

**College of Veterinary & Animal Sciences**

**Course Curriculum**

**B.V.Sc & A.H. Degree Programme**

**(As per Veterinary Council of India – MSVE 2016)**



**2019**

**Sardar Vallabhbhai Patel University of Agriculture &**

**Technology,**

**Meerut-250110 (U.P.)**

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**University Website:** [Svbpmeerut.ac.in](http://Svbpmeerut.ac.in)

**Published by:** Sardar Vallabhbhai Patel University of Agriculture &  
Technology, Meerut-250110 (U.P.)

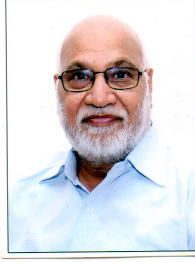
**Printed by:** Saumya Computers, Meerut

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सरदार वल्लभभाई पटेल कृषि एवं प्रौद्योगिक विश्वविद्यालय, मेरठ 250110  
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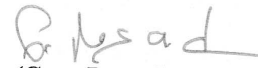


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**Foreward**

I am pleased to note that the College of Veterinary and Animal Sciences is bringing out the syllabi booklet on Bachelor of Veterinary Science and Animal Husbandry (B.V.Sc & A.H.) course curriculum as prescribed by Veterinary Council of India (VCI). This booklet provides the description of courses of study consisting of curriculum and syllabus spread over five and half complete professional years including a compulsory internship of one year duration. The course content of each discipline comprises of theory and practical sections grouped in various units.

I believe that the syllabi booklet would prove to be the ready reckoner for comprehensive understanding of individual topics and content of the courses. I hope the efforts of the college team in compilation of syllabi as academic document shall be of immense value to all stakeholders including students and teachers.

  
(Gaya Prasad)



Registrar  
Sardar Vallabhbhai Patel University of  
Agriculture & Technology, Meerut-  
250110



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### Message

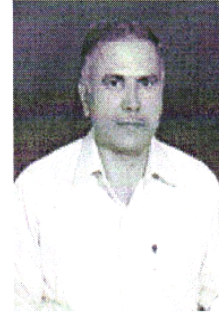
Livestock have been an integral component of India's agricultural and rural economy since time immemorial. They are natural capital that can be easily reproduced to act as a living bank with offspring as interest, and an insurance against crop failure and natural calamities. College of Veterinary and Animal Sciences is fully devoted to take care the livestock sector in terms of specialized human resource generation. So it is need of today to ensure best possible learning experience to the students through teaching skills and learning opportunities. Therefore, it is essential to strengthen the course curriculum for undergraduate students. Veterinary council of India since its inception is regulating the undergraduate veterinary education in the country. The course curriculum developed by VCI is comprehensive and sufficient to ensure quality education to the B.V.Sc & A.H. students.

I hope the course curriculum and syllabi booklet is being published by the College of Veterinary and Animal Sciences will provide consolidated insight of the syllabi to be taught during B.V. Sc & A.H. degree programme. I congratulate Dr Rajbir Singh and entire College of Veterinary and Animal Sciences team for preparing and publishing the syllabi booklet.

(Ashok Kumar)



Dean  
College of Veterinary and Animal Sciences  
Sardar Vallabhbhai Patel University of  
Agriculture & Technology, Meerut-  
250110



**Message**

It is a matter of great pleasure that college of Veterinary and Animal Sciences is publishing the course curriculum of B.V.Sc & A.H. degree programme in booklet form. It is a comprehensive course syllabus of all seventeen departments as prescribed by Veterinary Council of India (VCI). The course curriculum is basically divided in four and half years of professional courses and one year of compulsory internship. Each subject of the curriculum comprises of both theory and practical content separately. In my opinion the syllabus compiled by the college team may be of great value for the students and faculty members. Students can plan the study accordingly and faculty members can plan the teaching and practical schedule timely.

I am highly grateful to the Hon'ble Vice-Chancellor for valuable suggestions and granting the permission to publish the booklet for the benefits of students, faculty members and other stakeholders. I congratulate the team of college for their sincere and innovative efforts in bringing out the syllabi booklet.

  
(Rajbir Singh)

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## **Executive summery**

Bachelor of Veterinary Science and Animal Husbandry degree course shall comprise of a course of study consisting of curriculum and syllabus spread over five and half complete professional years including a compulsory internship of “one year duration undertaken after successful completion of all credits as prescribed in the syllabus. During the course of study there shall be training in veterinary clinical complex or state veterinary hospital, private veterinary hospital, animal farm or livestock farm complex as part of the course. Some of the salient features of B.V.Sc & A.H. degree programme (as per MSVE-2016) are as under:

1. First professional year of Bachelor of Veterinary Science and Animal Husbandry classes shall commence latest by 1st September of every year.
2. The annual examination shall be conducted prior to summer vacation for the year.
3. Each professional year shall cover at least two hundred ten days of instruction excluding time spent for annual examinations.
4. The curriculum shall provide adequate emphasis on cultivating logical and scientific habits of thought, clarity of expression, independence of judgment, ability to collect information and to correlate them and develop habits of self-education;
5. Medium of instruction for B.V.Sc. and A.H. degree course shall be in English;
6. Practical training at Livestock Farm Complex or Clinical practice shall be organised in small groups of 5 to 10 students so that each teacher can give personal attention to each student with a view to improve his or her skill and competence in handling of the patients and each practical batch for a course shall be preferably not more than twenty students;
7. Efforts shall be made to encourage students to participate in group discussions and seminars to enable them to develop personality, character expression and other abilities which are necessary for a veterinary graduate to function either in solo practice or as a team member when he or she begins his or her independent professional career and an appropriate time slot for this activity be provided in the student study time table.
8. In addition to the Core Courses as specified below, a student shall have to successfully complete the Internship including Entrepreneurial Training as has been specified in sub-regulation (1) of regulation 8 of VCI Gazette for the award of Bachelor of Veterinary Science and Animal Husbandry degree.
9. Remount Veterinary Squadron or National Cadet Crop or Equestrian or National Social Service or Sports and games shall be non- credit (0+1) training programmes any of which for all the Professional Years shall be compulsory (except fourth) for the award of Bachelor of Veterinary Science and Animal Husbandry degree and the performance of the students in these training programmes shall be assessed and graded as ‘Satisfactory’ or ‘Unsatisfactory’ and student has to obtain ‘Satisfactory’ grading for successful completion of course requirements.

## COURSES AND COURSE CONTENTS

### Professional Year wise Distribution of Courses

<b>First Professional</b> (One Year)	Veterinary Anatomy	4+3=7
	Veterinary Physiology	4+1=5
	Livestock Production Management	4+2=6
	<b>Total</b>	<b>12+6=18</b>
<b>Second Professional</b> (One Year)	Veterinary Biochemistry	2+1=3
	Veterinary Microbiology	3+2=5
	Veterinary Pathology	4+2=6
	Animal Genetics and Breeding	3+1=4
	Animal Nutrition	3+1=4
	<b>Total</b>	<b>15+7=22</b>
<b>Third Professional</b> (One Year)	Veterinary Pharmacology and Toxicology	4+1=5
	Veterinary Public Health and Epidemiology	3+1=4
	Veterinary Parasitology	3+2=5
	Livestock Products Technology	2+1=3
	Veterinary and Animal Husbandry Extension Education	3+1=4
	Veterinary Clinical Practices – I	0+1=1
	Livestock Farm Practices	0+2=2
	<b>Total</b>	<b>15+9=24</b>
<b>Fourth Professional</b> (One and a half year)	Veterinary Surgery and Radiology	2+1=3
	Veterinary Medicine	4+1=5
	Veterinary Gynaecology and Obstetrics	2+1=3
	Veterinary Clinical Practices –II	0+6=6
	<b>Total</b>	<b>8+9=17</b>
<b>Total Credit load</b>		<b>50+31=81</b>



## DEPARTMENT OF VETERINARY ANATOMY

### Veterinary Anatomy

**Credit Hours: 4+3**

Dissection will be carried out on cadavers procured by way of donation of animals or animals obtained from postmortem section and the donated animals should be either incurable or in terminal stages and prosected specimens should be used.

Within one year each college must setup a body donation programme or wild body programme. Computer simulations software's, models, mannequins, plastinated specimens, preserved body organs, models should be used for better understanding of the subject.

### Theory

*Unit I:* Introduction to anatomy and branches of anatomy and descriptive terms used in anatomy and study of anatomical planes.

*General Osteology, Arthrology and Myology:* Study of properties and structure of bone. Classification of skeletons, classification of bones with suitable examples and terms used in osteology Introduction to arthrology, classification of joints, different diarthrodial joints, structure of diarthrodial joints and movements permitted. Introduction to myology, classification of muscles, etymology of muscles. Description of tendon, ligaments, aponeurosis, synovial bursa and synovial sheath.

(Note: Detailed description of muscles of different regions of the body will be studied in the respective practical).

*General Angiology, Neurology and Aesthesiology:* Introduction to angiology. Structure of heart. General plan of systemic and pulmonary circulations, lymphatic and venous systems. Introduction to neurology and parts of central, peripheral and autonomic nervous system and sense organs. Formation of spinal nerve. Structure of meninges, brain, spinal cord.

Different surface regions, joint regions, Palpable Bony areas or prominences of the body of the animal. Palpable Lymph nodes and Arteries of the body and Surface veins for Venepuncture. Sites for collection of Bone marrow and Cerebrospinal fluid.

*General Splanchnology:* Introduction to splanchnology, boundaries of thoracic, abdominal and pelvic cavities, topography of different organs of digestive, respiratory, urinary, endocrine, male and female reproductive systems of domestic animals and fowl. Principles and application of Radiography and Ultrasound for bones and soft tissues.

*Unit-II Fore limb:* Study of bones of fore limb of ox and differences in horse, dog, pig and fowl. Study of hoof of ox and horse. Study of joints, ligaments, stay apparatus, major blood vessels, nerves, veins and lymph nodes of fore limb. Sites for Radial, Median, Ulnar and Volar nerve blocks.

*Unit-III Head and neck:* Study of cranial and facial bones, cervical vertebrae of ox and differences in horse, dog, pig and fowl. Boundaries of the oral, orbital, nasal and cranial cavities. Study of paranasal sinuses in ox, horse, dog and pig. Study of articulations and special ligaments of the head and neck. Muscles of face, mastication, eye, ear, tongue, pharynx, soft palate, hyoid and larynx. Study of teeth, hard and soft palate, tongue, pharynx, larynx, thyroid, parathyroid and salivary glands and differences in horse, dog, pig and fowl. Study of cranial

nerves, blood vessels and lymph nodes of head and neck regions. Study of boundaries of jugular furrow and structures of carotid sheath along with neck muscles. Study of sense organs, trachea and oesophagus. Age determination by Dentition. Sites for Tracheotomy, Esophagotomy, Ligation of Stensons duct and Mental, Mandibular, Maxillary , Cornual, Infraorbital , Supraorbital (frontal), Orbital and Auriculopalpebral nerve blocks and surgical approach to guttural pouches in horse. Importance of Cornual nerve and superficial Temporal artery in Amputation of Horn in cattle. *UNIT IV Thorax:* Study of thoracic vertebrae, ribs and sternum of ox and differences in horse, dog, pig and fowl. Study of joints, special ligaments, blood vessels, nerves, lymph vessels and lymph nodes of thorax. Study of organs of thorax i.e. trachea, thymus, oesophagus, lungs and differences in horse, dog, pig and fowl. Study of pleura, its reflections and mediastinum. Areas of auscultation and percussion of heart and lungs and site for Paracentesis Thoracis.

*Unit-V Abdomen:* Study of bones of abdomen of ox and differences in horse, dog, pig and fowl. Study of joints, special ligaments blood vessels, nerves of abdomen region. Blood and nerve supply to abdominal viscera. Study of peritoneal reflections, organs of digestive, urinary, male and female reproductive systems present in abdomen and differences in horse, dog, pig and fowl. Study of mammary glands in cow and differences in mare, bitch and sow. Study of spleen of ox and differences in horse, dog, pig and fowl. Study of major veins, lymph vessels, lymph nodes and endocrine glands of abdomen. Boundaries and Clinical importance of the flank and Para Lumbar Fossa. Sites for Liver ,Gall Bladder and Caecal Biopsies, Laparotomy,Rumenocentesis ,Rumenotomy,abomasotomy, splenectomy, Cystotomy , Caesarean Operation , enterotomy, and paravertebral block .

*Unit-VI Hind limb and pelvis:* Study of bones of hind limb and pelvis of ox and differences in horse, dog, pig and fowl. Study of joints, ligaments, blood vessels, lymph nodes and nerves of hind limb, pelvis and tail region and pelvic viscera. Study of pelvic peritoneal reflections, organs of digestive, urinary, male and female reproductive systems present in pelvic cavity and differences in horse, dog, pig and fowl. Boundaries of the inguinal canal and structures of the spermatic cord, pre pubic tendon and its importance. Study of external genital organs. Sites for Tibial , Peroneal ,Plantar and Pudic nerve blocks, Patellar desmotomy, Urethrotomy, Castration , Vasectomy, cranial and caudal epidural anaesthesia.

*Unit-VII :* Cytology, cell junctions, study of basic tissues i.e epithelial, connective, muscular and nervous tissues, blood and bone marrow. Study of microscopic structures of digestive, circulatory, urinary, respiratory, nervous, lymphatic, endocrine, male and female genital systems and mammary glands of domestic animals. Study of microscopic structure of sense organs i.e. eye, ear and integument.

*Unit-VIII:* Introduction to embryology, gametogenesis, fertilization, cleavage, types of eggs, morula, blastulation, gastrulation, types of implantation, twinning. Formation of foetal membranes in mammals and birds, Placenta and its classification. Different germ layers and their derivatives. Study of development of organs of digestive system including accessory structures i.e tongue, teeth, salivary glands, liver and pancreas. Study of development of organs of respiratory, urinary, circulatory, lymphatic, nervous, musculoskeletal, male and female reproductive systems. Development of endocrine glands, sense organs i.e eye and ear.

## **Practical**

*Unit-I:* Study of general terms used in anatomy, study of anatomical planes. Study of different parts of skeleton, different surface and joint regions. Study of boundaries of thoracic, abdominal and pelvic cavities. Demonstration of different types of joints, muscles tendons,

ligaments, synovial bursa and synovial sheath. In situ demonstration of heart, meninges, brain and spinal cord. Boundaries of Thoracic, Abdominal and Pelvic Cavities and in situ demonstration of organs of digestive, respiratory, urinary, endocrine, male and female reproductive systems of domestic animals. Demonstration of Different surface regions, joint regions and Palpable Bony areas or prominences of the body of the animal , Common sites of fractures, Palpable Lymph nodes and Arteries of the body ( ventral coccygeal artery in ox, femoral artery in dog and cat , facial artery in horse ) and Surface veins for Venepuncture( cephalic vein and recurrent tarsal vein in dog and cat , jugular vein in large animals.) and Sites for collection of Bone marrow and Cerebrospinal fluid. Visualization of Radiographs and ultrasound pictures of various organs and Fractures of various bones.

*Unit-II Fore limb:* Demonstration of different bones of fore limb of ox and comparison with horse, dog, pig and fowl. Dissection of the fore limb. Study of joints, ligaments, muscles, major blood vessels, lymph nodes and nerves of fore limb. Study of sites for different nerves blocks or neurectomies in fore-limb. Study of suprascapular nerve paralysis in shoulder, radial nerve paralysis in capped elbow. Structure of the equine hoof and comparison with ox. Demonstration of radiographs of normal bones of fore limb. Clinical importance of cephalic vein for intravenous injections in dog.

*Unit-III Head and neck:* Demonstration of cranial and facial bones, cervical vertebrae of ox and comparison with horse, dog and fowl. Dissection of muscles of face, mastication, tongue, pharynx, soft palate, hyoid, larynx, eye and ear. Dissection of superficial neck muscles. Dissection of brain and its parts. Dissection or demonstration of tunics of eye. Study of teeth, tongue, pharynx, thyroid, parathyroid and salivary glands and differences in horse, dog, pig and fowl. Study of cranial nerves, and blood vessels of head and neck regions. Study of trachea and oesophagus. Study of nerve blocks of the head i.e. cornual, auriculo-palpebral, Peterson's orbital nerve block, mandibulo-alveolar and mental nerve blocks. Importance of facial artery for recording pulse in horse. Surgical importance of Stenson's duct in domestic animals. Surgical approach to guttural pouches-Viborg's triangle. Clinical importance of jugular vein for intravenous injections in large animals. Demonstration of radiographs of normal bones of head and neck.

*Unit-IV Thorax:* Demonstration of thoracic vertebrae, ribs and sternum of ox and comparison with horse, dog, pig and fowl. Dissection of muscles, blood vessels, nerves and lymph nodes of thorax. Demonstration of organs of thorax i.e. trachea, oesophagus, thymus, lungs and heart and differences in horse, dog, pig and fowl. Study of pleural reflections of thoracic cavity. Demonstration of sites for auscultation and percussion. Recurrent laryngeal nerve paralysis-roaring in horses. Choke or oesophageal obstruction. Demonstration of radiographs and videos of ultrasonography of organs of thorax.

