantine, disinfection, disinfestation, immunization; Biosecurity program, types of biosecurity, component of biosecurity. Biosecurity as an international issue; Biosecurity risk assessment in laboratory, biosafety levels and corresponding biosecurity risk and physical security levels in laboratory; Acid rain and greenhouse effect.

**Practical:**

Determination of health by external appearance (signs of health); Methods of recording temperature, pulse and respiration; Methods for the administration of medicine; Methods of bandages and clothing; Sanitary inspection and disinfection of different farms and surroundings.

**MPH 161: General Microbiology:** Course Credit: **3+1.5** (T+P)

**Theory:**

Introduction and Clinical examination: **Introduction:** History and development of microbiology. Classification of microbes, General morphology, physiology and nutrition, cultivation, isolation, identification and growth of bacteria; **Bacterial genetics:** Nucleic acid, Plasmid, mutation, transformation, transduction and conjugation; **Mechanism of infection:** Infection, transmission of infection, route of infection, relationship of



microorganisms to a disease, general defense mechanism of the body, virulence, factors involving the virulence of microorganisms; **Bacterial toxins:** Toxins and antitoxins, endotoxin and exotoxins, toxins produced by bacteria and their effect on host tissue; **Sterilization and Disinfection:** Methods and principles of sterilization, types of disinfectants and their characteristics; Morphology, physiology and nutrition, cultivations and toxins of Fungi, Rickettsia, Chlamydia and Mycoplasma.

### **Practical:**

Operation of microscopes; Methods of sterilization and preparation of cultural media; Microscopic study of living microorganisms; Staining techniques; Demonstration of bacteria in specimens; Cultivation, isolation and identification of bacteria; Antibiotic sensitivity test; Sterility test of glass wares and equipment's.

## **MPH 231: Systemic Bacteriology and Mycology: Course Credit: 3+1.5 (T+P)**

### **Theory:**

Bacteriology: Classification of bacteria. Morphological, cultural, biochemical and pathogenic characteristics of the organisms belonging to the following genera-*Actinobacillus, Actinomyces, Aeromonas, Bacillus, acteriodes, Bordetella, Borrelia, Brucella, Campylobacter, Clostridium, Corynebacterium, Diplococcus, Enterobacter, Escherichia, Hemophilus, Klebsiella, Leptospira, Listeria, Moraxella, Mycobacterium, Nocardia, Pasteurella, Proteus, Pseudomonas, Salmonella, Serratia, Shigella, Sphaerophorus, Spirillum, Staphylococcus, Streptococcus, Treponema, Vibrio* and *Yersinia* spp; Classification, properties, pathogenicity, transmission and diagnosis of Mycoplasma, Rickettsia and Chlamydia of different animals and birds; Mycology: Important identifying characteristics and classification of following fungi- *Aspergillus, Histoplasma, Rhinosporidium, Microsporum, Trichophyton, Candida, Cryptococcus, Sporotrichum* and *Coccidioides* spp. as well as Mycotoxins.

### **Practical**

Growth characteristics of organisms of different bacteria on various media; Morphological, cultural, biochemical and fermentation characteristics of various organisms; Bacteriological and mycological examination of water, milk and food stuff; Methods of cultivation and identification of Rickettsia, Mycoplasma and Chlamydia; Antimicrobial susceptibility testing of common pathogens isolated from clinical and pathological samples.

## **MPH 261: Virology: Credit Hours: 3+1.5 (T+P)**

### **Theory:**

**Introduction:** History of virology, physical, chemical and biological properties of viruses, Classification of viruses, Viral inactivating agents, Purification of viruses, Replication of viruses and their effect on host tissues, Bacteriophages, Transmission and reservoir of viruses, Viral immunity, Interference phenomenon and interferon, Viral vaccines and chemotherapy, Persistent infection and slow virus infections; Studies on the properties, cultivation, pathogenicity, transmission, immunity and diagnosis of viruses of the following diseases of animals and birds; Avian encephalomyelitis, Avian leukosis complex, Canine distemper, Duck plague, Duck viral hepatitis Foot and mouth disease, Influenza viruses, Infectious bovine rhinotracheitis, Infectious bronchitis, Infectious bursal disease, Infectious canine hepatitis, Infectious laryngotracheitis, Marek's disease, Mucosal disease complex, Newcastle disease, Prion, Rabies, Rinderpest, Rota virus infection, Vesicular stomatitis, Pox diseases, Feline panleucopenia, Bovine ephemeral fever, PPR and other important viral infection of animals and birds.

### **Practical**

Selection, collection, transport, preservation, and preparation of virological specimens for laboratory examination and identification of viruses, Filters and filtration techniques; Purification of virus, analysis of viral proteins using sodium dodecyl sulphate polyacrylamide gel electrophoresis ( SDS-PAGE), Coomassie brilliant blue stain and Western blotting; Cultivation and titration of viruses in indicator host system (intact host system, embryonated eggs, tissue culture system). Assay of infectivity of viruses: plaque assay, Focus assay; Media, reagents and other necessary biologics prepared and used in the laboratory; Identification of viruses by PCR, RT-PCR; Methods of cultivation and identification of Mycoplasma, Rickettsia and Chlamydia; Introduction to biosafety cabinet.

### **MPH 301: Immunology, Serology and Molecular Technique: Credit Hours: 2+1.5 (T+P)**

#### **Theory:**

Introduction: History of immunology, Immunity and resistance and their types. Development, structure and functions of immune system Basic phenomenon's of immune response; Antigen: Definition, composition, properties of antigens, adjuvant. Types and uses of vaccines. Different types of adjuvants; Antibodies: Definition, composition, properties, formation and uses of antibody, Types of immunoglobulins and their properties and functions. Monoclonal and polyclonal antibodies and their production techniques; Cytokines and immune system; Major Histocompatibility Complex (MHC) Molecule; Complement: Definition, properties, and activation of complement and functions; Antigen processing, Lymphocytes, Helper T cells and their response to antigen, B cells and their response to antigen; T cell function and destruction of cell associated antigen; Regulation of immune response; Different techniques of Antigen and antibody reactions (eg Agglutination, precipitation, complement fixation, Enzyme Linked Immuno-sorbent Assay (ELISA), Fluorescent tagged antibody reaction, and neutralization, immune peroxidase); Immunologic disorder and their consequences; Hypersensitivity and immune tolerance; Basics of Vaccinology-Vaccines, vaccination and vaccination schedule. Production, evaluation, storage and transportation of vaccines; Principles of Molecular techniques- DNA extraction, Polymerase chain reaction and Gel electrophoresis.

#### **Practical:**

Serological test: Agglutination test, Agar gel precipitation test, complement fixation test, Enzyme Linked Immuno-sorbent Assay (ELISA), Fluorescent tagged antibody reaction (FAT), Neutralization test, Immunoperoxidase radioimmuno assay (RIA) and Haemagglutination inhibition test; Molecular techniques: DNA extraction, Polymerase chain reaction and Gel electrophoresis.

### **MPH 431: Dairy Microbiology and Food Hygiene: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

Introduction and significance of dairy microbiology, Sources of contamination of milk, Hygienic milk production; Classification of dairy microorganisms: Morphology and classification of dairy bacteria. Characteristics of important microorganisms, Characteristics of spoilage and pathogenic microorganisms, Characteristics of dairy associated fungi and bacteriophages. Microorganisms associated with milk: Microorganisms associated with raw milk and their significance, Role of psychrotrophs in milk, Effect of processing on microorganisms in milk; Microbial spoilage of milk: Role of microbes in spoilage of milk – Microbial interactions, Milk fermentations, Abnormal milk fermentations, contamination and spoilage of milk and milk product. Adulteration of milk. Diseases transmitted through milk and their significance on health. Bacteriological quality of milk and milk products. Mastitic milk: Mastitic milk – Suitability for processing and public health significance, Detection of mastitic milk. Milk borne diseases: Food infection, intoxication and toxic-infection, investigation of food borne disease outbreaks. Food safety practices: Microbiology in food plant sanitation. Food legislation, standards and codes of practices, Hazard Analysis Critical Control Point (HACCP); Antimicrobial substances in milk; Microbiology of market milk; Microbiology of lactic starter.

#### **Practical:**

Qualitative and quantitative methods of milk testing; Dye reduction test; Direct microscopic count (DMC); Standard plate count (SPC); Coliform counts in Milk; Methods of Enumeration of other groups of bacteria; Enumeration of yeast and molds in Milk.

### **MPH 501: Public Health and Zoonoses: Credit Hours: 2+0 (T+P)**

#### **Theory:**

**Public Health:** Definition, objectives, functions and activities of public health and veterinary public health; The common basis for veterinary and public health practices, public health team. Organization, administration and functions of public health; Importance of veterinary knowledge in public health; Public health aspects of milk production, transportation and marketing; Major obstacles of VPH delivery services in Bangladesh; Ante-mortem inspection, transportation of meat animal, slaughtering of meat animals and birds, pre-harvest

and post-harvest technology foods at farms and manufacturing level; Abattoir: Principles for planning of an abattoir and situation in Bangladesh.; Inspection and judgment of carcass; Adulteration and misinterpretation of meat foods. Diseases transmitted through meat and meat products; Capacity building in public health: Principles and Practices of One Health approaches in Bangladesh. **Zoonoses:** Concept, classification and impact; Zoonotic diseases: Bacterial, Viral, Parasitic and Fungal zoonoses; Impact of zoonotic diseases in human and animal health; Prevention, control and eradication of zoonotic diseases; General methods of epidemiological investigation of zoonotic disease.

### Department of Pathobiology (PBL)

#### **PBL-201: General Parasitology and Entomology: Credit Hours: 3+1.5 (T+P)**

##### **Theory:**

**General Parasitology:** Introduction to Parasitology, Basic terminology, History, Origin and Evolution of Parasites, Types of parasitism, Host Parasite relationship and adaptation of parasites. Injurious effects of parasites on their hosts, Resistance and immunity of parasites, Geographical distribution and transmission of parasites, Economic importance, Systematic Classification of parasites, Host and organ specificity, Parasitic zoonoses, definition and general pattern of life cycle of helminthes, General consideration of control measures against parasites; **Entomology:** Introduction to Entomology, Arthropods and their economic significance, Classification of Arthropoda, Respiratory, digestive, nervous and reproductive systems of arthropods, Morphology, life cycle, pathology and pathogenesis, vector role and control of the species of the following; **Phthiraptera:** Haematopinidae, Linognathidae, Pulicidae and others; **Hemiptera:** Cimicidae, Reduviidae; **Siphonaptera:** Pulicidae and others; **Diptera:** Culicidae, Ceratopogonidae, Simuliidae, Psychodidae, Tabanidae, Gastrophilidae, Glossinidae, Muscidae, Calliphoridae, Oesteridae, Hypodermatidae, Cuterebridae, Hippoboscidae and others; **Dictyoptera,** Coleoptera, Lepidoptera, Hymenoptera; **Acarina:** Ixodidae, Argasidae, Demodicidae, Sarcoptidae, Psoroptidae, Dermanyssidae, Cheylotidae and others Pathogens transmitted by insects and arachnids; Biological control of arthropods; Pesticides and pesticide formulations and pesticide resistance

##### **Practical:**

**General Parasitology:** Preparation of solutions used for parasitological examinations; Laboratory procedure for the diagnosis of parasitic infections; Methods for collection, preservation and transportation of parasitic materials; Qualitative and quantitative methods of estimating parasitic infection; Miscellaneous; **Entomology:** Methods for collection, shipment, fixation and preservation of arthropod samples; Methods for preparation of permanent mounts of insects and arachnids; Examination of skin scrapings for mange; Demonstration of wing venation of insects; Field visit at livestock and poultry farm for collection and identification of ectoparasites; Identification of the important members of the order Phthiraptera, Hemiptera, Siphonaptera, Diptera and Acarina; Miscellaneous;

#### **PBL-231: General and Nutritional Pathology: Credit Hours: 3+1.5 (T+P)**

##### **Theory:**

**Introduction:** Definition, Branches and scope of Pathology; **Cell injury, cell death and necrosis:** Definition, causes and biochemical and ultrastructural changes of cell injury and death. Characteristics of tissues and necrotic cells; **Apoptosis:** Definition, causes, pathogenesis, morphological features, significances and effects of apoptotic cell death, Differentiation between accidental and apoptotic cell death; **Cell death Necrosis:** Definition, classifications, causes, gross and histopathological features, significances and effects, outcome/disposition of necrosis, Differentiation between necrosis and postmortem autolysis; **Gangrene and Infarction:** Definition, classifications, causes, gross and histopathological features, significances and effects, outcome/disposition of gangrene and infarction; **Intracellular and extra cellular depositions and degenerations:** Fatty change, extra cellular accumulation of lipids, glycogen deposition and glycogen storage diseases; lysosomal storage diseases; extracellular deposition of proteins-amyloid, albumin and fibrin; **Mineral deposits and pigments:** Pathologic calcifications and ossification, gout, exogenous and endogenous pigments; jaundice, photosensitization dermatitis; **Disturbances of growth:** Development Anomalies and Malformation, Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Hypoplasia, Aplasia, Dysplasia, Anaplasia,

Neoplasia; **Disturbances of circulation:** Definition, classification, oetiology, occurrences, pathogenesis, changes, significances and effects of thrombosis, embolism, hyperemia and congestion, haemorrhage, oedema and shock; Failure to clot; **Inflammation:** Definition, cardinal signs, classification, oetiology, occurrences, pathogenesis, changes, significances and effects and; vascular and cellular events in inflammation; chemical mediators of inflammations; cells of inflammation; types of inflammation; Healing, Fever; **Immunopathology:** Immune response, cells related to immunity, and immune effectors mechanisms; hypersensitivity; autoimmunity; immunodeficiency; **Extraneous poisonings:** Classification of extraneous poisons on the baiss of pathologic features. Pathology of snake venoms, arsenics, urea, oleander, copper, carbon tetrachloride, gossypol, vetch, sulfonamides, selenium, dicoumarin, bracken fern, nitrate, nitric, kale, rape mycotoxins, organophosphates, strychnine, lathyrus, coffee senna, coyotillo; **Nutritional and Metabolic diseases:** Deficiencies of fat soluble and water soluble vitamins, deficiencies of calcium, phosphorus, iron, copper, zinc, iodine, deficiency of protein; ketosis, milk fever, grass tetany, rickets, osteomalacia, fibrous, osteodystrophy.

### **Practical:**

Methods of collection, Preservation, Fixation, processing and staining of pathological specimen and gross microphotographs.