*Unit-V Abdomen:* Demonstration of bones forming boundaries of abdomen of ox and comparison with horse, dog, pig and fowl. Dissection of muscles, blood vessels and nerves of abdomen. Demonstration of peritoneum, omentum, mesentery and organs of digestive, urinary, male and female reproductive systems present in abdomen and differences in horse, dog, pig and fowl. Demonstration of mammary glands of cow, mare, bitch and sow. Demonstration of major veins, lymph vessels and lymph nodes of abdomen. Topographic location of abdominal viscera of ox and comparison with horse, dog, pig and fowl. Demonstration of sites for laparotomy, caesarean section, ovario-hysterectomy, catheterization of urinary bladder and sites for paravertebral and epidural anaesthesia. Demonstration of Boundaries and Clinical importance of the flank and Para Lumbar Fossa, Sites for Liver , Gall Bladder and Caecal Biopsies, Laparotomy, Rumenocentesis , Rumenotomy, abomasotomy, splenectomy Cystotomy

, Caesarean Operation, catheterization of urinary bladder and enterotomy and paravertebral block . Demonstration of radiographs and videos of ultrasonography of organs of abdomen.

*Unit-VI Hind limb and pelvis:* Demonstration of bones of hind limb of ox and comparison with horse, dog, pig and fowl. Demonstration of joints and ligaments of hind limb and pelvis. Dissection of muscles, blood vessels, lymph nodes and nerves of hind limb and pelvic cavity. Demonstration of peritoneal reflections of pelvic cavity and organs of digestive, urinary, male and female reproductive systems in pelvic cavity and differences in horse, dog, pig and fowl. Study of external genital organs. Clinical importance of femoral artery to record pulse in dog. Clinical importance of recurrent tarsal vein for intravenous injections in dog. Demonstration of radiographs of normal bones and videos of ultrasonography of organs of pelvis. Demonstration of Sites for Tibial ,Peroneal ,Plantar and Pudic nerve blocks, Patellar desmotomy, Urethrotomy, Castration , Vasectomy and cranial and caudal epidural anaesthesia.

*Unit-VII Microscopy and micrometry:* Comparison of light and electron microscopy. Histological techniques, processing of tissues for paraffin sectioning and haematoxylin and eosin staining. Microscopic examination of epithelium, connective tissue, muscular tissue, nervous tissue and blood. Microscopic examination of organs of digestive, circulatory, urinary, respiratory, nervous, lymphatic, endocrine, male and female genital systems and sensory organs of domestic animals.

*Unit-VIII:* Demonstration of Placenta, umbilical cord and foetal membranes of different domestic animals. Demonstration of congenital anomalies of domestic animals as per availability. Study of slides of developing organs of different systems as per the availability. A embalmed cadaver of buffalo calf (procured through donated animals or cadevars obtained from post-mortem section) for every 24 students to be used for dissection purposes.

#### Annual Examination

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1, 2, 3and 4	100	20
Paper-II	5,6,7 and 8	100	20
<b>Practical</b>			
Paper-I	1, 2, 3and 4	60	20
Paper-II	5,6,7 and 8	60	20

## DEPARTMENT OF VETERINARY PHYSIOLOGY AND BIOCHEMISTRY

### Veterinary Physiology and Biochemistry

Credit Hours: 6+2

*Veterinary Physiology*

*Credit Hours: 4+1*

*Veterinary Biochemistry*

*Credit Hours: 2+1*

### Veterinary Physiology

#### Theory

*Unit- I (Blood, Cardiovascular, Nervous and Muscular Systems):* Introduction to Blood; Properties of blood as a body fluid, metabolism and fate of R.B.C; Hemoglobin-chemical structure, synthesis, physiological functions, derivatives of hemoglobin; *Heart-* morphological characteristic, systemic excitability conduction and transmission processes. Cardiac Cycle: Regulation of cardiac output; coronary circulation; properties of pulse; metabolism and energetic of working myocardial cell, extrinsic and intrinsic regulation; Electro Cardio Graph and its significance in Veterinary Sciences - Echocardiography. Haemorrhage haemostasis. Haemodynamics of circulation, circulatory mechanics, resistance to flow, vasoconstriction, nervous and circulating fluid volume controls of blood pressure, neurohormonal control of vascular smooth muscle. Circulatory controls- shock stresses, regional and fetal circulation. Capillary exchange, control of blood pressure. Adjustment of circulation during exercise.

*Muscle Physiology-*basic muscle unit characteristic-electrical phenomenon in muscle cell - muscle action potential, excitation and propagation of impulse characteristics- latent period refractive ness, threshold level-all and none characteristics - contractile mechanism - excitation - contraction coupling-neuro-muscular transmission, types of muscle contraction, phenomenon of fatigue, rigor mortis. Organization of nervous system- Mechanism of information processing, hierarchical control. Major function system- sensory, consciousness, emotion, motor and visceral control and basic functional unit - neuron structure, type- functional characteristics of sub-units of neuron. Membrane potential - ionic basis of resting membrane potential (RMP) nerve action potential, excitation and propagation of impulse characteristics- latent period- refractive-ness, threshold level-all and none characteristics. Degeneration and regeneration of nerve fibre. Synaptic and junctional transmission. Functions of nervous system-reflexes-control of posture and movements, autonomic nervous system and visceral control. Neurotransmitter wakefulness, sleep cycle. Higher function of neurons system - learning, memory, electroencephalography. Sense organs and receptors physiology of special senses - Eye: functional morphology, nourishment and protection neural pathway, receptors-optics, ocular muscles and movements, photochemistry, Vision defects Ear: Physiology of hearing and common hearing impairment. Vestibule apparatus. Physiology of olfaction and taste

*Unit-II (Digestive and Respiratory Systems):* Morphological characteristic of mono gastric and poly gastric digestive system. Prehension, rumination; defecation; vomiting; regulation of secretory function of saliva, stomach, intestine, pancreas; bile secretion; hunger, appetite control, developmental aspects of digestion; luminous, membranous and microbial digestion in rumen and intestine; permeability characteristics of intestine, forces governing absorption, control intestinal transport of electrolyte and water, enzymatic digestion in monogastric and fermentative digestion in rumen, modification of toxic substances in rumen. Digestion in birds.

Functional morphology of respiratory apparatus. Mechanics of breathing. Transport of blood gases, foetal and neonatal oxygen transport, dissociation curves, pressures, recoil tendency,

elasticity, surfactants, pleural liquid, compliance, exchanges of gases in lungs and tissues, neural and chemical regulation of breathing, diffusion, perfusion, hypoxia. Frictional resistance to air flow, airways smooth muscle contraction, respiratory muscle work, panting, adaptation of respiration during muscle exercise, high altitude hypoxia, Non-respiratory lung functions. Respiration in birds.

*Unit-III ( Excretory and Endocrine Systems):* *Kidney-* Functional morphology of nephrons, factors determining filtration pressure, determination of glomerular filtration rate (GFR) and renal plasma flow – Re-absorption mechanisms for glucose, protein, amino acids, electrolytes; ammonium mechanism, glomerulo-tubular balance, methods of studying renal functions; urine concentration; micturition, uremia. Fluid, water balance, fluid therapy, dehydration, water concentration mechanisms. Acid base balance and H<sup>+</sup> regulation, correction and evolution of imbalances, total osmotic pressure. Formation and excretion of urine of Birds. Cerebrospinal fluid, synovial fluids - composition, formation and flow; Joints. Regulation of bone metabolism and homeostasis.

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

*Unit-IV (Reproduction, Lactation, Growth and Environmental Physiology):* Genetic and endocrine control of gonadal development, modification of gonadotrophin release, ovarian functions, follicular development, dynamics, endocrine and receptor profiles, sexual receptivity, ovarian cycle, post-partum ovarian activity, ovum transport, capacitation, fertilization, reproductive cycles in farm animals- hormones present in the biological fluids during pregnancy and their uses for the diagnosis of pregnancy- maternal foetal placental participation in pregnancy and parturition, immunology of gestation, preparturient endocrine status.

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

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

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

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

*Climatology-* various parameters and their importance. Effect of different environmental variables like temperature, humidity, light, radiation, altitude on animal performance.

Acclimation, acclimatization - general adaptive syndrome. Clinical aspects of endocrine - reproductive functions, circadian rhythm. Neurophysiology of behaviours, types of behaviour, communication, Learning and memory behavioural plasticity.

### **Practical**

*Unit- I (Blood, Cardiovascular, Nervous and Muscular Systems):* Collection of blood samples - Separation of serum and plasma - Preservation of de-fibrinated blood - enumeration of erythrocytes, leucocytes - differential leucocytic count - platelet count - estimation of hemoglobin - haematocrit - erythrocyte sedimentation rate - packed cell volume - coagulation time- bleeding time -Erythrocyte fragility and viscosity - blood grouping - recording of ECG - measurement of arterial blood pressure (Sphygmomanometry). Simulation experiments on Nerve- Muscle and heart physiology.

*Unit-II (Digestive and Respiratory Systems):* Counting of rumen motility, estimation of volatile fatty acids and ammonia nitrogen in rumen liquor. Bacterial and protozoal count. In-vitro action of proteolytic enzymes- Amylase, pepsin and trypsin. Recording of respiration, spirometry. Recording of volume and capacities in different physiological states including determination of vital capacities.

*Unit-III ( Excretory and Endocrine Systems):* Urine analysis-physiological constituents, pathological determinates, determination of Glomerular Filtration Rate. Titerable acidity, determination of inorganic phosphorus, urine ammonia nitrogen and creatinine in urine. Recording of rumenorintestinal movements (Demonstration) and Bio assay for tropic hormone. Demonstration of hormone estimation.

*Unit-IV (Reproduction, Lactation, Growth and Environmental Physiology):* Oestrus and phases of oestrous cycle in animals (vaginal mucus). Behavioural signs of oestrus. Sperm motility, sperm concentration- live and dead - abnormal sperm count. Measurement of growth in various species. Measuring surface area of animals. Health parameters of animals- body temperature, pulse, respiration and heart rate. Measurement of animal environmental conditions. Behaviour of animals- mating behavior, feeding behaviour (liveorvideo graphicorcomputer simulated demonstration).

### **Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1 and 2	100	20
Paper-II	3 and 4	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3 and 4	60	20

**Theory**

*Unit-I (General Veterinary Biochemistry):* Scope and Importance of Biochemistry. Structure of Biological Membranes and Transport across Membranes. Donnan Membrane Equilibrium. Dissociation of Acids, pH, Buffer Systems, Henderson-Hasselbalch Equation. Biochemistry of Carbohydrates: Biological Significance of Important Monosaccharides (Ribose, Glucose, Fructose, Galactose, Mannose and Amino Sugars), Disaccharides (Maltose, Isomaltose, Lactose, Sucrose and Cellobiose), Polysaccharides, (Starch, Dextrins, Dextrans, Glycogen, Cellulose, Inulin, Chitin), and Mucopolysaccharides Including Bacterial Cell Wall Polysaccharides. Biochemistry of lipids: Properties and biological significance of simple, compound and derived lipids and lipoproteins. Fat indices. Structure and functions of prostaglandins. Biochemistry of proteins: Classification, Structure, Properties - Biological significance of proteins. Amino acids: Structure and classification. Physical and chemical properties of amino acids - amphoteric nature, optical activity, and peptide bond formation. Biochemistry of nucleic acids: Chemistry of purines, pyrimidines, nucleosides and nucleotides. Biological significance of nucleosides and nucleotides. Structures and functions of deoxyribonucleic acid (DNA) and a typical ribonucleic acid (RNA).

*Unit-II (Intermediary Metabolism): Enzymes-* Definition and classification. Coenzymes, cofactors and iso-enzymes. Properties: Protein nature, enzyme-substrate complex formation, modern concept of the active center of enzyme. Specificity of enzyme action: Substrate specificity, group specificity, stereo or optical specificity. Factors influencing enzyme action: Effects of temperature, pH, concentration of substrate and enzyme. Enzyme units: International Units, katal, turnover number and specific activity. Enzyme inhibition: Competitive, non-competitive, uncompetitive inhibition and suicidal inhibition. Allosteric enzymes. Biological oxidation: Enzymes and coenzymes involved in oxidation and reduction. Respiratory chain or electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain. Carbohydrate metabolism: Glycolysis, Krebs's cycle, HMP shunt, gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, Bioenergetics of carbohydrate metabolism. Lipid metabolism: Beta oxidation of fatty acids, ketone body formation, biosynthesis of fatty acids. Bioenergetics of lipid metabolism.

*Protein metabolism:* Biosynthesis and Degradation. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle. Nucleic acid metabolism: Metabolism of purines and pyrimidines. DNA and RNA biosynthesis and regulation. Regulation and Integration of metabolism.

*Unit- III (Veterinary Analytical Biochemistry):* Disorders of Carbohydrate Metabolism: Diabetes mellitus, Ketosis, Bovine Ketosis, Pregnancy toxemia, hypoglycaemia in baby pigs, hyperinsulinism in Dogs. Hormonal control of carbohydrate metabolism and regulation of blood sugar. Biochemical tests for the detection of disturbance in carbohydrate metabolism. Plasma Proteins and clinical significance, Proteins and Dysproteinemias, Acute Phase proteins. Lipid Profile in disease diagnosis. Clinical Enzymology - Diagnostic importance of non-functional plasma enzymes and Isoenzymes, Liver function tests - Classification - Biochemical tests for differential diagnosis. Biochemical tests of renal function - Urine analysis - Role of BUN, Uric acid and Creatinine in diagnosis. Disturbance in acid base balance and its diagnosis. Biochemistry of digestive disorders. Biochemistry of oxidative stress and shock. Biochemical basis of fluid therapy. Detoxification in the body: Metabolism of xenobiotics, General reactions for biotransformation of different groups of substances, Cytochrome p450 system of enzymes.



## Practical

*Unit-I (General Veterinary Biochemistry):* Concentration of solutions and system International (S.I.) Units; Preparation or standardization of acids and alkalies; Preparation of Buffers; Titration curve of acid versus base; Qualitative test for carbohydrates and identification of unknown carbohydrates; Determination of acid number of an oil; Color and precipitation reactions of proteins; Estimation of amino acids (Sorensen's Method).

Unit-II (Intermediary Metabolism): Effect of temperature and pH on enzyme activity; Estimation of blood or plasma Glucose, Protein, Inorganic phosphate, Calcium, Magnesium; Estimation of ascorbic acid by Dichlorophenolindophenol (DCPIP) method; Estimation of milk lactose by Benedicts quantitative method; Estimation of sodium and potassium by flame photometer; Paper or thin layer Chromatography of amino acids; Estimation of vitamin A by colorimetry.

*Unit-III (Veterinary Analytical Biochemistry):* Detection of Pathological Constituents in Urine; Assays of ALT and AST in Serum; Acute phase proteins (AorG Ratio); Estimation of total serum cholesterol, Blood Urea Nitrogen, creatinine, serum billirubin (Direct, Indirect and Total). Principles of various diagnostic tests, normal and abnormal values in different species, differential diagnosis, correlating with diseases and rationale of arriving at the conclusion need to be rediscussed in detail during Final Profesional in the course Veterinary Clinical Practices-II, Diagnostic Laboratory Section.

### Annual Examination

Papers	Units	Maximum Marks	Weightage
<b>Theory</b>			
Paper-I	1 and 3	100	20
Paper-II	2	100	20
<b>Practical</b>			
Paper-I	1 and 3	60	20
Paper-II	2	60	20

## DEPARTMENT OF LIVESTOCK PRODUCTION MANAGEMENT

### Livestock Production Management

Credit Hours: 4+2

#### Theory

*Unit-I (General Livestock Management):* Demographic distribution of livestock and role in Indian economy. Problems and prospects of livestock industry in India. Common animal husbandry terms. (glossary) Body conformation and identification. Transportation of livestock and wild or zoo animals. Common farm management practices including disinfection, isolation, quarantine and disposal of carcass. Introduction to methods of drug administration. Common vices of animals (Cattle, Buffalo, Sheep, Goat,) their prevention and care. Livestock production systems. Animal holding and land holding patterns in different agro-climatic zones. Organic livestock production. Judging and BCS for body parts of livestock. Preparation of animals for show. Culling of animals. Selection and purchase of livestock.

*Unit-II (Fodder Production and Conservation):* Importance of grasslands and fodder in livestock production. Agronomical Practices for fodder production. Important leguminous and non-leguminous fodders in different seasons. Soil and Water conservation and drainage of water for fodder production. Fodder production for small livestock units. Structures for storage of feeds and fodders. Scarcity fodders and preservation of green fodder. Recycling of animal washings and wastes in fodders production and use of recycle waste.

*Unit-III (Livestock Production Management-Ruminants):* Housing systems, layout and design of different buildings for animals. Selection of site. General principles affecting the design and construction of building for housing for various livestock species. Arrangements of the building with special reference to Indian conditions. Utilization of local materials. Building materials used for construction of wall, roof and floor of animal houses, their characteristics, merits and demerits. Breeds of cattle and buffalo and descriptions of important breeds. Economic traits of cattle and buffaloes. General management and feeding practices of calves, heifers, pregnant, lactating and dry animals, bulls and working animals. Draught ability of cattle and buffaloes. Raising of buffalo males for meat production. Routine animal farm operations and labour management. Animal farm accounts and records. Methods of milking and precautions. Factors affecting quality and quantity of milk production. Clean milk production. Breeds of sheep and goat and their descriptions. Important economic traits for meat, milk and fibre. General management and feeding practices during different stages of growth, development and production (milk, meat and wool). Breeding schedule and management of ram and buck. Weaning and fattening of lambs and kids.

*Unit-IV (Zoo Animals Production Management):* Taxonomy of important wild zoo animals. Status and conservation practices of wild life in India. Basic principles of habitat and housing of various classes of wild zoo animals. Size and space requirement (dimension) of cubicles, enclosures of important wild zoo animals. Management of livestock in fringe areas, in and surrounding the breeding areas. Feeding habits, feeds and feeding schedules of captive animals. Restraining, capture, handling, physical examination of captive animals. Classification of zoos, management of sanctuaries, national parks etc. Acts and Rules related to captive animals. National and international organization and institutions interlinked to captive animals role and functioning.

*Unit-V (Animal Welfare):* Definition of animal welfare and ethics. Human and animal welfare in relation to ecosystem and environmental factors. Role of veterinarians in animal welfare. Animal welfare organizations, Animal Welfare Board of India - their role, functions and current status. Rules, regulations, laws on animal welfare. Prevention of Cruelty to Animals

(PCA) Act, 1960 {59 of 1960). Role and function of Committee for the Purpose of Controlling and Supervising Experiments in Animals (CPCSEA). Protection of wild life in nature and captivity. Protection and welfare of performing animals. Welfare of animals during transportation. Animal welfare in commercial livestock farming practices. Protection and welfare of working animals. Pet and companion animal welfare. Animal welfare during natural calamities and disaster management. Legal duties of veterinarians, Common offences against animals and laws related to these offences. Provincial and Central Acts relating to animals. Laws relating to offences affecting Public Health. Livestock Importation Act Evidence, liability and insurance. Code of Conduct and Ethics for veterinarians - the Regulations made under the Act.

*Unit-VI (Poultry Production Management):* Indian poultry industry – Brief outline of the different segments – poultry statistics. Classification of poultry with respect to production characters, age and standards. Production characters of other avian species. Description of indigenous fowls and their value in rural farming. Specific strains developed for rural poultry production; their acceptability and importance in rural eco-system Brooding management – Types of brooders – preparation of shed – Importance of environmental factors. Housing – Types of poultry houses – space requirements. Recent advances in housing systems and rearing systems. Scavenging system of management – Low input technology – Backyard and semi-intensive units; their management and economic achievements. Deep litter management – control of litter-borne diseases and recycling of litter. Cage management – Different types; Advantages and disadvantages. Management of growers and layers. Management of broilers and breeders. Stress management. Feeding management–Classification of nutrients – Nutrient requirements and feed formulations. Feeding systems–Feed restrictions – phase feeding – Additives and supplements. Water management. Breeding systems and methods of mating. Selection and culling. Breeding for specific characters and for hybrid chicken production. Poultry judging. Egg structure – Physical and chemical composition. Bio-security and principles of disease prevention management. Health care for common poultry diseases – vaccination. General principles of poultry medication.

*Unit-VII (Diversified Poultry Production and Hatchery Management):* Principles of incubation and hatchery management practices. Factors affecting fertility and hatchability, selection and care of hatching eggs and hatchery hygiene. Candling, sexing, grading, packing and disposal of hatchery waste. Economics of hatchery business – Troubleshooting hatchery failures– Computer applications in hatchery management. Poultry waste management, pollution and environmental issues. Organic and hill farming. Mixed or integrated poultry farming Vertical & horizontal integration in commercial poultry production – Contract farming. Exportorimport of poultry produce and marketing. Management of ducks, geese, turkeys, Japanese quails, guinea fowls etc.

*Unit-VIII (Laboratory or Rabbit or Pet Animal Production Management):* Importance and selection of laboratory animal, care and housing standards of mice, rats, hamster and guinea pigs. General considerations on feeding and breeding of laboratory animals. Concept of production of specific pathogen free and germ free laboratory animals. Scope of rabbit farming in the country, breeds and their distributions in India. Limitation of rabbit animal production, Selection, care and management of breeding stock for commercial purpose. Identification, care and management of kindling animals. Care of new born, growing stock. Breeding and selection techniques for optimal production of rabbit. Feeds and feeding for rabbit production. Hygienic care and Housing for rabbit production. Disposal, utilization and recycling of waste etc. Preparing projects for micro (Backyard), mini and major rabbit farms. Important breeds of dogs, cats and pet birds. Feeding of dogs, cats and pet birds. Dog show: preparation for show,

kennel clubs, important characteristics for judgment. Utility of dogs- guarding, defense, patrolling, riot control, scouting, espionage, mine detection, tracking, guiding, hunting, races, retrieving rescue and other uses.

*Unit-IX (Swine or Equine or Camel, Yak And Mithun Production Management):* Introduction and scope of swine farming in the country. Demography of swine population. Selection and breeding techniques in swine. Important breeds (exotic and indigenous) & their characteristics. Housing and feeding of swine. Management of different categories of swine for optimal production: breeding and pregnant sows; sows at farrowing and after farrowing: pig-lets, growing stock, lactating sows, feedlot stock. Equine population of India. Horses, donkeys and mules and their utility. Colors and markings. Identification of breeds of horses. Dentition and ageing of horses. Care and routine management of equines including grooming, saddling and exercise. Stable and its management. Vices of horses. Foot care and shoeing care. Feeding routine for horse, donkeys and mules. Care of stallion. Mating of horses, brood mare and its care. Foaling and care of newborn. Breeding mules. Care of race horses and preparing horses for show. Doping and its detection. Colic and its prevention. Common breeds of camel in India and their utility, peculiarities in camel. Feeding schedule of camel, rutting symptoms in camel, Vices of camel. Care of breeding in camel, pregnancy and parturition of camel. Population statistics and utility, peculiarities of yak. Feeding and breeding of Mithun or Yaks. Yak × cattle crossing, hybrids from Mithun or Yaks and their adaptation to high altitude, milk composition of Mithun or Yaks.

## **Practical**

*Unit-I (General Livestock Management):* General introduction of the Institute animal farm. Identification of common tools used on animal farm. Familiarization with body points of animals. Methods of identification (marking, tattooing, branding, tagging and electronic chip under pre-emptive analgesia). Use of rope for knot and halter making. Dentition and ageing of animals. Preparation of animals for show and judging. Selection and culling of animals. Preparation of project proposal

*Unit-II (Fodder Production and Conservation):* Visit to the fodder farm. Familiarization with the various types of fodders in the state and India. Familiarization with various fertilizers and manures. Collection, preservation and storage of feed and fodder; Damages or loss during transfer and storage; methods to prevent them. Cost of calculations of fodder production. Livestock waste utilization and recycling.

*Unit-III (Livestock Production Management-Ruminants):* Layout plans for different livestock houses. Visit to different animal farms and Identification of various breeds of cattle, buffalo, sheep and Goat. Humane handling and restraining of cattle, buffalo, sheep and Goat. Clipping, shearing, dipping, spraying and spotting sick animals. Determination of body weight using different measurements. Familiarization with routine cattle, buffalo, sheep and goat farm operations. Milking of dairy animals. Shearing of sheep. Training of breeding males. Detection of heat. Identification and care of pregnant animals, care of neonatal and young stock. Economics of dairy, sheep or goat farm.

*Unit-IV (Zoo Animals Production Management):* Visit to nearby wildlife sanctuary, captive animals centres to study care and management of these animals. To study housing of captive animals. To study feeds and feeding schedule of captive animals. Hygienic preparation, preservation and storage of feeds of captive animals. Familiarization about restraining, handling and physical examination of captive animals.

*Unit-V (Poultry Production Management):* Common breeds of poultry, different classes, Indian chickens and other avian species breeds. Digestive and respiratory system of chicken. Male and female reproductive system—Quality changes in egg during storage. Economic traits

of broilers. Economic traits of egg-type chicken and breeders. AI in poultry. Housing and design of a poultry farm. Poultry farm equipment and their classification. Brooding arrangement in broiler farms. Poultry feed ingredients and its quality assessment. Poultry feed preparations. Calculation of different economic indices of broiler farm. Calculation of economic indices of layer farm. Fundamentals in poultry Post-mortem examination for sample collection. Collection and dispatch of samples for PM examination. Management during Summer, Winter and Rainy season. Automization in poultry farms (EC house).

*Unit-VI (Incubation and Hatchery Management):* Hatchery layout and design. Project report for establishing a broiler farm. Project report for establishing a layer farm. Project report for establishing a breeder farm. Visit to commercial poultry farms or hatchery or feed mill. Visit to farms of other avian species.

*Unit-VII (Laboratory or Rabbit or Pet Animal Production Management):* Identification of body parts and handling, weighing, sexing and weaning of laboratory animals. Marking for identification of laboratory animals for purpose of their individual recording. Computation, feeding schedule of balanced diet for high breeding efficiency of laboratory animals. Maintenance of breeding records of laboratory animals. Prophylactic measures against common disease of laboratory animals. Hygienic care and control of parasites. Shearing of rabbit. Feeding and Housing requirement and equipments for rabbit. Projects report for establishing of rabbit farm. Handling and restraining of dog, cat and pet bird and equipments for pet animals and birds. Brushing or grooming and bathing of dogs and cats. Nail and tooth care, clipping of hairs for show purpose. Care of pups, kitten and weaning.

*Unit-VIII (Swine or Equine or Camel, Yak And Mithun Production Management):* Handling, restraining of swine, equines, camel. Identification of pregnant animals, care during pregnancy, isolation and care of farrowing sows and piglets. Preparation of swine, equine for show and judging, Economics of pig. Routine inspection, tooth care and vaccination schedule. Horse riding: walking, trotting, cantering and galloping. Layout plans for sty, stables.

#### Annual Examination

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2,3,4 and 5	100	20
Paper-II	6,7,8 and 9	100	20
<b>Practical</b>			
Paper-I	1,2,3 and 4	60	20
Paper-II	5,6,7 and 8	60	20

## DEPARTMENT OF VETERINARY MICROBIOLOGY

### Veterinary Microbiology

Credit Hours: 3+2

#### Theory

*Unit-I (General & Systematic Veterinary Bacteriology):* Introduction and history of Microbiology; Classification and nomenclature of bacteria; Microscopy and Micrometry; Bacterial stains and techniques; Structure and morphology of bacteria; Growth and nutritional requirement of aerobic and anaerobic bacteria; Normal, opportunistic and saprophytic bacterial flora: Types and sources of infection, method of transmission of infection. Pathogenicity, virulence, determinants of virulence, Epizootic and enzootic diseases, bacteremia, septicaemia and toxemia, endotoxins, exotoxins, antitoxins, toxoids; Bacterial genetics (Mutation, Transformation, Transduction and Conjugation), plasmids and antibiotic resistance.

Study of the following bacteria in relation to isolation, growth, cultural, morphological, biochemical and antigenic characteristics, epidemiology and pathogenesis, pathogenicity, diagnosis, prevention and control of bacterial diseases caused by following bacteria: *Staphylococcus; Streptococcus; Corynebacterium, Trueperella, Rhodococcus; Listeria and Erysipelothrix; Bacillus; Mycobacterium; Clostridium, Actinomyces, Nocardia, Streptomyces and Dermatophilus; Family Enterobacteriaceae (E.coli, Klebsiella, Salmonella, Yersinia, Proteus); Pseudomonas and Burkholderia; Pasteurella, Mannheimia, Actinobacillus and Haemophilus, Brucella; Vibrio; Campylobacter; Bordetella and Moraxella; Gram negative anaerobes: Bacteroides, Dichlobacteria and Fusobacterium; Leptospira and other Spirochaetes; Mycoplasma, Coxiella, Neorickettsia, Ehrlichia, Anaplasma, Rickettsia; Chlamydia and Chlamydophila*

Emerging, re-emerging and transboundary bacterial pathogens.

*Unit-II (Veterinary Mycology):* Introduction, classification, general properties of fungi; Growth and Reproduction of fungi; Study of following important pathogenic fungi in relation to their isolation, growth, morphological, cultural, biochemical and antigenic characteristics, epidemiology, pathogenesis, diagnosis and control of fungal diseases caused by following genera: *Candida and Cryptococcus; Aspergillus; Penicillium; Dermatophytes and Malassezia; Dimorphic fungi, Rhinosporidium and Sporotrichum; Mycetoma and Zygomycetes; Mycotic mastitis and mycotic abortion; Mycotoxicoses*

*Unit-III (Microbial Biotechnology):* Basic concepts and scope of Recombinant DNA technology; Gene cloning, Cloning vectors and expression vectors; Transformation and transfection; Southern, Northern and Western blotting; Bioinformatics, Gene banks; Application of molecular and biotechnological techniques: Polymerase chain reaction, Nucleic acid hybridization, DNA library, DNA sequencing and DNA fingerprinting; IPR. Ethics and regulatory issues in Animal Biotechnology.

*Unit-IV (Veterinary Immunology and Serology):* History of Immunology; Lymphoid organs, tissues and Cells: Types of Immunity; Antigens, hapten, epitope, Specificity, T dependent and T independent Antigens, heterophile Antigens, cross reacting Antigens, blood group Antigens, Mitogens and factors affecting immunogenicity; Adjuvants; Antibody: Structure, physiochemical properties and functions of various classes of immunoglobulins, Theories of antibody production; Hybridoma and monoclonal antibodies, Serological reactions. Major histocompatibility complex (MHC) structure, function and gene organization; Structure of BCR and TCR; Antigen processing and presentation; Complement system: activation pathways

and biological consequences; Cytokines: general properties, major types and function; Hypersensitivity: classification and mechanism of induction; Autoimmunity; Immunotolerance; Concept of Immunity to Microbes, Vaccines and other biological.

*Unit-V (General and Systematic Veterinary Virology):* History of Virology; Introduction to viruses; Structure of Viruses; Classification of Viruses; Viral Replication; Genetic and Non-genetic viral interactions; Virus-Cell Interactions; Viral Pathogenesis, Oncogenesis, latency and immunopathology. Studies on General Properties, Antigens, Cultivation, Pathogenesis, Epidemiology, Clinical Signs, Diagnosis, Prevention and Control of following Viruses and Prions Causing Diseases in Livestock and Poultry: Birnaviridae: Infectious bursal disease virus; Reoviridae: Rotaviruses, Bluetongue virus, African horse sickness virus; Paramyxoviridae: Newcastle disease virus, Canine distemper virus, PPR virus; Rhabdoviridae: Rabies virus, Ephemeral fever virus, Bornaviridae: Borna virus. Orthomyxoviridae: Swine, Equine, Avian Influenza Viruses. Coronaviridae: Infectious Bronchitis virus, Transmissible gastroenteritis virus; Arteriviridae: Equine viral arteritis virus, Picornaviridae: FMD virus, Duck viral hepatitis virus; Caliciviridae: Feline calici Virus, Togaviridae: Equine encephalomyelitis viruses; Flaviviridae: Swine fever virus, BVD virus; Retroviridae: Visna or maedi virus, Equine infectious anemia virus, Lymphoid leucosis virus, Bovine leukemia virus. Poxviridae: Capripoxvirus, Avipoxvirus, Cowpoxvirus; Asfarviridae: African Swine Fever Virus; Herpesviridae: Bovine herpes viruses, Equine Herpes viruses, Infectious laryngotracheitis virus, Marek's disease virus, Pseudorabies virus, Malignant Catarrhal Fever virus; Duck Plague virus, Adenoviridae: Infectious Canine Hepatitis virus, Egg Drop Syndrome virus, Fowl adenovirus, Papillomaviridae: Papillomatosis, Parvoviridae: Canine parvoviruses, Feline panleucopenia virus; Circoviridae: Chicken Anemia Virus; Prions: Scrapie, Bovine Spongiform Encephalopathy; Emerging, re-emerging and transboundary viruses and Viral Infections.