### **PBL-261: Helminthology and Malacology: Credit Hours: 3+1.5 (T+P)**

### **Theory:**

**Trematoda:** General characteristics, general life cycle, classification of trematodes; Morphology, life cycle, pathology and pathogenesis, diagnosis, control/biocontrol of the species of the following: Fasciola, Fasciolopsis, Fascioloides, Dicrocoelium, Prosthogonimus, Eurytrema, Paramphistomum, Gastrothylax, Gigontocotyle, Cotylophoron, Gastrodiscus, Homalogaster, Metagonimus, Paragonimus, Echinostoma, Catatropis, Schistosoma, Nanophyetus, Ornithobilharzia, Opisthorchis, Clonorchis and other veterinary important genera; Nematodes: **General characteristics, general life cycle, classification of nematodes:** Morphology, life cycle, pathology and pathogenesis, diagnosis, control/biocontrol of the species of the following: Ascaris, Parascaris, Toxascaris, Toxocara, Oxyuris, Enterobius, Heterakis, Asaridia, Subulura, Strongyloides, Chabertia, Oesophagostomum, Stephanurus, Ancylostoma, Stephanurus, Ancylostoma, Necator, Uncinaria, Bunoatomum, Trichostrongylus, Ostertagia, Cooperia, Haemonchus, Dictyocaulus, Metastrongylus, Protostrongylus, Angiostrongylus, Habronema, Thelazia, Spirocerca, Parafilaria, Setaria, Gongylonema, Tetremeres, Gnathostoma, Dirofilaria, Wuchereria, Loa, Dipetalonema, Onchocerca, Dracunculus, Trichuris, Capillaria, Trichinella, Dioctophyma and other veterinary important genera; **Cestoda:** General characteristics, general life cycle, classification of cestodes Morphology, life cycle, pathology and pathogenesis, diagnosis, control/biocontrol of the species of the following: Taenia, Echinococcus, Moniezia, Anoplocephala, Paranoplocephala, Davainea, Raillietina, Cotugnia, Stilesia, Thysanosoma, Avitellina, Amoebotaenia, Choanotaenia, Metroliaesthes, Dipylidium, Hymenolepis, Diphyllbothrium, Mesocestoides, Spirometra and other veterinary important genera; **Malacology:** A brief introduction to Malacology; Classification, Morphology, Biology and Ecology of common fresh water snails; Important genera and species of snails involved in the life cycle of parasites; Control of Veterinary Important snails.

### **Practical:**

**Helminthology:** Laboratory procedure for the diagnosis of trematodes, nematode and infections; Identification of helminth eggs; Identification of metacestodes; Identification of nematode larvae; Preparation of permanent slides; Preparation of temporary slide and supravital staining; **Identification of important members of Trematoda, nematodes and Cestoda;** Microscopic mesearument of helminthes and their eggs. Practical demonstration of helminths at slaughter house; **Malacology:** Collection and shipment of snails; Morphological study of snails and their identification; Examination of snails for the recovery of cercariae; Miscellaneous;

### **PBL-301: Protozoology: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

History of Protozoology, Anatomy of Protozoa, Nutrition, locomotion, reproduction and excretion of Protozoa, Classification of Protozoa, Morphology, life cycle, diagnosis, pathogenesis and control of the following species of genera: Trypanosoma, Leishmania, Tritrichomonas, Trichomonas, Hexamita, Histomonas, Giardia, Entamoeba, Eimeria, Isospora, Toxoplasma, Sarcocystis, Neospora, Cryptosporidia, Plasmodium Haemoproteus, Leucocytozoon, Hepatozoan, Babesia, Theileria, Balantidium, Anaplasma, Ehrlichia, Eperythrozoon, Hemobartonella and others.

#### **Practical:**

Qualitative and quantitative fecal examination for protozoa; Blood examination for protozoa; Examination of crop and genital discharges for Trichomonas; Microscopic measurement of Protozoa; Identification of important members of Protozoa; Miscellaneous;

### **PBL-302: Systemic Pathology and Oncology: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

Etiology, Pathogenesis, Lesions, Signs, Significances and effects, Diagnosis of the disorders of the following systems: Digestive system; Respiratory system; Urinary system; Genital system; Cardiovascular system; Musculoskeletal system; Skin and appendages; Haemopoietic and Lymphatic systems; Endocrine system; Nervous system and Organs of Special Senses.

#### **Oncology:**

Definition, scope and importance of oncology; Neoplasia: Definition, classification, differentiation between benign and malignant tumors; Brief description of important neoplasms including etiology, pathogenesis and prognosis; Diagnosis of cancer; Immune against cancer;

#### **Practical:**

Techniques of preservation of pathological specimen: Processing of tissues; Preparation and staining of microslides. Practical demonstration of pathological museum specimens and gross micro photographs

### **PBL-331: Pathology of Infectious Diseases: Credit Hours: 3+0 (T+P)**

#### **Theory:**

Introduction to general pathogenesis and pathology of infectious diseases: **Bacterial Diseases:** Pathogenesis and pathology of different bacterial diseases of animals with special emphasis on anthrax, clostridial infections, streptococcal and staphylococcal infections, campylobacter infections, colibacillosis, brucellosis, tularemia, salmonellosis, actinobacillosis, pasteurellosis, yersiniosis, listeriosis, leptospirosis, borreliosis, corynebacterium infections, tuberculosis, paratuberculosis, and mycoplasmosis; **Viral Diseases:** Pathogenesis and pathology of important viral diseases of animals with special emphasis on pox, infectious bovine rhinotracheitis, bovine malignant catarrh, infectious canine hepatitis, papillomatosis, canine parvovirus infection, foot and mouth disease, African horse sickness, rotavirus infections, bovine virus diarrhoea-mucosal disease, hog cholera, equine viral arteritis, canine distemper, rinderpest, rabies, bovine ephemeral fever, equine infectious anemia, bovine spongiform encephalopathy; **Fungal diseases:** Pathogenesis and pathology of important fungal diseases of animals with special emphasis on Aspergillosis, Blastomycosis, Coccidioidomycosis, Cryptococcosis, Histoplasmosis, Candidiasis and Dermatomycoses; **Rickettsial Diseases:** Pathogenesis and pathology of important viral diseases of animals with special emphasis on Typhus fever, Rocky Mountain spotted fever, Scrub typhus, Q fever, Salmon disease of dogs, "Heart water", Tickborne fever and Bovine petechial fever, Bartonellosis, Anaplasmosis, Haemobartonellosis, Eperythrozoonosis. **Chlamydial Diseases:** Pathogenesis and pathology of important viral diseases of animals with special emphasis on Psittacosis, Sporadic bovine encephalomyelitis, Polyarthritides, Enzootic bovine abortion, Enzootic ovine and caprine abortion and Pneumonia

## **PBL-361: Avian Pathology: Credit Hours: 3+1.5 (T+P)**

### **Theory:**

**Introduction:** Present situation of poultry diseases and biosecurity status in Bangladesh; **Bacterial Diseases:** Salmonellosis, colibacillosis, pasteuriosis, infectious coryza, tuberculosis, streptococcosis, staphylococcosis; **Viral Diseases:** Infectious bursal disease, Newcastle disease, Marek's disease, avian leucosis, fowl pox, infectious bronchitis, infectious laryngotracheitis, avian influenza, chicken infectious anaemia, egg drop syndrome, duck plague, duck viral hepatitis, viral arthritis; **Parasitic Diseases:** Ascariasis and other nematodiasis, tapeworm infection, coccidiosis, infestation by ectoparasites; **Fungal Diseases:** Aspergillosis, thrush, candidiasis; **Mycoplasmal and Chlamydal Diseases:** Avian mycoplasmosis avian mycoplasmosis, avian chlamydiosis; **Non-infectious Diseases:** Deficiencies of fat soluble and water soluble vitamins, deficiencies of calcium, phosphorus, copper, zinc, deficiencies of amino acids and protein, calories and water; common vices, mycotoxicosis and other poisonings; **Diseases of complex or unknown etiology:** Gout, multicausal respiratory disease, hydro pericardium hepatitis, syndrome, ascites and right ventricular hypertrophy, enteric disease complex, spiking mortality syndrome.