## **Practical**

*Unit-I (General and Systematic Veterinary Bacteriology):* Orientation to bacteriology laboratory; Methods of sterilization and disinfection; Preparation of culture media for cultivation of aerobic and anaerobic bacteria; Methods of inoculation, Cultivation of aerobic and anaerobic bacteria; Isolation of bacteria in pure culture; Simple staining, Negative staining, Differential staining procedures of bacteria: Gram's staining, Acid fast staining; Special staining procedures: Capsule and Spore staining; Bacterial motility; Culture sensitivity test; Outlines of collection, transportation and processing of samples for bacterial disease diagnosis. Characterization of Staphylococcus; Streptococcus; E. coli Salmonella; Klebsiella and Proteus; Pseudomonas; Pasteurella; Clostridium; Isolation and identification of bacteria from clinical cases of Mastitis, Abortions, Enteric, Respiratory and Pyogenic infections.

*Unit-II (Veterinary Mycology):* Outline of collection, transportation and processing of samples for fungal disease diagnosis, Preparation of culture media, Cultivation and slide culture technique of fungi; Cultural characteristics of fungi; Lactophenol cotton blue staining to study morphology of fungi; Culture sensitivity test of fungi; Diagnosis of Aspergillosis and Candidiasis; Demonstration of other important yeast, moulds and Dermatophytes

*Unit-III (Microbial Biotechnology):* Extraction and quantitation of nucleic acid; Plasmid isolation and plasmid profiling; Agarose gel electrophoresis for studying or diagnosis of nucleic acid of microbes; SDS PAGE electrophoresis for studying or diagnosis of proteins of microbes; Use of Multimedia and audio-visual aids for molecular biology aspects.

*Unit-IV (Veterinary Immunology and Serology):* Inoculations of lab animals, preparation of antigen, Raising of antisera, separation and preservation of serum, Concentration of Immunoglobulins, Agglutination tests: Plate, Tube, Haemagglutination, Precipitation test: Agar gel precipitation Test, Single radial immunodiffusion test, Immunoelectrophoresis, Cell mediated immune response (DTH), Enzyme linked immunosorbent assay (ELISA), Visit and appraisal of Veterinary biological institute.

*Unit-V (General and Systematic Veterinary Virology):* Orientation to a virology laboratory; Collection, preservation, transport of samples and their processing in virology laboratory; Isolation of viruses in laboratory animals or poultry or embryonated chicken eggs; Preparation of media and reagents for cell culture; Subculture and maintenance of continuous cell lines; Quantitation of cells by viable cell counts in a haemocytometer; Cryopreservation and recovery of cell cultures; Preparation of Primary cell culture (chicken embryo fibroblast or Lamb kidney); Demonstration of cytopathic effect by viruses in cell culture (Important virus isolates available in the department); Demonstration of Titration of virus by TCID50 and plaque assay in cell cultures\*; Demonstration of neutralizing antibodies by serum neutralization test in cell cultures\* ; Agar gel precipitation test for detection of virus infection\*; Titration of Newcastle disease virus by haemagglutination test; Haemagglutination inhibition test for detection of antibodies to Newcastle disease virus; ELISA for detection of viral antigen and antibodies; Molecular techniques for viral disease diagnosis \*Important virus isolates available in the department.

#### Annual Examination

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 and 3	100	20
Paper-II	4 and 5	100	20
<b>Practical</b>			
Paper-I	1,2 and 3	60	20
Paper-II	4 and 5	60	20



## DEPARTMENT OF VETERINARY PATHOLOGY

**Veterinary Pathology**

**Credit Hours: 4+2=6**

### **Theory**

*Unit-I (General Veterinary Pathology):* Introduction and scope of Veterinary Pathology. Major intrinsic and extrinsic causes of disease. Haemodynamic disorders (hyperaemia, congestion, haemorrhage, oedema, thrombosis, embolism and infarction). Glycogen overload, amyloidosis and fatty changes. Reversible and irreversible cell injury- degenerations, necrosis and its types, apoptosis, differences between post-mortem autolysis and necrosis, gangrene and its types. Major exogenous and endogenous pigments. Metastatic and dystrophic calcification. Photosensitization. Disturbances in growth (Aplasia, hypoplasia, atrophy, hypertrophy, hyperplasia, metaplasia and dysplasia). Inflammation: Definitions, classification, various cell types and their functions, mediators, cardinal signs and systemic effects. Wound healing by primary and secondary intention including growth factors. Immunopathology in brief (immunodeficiency, hypersensitivity and autoimmunity).

*Unit-II (Systemic Veterinary Pathology):* Pathological changes affecting Digestive, Respiratory, Musculoskeletal, Cardiovascular, Haematopoietic, Lymphoid, Urinary, Reproductive, Nervous, Endocrine systems, Skin and Appendages, Ear and Eye.

*Unit-III (Animal Oncology, Veterinary Clinical Pathology and Necropsy):* *Animal Oncology-* Definitions, general characteristics and classification of neoplasms. Differences between benign and malignant tumours, aetiology, carcinogenesis and spread of neoplasms, tumour immunity, effects and diagnosis of tumours, staging and grading of neoplasms. Pathology of various types of tumours in domestic animals (epithelial, connective tissue, hematopoietic tissue etc.)

*Veterinary Clinical Pathology:* Introduction, Haematology – Different anticoagulant used in haematology, interpretation of blood tests (haemoglobin, packed cell volume, total erythrocyte count, erythrocytic indices, erythrocytic sedimentation rate, total leukocyte count, absolute count of different leucocytes), blood smear examination and its interpretation.

*Urinalysis-* Interpretation of physical, chemical and microscopic examination of urine. Study of biopsy and cytology including exfoliative cytology as rapid diagnostic techniques.

*Necropsy:* Introduction, objectives, pre-necropsy guidelines, procedure for post mortem examination of various species of animals including wild animals, post mortem changes, collection, preservation and dispatch of specimens (morbid materials) for laboratory examination, writing of post mortem report, veterolegal necropsy, veterolegal wounds.

*Unit-IV (Pathology of Infectious and Non-Infectious Diseases of Domestic Animals):* Pathology of viral infections: Pathogenesis, gross and microscopic pathology of foot and mouth disease, Rinderpest, malignant catarrhal fever, blue tongue, infectious bovine rhinotracheitis, bovine viral diarrhoea, Peste des Petitis (PPR), equine infectious anaemia, equine influenza, equine viral arteritis, equine rhinopneumonitis, classical swine fever, swine influenza, rabies, canine distemper, infectious canine hepatitis, canine parvovirus infection, feline panleukopenia, maedi, jaagziekte, pox virus diseases in different animals. Vesicular stomatitis, vesicular exanthema, equine encephalomyelitis, diseases caused by rota and corona viruses.

Pathology of prion diseases (scrapie, bovine and feline spongiform encephalopathies).

*Pathology of bacterial infections:* Pathogenesis, gross and microscopic pathology of tuberculosis, Johne's disease, actinomycosis, actinobacillosis, anthrax, clostridial group of diseases (black quarter, black disease, enterotoxaemia, braxy, botulism tetanus), streptococcosis including strangles in horses, staphylococcosis, glanders, pasteurellosis, leptospirosis, listeriosis, swine erysipelas, brucellosis, corynebacterium infections (caseous lymphadenitis, pseudotuberculosis), campylobacteriosis, salmonellosis, and colibacillosis including oedema disease in pigs, and necrobacillosis).

Pathogenesis, gross and microscopic pathology of mycoplasma infection (contagious bovine pleuropneumonia, contagious caprine pleuropneumonia, porcine enzootic pneumonia), diseases of chlamydial group, Q-fever, anaplasmosis and ehrlichiosis. Pathogenesis, gross and microscopic pathology of superficial and deep mycoses - ringworm (dermatophytosis), aspergillosis, zygomycosis, histoplasmosis, cryptococcosis, rhinosporidiosis and candidiasis. Pathogenesis, gross and microscopic pathology of aflatoxicosis, ochratoxicosis, trichothecosis, Degnala disease and ergototoxicosis.

Pathogenesis, gross and microscopic pathology of fasciolosis, babesiosis, theileriosis and trypanosomosis. Pathological changes (in brief) of amphistomiasis, ascariasis, strongylosis, haemonchosis, spirocercosis, filariasis, hookworm, tapeworm infections, coccidiosis, toxoplasmosis, cryptosporidiosis,

Pathological changes of nutritional imbalances (in brief) due to carbohydrates, proteins, fats, minerals and vitamins and metabolic diseases (pregnancy toxemia, post-parturient haemoglobinuria, hypomagnesemic tetany, azoturia, and sway back/renzootic ataxia, pica and Rheumatism like syndrome).

Gross and microscopic pathology (in brief) of toxicities like arsenic, copper, lead, mercury, cadmium, strychnine, nitrate/nitrite, hydrocyanic acid, fluoride, selenium and oxalates; insecticide/pesticide poisoning, plant poisoning (bracken fern, gossypol, ratti and lantana).

*Unit-V (Avian Pathology):* Avian Inflammation, Viral Diseases: Pathogenesis, gross and microscopic pathology of Ranikhet disease, infectious bursal disease, infectious bronchitis, infectious laryngotracheitis, fowl pox, avian influenza, Marek's disease, leukosis/sarcoma group of diseases, reticuloendotheliosis, avian encephalomyelitis, inclusion body hepatitis, hydropericardium syndrome, chicken infectious anaemia, avian nephritis, egg drop syndrome, reovirus infections.

*Bacterial Diseases:* Pathogenesis, gross and microscopic pathology of colibacillosis, infectious coryza, clostridial diseases, salmonella infections, fowl cholera, tuberculosis and spirochaetosis. Pathogenesis, gross and microscopic pathology of Mycoplasma infections, chlamydiosis. Pathogenesis, gross and microscopic pathology of aspergillosis, thrush, favus, aflatoxicosis, ochratoxicosis and trichothecosis.

Gross and microscopic pathology (in brief) of helminthic diseases (flukes, cestodes, nematodes), protozoal diseases (coccidiosis, histomoniasis), ectoparasites.

Gross and microscopic pathology of nutritional imbalances due to carbohydrates, proteins, minerals and vitamins. Miscellaneous diseases (Heat stroke, vent gleet, internal layer, false layer, pendulous crop, breast blister, ascites syndrome, fatty liver and kidney syndrome, fatty liver syndrome, cage layer fatigue, gout, hemorrhagic syndrome, round heart disease, impaction of oviduct, egg bound condition, bumble foot) and common vices.

*Unit-VI (Pathology of Diseases of Laboratory and Wild Animals):* Pathology of important diseases of rats, mice, and guinea pigs (Tyzzer's disease, Pseudotuberculosis, Salmonellosis, Infectious ectromelia, Infantile diarrhea, Murine hepatitis virus, Lymphocytic choriomeningitis); Pathology of important diseases of rabbits (Pasteurellosis, Blue breasts, Treponematosi s, Enterotoxaemia, Rabbit pox , Infectious myxomatosis, Papillomatosis , Coccidiosis, Mite infestation). Gross and microscopic pathology of important diseases of wild animals (West Nile Fever, Rabies, FMD, Pox, Kyasanaur forest disease, Infectious hepatitis virus, Anthrax, Tuberculosis, Colibacillosis, Clostridial infections Trypanosomosis, Babesiosis, Theileriosis, Nutritional deficiency diseases)

### **Practical**

*Unit-I (General Veterinary Pathology):* Study of gross pathological specimens and recognition of pathological lesions. Histopathological techniques– Processing of tissue for paraffin embedding technique, section cutting, staining and identification of microscopic lesions. Examination of histopathological slides showing general pathological alterations.

*Unit-II (Systemic Veterinary Pathology):* Study of gross specimens and histopathological slides pertaining to systemic pathology.

*Unit-III (Animal Oncology, Veterinary Clinical Pathology and Necropsy):* Macroscopic and microscopic examinations of various types of benign and malignant tumours. Examination of blood for routine haematological tests in domestic animals and poultry. Physical, chemical and microscopic examination of urine. Post mortem examination of different species of animals including wild and laboratory animals.

*Unit-IV (Pathology of Infectious and Non-Infectious Diseases of Domestic Animals):* Post mortem examination and its interpretations, Study of gross specimens and histopathological slides of various organs pertaining to infectious and non- infectious diseases of domestic animals. Demonstration of causative agents in tissue section by special staining methods and use of rapid diagnostic tests.

*Unit-V (Avian Pathology):* Post mortem examination of poultry and writing of post mortem report. Collection, preservation and dispatch of morbid materials in poultry diseases. Study of gross specimens and histopathological slides of different diseases of poultry.

*Unit-VI (Pathology of Diseases of Laboratory and Wild Animals):* Post mortem examination of laboratory and wild animals. Study of gross specimen and histopathological slides of diseases affecting laboratory and wild animals.

### **Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 and 3	100	20
Paper-II	4,5 and 6	100	20
<b>Practical</b>			
Paper-I	1,2 and 3	60	20
Paper-II	4,5 and 6	60	20

## DEPARTMENT OF ANIMAL GENETICS AND BREEDING

### Animal Genetics and Breeding

Credit Hours: 3+1

#### Theory

*Unit-I (Biostatistics and Computer Application):* Biostatistics: Introduction and importance of statistics and biostatistics, Classification and tabulation of data. Parameter, Statistic and Observation. Graphical and diagrammatic representation of data. Measures of Central tendency (simple and grouped data). Measures of Dispersion (simple and grouped data). Probability and probability distributions: Binomial, Poisson and Normal. Moments, Skewness and Kurtosis. Correlation and Regression. Introduction of sampling methods. Tests of hypothesis- t and Z-tests. Chi-square test. Design of experiment- Completely randomized design (CRD). Randomized block design (RBD). Analysis of variance and F-test of significance. Introduction to Non-parametric tests.

*Computer Application:* Introduction to computer languages. Data Base Management. Review of MS-Office and its components (MS-Word, Excel, Power Point and Access). Analysis of data using MS-Excel. Concepts of computer networks, internet & e-mail.

*Unit-II (Principles of Animal And Population Genetics):* *Animal Genetics-* History of Genetics. Mitosis vs Meiosis. Chromosome numbers and types in livestock and poultry. Overview of Mendelian principles. Modified Mendelian inheritance. Pleiotropy, Penetrance and expressivity. Multiple alleles; lethals; sex-linked, sex limited and sex influenced inheritance. Sex determination. Linkage, crossing over and construction of linkage map. Mutation, Chromosomal aberrations. Cytogenetics, Extra-chromosomal inheritance. Molecular genetics, nucleic acids-structure and function. Gene concept, DNA and its replication. Introduction to molecular techniques.

*Population Genetics:* Introduction to population genetics; individual vs population. Genetic structure of population: Gene and genotypic frequency. Hardy - Weinberg law and its application. Forces changing gene and genotypic frequencies (eg Mutation, migration, selection and drift). Quantitative vs qualitative genetics; concept of average effect and breeding value. Components of Variance. Concept of correlation and interaction between Genotype and Environment. Heritability and Repeatability. Genetic and Phenotypic Correlations.

*Unit-III (Principles of Animal Breeding):* Livestock and Poultry Breeding: History of Animal Breeding. Classification of breeds. Economic characters of livestock and poultry and their importance. Selection, types of selection, response to selection and factors affecting it. Bases of selection: individual, pedigree, family, sib, progeny and combined, indirect selection. Method of selection, Single and Multi trait. Classification of mating systems. Inbreeding coefficient and coefficient of relationship. Genetic and phenotypic consequences of inbreeding, inbreeding depression, application of inbreeding. Out breeding and its different forms. Genetic and phenotypic consequences of outbreeding, application of outbreeding, heterosis. Systems of utilization of heterosis; Selection for combining ability (RS and RRS). Breeding strategies for the improvement of dairy cattle and buffalo. Breeding strategies for the improvement of sheep, goat, swine and poultry. Sire evaluation. Open nucleus breeding system (ONBS). Development of new breeds or strains. Current livestock and poultry breeding policies and programmes in the state and country. Methods of conservation- livestock and poultry conservation programmes in the state and country. Application of reproductive and biotechnological tools for genetic improvement of livestock and poultry. Breeding for disease resistance.

Breeding of pet, zoo and wild animals: Classification of dog and cat breeds. Pedigree sheet, selection of breeds and major breed traits. Breeding management of dogs and cats. Common pet birds seen in India and their breeding management.

Population dynamics and effective population size of wild animals in captivity or zoo or natural habitats. Planned breeding of wild animals. Controlled breeding and assisted reproduction. Breeding for conservation of wild animals.

**Practical**

*Unit-I (Biostatistics and Computer Application):* Collection, compilation and tabulation of data. Estimation of measures of central tendency (mean, median, mode) for simple and grouped data. Estimation of measures of dispersion (Range, standard deviation, standard error, variance, and coefficient of variation) for simple and grouped data. Graphical and diagrammatic representation of data. Estimation of correlation and regression. Simple probability problems, Normal distribution. Tests of significance: t-test, Z – test, Chi- square, F-tests. Completely randomized design (CRD). Randomized block design (RBD). Computer basics and components of computer. Simple operations: internet and e-mail, Entering and saving biological data through MS-Office (MS-Excel)

*Unit-II (Principles of Animal and Population Genetics):* Monohybrid, Dihybrid cross and Multiple alleles. Modified Mendelian inheritance and sex linked inheritance. Linkage and crossing over. Demonstration of Karyotyping in farm animals. Calculation of gene and genotypic frequencies, Testing a population for Hardy-Weinberg equilibrium. Calculation of effects of various forces that change gene frequencies. Computation of population mean, average effect of gene and gene substitution and breeding value. Estimation of repeatability, heritability, genetic and phenotypic correlations.