### **Practical:**

Study of virus poultry diseases using laboratory specimens, histopathological slides illustrations and transparencies. Postmortem examinations and interpretations

**Field Trip:** Visiting the poultry farm for acquiring practical knowledge of farming.

## **PBL-501: Clinical Pathology and Necropsy: Credit Hours: 0+2 (P)**

### **Practical:**

**Clinical Pathology: Introduction:** Definition and scope of clinical pathology and necropsy, setting up a clinical pathology laboratory, cleaning and maintenance of glassware and instruments used in clinical pathology, Preparation of various buffers, stains and reagents; **Clinical haematology:** Methods of collection of blood, serum and plasma. Routine hematological test-total erythrocyte count, total leukocyte count, hemoglobin estimation, erythrocyte sedimentation rate, packed cell volume tests for coagulation disorders; interpretation of hematological findings in animals and birds; **Clinical biochemistry:** Clinical tests for urine and their interpretations. Tests for heart, muscles, liver, kidney, pancreas and bone function with their interpretations; **Clinical diagnosis of parasitic diseases:** Qualitative and quantitative examination of faecal samples. Examination of skin scrapings; **Clinical laboratory diagnosis of bacterial and fungal infections:** Methods of sample collection, culture, common staining and antibiotic sensitivity tests; **Techniques of Immunodiagnosis:** ELISA, agar gel precipitation test, haemagglutination and haemagglutination inhibition tests.; Collection and examination of biopsy materials and clinical cytology; Methods of writing clinical report; **Necropsy:** Techniques of postmortem examination of animals and poultry: interpretations of post-mortem findings, Selection, collection, preservation and shipment of pathological specimens to the diagnostic laboratories for diagnosis of specific disease or disease conditions; Methods of disposal of carcasses. Methods of recording of necropsy findings and writing report.

## **Department of Physiology and Pharmacology (PHP)**

## **PHP 161: General Physiology: Credit Hours: 3+1.5 (T+P)**

### **Theory:**

Introduction to Physiology: Definition, branches, objectives and scopes of physiology; The Cell: Definition, cell concept, organization and functions of the cell; Membrane Physiology- osmosis, Simple diffusion, Facilitated diffusion, filtration, ultra-filtration, dialysis, surface tension, suspensoids, emulsoids, absorption, adsorption, inhibition, Na- K ATPase system, phagocytosis, pinocytosis. Transport through cell membrane, Membrane potential, Action potential, Donnan's theory of membrane Equilibrium; Physiology of blood and body fluids: Properties of blood, composition and function of blood, plasma and serum, Origin and development of erythrocytes (Erythropoiesis), structure composition and function of erythrocyte, Hemoglobin and its derivatives, Physiological hemolysis, Fate of erythrocytes, anemia and its type, polycythemia and its

type, effect of anemia and polycythemia, hemagglutination and blood groups, cross matching, erythroblastosis fetalis, Leukocytes- Leukopoiesis, structure and function of leukocytes, types of leukocytes, life span of leukocytes, leukemia and its effects. Pus, Thrombocytes-Thrombopoiesis, structure and function of thrombocytes, hemostasis and blood coagulation, natural anticoagulant, fibrinolysis, Plasma protein and its function, edema, Lymph- formation, composition and function, Tissue fluids- intracellular and extracellular fluid; Temperature regulation, basal metabolism and homeostasis: Poikilothermism and Homeothermism, body temperature, heat balance, physiological responses to heat and cold, regulation of body temperature, Reaction to extreme environmental temperature, Basal Metabolic Rate (BMR), Fever, mechanism of fever, Hypothermia, Hyperthermia, feedback mechanism, reaction of solution (PH), acid- base balance; Physiology of sense organs: Perception, general characteristics of perception and sensory modalities, physiology of Skin (receptors and functions), physiology of olfaction (Nerve of olfaction and its pathways), physiology of vision (rhodopsin cycle, pathways, types and errors of vision), physiology of audition (nerve of auditory, labyrinth, mechanism of hearing and auditory pathways) and physiology of gustation (Taste buds, definition and classification of taste, adaptation of taste and taste pathways).

### **Practical:**

Measurement of Respiration, Pulse and Temperature of different animals and birds; Methods of collection and preservation of blood, plasma and serum from various species of animals; Preparation and uses of anticoagulants; Total Erythrocyte Count (TEC) – Principle, method, interpretation and precautions; Total Leukocyte Count (TLC) – Principle, method, interpretation and precautions; Differential Leukocyte Count (DLC)- Principle, method, interpretation and precautions, absolute number of leukocyte count; Hemoglobin determination -Principle, method, interpretation and precautions; Blood Grouping; Packed Cell Volume (PCV); Erythrocyte Sedimentation Rate (ESR)

Clotting time and bleeding time; Hemolysis and hematin test; Isolation and perfusion of organs from live laboratory animals; Separation, Preservation and culture of cell from different organs of laboratory animals.

### **PHP 201: Systemic Physiology: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

**Physiology of respiratory System:** Respiratory apparatus, types of respiration, mechanism of respiration, respiration of newborn; Types of breathing, volumes of air respired, intrapulmonary pressure; intrathoracic pressure, Pulmonary compliance. Pneumothorax, respiratory rates, composition of inspired and expired air, transport and exchange of blood gases; Regulation of respiration; Respiration in birds, Hypoxia, Hypoventilation, Decompression sickness.

**Physiology of urinary system:** Function of kidney, Urine. Mechanism of urine formation and composition, renal threshold, Plasma clearance, rennin- angiotensin pathway, control of renal excretion, Micturition, urine of birds.

**Physiology of Muscles:** Types, properties and functions of muscles, isotonic isometric contraction; Tetanus, changes in muscle during contraction, rigor mortis; Smooth muscle and its contraction.

**Physiology of nervous system:** Function of Neuron, nerve fibers, glial cell, synapse. Nerve impulse and stimuli, receptors and perception, Function of Brain, Spinal cord and peripheral nerves. Autonomic nervous system- classification and functions. Reflex action, postural and condition reflexes.

**Physiology of Cardio vascular system:** Origin and conduction of heart beat, theories of heart beat, course of circulation- systemic, coronary, pulmonary and portal circulation, cardiac cycle, cardiac output, electrocardiogram; Heart sounds, venous return, Regulation of the heart rate, blood pressure, vasomotor mechanisms.

**Physiology of Endocrine system:** Introduction of Hormone and receptors, classification, mode of action, regulation of hormone secretion. Hormones of Hypothalamus, pituitary, thyroid, parathyroid, adrenal, pineal, pancreas, testis, ovary, corpus luteum, uterus and placenta – their secretions, mode of action and function.

#### **Reproductive Physiology:**

**Male:** Spermatogenesis, transportation of spermatozoa, semen, capacitation. Preservation of spermatozoa for artificial insemination, Thermoregulation of testis. Male sex hormones, their mode of action and functions.

**Female:** Functions of ovary, folliculogenesis, ovulation and transport of ova, Puberty, Factors influence puberty, estrous cycle, menstrual cycle, corpus luteum- its formation and function, fertilization, cleavage and implantation, gestation, lactation.

### **Practical:**

Urine- a) general chemistry, (b) Physical examination of urine e.g. volume, color, odor, transparency (c) Determination of specific gravity of urine (d) estimations of ammonia, chlorides, phosphates, (e) Tests for abnormal constituents of urine, e.g. Acetone and aceto acetic acid, glucose, albumin, bile pigments, bile salts, blood, pus; Examination of blood biochemistry; Use of apparatus for data acquisition-cardiac function, tension measurement of blood vessels, summation, tetanus and fatigue of muscle; Arterial blood pressure measurement (clinical); Measurement of respiratory volumes and capacity; Oxygen content and oxygen capacity of blood; Pregnancy test: Pregnancy determination by barium chloride test, Urine test strips; Hormonal analysis of biological fluids; Normal Physiology of reproductive organs, Routine examination of semen (collection and evaluation of semen); General knowledge on radioimmunoassay and enzyme immunoassay.

### **PHP 231: Nutritional Physiology: Credit Hours: 2+0 (T+P)**

#### **Theory:**

**Physiology of Digestion:** Physiology of digestion, Organs of digestion, Factors of digestion- Mechanical, Chemical and Biological, Digestion in mouth, salivary glands and their secretions, composition of saliva, secretion from stomach/gastric juice and its other biochemical processes in the stomach, Control of secretion and motility of Stomach, Intestinal movement, hunger contraction, thirst, vomiting, pancreatic juice and its composition and function, Regulation of pancreatic secretion, Digestion of carbohydrate, protein and fat.

**Physiology and microbiology of rumen:** Establishment of rumen microbes, microbial population, rumen environment, types and nutrient requirements by rumen microbes. Ruminal digestion of different types of feed.

**Physiology of Absorption and metabolism of nutrients:** Definition and classification of nutrients, field of nutrient, functions, deficiencies (essentiality of nutrients in animal health and production), sources of nutrients. Absorption (site, routes and mechanism) and metabolism of CHOs, proteins, fats, minerals, vitamins and water. Deficiency symptoms in animal and birds, Nutrients exchange and utilization by body tissue, Factors affecting metabolism.

**Digestion absorption and metabolism of nutrients of birds:** Digestion in birds, absorption and metabolism of nutrients in poultry.

**Physiology of Growth and Behavior:** Growth curve, Measurement of growth, body measurements, prenatal and postnatal growth, Factors affecting live weight growth, the observation and recording of farm animal behavior, classification and description of farm animal behavior.

### **PHP 261: General Pharmacology and Therapeutics: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

##### **General Pharmacology**

**Introduction:** Definition of pharmacology and its branches, historical development of pharmacology, scope of pharmacology, Definition, sources and composition of drug, Drug standards, assay and regulation, Drug dosage forms, Prescription writing, Drug nomenclature and classification; **Pharmacokinetics:** Pharmacokinetics and pharmacodynamics, Methods and routes of administration of drug, Factors altering drug response, Principle of drug activity, Drug incompatibility and adverse drug effects, Receptors and Drug-receptor theory; **Therapeutics-Chemotherapy:** Definition and basic principles of chemotherapy (General consideration), Different chemotherapeutics (Drugs of antimicrobial, local anti-infective drugs-antiseptics and disinfectants); **Antibiotics:** Definition, classification of antibiotic with chemistry ( Based on mode of action, spectrum of activity, bacteriostatic or bacteriocidal) Ideal features, sensitivity and the ways of resistance of antibiotic, Dose, mode of action, pharmacokinetics, residues in food animals, bacterial resistants, Toxicity (Acute and chronic), contraindication and precautions of different antibiotics ( $\beta$ -lactam penicillin, Tetracycline and Chloramphenicol, Aminoglycosides, Macrolids, Cephalosporin and Miscellaneous antibiotics); **Sulphonamides:** History, chemistry, classifications, commonly used sulphonamides with doses, potentiated sulphonamides, clinical uses and microbial susceptibility (sensitivity and resistance) of sulphonamides (Antibacterial spectrum), Mechanism of antibacterial action of sulphonamides, Pharmacokinetics of sulphonamides, Residues of sulphonamides in food animals, Toxicity (Acute and



chronic), contraindication and precautions of sulphonamides, Fluroquinolones and miscellaneous; **Anthelmintics:** Definition and classification of anthelmintics, antinematodal, anticestodal, antitrepatodal drugs with their doses, mode of action, pharmacokinetics, indications, toxicities, contraindication and precautions; Antiprotozoal drug, antiarthropodal drug, antifungal drug, antiviral drug, antineoplastic drug and immunomodulatory agents; An introduction to gene therapy; Herbal drugs: Identification, active principle/ingredients, indication, contraindication and side effects of different important medicinal plant with their therapeutics.

### **Practical:**

Identification of various instruments used in pharmacology, Weights and measures; Identification, preparation and study of actions and dosages of common veterinary drugs; Study of the actions of drugs on laboratory animals; Preparation of solution (Iodine, acriflavin and calcium borogluconate), lotion (Boric acid lotion), Ointments (Iodine, Sulphonamides and Whitfield's), liniments (ABC), Paste (BIPP) and powder (Dusting), pills, tablet, capsule, bolus; Group discussion, interpretation and presentation of antimicrobial drugs (Bacteria, virus and fungus), Anthelmintics, antiprotozoal, ant arthropodal drugs, Local anti-infective drugs,

### **PHP 301: Systemic Pharmacology: Credit Hours 3+0 (T+P)**

#### **Theory:**

**Digestive Pharmacology:** Introduction, Drugs use in gastro-intestinal tract's disorders (Sialics and Antisialics, Demulcents, stomachics, Emetics and antiemetics, Carminative and Antizymotics, Intestinal astringents, Antidiarrheal, Antacids, Cathartic drugs (Laxatives and Purgatives), Different tonics of digestive system; **Respiratory Pharmacology:** Introduction, Drugs for cough and bronchial asthma (Pharyngeal demulcents, Expectorants, Mucolytics, Antitussive, Antihistamines and bronchodilators), membrane shrinking drugs and respiratory stimulants; **Urinary Pharmacology:** Introduction, Drugs acting on kidney (Diuretics and Antidiuretics), Drugs altering the pH of the urine (Urinary acidifiers and Alkalizers), Drugs which alter the excretion of organic molecules, Urinary antiseptics and kidney tonic; **Pharmacology of heart and circulatory system:** Introduction, drugs affecting myocardial contractility and rhythmicity ,drugs affecting heart, vasculature and peripheral circulation, antihypertensive drug, heart tonic, heart stimulant and depressant, Cardiac glycosides; **Haematopoietic pharmacology:** Introduction, anti-anaemic, haemostatic, coagulant and anti-coagulants, Blood volume expanders and fluid therapy; **Pharmacology of nervous system:** Introduction, Depressant (General depressant: sedative, Hypnotics or soporifics, Narcotics, Analgesics or Anodynes, Tranquillizers, Anesthetics, Sympatholytic and parasympatholytic drugs, Ganglionic blocking drugs) Stimulants (Sympathomimetic and parasympathomimetic drugs); **Endocrine Pharmacology:** Introduction, Classification of drugs affecting the endocrine system (Hormones and related drugs) with their pharmacological effects, interpretation of mechanism of actions, pharmacokinetics, indications, toxicities, contraindication and precautions; **Nutritional Pharmacology:** Introduction, Supplementation of nutrients as drugs (Vitamins, Minerals and trace elements); **Dermatologic and ophthalmic pharmacology:** Introduction, Study of the drugs acting locally on the skin, mucous membranes, eyes and ears; **Prophylactic Pharmacology:** Introduction, Study of vaccine, sera and diagnostic agents; **Miscellaneous Drugs:** Autacoids and anti-inflammatory drugs with special reference to histamine, antihistamine, H1 and H2 blocker, Serotonin, Bradykinin, Angiotensin, prostaglandin and non-steroidal anti-inflammatory drugs.