*Unit-III: (Principles of Animal Breeding):* Computation of selection differential and intensity of selection, Generation interval, expected genetic gain, correlated response, EPA and Most probable producing ability (MPPA). Estimation of inbreeding and relationship coefficient. Estimation of heterosis. Computation of sire indices. Computation of selection index.

**Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1 and 2	100	20
Paper-II	3	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3	60	20

## DEPARTMENT OF ANIMAL NUTRITION

### Animal Nutrition

Credit Hours: 3+1

#### Theory

*Unit-I (Principles of Animal Nutrition and Feed Technology):* History of animal nutrition. Importance of nutrients in animal production and health. Composition of animal body and plants. Nutritional terms and their definitions. Nutritional aspect of carbohydrates, protein and fats. Role and requirement of water, metabolic water. Importance of minerals (major and trace elements) and vitamins in health and production, their requirements and supplementation in feed. Common feeds and fodders, their classification, availability and importance for livestock and poultry production. Measures of food energy and their applications - gross energy, digestible energy, metabolizable energy, net energy, total digestible nutrients, starch equivalent, food units, physiological fuel value. Direct and indirect calorimetry, carbon and nitrogen balance studies. Protein evaluation of feeds- Measures of protein quality in ruminants and non-ruminants, biological value of protein, protein efficiency ratio, protein equivalent, digestible crude protein. Calorie protein ratio. Nutritive ratio. Introduction to feed technology- Feed industry; Processing of concentrates and roughages. Various physical, chemical and biological methods for improving the nutritive value of inferior quality roughages. Preparation, storage and conservation of livestock feed through silage and hay and their uses in livestock feeding. Harmful natural constituents and common adulterants of feeds and fodders. Feed additives in the rations of livestock and poultry and their uses.

*Unit-II (Applied Ruminant Nutrition-I):* Importance of scientific feeding. Feeding experiments. Digestion and metabolism trial. Norms adopted in conducting digestion trial. Measurement of digestibility. Factors affecting digestibility of a feed. Feeding standards, their uses and significance, merit and demerits of various feeding standards with reference to ruminants. Balanced ration and its characteristics.

*Unit-III (Applied Ruminant Nutrition-II):* Nutrient requirements and methods for assessing the energy and protein requirements for maintenance and production in terms of growth, reproduction, milk, meat, wool and draft purpose. General principles of computation of rations. Formulation of rations and feeding of dairy cattle and buffaloes during different phases of growth and production (neonate, young, adult, pregnant, lactating and dry animals; breeding bull) and working animals. Formulation of ration and feeding of sheep and goat during different phases of growth and production (milk, meat and wool). Feeding of high yielding animals and role of bypass nutrients. Metabolic disorders and nutritional interventions. Use of NPN compound for ruminants.

*Unit-IV (Applied Non-Ruminant Nutrition):* Nutrient requirements in poultry, swine and equine - Energy and protein requirement for maintenance and production. Methods adopted for arriving at energy and protein requirements for maintenance and production in terms of growth, reproduction and production (egg, meat and work). Feeding standards for non-ruminants and poultry Formulation of rations as per Bureau of Indian Standards and Indian Council of Agricultural Research specifications. Feeding of swine (Piglets, Growers, Lactating and pregnant sows, Breeding boar, Fattening animals), equine (foal, yearling, broodmare, stallion and race horses) and poultry (Starter, Growers, Broilers, Layers) with conventional and unconventional feed ingredients. Feeding of ducks, quails, turkeys and laboratory animals. Nutrient requirements of mice, rat, rabbit and guinea pig. Diet formulation, preparation and feeding of rabbits and laboratory animals. Nutrient requirement and feeding of different

categories of dogs and cats; peculiarities of feeding cats. Feeding of wild animals and birds in captivity. Metabolic disorders and nutritional intervention.

### **Practical**

*Unit-I (Principles of Animal Nutrition and Feed Technology):* General precautions while working in nutrition laboratory. Familiarisation of various feeds and fodders. Preparation and processing of samples for chemical analysis - herbage, faeces, urine and silages. Preparation of solutions. Weende System of analysis - Estimation of dry matter, total ash, acid insoluble ash, crude protein, ether extract, crude fibre, nitrogen free extract in feed samples. Estimation of calcium and phosphorus. Demonstration of detergent methods of forage analysis. Qualitative detection of undesirable constituents and common adulterants of feed.

*Unit-II (Applied Ruminant Nutrition-I):* Calculation of nutritive value of different feed stuffs in terms of digestible crude protein (DCP), total digestible nutrient (TDN), Nutritive ratio (NR) and balance of nutrients.

*Unit-III (Applied Ruminant Nutrition-II):* Calculation of requirements of nutrients in terms of DCP, TDN and metabolisable energy (ME) for maintenance, growth, and other types of production like meat, milk, wool, reproduction and draft purpose. Formulation of rations for different categories of livestock under different conditions. Formulation of rations for feeding of livestock during scarcity periods. Visit to Animal Farm and Feed Mill.

*Unit-IV (Applied Non-Ruminant Nutrition):* Calculation of requirements of nutrients for growth, reproduction and other types of production like egg and meat. Formulation of rations for poultry and swine with conventional and unconventional feed ingredients. Principles of compounding and mixing of feeds. Visit to farms. Formulation of balance diets for horses, dogs and cats. Feeds and feeding schedule of zoo animals and birds-diet charts.

### **Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1 and 2	100	20
Paper-II	3 and 4	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3 and 4	60	20

## DEPARTMENT OF VETERINARY PHARMACOLOGY AND TOXICOLOGY

### Veterinary Pharmacology

Credit Hours: 4+1

#### Theory

*Unit-I (General Pharmacology):* Introduction, historical development, branches and scope of Pharmacology. Sources and nature of drugs. Pharmacological terms and definitions, nomenclature of drugs. Principles of drug activity: Pharmacokinetics - Routes of drug administration, absorption, distribution, biotransformation and excretion of drugs. Pharmacodynamics - Concept of drug and receptor, dose-response relationship, terms related to drug activity and factors modifying the drug effect and dosage. Adverse drug reactions, drug interactions.

*Unit-II (Drugs Acting on Autonomic Nervous System):* Neurohumoral transmission, Pharmacology of neurotransmitters. Adrenoceptors agonists and antagonists, adrenergic neuron blockers, cholinergic agonists and antagonists.

Autacoids: Histamine, histamine analogues and antihistaminic agents, 5-Hydroxytryptamine and its agonists and antagonists, eicosanoids, platelet activating factors, angiotensin, bradykinin and kallidin.

*Unit-III (Drugs Acting on Central Nervous System):* Classification of drugs acting on CNS. History, mechanism and stages of general anaesthesia. Inhalant, intravenous and dissociative anaesthetics. Hypnotics and sedatives; psychotropic drugs, anticonvulsants, opioid analgesics, non-steroidal anti-inflammatory drugs, analeptics and other CNS stimulants. Drugs acting on somatic nervous system: Local anaesthetics, muscle relaxants. Euthanizing agents.

*Unit-IV (Drugs Acting on Different Body Systems):* Drugs acting on digestive system: Stomachics, antacids and antiulcers, prokinetics, carminatives, antizymotics, emetics, antiemetics, purgatives, antidiarrhoeals, cholagogues and choleretics. Rumen pharmacology.

Drugs acting on cardiovascular system: Cardiotonics and cardiac stimulants, antiarrhythmic drugs, vasodilators and antihypertensive agents, haematopoietic drugs, coagulants and anticoagulants.

Drugs acting on respiratory system: Expectorants and antitussives, respiratory stimulants, bronchodilators and mucolytics.

Drugs acting on urogenital system: Diuretics, drugs affecting urinary pH and tubular transport of drugs, ecbolics and tocolytics.

Pharmacological basis of fluid therapy. Pharmacotherapeutics of hormones. Drugs acting on skin and mucous membranes: Emollients, demulcents and counter irritants.

*Unit-V (Veterinary Chemotherapy):* Introduction and historical developments of chemotherapy. Antimicrobial agents: Classification, general principles in antimicrobial chemotherapy, antimicrobial resistance, combined antimicrobial therapy. Sulphonamides and their combination with diaminopyrimidines. Penicillins, cephalosporins, cephamycins and other beta lactams, beta lactamase inhibitors. Aminoglycosides and aminocyclitols, tetracyclines, amphenicols (chloramphenicol, thiamphenicol, florfenicol), macrolides, quinolones and fluoroquinolones, polypeptides (polymixins, bacitracin) and glycopeptide antibiotics, Miscellaneous agents: Lincosamides, novobiocin, virginiamycin, tiamulin,



nitrofurans and methenamine, Antitubercular drugs. Antifungal agents: Topical and systemic agents including anti-fungal antibiotics. Antiviral and anticancer agents. Anthelmintics: Drugs used against nematodes, cestodes, trematodes. Antiprotozoal agents: Drugs used in trypanosomiasis, theileriosis, babesiosis, coccidiosis, amoebiasis, giardiasis and trichomoniasis. Ectoparasiticides. Antiseptics and disinfectants. Pharmacology of drugs of abuse in animals.

Pharmacology of indigenous medicinal plants: Scientific name, common name, active principles, pharmacological actions and therapeutic uses of Ginger, ocimum, neem, piper longum, withania, leptadenia, tinospora, embilica, eucalyptus, glycyrrhiza, trichospermum, curcuma, adiantum, butea, aloes, sena, rheubarb, catechu etc.

*Unit-VI (Veterinary Toxicology):* General Toxicology: Definitions, history of toxicology, fundamentals and scope of toxicology. Sources and classification of toxicants, factors modifying toxicity, general approaches to diagnosis and treatment of poisoning.

Toxicity caused by metals and non-metals: Arsenic, lead, mercury, copper, molybdenum, selenium, phosphorus, fluoride, nitrates or nitrites, chlorate, common salt and urea.

Poisonous plants: Cyanogenetic plants, abrus, ipomoea, datura, nux vomica, castor, oxalate producing plants, plants causing thiamine deficiency, plants causing photosensitization and lathyrism, oleander, and cotton.

Toxicity caused by Agrochemicals: Insecticides - Chlorinated hydrocarbons, organophosphates, carbamates, pyrethroids, newer insecticides. Herbicides, fungicides and rodenticides.

Fungal and bacterial toxins: Aflatoxins, rubratoxin, ochratoxin, sporidesmin, citrinin, F-2 toxin, trichothecenes, ergot, fescue, botulinum toxin and tetanus toxin.

Venomous bites and stings: Snake, scorpion, spider, bees and wasp, toad and fishes (puffer fish, shellfish). Toxicity caused by food additives and preservatives. Drug and pesticide residue toxicology. Environmental pollutants: Air and water pollutants. Concept of radiation hazards.

## **Practical**

*Unit-I (General Pharmacology):* Handling and washing of laboratory wares. Handling and operation of commonly used laboratory instruments. Concept of good laboratory practices (GLP). Pharmacy appliances. Principles of compounding and dispensing. Metrology, systems of weights and measures, pharmacy calculations. Pharmaceutical processes. Pharmaceutical dosage forms. Prescription writing, incompatibilities. Drug standards and regulations, custody of poisons. Compounding and dispensing of powders, ointments, mixtures, liniments, lotions, liquors, tinctures, emulsions, and electuaries.

*Unit-II (ANS Pharmacology):* Demonstration of the action of autonomic agonists and antagonists on intact or isolated preparations of the laboratory animals. Simulated animal experiments should be preferred over use of live animals. The lab for simulated experiments should be established within a span of one year.

*Unit-III (CNS Pharmacology):* Handling of lab animals. Regulatory guidelines for use of lab animals. Demonstration of the effect of CNS active drugs and local anaesthetics in laboratory animals. The lab for simulated experiments should be established within a span of one year.

*Unit-IV (Veterinary Chemotherapy):* Demonstration of various chemotherapeutic agents and their dosage forms. Demonstration of antibiotic sensitivity test and its interpretation.

*Unit-V (Veterinary Toxicology):* Collection, preservation and dispatch of material for toxicological analysis. General principles for toxicological analysis. Detection of heavy metals or non-metals or plant poisons. Demonstration of agrochemical toxicity and its antidotal therapy via simulation methods. Demonstration of toxic weeds and plants of local area. Methods of calculation of median lethal dose (LD50) or maximum tolerated dose (MTD).

#### **Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1, 2,3 and 4	100	20
Paper-II	5 and 6	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3, 4 and 5	60	20

## DEPARTMENT OF VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY

Department of Veterinary Public Health and Epidemiology

Credit Hours: 3+1=4

### Theory

*Unit-I (Veterinary Public Health and Food Safety):* Aims and scope of Veterinary Public Health. Role of veterinarians in public health. One Health concept and initiatives. Veterinary Public Health administration. Sources of contamination. Principles and concepts of food hygiene and safety. Milk hygiene in relation to public health. Hygienic and safe milk production practices including steps for prevention and control of milk contamination, adulterants, antimicrobial residues, agrochemicals, subclinical mastitis orudder infections etc.. Microbial flora of milk and milk products. Milk plant and dairy equipment hygiene. Quality control of milk and milk products. Milk hygiene practices in India and other countries.

Elements of meat inspection and meat hygiene practices. Pathological conditions associated with the transport of food animals. Hygiene in abattoirs and meat plants. Detection of conditions or diseases and judgements during ante mortem and post mortem inspection. Examination of lymph nodes. Meat as a source of disease transmission. Sources of contamination of meat and methods of carcass decontamination. Speciation of meat. Animal welfare and public health issues. Classification of low risk and high risk material generated in an abattoir and its hygienic disposal. Inspection of poultry for human consumption. Occupational health hazards in abattoir and meat plants.

Foodborne infections and intoxications associated with foods of animal origin. Toxic residues (pesticides, antibiotics, metals and hormones) in foods and associated health hazards. Types of biohazards. Hazard analysis and critical control points (HACCP) system. Importance of ISO 9000 and 14000 series in meat industry. Risk analysis, assessment and management. International food safety standards: World Organisation for Animal Health (OIE), World Trade Organization (WTO) agreements and Codex Alimentarius Commission. Sanitary and phytosanitary measures in relation to foods of animal origin. Food Safety and Standards Act and Regulations. Role of Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS) and other national agencies.

*Unit-II (Veterinary Epidemiology):* Definitions, components and aims of epidemiology. Factors influencing occurrence of livestock diseases and animal production. Determinants of disease. Transmission and maintenance of infections. Ecology of disease. Measures and patterns of disease occurrence. Survey and surveillance of animal diseases and related parameters. Epidemiological methods- Descriptive, analytical, experimental, theoretical, serological and molecular. Animal disease forecasting. Strategies of disease management: prevention, control and biosecurity. Economics of animal diseases. National and international regulations on livestock diseases. Role of OIE and laws on international trade of animals and animal products.

*Unit-III (Zoonotic Diseases):* Definition, history and socio-economic impact of zoonotic diseases. Classification of zoonoses and approaches to their management. Multisectoral approach for zoonoses prevention and control. Emerging, re-emerging and occupational zoonoses. Role of domestic, wild, pet and laboratory animals and birds in transmission of zoonoses. Zoonotic pathogens as agents of bioterrorism. Epidemiology, clinical manifestations and management of the following zoonoses: Rabies, Japanese encephalitis, influenza, Kyasanur forest disease, Crimean Congo haemorrhagic fever, Nipah encephalitis, Ebola virus infection, anthrax, brucellosis, tuberculosis, leptospirosis, listeriosis, plague, glanders, Q fever,

rickettsiosis, chlamydiosis, taeniasis, cysticercosis, hydatidosis, larva migrans, diphyllorhynchiasis, trichinellosis, toxoplasmosis, fasciolosis, paragonimiasis, sarcocystosis, cryptosporidiosis, amoebiasis, giardiasis, leishmaniasis, superficial and systemic mycosis and prion diseases. Foodborne bacterial zoonoses: salmonellosis, E. coli infection, staphylococcal gastroenteritis, clostridial food poisoning, campylobacteriosis etc.

*Unit-IV (Environmental Hygiene):* Scope and importance. Ecosystem: Components structure and functions. Biodiversity: uses, threats and conservation. Natural resources: types, uses and abuses. Environmental contaminants in food chain-bioaccumulation, biomagnification and persistent organic pollutants. Environmental pollution: Sources, nature of pollutants, effects on animal and human health. Rural and urban pollution. Air pollution, sources and hazard. Air pollution in animal houses, effect on health and productivity. Airborne diseases – Classification, health hazard, prevention and control. Water-Sources, contamination & their prevention. Water qualities- Physical, chemical, bacteriological and radiological. Water purification methods for community water supplies. Waterborne diseases – Classification, health hazard, prevention and control. Soil, marine and thermal pollution- Classification, sources, hazard, prevention and control. Noise pollution – Sources, hazards, prevention and control. Nuclear hazards or radiological hazard-Types, hazards and radiation protection. National rules and legislations related to environmental pollution and role of pollution control board in India. Biosafety: Importance, classification and biosafety measures for prevention of risk hazards. Disaster management and mitigation. Solid and liquid waste management at farms and biomedical waste management. Sanitation and disinfection of farm and hospital environment in veterinary public practice for infection control. Global warming and greenhouse effect- Definition, greenhouse gases, impact of climate change and international treaties or protocols. Management of waste from animal industries. Stray and fallen animal management and carcass disposal. Vector and reservoir control.

## **Practical**

*Unit-I (Veterinary Public Health and Food Safety):* Collection of samples for chemical and bacteriological examination. Grading of milk by dye reduction test, direct microscopic examination and standard plate count. Quality assurance tests for processed milk and milk products. Tests for plant sanitation-Air, water and equipment. Microbiological examination of raw milk, pasteurized milk, milk products, meat, meat products and eggs-standard plate count, coliform count, enterococcal count, psychrophilic and psychrotrophic organisms, thermophilic bacteria and yeast and mold count. Detection of organisms of public health significance from food products by techniques. Tests for detection of mastitic milk. Ante-mortem and post-mortem inspection of food animals. Demonstration or detection of toxic chemicals and contaminants of public significance from milk and meat. Detection of antimicrobial residues in milk and meat by microbiological and analytical techniques. Demonstration of speciation of meat.

*Unit-II (Veterinary Epidemiology):* Sampling methods for epidemiological studies. Measurement of disease frequencies. Sources, storage, retrieval and representation of disease information or data. Demonstration of selected software programmes or models. Evaluation of sensitivity and specificity of diagnostic tests by epidemiological methods. Determination of associations of disease and hypothesized causal factors. Survey of an animal disease on a farm. Epidemiological investigation of disease outbreaks.

*Unit-III (Zoonotic Diseases):* Detection, isolation and identification of important pathogens of zoonotic importance from animal, human and environmental sources including foods of animal origin. Detection of zoonotic diseases by serological, molecular and hypersensitivity tests.

Study of probable association of human disease conditions with animal diseases present in an area. Study of rural environment and health status of rural community.

*Unit-IV (Environmental Hygiene):* Sampling methods for testing quality of air, water, soil and other environmental sources. Physical, chemical and microbiological examination of water. Estimation of residual chlorine and chlorine demand. Isolation & identification of pathogens from air, water and other environmental sources. Disinfection of animal houses. Determination of efficacy of disinfectants – Phenol coefficient, MIC and MBC. Demonstration or visit to water purification system. Demonstration of various ventilation systems in animal houses and specialized laboratories. Demonstration of toxic residues in water and other environmental sources. Visit to local polluted site and documentation of local environmental problems – like dumping grounds, local slum areas, crowded localities etc.

#### Annual Examination

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1 and 2	100	20
Paper-II	3 and 4	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3 and 4	60	20

## DEPARTMENT OF VETERINARY PARASITOLOGY

### Veterinary Parasitology

Credit Hours: 3+2

#### Theory

*Unit- I (General Veterinary Parasitology): Parasitology-* Introduction, Important historical landmarks, importance of parasitology in veterinary curriculum. Types of parasites (ecto, endo, hyper, obligatory, facultative, stenoxenous, euryxenous, monoxenous, heteroxenous, histozoic, coelozoic, temporary, permanent, pseudo, aberrant, incidental, opportunistic, zoonotic, protelean etc.). Types of hosts (definitive, intermediate, reservoir, paratenic, natural, unnatural, etc.) and vectors. Types of animal associations (symbiosis, phoresy, commensalism, parasitism, mutualism and predatorism). Modes of transmission of parasites and methods of dissemination of the infective stages of the parasites. International Code of Zoological Nomenclature: Rules and regulations, Standard Nomenclature of Animal Parasitic Diseases (SNOAPAD). Immunity against parasitic infections or infestations, natural and acquired immunity, premunity, sterile immunity, autoimmunity, passive immunity, concomitant immunity and immune evasion by parasites. General harmful effects of parasites including various tissue reactions caused by parasites. General control measures against parasites. Characters of various phyla of parasites.

*Unit-2 (Trematodes and Cestodes of Veterinary Importance): Trematodes-* Introduction, general account and classification, general life cycle of trematodes with morphological features of their developmental stages. Important morphological features, life cycles, modes of transmission, pathogenesis, epidemiology, diagnosis and general control measures (including chemo- and immuno-prophylaxis) of the following trematode parasites: Liver flukes (*Fasciola*, *Dicrocoelium* and *Opisthorchis*), intestinal flukes (*Fasciolopsis*). Blood flukes causing nasal schistosomosis (*Schistosoma nasalis*), visceral schistosomosis (*S. spindale*, *S. indicum*, *S. incognitum*) and cercarial dermatitis. Paramphistomes (*Paramphistomum*, *Cotylophoron*, *Calicophoron*, *Gigantocotyle*, *Gastrothylax*, *Fiscoederius*, *Carmyerius*, *Gastrodiscus*, *Gastrodiscoides* and *Pseudodiscus*). *Paragonimus*, *Prosthogonimus* and *Echinostomes*.

*Cestodes:* Introduction, general account and classification, general life cycle of cestodes with morphological features of their developmental stages (Metacestodes). Important morphological features, life cycles, modes of transmission, pathogenesis, epidemiology, diagnosis and management of the following cestode parasites: Equine tape worms (*Anoplocephala*, *Paranoplocephala*) and ruminant tape worms (*Moniezia*, *Avitellina*, *Stilesia*, *Thysaniezia*). Dog tape worms (*Dipylidium*, *Taenia*, *Echinococcus*). Poultry tape worms (*Davainea*, *Cotugnia*, *Raillietina*, *Amoebotaenia*, *Choanotaenia* and *Hymenolepis*). Broad fish tapeworm (*Diphyllobothrium*) and *Spirometra*.

*Unit-III (Nematodes of Veterinary Importance): Nematodes-* Introduction, general account and classification, general life cycle of nematodes with morphological features of their developmental stages. Important morphological features, life cycles, modes of transmission, pathogenesis, epidemiology, diagnosis and management of the following nematode parasites: *Ascaris*, *Parascaris*, *Toxocara*, *Toxascaris*, *Ascaridia*, *Heterakis* and *Oxyuris*. *Strongyloides*, *Strongylus*, *Chabertia*, *Syngamus* and *Oesophagostomum*. Kidney worms (*Stephanurus* and *Diectophyma*), hook worms (*Ancylostoma* and *Bunostomum*). *Trichostrongylus*, *Ostertagia*, *Cooperia*, *Nematodirus*, *Haemonchus* and *Mecistocirrus*. *Habronema*, *Draschia*, *Thelazia*, *Spirocerca*, *Gongylonema*, *Physaloptera* and *Gnathostoma*. *Dirofilaria*, *Parafilaria*, *Onchocerca*, *Setaria* and *Stephanofilaria*. Lung worms (*Dictyocaulus*, *Muellerius*, *Protostrongylus* and *Metastrongylus*). Guinea worm (*Dracunculus*), *Trichinella*, *Trichuris*,

Capillaria. Acanthocephala (Macracanthorhynchus). Study of anthelmintic resistance and its types.

*Unit-IV (Arthropods of Veterinary Importance): Arthropods-* Introduction, general account and classification, general life cycle of arthropods with morphological features of their developmental stages. Important morphological features, general bionomics, life cycle, vector potentiality, pathogenesis and control of following arthropods affecting animals and birds: Bugs (Cimex). Biting midges (Culicoides), black flies (Simulium), sandflies (Phlebotomus), mosquitoes (Culex, Anopheles and Aedes). Horse flies (Tabanus), Haematopota and Chrysops. Musca, Stomoxys, Haematobia and Sarcophaga. Warbles (Hypoderma), stomach bots (Gasterophilus, Cobboldia), nasal bots (Oestrus ovis, Cephalopina), Bottle flies (Calliphora, Lucilia, Chrysomya), myiasis. Hippobosca, Melophagus, Pseudolynchia. Lice (Haematopinus, Linognathus, Trichodectes, Damalina, Menopon, Lipeurus, Menacanthus and Heterodoxus). Fleas (Ctenocephalides, Echidnophaga, Xenopsylla, Pulex). Arachnids : General account, soft ticks (Argas, Ornithodoros and Otobius). Hard ticks (Hyalomma, Haemaphysalis, Rhipicephalus (Boophilus), Dermacentor, Ixodes and Amblyomma). Mites (Dermanyssus, Ornithonyssus, Demodex, Notoedres, Sarcoptes, Psoroptes, Chorioptes, Cnemidocoptes and Otodectes). Pentasomida (Linguatula). Study of insecticide or acaricide resistance.

*Unit-V (Protozoa of Veterinary Importance):* Introduction, general account and classification, general life cycle of protozoa with morphological features of their developmental stages. Differentiation from bacteria and rickettsia. Important morphological features, life cycles, modes of transmission, pathogenesis, epidemiology, diagnosis and general control measures (including chemo- and immunoprophylaxis) of the following protozoan parasites of veterinary and zoonotic importance : Leishmania (Visceral and cutaneous leishmaniasis), Trypanosoma (T. evansi, T. theileri, T. equiperdum). Trichomonas (Bovine and avian trichomoniasis). Histomonas (Black head in turkeys). Entamoeba, Giardia and Balantidium spp, Coccidia and coccidiosis of poultry and domestic animals. Cyst forming coccidia (Toxoplasma, Sarcocystis and Neospora caninum) and Cryptosporidium. Malarial parasites of animals and poultry (Plasmodium, Haemoproteus and Leucocytozoon). Piroplasms (Babesia, Theileria) and Hepatozoon. Anaplasma and Ehrlichia Resistance to antiprotozoals.

## **Practical**

*Unit- I (General Veterinary Parasitology):* Demonstration of the types of final and intermediate hosts. Demonstration of different organs or tissues of the hosts affected with endo- and ectoparasites. Visit to Post Mortem Hall to acquaint with different organs of animals affected with parasites. Demonstration of specific parasitic lesions caused by endo- and ectoparasites. Faecal examination techniques, egg counts, examination of faecal samples for the trematode, cestode, nematode eggs and protozoan cysts or oocysts or trophozoites. Demonstration of faecal culturing techniques. Methods of collection, fixation, preservation, staining and mounting of various types of parasites. Blood smear preparation: Wet, thin and thick smears. Staining of blood smears for demonstration of microfilariae and haemoprotozoan parasites. Collection and examination of skin scrapings for mites. Examination of urine samples and nasal washings for parasitic findings.

*Unit-II (Trematodes and Cestodes of Veterinary Importance):* Study of morphological characters of adults and developmental stages of the following trematodes and cestodes: Fasciola, Fasciolopsis, Dicrocoelium, Opisthorchis, Schistosoma, Paragonimus, Prosthogonimus, Echinostomes, Paramphistomes (Paramphistomum, Cotylophoron, Gigantocotyle, Gastrothylax, Fiscoederius, Gastrodiscus, Gastrodiscoides and Pseudodiscus). Anoplocephala, Paranoplocephala, Moniezia, Avitellina, Stilesia, Davainea, Cotugnia,

Raillietina, Amoebotaenia, Choanotaenia, Hymenolepis, Dipylidium, Taenia, Echinococcus, Diphyllbothrium and Spirometra. Demonstration of gross and microscopic lesions of parasites.

*Unit-III (Nematodes of Veterinary Importance):* Study of morphological characters of adults and developmental stages of the following nematodes : Ascaris, Parascaris, Toxocara, Toxascaris, Ascaridia, Heterakis, Oxyuris, Strongyloides, Strongylus, Chabertia, Syngamus and Oesophagostomum. Stephanurus, Dioctophyma, Ancylostoma, Bunostomum, Ostertagia, Trichostrongylus, Cooperia, Nematodirus, Haemonchus and Mecistocirrus. Habronema, Draschia, Thelazia, Spirocerca, Gongylonema, Physaloptera, Gnathostoma, Dirofilaria, Parafilaria, Onchocerca, Setaria, Stephanofilaria, Dictyocaulus, Muellerius, Protostrongylus, Metastrongylus, Dracunculus, Trichinella, Trichuris, Capillaria and Macracanthorhynchus. Demonstration of gross and microscopic lesions of parasites.

*Unit-IV (Arthropods of Veterinary Importance):* Study of morphological characters of adults and life cycle stages of the following arthropods : Culicoides, Simulium, Phlebotomus, Cimex, Culex, Anopheles, Aedes, Tabanus, Haematopota and Chrysops Musca, Stomoxys, Haematobia, Gasterophilus, Hypoderma, Oestrus ovis, bottle flies, Sarcophaga, Hippobosca, Melophagus and Pseudolynchia. Trichodectes, Menopon, Menacanthus, Lipeurus, Haematopinus, Linognathus and Damalinia Xenopsylla, Ctenocephalides and Echidnophaga. Argas, Ornithodoros, Otobius, Ixodes , Hyalomma, Rhipicephalus (Boophilus), Haemaphysalis, Dermacentor and Amblyomma. Dermanyssus, Ornithonyssus, Demodex, Notoedres, Sarcoptes, Psoroptes, Chorioptes, Cnemidocoptes, Otodectes and Pentastomida. Demonstration of gross and microscopic lesions of parasites.

*Unit-V(Protozoa of Veterinary Importance):* Study of morphological characters of different stages of following protozoan parasites: Leishmania, Trypanosoma, Trichomonas, Histomonas, Entamoeba, Balantidium, Giardia, Eimeria, Isospora, Sarcocystis , Toxoplasma and Cryptosporidium. Plasmodium, Haemoproteus and Leucocytozoon. Babesia, Theileria and Hepatozoon, Rickettsial organism Anaplasma and Ehrlichia. Demonstration of formol ether and Ziehl-Neelson's staining techniques and other faecal examination techniques. Diagnosis of intestinal protozoan infections by iodine and eosin stain methods. Demonstration of gross and microscopic lesions due to protozoan parasites. Demonstration of Haemoproteus columbae in the blood. Demonstration of sporulation for diagnosis of coccidian parasites.

#### Annual Examination

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 and 3	100	20
Paper-II	4 and 5	100	20
<b>Practical</b>			
Paper-I	1,2 and 3	60	20
Paper-II	4 and 5	60	20



## DEPARTMENT OF LIVESTOCK PRODUCTS TECHNOLOGY

### Livestock Products Technology

Credit Hours: 2+1=3

#### Theory

*Unit-I (Milk and Milk Products Technology):* Retrospect and prospects of milk industry in India. Layout of milk processing plant and its management. Composition and nutritive value of milk and factors affecting composition of milk. Physico-chemical properties of milk. Microbiological deterioration of milk and milk products. Collection, chilling, standardization, pasteurization, UHT treatment, homogenization, bacto-fugation. Dried, dehydrated and fermented milk. Introduction to functional milk products. Preparation of cream, butter, paneer or channa, ghee, khoa, lassi, dahi, ice-cream, mozzarella cheese and dairy byproducts. Common defects of milk products and their remedial measures. Packaging, transportation, storage and distribution of milk and milk products. Good manufacturing practices and implementation of HACCP in milk plant. Organic milk products. Food safety standards for milk and milk products. Cleaning and sanitation in milk plant. Dairy effluent management.

*Unit-II (Wool Science):* Introduction to wool, fur, pelt and specialty fibers with respect to processing industry. Glossary of terms of wool processing. Basic structure and development of wool follicle. Post shearing operations of wool, classification and grading of wool, physical and chemical properties of wool. Impurity of wool, factors influencing the quality of wool. Brief outline of processing of wool.

*Unit-III (Abattoir Practices and Animal Byproducts Technology):* Layout and management of rural, urban and modern abattoirs. HACCP concepts in abattoir management. FSSAI standards on organization and layout of abattoirs. Animal welfare and pre-slaughter care, handling and transport of meat animals including poultry. Procedures of Ante-mortem and post mortem examination of meat animals. Slaughtering and dressing of meat animals and birds. Emergency and casualty slaughter. Evaluation, grading and fabrication of dressed carcasses including poultry. Abattoir byproducts; rendering, meat, bone, glue, gelatin, fat and byproducts of pharmaceutical value. Skin and hides; methods of flaying, defects, preservation and tanning. Treatment of condemned meat and carcasses. Management of effluent emanating from abattoir.