### **PHP 331: Toxicology: Credit Hours: 3+1.5 (T+P)**

#### **Theory:**

**General Toxicology: Introduction:** Definition and classification of toxicology, Definition of some toxicology related terminology (Poison, Toxin, Toxicity, Hazards and Lethal dose 50 etc), Sources of poisoning, Classification of toxicants, Toxicokinetic (Absorption, distribution, Biotransformation and excretion of toxicants), Mechanisms of poison, Fundamentals of toxicology, Factors altering the action of poisons, General diagnosis, collection and sending of materials for toxicological analysis and general treatment of poisoning. **Clinical Toxicology-Poisonous plants:** Cyanogenetic, estrogenic and teratogenic plants, Plants producing lathyrism, Plants producing oxalate, Plants producing photosensitization, oleander, Castor bean, Datura, Strychnine, Ergot, Ipomoea, Abrus, Nuxvomica poisoning; **Inorganic Poisons:** Iodine, Fluoride, Phosphorous, Arsenic, lead, mercury, selenium, Copper, Molybdenum, Iron, Zinc and Thallium, sodium chloride, Ammonia, Ammonia compounds and Urea; **Organic poisons:** Anesthetics, acetylcholine,

adrenaline, anthelmintics, antibiotics and sulfonamides; **Pesticides:** Botanical insecticides, organochlorine compounds, organophosphate and organ carbamate compounds, Acaricides, Insecticides, fungicides, herbicides, Fumigants and rodenticides; **Fungal and bacterial toxins:** Mycotoxins and bacterial toxins; **Poisonous Animals:** Honey, bees, wasps, Ants, Snakes etc; **Environmental toxicology:** Various agents causing environmental pollution, i.e. soil, air and water pollution. Food additives and contaminants. Drug and chemical residues in the edible tissues of animals. Radiation and radioactive materials. Green house effects; **Miscellaneous poisons:** Plants and chemicals producing teratogenic, mutagenic, carcinogenic and allergic conditions.

**Practical:**

Identification, characterization of common poisonous plants available in Bangladesh; General diagnostic procedure for different poisoning cases; Collection, preservation and sending of specimens for toxicological analysis; Laboratory diagnosis of poisons (Cyanide, Nitrate, Arsenic, mercury and Mycotoxin) etc.

**PHP 501: Clinical Pharmacology and Pharmacy: Credit Hours: 0+2 (T+P)**

**Practical:**

Collection, preparation, packaging and preservation of solution, suspension, capsules, tablet, paste, emulsion, ointment, etc. Compounding and dispensing of various preparations; Pharmaceutical dosage forms and packaging; Collection, identification and use of common indigenous medicinal plants and plant extract; Techniques used for the assessment of antibiotics, anthelmintics, anti-inflammatory drugs, antiseptics and other common drugs; Clinical aspects of rational safe and effective drug therapy; Drug therapy of individual disease, introduction of new medicines; Techniques of transfusion and Infusion, Measurement of Hemodynamic in rat and mice; Methods of drug administration.

**Field trip:** Three days to visit various pharmaceuticals companies/industries (Pharmaceutical Preparation Packaging, Pharmaceutical quality control).

**Department of Surgery and Radiology (SRA)**

**SRA 361: General Surgery: Course Credit: 3+1.5 (T+P)**

**Theory:**

**Introduction:** Definition of common surgical terms and methods of therapy; **Principles of surgery:** Preoperative consideration of animals, inflammation, suppuration and abscess formation, affections of uropygeal gland in bird, contusions, fibrosis and sclerosis, wounds, ulceration, necrosis, gangrene, sinus, fistula, cysts, tumors, haematoma, lymphangitis, edema, emphysema, physical lesions, affections of joints, fractures and repair of bones, yoke gall, hemorrhage and homeostasis, burns and scalds, frost bite, shock and its management, cryosurgery, paracentesis, asepsis and antisepsis; **Surgical affections causing lameness:** Definition, classification, etiology, clinical signs, diagnosis, prognosis and treatment of different foot diseases causing lameness; **Fluid therapy:** Different types of fluids, assessment of fluid deficit, administration of fluids, electrolyte and acid-base balance, transfusion of physiological fluids, blood and blood plasma.

**Practical:**

**General considerations for surgery:** Preparation of patient and surgeon, restraint of animals, identification and use of instruments, sterilization of surgical instruments, dressing, bandaging, sutures and suture materials, different types of knots, operative technique, haemostasis, practice of fluid therapy and blood transfusion; Passing of stomach tube, probang and catheter in domestic animals, nerve blocking, parenteral injection of drugs, techniques of diagnosis and treatment of lameness, common minor operations in domestic animals, parenthesis abdominis in bovine.

## **SRA 401: Anesthesiology: Credit Hours: 2+1.5 (T+P)**

### **Theory:**

Definition of common terms, general consideration for anaesthesia, Classification of anaesthesia and anaesthetics, mode of action of anaesthetics, stages of anaesthesia; **Principles of sedation and premeditation:** Indication, agents used and their doses in different species; **Muscle relaxants:** Drugs used and their doses in various species; **Local and regional analgesia:** Topical analgesia, paravertebral, field block, epidural, corneal, auriculopalpebral, supra-orbital, mandibular, infra-orbital, planter, perineal, pubic nerve block, intravenous regional analgesia; **General anaesthesia and anaesthetics:** Injectable agents-Chloral hydrate, barbiturates, dissociative agents, steroid and other agents. Inhalation agents-Chloroform, diethylether, halothane, methoxyflurane, enflurane, isoflurane, nitrous oxide, and cyclopropane. Anaesthesia of zoo and laboratory animals and birds. Hazards of anesthesia and their management; **Euthanasia:** Indications, various methods and agents used.

### **Practical:**

Preanaesthetic examination and preparations of the animal. Orientation with different anaesthetics and devices used for administration of anaesthetics; Demonstration of local, regional and general anesthesia in various species; Monitoring of anaesthesia- central nervous system function, cardiovascular function, respiratory function, temperature and urine output; Management of anesthetic hazards.

## **SRA 402: Radiology and Imaging: 2+1.5 (T+P)**

### **Theory:**

Introduction, definition of common terms, properties of X-rays, X-ray machine, production of X-ray imaging, exposure factors, positioning of animals, exposure and processing of films, contrast media; Quality of a radiograph, interpretation of radiographs, radiographic artifacts, diagnostic radiography, principles of ultrasonography, fluoroscopy, endoscopy, computed tomography (CT), magnetic resonance imaging (MRI) and light amplification by stimulated emission of radiation (LASER); Principles and application of radiotherapy in veterinary practice. Radiation hazards and safety; **Soundness:** Introduction, causes of unsoundness; unsoundness due to hereditary and acquired diseases, systemic examination, conformation, colour and markings, vices, blemishes, examination of animals and birds for soundness.

### **Practical:**

Radiographic equipment and accessories, preparation of animals and birds for taking radiographs, estimation of exposure factors, contrast media, methods of taking and processing radiographs, viewing of X-ray film, use of infra-red and ultraviolet rays; Radiographic artifacts and interpretation of radiographs. Radiographic safety measures. Management of X-ray film and dark rooms. Method of examination of animals and birds for soundness and certificate writing.

## **SRA 431: Farm Animal Surgery: Course Credit: 3+1.5 (T+P)**

### **Theory:**

**Ophthalmic surgery:** Examination of eye, ectropion, entropion, ocular foreign keratitis, keratocele, keratoconjunctivitis, corneal opacity, periodic ophthalmia, uveitis, cataract, glaucoma, hydrophthalmia, panophthalmia, parasite in the eye, dermoid cyst; **Respiratory affections:** Epistaxis, haemoptysis, foreign bodies and parasites in the nostrils, retropharyngeal abscess, roaring; **Gastrointestinal surgery:** Ranula, chocking, oesophageal stricture and diverticulum, surgical approaches to the abdomen, foreign bodies in the stomach, bloat, impaction, traumatic reticuloperitonitis, abomasal displacement and torsion, intestinal obstruction, intussusceptions, volvulus, intestinal anastomosis, rectal prolapse, atresia coli, atresia recti, atresia ani, other surgical diseases of abdomen and various hernias; **Urogenital surgery:** Pyelonephritis, hydronephrosis, obstruction of urethra, urolithiasis, rupture of the bladder and urethra, retention of urine, urinary fistula, surgical affections of the penis and prepuce; **Udder and teat surgery:** Supernumerary teats, imperforate teats, fissure of teats, obstruction in the teat, duct, fistula, papilloma, abscess and diseases; **Miscellaneous affections:** Hydrocephalus, empyema of sinus, disbudding and dehorning, actinomyces, cleft palate, contracted tendon, sinus affections, neoplasm and their modern therapy; **Affections of head and neck:** Fistula withers, poll evil, hump sore, botryomycosis and gid disease.