*Unit-IV (Meat Science):* Prospect of meat industry in India. Structure and composition of muscle (including poultry muscle). Conversion of muscle to meat. Nutritive value of meat. Fraudulent substitution of meat. Preservation of meat and poultry; drying, salting, curing, smoking, chilling, freezing, canning, irradiation and chemicals. Ageing of meat. Modern processing technologies of meat and meat products. Packaging of meat and meat products. Formulation and development of meat; kabab, sausages, meat balls or patties, tandoori chicken, soup, pickles. Fermentation of meat products. Physico-chemical and microbiological quality of meat and their products. Basics of sensory evaluation of meat products. Nutritive value, preservation, packaging of egg and egg products. Laws governing national or international trade in meat and meat products. Organic and genetically modified meat and poultry products.

#### Practical

*Unit-I (Milk and Milk Products Technology):* Sampling of milk. Estimation of fat, solid not fat (SNF) and total solids. Platform tests. Cream separation. Detection of adulteration of milk. Determination of efficiency of pasteurization. Preparation of milk products like ghee, paneer or channa, khoa, ice-cream or kulfi, milk beverages. Visit to modern milk processing and milk products manufacturing plants.

*Unit-II (Wool Science):* Wool sampling techniques. Tests for identification of wool; determination of fleece density, fiber diameter, staple length, crimp and medulation percentage. Scouring or clean fleece yield.

*Unit-III (Abattoir Practices and Animal Byproducts Technology):* Methods of ritual and humane slaughter, flaying and dressing of food animals including poultry. Carcass evaluation. Determination of meat yield, dressing percentage, meat bone ratio and cut up parts. Preparation of different abattoir byproducts. Visit to slaughterhouses or meat plants.

*Unit-IV (Meat Science):* Packaging of meat, poultry and shell eggs and their products. Estimation of deteriorative changes in meat and meat products. Preparation of comminuted and non comminuted meat and poultry products. Evaluation of external and internal egg quality and preservation technique of eggs

**Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1 and 2	100	20
Paper-II	3 and 4	100	20
<b>Practical</b>			
Paper-I	1 and 2	60	20
Paper-II	3 and 4	60	20

**DEPARTMENT OF VETERINARY AND ANIMAL HUSBANDRY EXTENSION  
EDUCATION**

**Veterinary and Animal Husbandry Extension Education**

**Credit Hours: 3+1**

**Theory**

*Unit-I (Livestock Based Livelihoods and Their Evolution):* History of domestication and their social dimensions. Evolution and relationship between agriculture and animal husbandry. Farming and characteristics of farming in India. Classification of farming, types and systems. Peasant farming, cooperative farming, collective farming, contract farming, estate farming, organic farming, capitalistic farming, small-scale farming, large-scale farming, intensive, extensive farming, specialized, diversified, mixed, integrated and dry land farming. Role of animals in the contemporary society.

*Unit-II (Extension Education and Development):* Early extension efforts in India. Types of education: Formal, non-formal and informal education. Extension education: Concept, levels, objectives and dimensions. Principles, philosophy and functions of extension education. Teaching-learning process and steps in extension teaching. Concept of need and its types. Rural development - Concept, significance and importance of rural development programmes for poverty alleviation. Problems and Issues in development. Panchayati Raj System.

*Unit-III (Rural Sociology in Veterinary Extension):* Concept of sociology and rural sociology in animal husbandry extension. Culture: definition, elements, change, impact on production systems. Basic sociological concepts - society, community and association. Rural society: characteristics and differences among society, community and culture. Characteristics and differences among tribal, rural and urban communities. Social control: concept and means of social control (techniques, folkways, taboos, mores and laws). Social stratification: definition, forms and characteristics (caste system and class system). Social institutions in rural society: Social, economic, political, religious and educational (definition, composition and function). Social change: concept, importance and factors. Social groups: different groups, classification of social groups and their characteristics. Leadership: definition, functions of leader, types of rural leaders, Key communicators and their role in the animal husbandry extension.

*Unit-IV (Transfer of Technology for Livestock Development):* Technology- Concept, generation process, application, merits and de-merits. Adoption and diffusion of innovations, stages of adoption, adopter categories, innovation decision process, attributes of innovations, diffusion process, factors affecting adoption and diffusion processes. Programme planning-principles, objectives and steps. Evaluation of extension programme, constraints in the adoption of scientific animal husbandry practices. Role of extension agents in diffusion of livestock innovations. Cattle and buffalo improvement programmes: Key Village Scheme, Intensive Cattle Development Project, Gosadan and Gaushala. Dairy development programmes: concept of cooperation, Rochdale principles of cooperation, objectives of cooperative, Amul pattern of dairy cooperative system and Operation Flood. Transfer of technology projects of Indian Council of Agricultural Research (ICAR): Krishi Vigyan Kendra (KVK), Agricultural Technology Information Centre (ATIC), Agricultural Technology Management Agency (ATMA), National Agricultural Innovation Project (NAIP), Rashtriya Krishi Vikas Yojana (RKVY) etc. Different ongoing central and state government animal husbandry development programmes being run related to sheep, goat, poultry, piggery, fodder production etc.

*Unit-V (Communication and Extension Teaching Methods):* Communication and its functions. Basic concepts: communication fidelity, communication gap, time lag in communication, empathy, homophily and heterophily, propaganda, publicity, persuasion and development communication. Types of communication: Intrapersonal, interpersonal, verbal, non- verbal, vertical, horizontal, organizational communication etc. Elements of communication: Communicator, message, channel, treatment of message, audience, and audience response (feedback). Barriers of communication. Individual contact methods: Farm and home visit, farmer's call, personal letter, adaptive or minikit trial, farm clinic etc. Group contact methods: Result demonstration, method demonstration, group meeting, training, field day or farmers' day, study tour etc. Mass contact methods: Farm publications (leaflet, folder, pamphlet, booklet, bulletin, farm magazine, newsletter etc.), mass meeting, campaign, exhibition, newspaper, radio, television, mobile short message service. Selection and use of extension teaching methods.

*Unit-VI (Livestock Economics and Marketing):* Introduction to Economics and Livestock Economics: definition and scope (production, consumption, exchange and distribution). Basic concepts- wants, goods, wealth, utility, price, value, assets, capital, money, income etc. Important features of land, labour, capital and organization. Theories of demand, supply and cost. Theories of production (law of diminishing return, increasing return, constant return and return to scale). Concept of market: market, market structure and classification of markets. Market price and normal price, price determination under perfect competition in short and long run. Marketing functions: meaning and their classification (packaging, transportation, grading, standardization, storage and warehousing, processing and value addition, buying and selling, market information, financing, risk bearing, minimization of risks (speculation and hedging). Marketing agencies, institutions and channels for livestock and livestock products. Government interventions and role in marketing of livestock and livestock products. External trade in livestock products, recent policies on trade and international trade agreements and their implications in livestock sector.

*Unit-VII (Livestock Entrepreneurship):* Definition of entrepreneur, entrepreneurship, enterprise and manager. Difference between entrepreneur and entrepreneurship, entrepreneur and enterprise, entrepreneur and manager. Theories of entrepreneurship: Sociological theory, economic theory, cultural theory, psychological theory. Types, characteristics and functions of an entrepreneur. Forms of entrepreneurship: (Sole proprietorship, partnership, corporation, cooperative, joint stock company, Private and Public Limited Company). Introduction to financial management: concept, function, analysis of financial statement, sources of capital (banks, venture capitals, etc.). Project appraisal- Introduction, importance, techno-economic feasibility, criteria of project evaluation (discounted and non-discounted), capital budgeting, etc. Business plan for enterprise. Institutions promoting entrepreneurship in India. Entrepreneurship development programmes. Accounting: objectives, common terms. Personnel management-identification of work, job analysis, division of labour etc. Resource management- organization aspect of livestock farms, resources and procurement of inputs and financial resources, breakeven- analysis etc.

*Unit-VIII (Information and Communication Technology):* Strengths and limitations of ICTs application in livestock sector and farmers capacity building. Information kiosk, Elearning, CAD, virtual class room, virtual reality, multi-media etc. Cyber extension- problems and prospects in livestock extension. Computer networking: (LAN, MAN, WAN, Internet, tele-conferencing, tele-text, radio-text, video-text, interactive cable distribution system, satellite communication, internet, www, etc.).

*Unit-IX (Contemporary Issues in Livestock Enterprises):* Gender and animal husbandry- definition, difference between gender and sex, role of women in animal husbandry, gender sensitization, importance of gender sensitization in animal husbandry, need for gender analysis, gender budgeting and mainstreaming. Salient features of recent livestock census, livestock insurance scheme, national livestock mission. Sustainability- concept of sustainability of livestock production system (social, environmental and economic challenges faced). Introduction to environmental consequences of livestock rearing. Animal welfare: Introduction to animal welfare, ethics and rights. Importance of animal welfare in the contemporary society. Expectations from veterinary professionals.

### **Practical**

*Unit-I Tools of data collection:* Preparation of instrument for conducting social survey; Visit to nearby village: Conducting social survey for assessment of farming system and constraints; Data analysis and reporting; Organizing demonstration for farmers; identification of key communicators by Socio-metric method; Familiarization with audiovisual aids; Principle and use of projectors; Preparation of Radio Script Preparation of Television script; Preparation and use of poster; Preparation and use of chart; Preparation and use of flash cards; Preparation and use of farm publications for extension work; Planning and organizing an awareness campaign (Health and Production); Planning and organization of animal health camps; Exercise on rapid rural appraisal (RRA).; Exercise on participatory rural appraisal (PRA) technique; Planning and organization of group discussion.

*Unit-II* Rules of debit and credit in livestock business transactions. Journal Entry and Ledger Posting. Writing of Cash Book. Balancing and preparation of final accounts. Exercise on calculation of depreciation. Visit to commercial enterprises of livestock production. Preparation of dairy entrepreneurial project report. Preparation of sheep and goat entrepreneurial project report. Preparation of poultry entrepreneurial project report. Preparation of piggery or rabbit entrepreneurial project report. Techno-economic feasibility report. Exercise on Break-even analysis. Exercise on BCR, IRR and NPW. Case study of successful entrepreneurial project. Visit to livestock market. Visit to livestock fair. Exercise on economics of diseases

### **Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 ,3,4 and 5	100	20
Paper-II	6, 7, 8 and 9	100	20
<b>Practical</b>			
Paper-I	1	60	20
Paper-II	2	60	20

## VETERINARY CLINICAL COMPLEX (VCC)

### Veterinary Clinical Practices-I (Third year)

**Credit Hours: 0+1**

Orientation and understanding the working of Veterinary Clinics including hospital set up, administration and work force management. Doctor client interaction, Orientation to local language or dialect or local terminology of the diseases. Registration, filling up registration cards, history taking, handling and restraining of animals. Preliminary clinical examination such as recording of temperature, respiration, pulse, motility of digestive system etc. Familiarization and practice of first aid procedures. Practice of collection, labeling, packaging and storage of laboratory samples. Preparation and sterilization of surgical packs, instruments, drapes and operation theaters. Familiarisation with antiseptic dressing techniques and bandaging.

### Veterinary Clinical Practices-II (Fourth year)

**Credit Hours: 0+6**

The students shall be Imparted the trainings on rotation basis in the following sections of Veterinary Clinical Complex (VCC):

*Ambulatory Section:* Each Veterinary college should adopt five villages where in the health, production and treatment part should be taken care of in a holistic manner.

Handling, examination, diagnosis and treatment of sick animals in the field conditions under the supervision of faculty. Ambulatory Clinics shall be operated by small groups of students and faculty of clinical departments through an equipped ambulatory mobile unit.

*Diagnostic Laboratory Section:* Veterinary Clinical Diagnostic Laboratory will be an important component of Teaching Veterinary Clinical Complex that will impart training to students for laboratory evaluation and interpretation of clinical samples leading to definitive diagnosis of diseases. This activity will improve competence of students in examining clinical samples (biochemical, toxicological, pathological, parasitological and bacteriological) at the clinical complex, analyzing and correlating with clinical findings and interpreting the results. Collection labeling, transportation, and preservation of body fluid samples, writing results and report. Interpretation of data in relation to specific diseases. Clinical significance and interpretation of serum glucose, lipids, proteins, blood urea nitrogen, creatinine, uric acid, ketone bodies, bilirubin and electrolytes from samples. Clinical significance and interpretation of examination of urine samples. Clinical evaluation of blood (Haemoglobin, packed cell volume, total erythrocytic count, erythrocytic sedimentation rate, total leukocytic count and differential leukocytic count) from clinical samples. Evaluation of acid-base balance and interpretation. Biochemical aspects of digestive disorders, endocrine functions. Liver, kidney and pancreatic function tests. Role of enzymes for detection of tissue or organ affection. Preparation of microscopic slides from tissue collected for diagnosis and its histopathological interpretation. Examination of biopsy and morbid material for laboratory diagnosis. Laboratory evaluation and diagnosis of samples for parasitic diseases (routine faecal examinations- direct smear method, simple sedimentation and floatation methods, quantitative faecal examination, pastural larval counts). Examination of skin scrapings, examination of blood. Orientation to a clinical Microbiology laboratory, collection, transport and processing of specimens from clinical cases for diagnosis of important bacterial, fungal and viral diseases. Isolation of bacteria from clinical samples, identification of bacteria by Grams staining and cultural or biochemical characteristics. Drug sensitivity and rationale for therapy. Diagnosis of diseases by employing tests like Agar Gel precipitation Test, ELISA etc.

*Note: The Laboratory shall run in collaboration with the Department of Pathology and Physiology and Biochemistry. Biochemist appointed in this section will be involved in teaching of students regarding principles of various diagnostic tests, normal and abnormal values in different species, differential diagnosis, correlating with diseases and rationale of arriving at the conclusion.*

*Medicine Section:* Orientation and understanding the working of Veterinary Clinics including hospital set up, administration and work force management. Understanding the different methods of record keeping, retrieval, processing, analysis and interpretation of data. Involvement in outpatient department (OPD), Indoor patient, Critical care or intensive care unit, sanitation, practice management etc. Doctor client interaction: Orientation to local language or dialect or local terminology of the diseases.

Registration, filling up registration cards, clinical practice comprising of clinical examination of the patient, with emphasis on history taking, examination techniques- palpation, percussion and auscultation. Familiarization and practice of first aid procedures and emergency medicine. Practice of collection, labeling, packaging and evaluation of laboratory samples. Relating generic and trade names of drugs along with their doses, indications and contraindications to prescribed treatment regimens.

Systematic examination of various systems, recording of clinical observations viz. temperature, respiration, pulse, cardiac sounds, cardiac function, pulmonary function, functional motility of digestive system, routes and techniques of administration of medicaments. Tentative and confirmatory diagnosis and treatment of common clinical cases like pharyngitis, laryngitis, stomatitis, indigestion, gastritis, ruminal impaction, tympany, enteritis, traumatic reticuloperitonitis, traumatic pericarditis, pneumonia, haemoglobinuria, haematuria. milk fever, ketosis, rickets, osteomalacia, common poisoning, and others clinical cases as reported in the section.

Collection of materials like urine, faeces, skin scraping, blood, milk and other body fluids for laboratory tests. Preparation of case records; follow-up records etc. Readiness to treat and handle casualties and other emergencies in the clinics. Learning and practicing passing of stomach and naso-gastric tube. Screening of livestock or poultry through tests, mass diagnostic campaigns. Vaccination and other disease prevention and control programmes in the field.

Learning the use of various advance non invasive diagnostic aids like Ultrasonography, Ophthalmoscope etc.

Practice of feeding of sick animals. Acts and regulations pertaining to generation and disposal of biomedical wastes in veterinary institutions. Biomedical waste generation, handling, storage, sorting, coding, transportation and disposal. Hazards of biomedical waste, and impact of biomedical waste on the environment.

*Gynecology and Obstetrics Section:* Practice of artificial insemination, pregnancy diagnosis, clinical examination and management of cases of anoestrus, silent oestrus, infertility and conception failure. Treatment of cases of metritis, cervicitis, vaginitis etc. Handling and management of cases of retention of placenta or fetal membranes, ante and post partum prolapse of vagina. Examination and handling of cases of dystocia, fetotomy, caesarian etc. Castration of male calves, breeding soundness, evaluation of bulls, ovariohysterectomy and collection of cervical and vaginal mucus for cytology. Rectal examination and vaginal examination of genitalia. Familiarization with common drugs and hormones used in reproductive disorders

including infertility, epidural and local anaesthesia for gynaecological cases. Filling of clinical case records and their maintenance.

*Surgery and Radiology Section:* Familiarization and understanding the use of equipments used in surgical sections of the VCC. Restraining and positioning of different species of animals for examinations, diagnosis and surgical treatment. Prescription of common drugs, their doses and uses in clinical surgical practice. Filling of clinical case records and their maintenance. Preparation and sterilization of surgical packs, instruments, drapes and operation theaters. Passing of stomach tube and gastric tube. Catheterization and urine collection.