**Practical:**

**Clinical practice:** Surgery of the clinical patients at Veterinary Teaching Hospital (VTH)- abscess, cyst, tumor, septic wound infections etc; Anaesthesia and analgesia related to specific operations; Amputation of tail, digit, limb, trephining of sinuses, tracheotomy, oesophagectomy, entropion and ectropion operation, enucleation of eyeball, castration and caponisation, urethrotomy, ligation of Stenson's ducts, opening of guttural pouch, roaring operation, penile deviation, vasectomy, cystotomy, amputation of penis, Caslick's operation, episisotomy, tenotomies, gastrotomy, rumenotomy, enterotomy, enterectomy, intestinal anastomoses, splenectomy, nephrectomy.

**SRA 461: Wildlife, Zoo, Aquatic and Companion Animal Surgery: Course Credit: 2+1.5 (T+P)**

**Theory:**

Anaesthesia and analgesia related to specific operations in wildlife, zoo and companion animals. Amputation of tail, digit, declawing, aural resection in dogs, entropion and ectropion operation, enucleation of eyeball, abscess, castration, caponization, ovariohysterectomy, caesarean section, urethrotomy, cystotomy, ventriculochordectomy (debarking), tracheotomy, oesophagotomy, gastrotomy, enterotomy, enterectomy, intestinal anastomoses, splenectomy, cholecystectomy, trephining of sinus, ligation of Stention's ducts, opening of guttural pouch, roaring operation, penile deviation, vasectomy, amputation of penis, Caslick's operation, trocarization, tenotomy, nephrectomy.

**Practical:**

Clinical diagnosis and treatment of surgical disease and disorders in Wildlife, Zoo, Aquatic and companion animals and birds at the Veterinary Teaching Hospital (VTH), ambulatory surgical services at different zoos, national parks, safari park and other field stations, clinical practices of surgical cases at various government and private veterinary hospitals, clinics safari park, and zoo.

**SRA 501: Surgery (Clinics): Course Credit: 0+2 (T+P)**

**Practical:**

Clinical diagnosis and treatment of surgical disease and disorders in animals and birds at the Veterinary Teaching Hospital (VTH), ambulatory surgical services at various farms and field stations, clinical practices of surgical cases at various government and private veterinary hospitals, clinics and zoo.

**Department of Agricultural Economics (AEC)**

**AEC 201: Livestock Production Economics: Course Credit: 3+0 (T+P)**

**Theory**

Definition and scope of economics, microeconomics and macroeconomics, economics - as a science and as an art, economic systems operating in the world, importance of livestock production economics, utility, characteristics of utility, kinds of utility, total utility and diminishing marginal utility, total and marginal utility, maximization of utility, indifference curve, indifference map, budget line, consumer equilibrium, demand and law of demand, exceptions in law of demand, determinant of demand, factors affecting demand, types of demand, supply and law of supply, supply schedule and supply curve, factors affecting changes in supply, market equilibrium, definition of elasticity of demand, price, income and cross elasticity of demand, factors affecting price elasticity of demand, point and arc elasticity, factors of production, concepts of land, labour, capital and organization and their related aspects, production function, the law of three stages of production, cost and revenue concepts, different types of cost like fixed cost, variable cost, enterprise costing and budgeting, equilibrium of firm, equilibrium of firm, the concept of market, definition and function of money, inflation, deflation, banking concept, concepts of national income.

## Department of Biochemistry and Molecular Biology (BMB)

### BMB 131: Biophysics and Chemistry of Biomolecules: Course Credit: 3+1.5 (T+P)

#### Theory:

**Basics of Biophysics and Molecular Biology:** basic concept of biophysics that applies in biological phenomena, Law of mass action. Water, acids, bases and electrolytes, pH and buffers. Surface tension. Viscosity. Adsorption. Colloidal state and membrane phenomenon. Diffusion and Osmosis. Spectrophotometry, Electrophoresis, Isoelectric focusing chromatography. Biochemistry and Molecular Biology and various terms related to this subject, the scope and importance of biomolecules, overview on Biomolecules and their relationships in biological system; **Carbohydrates:** Definition and classification carbohydrates on the basis of structure and functions, different functions of carbohydrates, different sources of carbohydrates, monosaccharides, aldoses, ketoses, and to illustrate properties and stereochemistry of monosaccharides; isomerism, D-, L-isomers, chiral carbon, optical activity, racemic mixtures, meso-compound, enantiomers and diastereoisomers, cyclization of monosaccharides, mutarotation and derivatives of monosaccharides, functions of disaccharides, trisaccharides, polysaccharides, glycosidic linkages, reducing and non-reducing sugars, and structural features of starch, glycogen, cellulose, chitin, dextran, and heteropolysaccharides like heparin, hyaluronic acids, Keratan sulfate etc; **Proteins:** Discovery of amino acids, amino acids, and proteins, and to explore the functions and properties of amino acids and proteins, classification amino acids and understand the general structure of amino acids and proteins, peptide bond formation and the features of peptide bond, structural organization, properties and functions of proteins; **Enzymes:** Brief history of enzymes, definition and classification of enzymes, and importance of enzyme study, differences between catalysts and biocatalysts, nomenclature and properties of enzymes; including regulation of enzyme activity, ribozymes, exo-and endo-enzymes; **Lipids:** Definition, classification and understand the biological functions of lipids and fats, classification of fatty acids based on structures and nutritional aspects, nomenclature and structure of various essential and non-essential fatty acids, structure and function of cholesterol and other complex lipids; **Nucleic acid:** Definition and classification of nucleotides and nucleic acids, properties and structural features of DNA and RNA, Chargaff's rule, Watson and Crick model of DNA, differentiate between nucleosides and nucleotides, and DNA and RNA, occurrence of nucleic acids in different species and cellular compartments.

#### Practical:

Demonstration on lab-safety rules, and use of pH meter and analytical balance; Preparation of different solutions and their standardization; Qualitative analysis of carbohydrates and proteins; Estimation of water-soluble vitamin (L-ascorbic acid); Estimation of glucose content by Fehling's method; Estimation of acid value of oil; Detection of sugars and proteins in animal blood and urine; Estimation of acetic acid content in the supplied vinegar solution; Extraction of DNA and RNA from a given sample and qualitative test for nucleic acids.

### BMB 161: Metabolism of Biomolecules: Course Credit: 3+0 (T+P)

#### Theory

**Basics of metabolism:** Definition of metabolisms and to differentiate between different classes of metabolism in biological system, list of major metabolic pathways involved in living cells, intermediary metabolism and metabolic regulations; **Carbohydrate metabolism:** Different pathways and fates of carbohydrate metabolism, carbohydrate biosynthesis by taking examples of glucose, sucrose, starch, glycogen and cellulose, carbohydrate catabolism in terms of glycolysis, glycogenolysis, and starch mobilization, differences between aerobic and anaerobic glycolysis, and their importance in living cells, alternative fate of glucose metabolisms in terms of pentose phosphate pathway, importance of pentose phosphate pathway in biological reactions, gluconeogenesis and its hormonal regulation, Cori-cycle and its importance in health, glyoxalate cycle and its importance, tricarboxylic acid (TCA) cycle and its regulation, biosynthetic roles of TCA cycle intermediates, and anaplerotic reactions, electron transport chain (ETC), and its different complexes involved in ETC, chemiosmotic hypothesis and oxidative phosphorylation for ATP production in ETC, contribution of ETC to reactive oxygen species (ROS) production and antioxidant mechanism for ROS detoxification; **Amino acid and protein metabolism:** Protein turnover, and amino acid biosynthesis and regulation, pathways that convert

amino acids to specialized products, amino acid catabolism by transamination and oxidative degradation, metabolic fate of carbon skeletons derived from amino acid catabolism, biosynthesis and importance of ketone bodies, importance of urea cycle for nitrogen metabolism, the linkage between Urea cycle and TCA cycle, how hormones regulate protein biosynthesis; **Lipid and fat metabolism:** Cell membrane structure made up of different types of lipids, fat mobilization and production of fatty acids, biosynthesis of saturated and unsaturated fatty acids, how fatty acids are catabolized by different types of oxidation reactions and their regulations, biosynthesis of (phyto) cholesterol and its roles in vitamin-D synthesis, synthesis and degradation of phospholipids and glycolipids; **Nucleotide and nucleic acid metabolism:** Biosynthesis of purine and pyrimidines using salvage and de-novo pathways, formation of deoxy-nucleotides, pathways involved in the synthesis of nucleotide co-enzymes, e.g. NAD (P), Coenzyme A, FAD etc., degradation of nucleotides and associated metabolic disorders, synthesis of DNA from DNA (replication), RNA from DNA (transcription) and protein from RNA (translation); **Intermediary metabolism and bioenergetics:** Concept of bioenergetics, free energy, enthalpy, entropy, and standard free energy change, ATP's role as universal energy carrier and ATP-ADP cycle.

### Department of Computer Science and Information Technology (CST)

#### **CST 131: Computer Application: Course Credit: 0+1.5 (T+P)**

##### **Theory:**

Introduction to computer-Compare the computer with calculator, Definition of computer, Classification of computer; Information Needed. The focus of ICT in Veterinary Science and Animal Husbandry is to meet the modern advances in research and extension technologies, Collection of Agro veterinary Data and Information; Information Retrieval System: Store and retrieval of information, Search engines, User friendly interface, Different types of information system such as Decision Support Systems (DSS), Customer Relationship Management (CRM), Accounting Information Systems (AIS), Human Resource Management Systems (HRMS); Data representation: Data, Information, Presentation in the form of reports, graphs, images, tables, etc. System, Data Tabulation, Data Processing, Data Manipulation; Real-time monitoring and prediction: Online health and biosciences, locally stored veterinary and medical imaging, Computer-assisted learning packages and simulation. Multi-user virtual environments, Web's growth and advances in wireless and mobile communications linked to biosensor tags or radio-frequency identification technologies; Web Technologies: Web search processes- World Wide Web-Cloud computing (Drop box, Google drive), Online data surveying using cloud services, Web tool for animal experiments, Experimental Design Assistant (EDA), Design and reporting animal studies-, Visual representation of animal experiment; ICT in Analytical techniques: Aquatic Animal Health-Small Animal Clinical Sciences-Large Animal Clinical Sciences; Constraints and challenges of veterinary e-learning development.

##### **Practical:**

Practical Based Lab Work Plan; Application software (word and excel) for assignment and tutorial; Graphical representation of veterinary medicine data; Web search and database processing for animal science; Application software (MS power point) for Scientific presentations.

### Department of Statistics (SST)

#### **STT 361: Biostatistics: Course Credit: 3+1.5 (T+P)**

##### **Theory:**

Over viewing different introductory terms/concepts of statistics and apply in animal sciences; Discuss different tabular and graphical presentations (such as frequency table, histogram, boxplot, scatter plot etc.); Learning summary statistics of measures of central tendency; Learning to compare and interpret the structure of the datasets; Discuss different probability distributions and their properties; Learning to draw inference on the basis of sample from hypothesis test about the phenomena; Discuss how to apply correlation and regression analysis for animal sciences; Finally, learn about basic observational studies and their application on animal sciences.

### **Practical:**

Application of data presentation (tabular and graphical) in the field of animal sciences; Application and interpretation of the calculated results in the field of animal sciences; Application and interpretation of the calculated results in the field of animal sciences; probability distribution functions for fisheries data analysis; Draw inference on the basis of sample from hypothesis test about the animal sciences problem; Application of correlation and regression analysis; Analysis of data with association measurements and interpretation of the results.

### **Department of Agribusiness (AGB)**

#### **AGB 501: Livestock and Poultry Marketing and Agri-business: Course Credit: 3+0 (T+P)**

### **Theory:**

**Understanding livestock and poultry marketing:** To discuss the goal and significance of livestock and poultry marketing in Bangladesh, distinguish between marketing of agricultural and manufacturing goods; **Core concepts of marketing:** To define core concepts of marketing: customer needs, wants, demands, value and satisfaction, exchange and relationship; **Market and market structure:** To explain the meaning of market and its characteristics, describe the components and dimensions of a market, classify markets on different basis; identify and distinguish different types of markets based on competition; **Market functionaries/agencies:** To identify different stakeholders/participants (producer, consumer, middlemen, traders, government) prevailing in the market; assess the role of different stakeholders in marketing; **Marketing functions:** To discuss the advantages and disadvantages of different marketing functions: packaging, transportation, storing, grading and standardization; processing, buying and selling; market information, speculation and hedging; **Marketing Channels:** To define the meaning of marketing channel, identify the factors affecting the length of marketing channel, draw the marketing channel of different livestock and poultry products; **Supply chain and value chain analysis:** To elaborate and distinguish between the concepts of supply chain and value chain in livestock and poultry marketing; **Producer's surplus of agricultural commodities:** To know the difference between the types of producer's surplus: marketed and marketable surplus, point out the factors affecting the producers surplus; **Market integration, efficiency, cost, margin and price spread:** To explain different types of market integration, estimate marketing cost, margin, efficiency using different methods, discuss the reasons of incurring higher marketing cost and the ways to minimize it; **Agribusiness and the related topics:** To define agribusiness and associated terms, know the importance of studying agribusiness in the context of Bangladesh, describe the nature of a successful agribusiness, identify the potentials and challenges of agribusiness.

### **Department of Agricultural and Rural development (AER)**

#### **AER 461: Veterinary Extension Education: Course Credit: 3+1.5 (T+P)**

### **Theory:**

**Agricultural Extension:** Concept, meaning and principles of agricultural extension; Importance of veterinary extension and livestock situation in Bangladesh; **Education:** Education and its type; objectives of education; learning and its types; theories and laws of learning; criteria for effective learning; elements and teaching process; **Extension Organization and Leadership:** Meaning and features of an extension organization; meaning, types and forms of leadership; qualities of a good leader; Roles of professional and local leaders on veterinary extension work; **Motivation and Learning:** Concept and meaning of motivation; Maslow's need theory; learning process and laws of learning with their implications in veterinary extension education; **Extension Teaching Methods:** Classification of extension methods, essential elements, requirements and use of extension teaching methods, advantages and limitations of using different extension teaching methods with reference to Bangladesh condition; **Communication in Extension:** Meaning and importance of communication; key elements in the communication process; factors affecting communication in livestock extension work; **Diffusion and Adoption of Innovation:** Concept of diffusion, adoption and innovation; elements in the diffusion process; paradigm of innovation decision process; innovativeness and adopter categories; **Program planning and Evaluation in Extension:** Concept, importance, principles and steps of

extension program planning for livestock development; meaning, purpose, principles and steps of monitoring and evaluation of projects related to veterinary extension work; **Rural women and rural youth** : Rural Youth, Definition, Characteristics of Rural Youth, Basic needs of Rural Youth, Possibilities of Rural Youth and women in Involving Agriculture and other Nation building Activities.

**Practical:**

An orientation to different organizations related to agricultural development; Preparation of teaching aids: scientific poster; Preparation of lesson plan; Lecture and its practice; Preparation of plan of work and calendar of work for a livestock extension program; Preparation of training program; Using PRA technique in Extension; Preparation of interview schedule for collection of data about rural and livestock situation; Extension field trip to rural areas/Upazila Headquarters to observe rural development activities in the field situation with special emphasis on livestock.