Techniques of examination of neuromuscular and skeletal functions, Familiarisation with antiseptic dressing techniques, bandaging, abdomino-centesis, thoracocentesis. Topography anatomy of animals. Radiographic positioning, terminology and interpretation.

Treatment and Management of various surgical conditions including inflammation, wounds, abscess, cysts, tumors, hernia, haematoma, hemorrhage, sinus, fistula, necrosis, gangrene, bum, sprain, tendinitis etc. Management and treatment of fractures, dislocations and other affections of joints, facial paralysis, Eye worm and other affections of Eye. Irregular teeth and their rasping, tail amputation, knuckling, upward fixation of patella (medical patellar desmotomy) etc.

Familiarisation with the landmarks for the approach to various visceral organs, thoracocentesis, abdominocentesis. Rumenotomy, laparotomy, palpation and visualisation of viscera, urethrotomy, castration, vasectomy, caudectomy, thoracotomy, cystotomy, cystorraphy and splenectomy. Examination of horse for soundness, lameness and preparation of certificate for soundness. Tenotomies, suturing of tendon, shortening of tendon.

*Pet Animal Section:* Registration, filling up registration cards, history taking. Relating generic and trade names of drugs alongwith their doses, indications and contraindications to prescribed treatment regimens. Familiarization and practice of first aid procedures and emergency medicine. Practice of collection, labeling, packaging and evaluation of laboratory samples. Clinical examination techniques- palpation, percussion and auscultation, systematic examination of various systems, recording of clinical observations viz. temperature, respiration, pulse, cardiac sounds, cardiac function, pulmonary function, functional motility of digestive systems. Routes and techniques of administration of medicaments. Diagnosis and treatment of diseases. Collection of materials like urine, faeces, skin scraping, blood, milk and other body fluids for laboratory tests. Preparation of case records; follow-up records etc. Vaccination and other disease prevention and control programmes. Practice of pregnancy diagnosis, examination of cases of anoestrus, silent oestrus and conception failure. Rectal examination of genitalia, vaginal examination. Epidural and local anaesthesia for gynaecological cases. Restraining and positioning techniques for examination, diagnosis and surgical treatment. Preparation of surgical packs, sterilization procedures for surgical instruments. Passing of stomach tube and gastric tube. Catheterization and urine collection. Familiarization with antiseptic dressing techniques. Topography anatomy of pet animals. Radiographic positioning and terminology.

The practical component will be dealt with internally. The examination for VCP shall be conducted twice a year i.e. first practical exam after completion of 50% syllabus and the second one, when the course is completed but the second exam shall comprise of entire syllabus. Annual professional examination shall be held after the completion of 100% course content in each subject.



The examination should comprise of following components:

- (i) Submission of 10 complete cases each of Surgery, Medicine, Gynaecology
- (ii) Case presentation
- (iii) Review of treatment of 5 cases
- (iv) Written Objective Questions (Surgery, Medicine, Gynaecology
- (v) and Lab diagnosis)
- (vi) Viva

## **LIVESTOCK FARM COMPLEX**

### **Livestock Farm Practices**

**(Third year)**

**Cr. Hr. 0+2**

Aim of Livestock farm practices is actual involvement of students in all aspects of animal rearing so that they can rear animals on their own. Hands on training of the students on the overall farm practices of livestock management including cleaning, feeding, watering, grooming, milking, routine health care, record keeping, sanitation, housing, fodder production, preparation of mineral mixture, cost economic of fodder production. Care of pregnant animals, management of parturition, care of neonatal and young stock. Management of broiler, layer farm and hatchery.

One full day per week comprising of six contact hours will be kept entirely for LFP where the students should be divided into small batches on rotational basis wherein they should be actually involved in different activities such as milking, feeding etc.

The practical component will be dealt with internally. The examination for LFC shall be conducted twice a year i.e. first practical exam after completion of 50% syllabus and the second one, when the course is completed but the second exam shall comprise of entire syllabus. Annual professional examination shall be held after the completion of 100% course content in each subject.

The examination should comprise of following components:

- (i) Day to day activities
- (ii) Record Book
- (iii) Written Objective Questions
- (iv) Viva Any other suitable component as per conditions

## DEPARTMENT OF VETERINARY SURGERY AND RADIOLOGY

### Veterinary Surgery and Radiology

Credit Hours:2+1

#### Theory

*Unit-1 (Veterinary General Surgery): Introduction-* Historical perspective, Definitions, classification of surgery, tenets of Halsted. Pre-operative, intraoperative and post-operative considerations: History taking, physical examination, clinico-pathological testing, intraoperative and postoperative care.

*Sterilization and disinfection:* Definitions, surgical sterilization, various methods of sterilization (Heat, chemical and radiations etc.), disinfections.

*Sutures:* Definitions, suturing, factors influencing suturing, characteristics of an ideal suture material, types of suture material-absorbable and non-absorbable, surgical knots, various suture patterns-apposition, eversion, inversion and special.

Treatment of acute and chronic inflammation: Use of anti-inflammatory drugs and proteolytic enzymes. Haemostasis (physical and chemical methods, systemic haemostats, surgical diathermy)

Basic surgical affections: Definitions, classification, diagnosis and treatment of abscess, tumour, cyst, hernia, haematoma, necrosis, gangrene, burn and scald, frost bite and surgical affections of muscles, artery and vein, sinus and fistula.

Wounds: Definition, classification, examination and diagnosis, general principles for treatment of aseptic, contaminated and septic wounds, healing and factors affecting wound healing, complications of wounds and their remedies. Surgical infection; their prevention and management: Classification of infection, Introduction to biomaterials and stem cell therapy in wound management Management of surgical shock. Principles of fluid therapy in surgical patients.

*Unit-II (Veterinary Anaesthesiology): Introduction-* Development of anaesthesiology, Terminology, classification and indications. General considerations of anaesthesia: Factors affecting anaesthesia and selection of anaesthetic technique, factors modifying uptake, distribution and elimination, patient evaluation, categories of patients according to physical status, selection of anaesthetic agent and patient preparation. Pain and its management in animals Local and regional anaesthesia: Definitions, local anaesthetics, mechanism of action Premedication, properties and use of different preanaesthetics: Uses of premedication.

Anticholinergic, sedatives and tranquilizers (Phenothiazine derivatives, Benzodiazepines, Butyrophenones, Narcotic analgesics, Alpha-2 agonists, dosage chart of all the drugs.

*General anaesthesia:* Definitions, methods of induction of anaesthesia, Intravenous anaesthetics (Total intravenous anaesthesia), monitoring of anaesthesia.

*Inhalation anaesthesia:* Advantages of inhalant anaesthetics, types of inhalant anaesthetics their properties and effect on various systems, methods of administration of inhalant anaesthesia. *Dissociative anaesthesia:* Definition, drugs, clinical application, properties and effect on various body systems.

Avian, wild, zoo, exotics and lab animal anaesthesia and capture myopathy

Anaesthetic emergencies and management, Toxicity, antidote and reversal agents.

*Unit-III (Veterinary Diagnostic Imaging Techniques):* Introduction to Radiology-General terminology of radiology, Physical properties of X-Rays, Scope and uses of Radiology, Directional terms for veterinary radiology. Production of X-rays and factors influencing production of X-rays. Radiation hazards and safety measures- Scattered radiation, Biological effects of radiation, Direct and indirect effects, Early and late effects, Radiation sensitivity of different body cells, Radiation protection, General principles of radiation safety, Radiation monitoring devices, Requirement of an ideal radiographic section. The statutory requirements of radiology set-up as per Atomic Energy Regulatory Board of India (AERB). Production of quality diagnostic radiograph. Recording of image- Manual and digital processing of X-ray films, storage and retrieval system. Radiographic Quality and faults- Radiographic detail, density and contrast and factors affecting them, Radiographic faults, their possible causes and prevention. Contrast radiography- Definition, indications, contraindications and types of contrast radiography, Different contrast materials and their use, Techniques of some selected contrast radiography in animals (Barium swallow, Retrograde urography etc) Diagnostic ultrasonography- Principles, indications, techniques and artifacts of ultrasonography. Advanced diagnostic imaging tools- The brief introduction to the use and limits of some advanced imaging techniques, Interventional radiology - CAT scanning, MRI, etc

*Unit-IV: (Regional Surgery-I):* Head and Neck: Affections of lips, cleft palate, tongue, cheek, and their treatment: General anatomical considerations, avulsion of lip, cleft lip, ranula, neoplasm and traumatic injuries. Affections of teeth and jaws and their treatment: General anatomical considerations, Developmental abnormalities, dental tartar, periodontal disease, overgrown molars, fractures and luxations of jaw. Affections of nose, face, ear, head and horn and their treatment: General anatomical considerations. Brachycephalic syndrome, Stenotic nostrils, nasal polyps, empyema of sinuses, fracture and avulsion of horn, horn cancer, aural haematoma, otitis. Affections of eye and their treatment: General anatomical considerations and examination of eye. Affections of eyelids and nictitating membrane and their treatment: entropion, ectropion, chalazion, sty, Cherry eye and traumatic injuries. Affections of lachrymal apparatus, eyeball and orbit and their treatment: occlusion of nasolacrimal duct, traumatic proptosis, panophthalmia, orbital neoplasms, glaucoma, eye worms. Affections of cornea, iris and lens and their treatment: corneal ulcers, corneal opacity, Kerato Conjunctivitis Sicca (KCS), prolapse of iris, corneal dermoid, corneal lacerations and perforations, cataract. Affections of guttural pouch, oesophagus and their treatment: General anatomical considerations. Empyema, tympanitis and Mycosis of guttural pouch, oesophageal diverticulum, megaesophagus, achalasia and choke. Affections of glands of head and neck and their treatment: General anatomical considerations. Salivary mucocele, sialoliths, salivary fistula Affections of neck and their treatment: General anatomical considerations. Yoke gall, yoke abscess, fistulous withers, poll evil, torticollis. Affections of larynx and Trachea: Tracheal collapse, stenosis, roaring in horses, dorsal entrapment of soft palate in horses and camels, emergency tracheotomy. Management of ocular emergencies. Tracheotomy

*Unit-V (Regional Surgery-II):* Thorax and Abdomen: Thoracic affections: Surgical approaches, perforated wounds, pyothorax, pneumothorax, pneumocele, Diaphragmatic hernia and traumatic pericarditis in cattle. Abdominal affections: Surgical approach to the abdomen in different animal species. Common surgical affections of the stomach in dogs and their management: dilation and torsion of stomach, gastric ulcerations, foreign bodies in the stomach, pyloric stenosis. etc Surgical affections of the stomach in large animal and their management: Ruminal impaction, traumatic reticulitis, omasal and abomasal impaction and abomasal displacement. Surgical affections of small intestines and their management: Intestinal

obstruction, intussusception and strangulation (volvulus). Techniques of intestinal anastomosis. Surgical affections of large intestine and their management: Caecal dilatation and torsion, rectal prolapse, rectal and perineal tear, recto-vaginal fistula. Surgical affections of anus and perineal region and their management: Atresia-ani, anal stenosis, anal sac impaction. Other surgical affections of abdomen and their management: Perforating wounds and fistulae of abdomen, umbilical hernia, ventral abdominal hernia, inguinal and scrotal hernia, perineal hernia. Urinary system: Urolithiasis and its management. Urolithiasis in small and large animals. Patent urachus, ectopic ureter. Surgical management of equine colic. Genital system: Surgical affections of male genital system and their management, prostatic enlargement or hyperplasia or neoplasm, Phimosis, paraphimosis, preputial prolapse, penile amputation. Castration, vasectomy, scrotal ablation in large and small animals. Surgical affections of female genital system and their management: Canine transmissible venereal tumour. Ovariohysterectomy and caesarean section. Applications of rigid and flexible endoscopes in the management of surgical disorders. Integumentary system: Surgical affections of udder, teat and canine mammary neoplasms. Surgical affections of tail and tail docking Wildor zoo animal surgery (only awareness)

*Unit-VI (Orthopedics and Lameness):* Body conformation of the horse in relation to lameness (trunk, fore limb and hind limb).

*Lameness:* Its definition classification and diagnosis. General methods of therapy for lameness. Body and limb conformation in relation to lameness in equine.

*Equine lameness:* Shoulder slip (sweeny), bicipital bursitis, omarthritis, capped elbow, radial paralysis, carpalitis. bent knee, and knock- knee. Hygroma of knee, open knee, blemished knee. Fracture of carpal bone, fracture of accessory carpal, contraction of digital flexors. Splints, sore shin, wind puffs, sesamoiditis, Osstots, ringbone, quittor, side bone, Navicular disease, pyramidal disease. Laminitis, sand crack, seedy toe, fractures of third phalanx, pedal osteitis, and sole penetration. Canker, thrush and corn, Monday morning disease, cording up, myositis of psoas, Mac thrombosis, Crural paralysis, subluxation of sacroiliac joint rupture of round ligament trochanteric bursitis. Upward fixation of patella, stringhalt, gonitis, chondromalacia of patella, rupture of tendoachilles, rupture of peroneus tertius, fibrotic myopathy and ossifying myopathy. Thoroughpin, bog spavin, spavin, curb, capped hock.

*Canine lameness:* Intervertebral disc diseases, elbow and hip dysplasia, rupture of cruciate ligament, elbow hygroma etc.; their management, Onychectomy.

*Bovine lameness:* Contusion of sole, ulceration of sole, septic laminitis, avulsion of hoof and subluxation of patella, interdigital fibroma, cyst, sand crack, and hoof deformities.

Fracture: Definitions, classification, fracture healing and complications.

Fracture: The preliminary assessment and management of fractures. Techniques of external immobilization of fractures. Techniques of internal immobilization of fractures. Management of fracture complications

Luxations: Definition, signs, diagnosis. Management of common joint luxations in animals. Spinal trauma, diagnosis and its management

Rehabilitation and physiotherapy of orthopaedic patients

## **Practical**

*Unit-I (Veterinary General Surgery):* Introduction to layout of operation theatre and surgical unit. Introduction of common surgical equipment and instruments. Suture materials, surgical knots and suture patterns. General examination of surgical patients. Preparation of surgical patients. Other operation theatre routines like sterilization, preparation of theatre, Surgeon and surgical pack. Bandaging and basic wound management Demonstration (or Audio visual aids) of surgery, control of haemorrhage and suturing

*Unit-II (Veterinary Anaesthesiology):* Familiarization with anaesthetic apparatus, monitoring equipment and accessories. Methods of local infiltration analgesia (Linear ring block, inverted L block etc.) Regional nerve block demonstration and practice (Auriculopalpebral block, Peterson block or 4 point retrobulbar nerve block, Paravertebral, epidural etc.) Intravenous regional anaesthesia in cattle. Administration of general anaesthesia in small and large animals. (Demonstration and practice). Administration of inhalant anaesthesia (Demonstration). Monitoring of general anaesthesia. Management of anaesthetic emergencies, use of artificial respirator and analeptics. Visit to a wild animal facility or audio-visual aids or both.

*Unit-III (Veterinary Diagnostic Imaging Techniques):* Familiarization with the operation of the x-ray unit. Formulation of X-ray exposure technique charts, Adoption of safety measures and film processing. Positioning and radiography of different parts of the body in small and large animals Handling, viewing and interpretation of radiograph. Familiarization with the film contrast, density and details, common radiographic artifacts. Radiographic pathology of the head, neck and thorax of large and small animals. Radiographic pathology of abdomen of large and small animals. Radiographic pathology of the bones and joints of large and small animals. Demonstration of contrast radiographic techniques in animals. Demonstration of ultrasonography in animals. Fluoroscopy or Image intensifier (familiarization).

*Unit-IV (Regional Surgery-I):* Demonstration or Audio visual aids: Amputation of horn and disbudding. Tooth rasping, dental scaling. Examination of ear (otoscopy). Examination of eye (General examination, Ophthalmoscopy, tonometry, fluorescein dye test, Scherimer tear test, test for blindness). Operation for aural haematoma. Protection and bandage of eyes, tarsorrhaphy, third eyelid flap, flushing of nasolacrimal duct

*Unit-V (Regional Surgery-II):* Demonstration or Audio visual aids-Castration in different species in clinical cases and under animal birth control programme in canine. Ovariohysterectomy in dogs and cats. Rumenotomy, Gastrotomy in dogs, Urethrotomy and urethrostomy. Cystotomy and cystorrhaphy. Enterotomy or Enterectomy. Management of teat and udder affections. Amputation of tail in different animals in clinical cases. Circumcision operation for prepuce and rectal prolapse. Thoracocentesis and abdominocentesis.

*Unit-VI (Orthopedics and Lameness):* Demonstration or Audio visual aids-Familiarization with various orthopaedic instruments and implants. Basic orthopaedic and neurological examination in small and large animals. Nerve blocks in equine. Application of basic physiotherapy techniques in animals. Basic limb stabilization techniques and splinting techniques. Application of cast in small and large animals. Internal fixation techniques in animals. Medial patellar desmotomy in bovines. Examination of animals for soundness and preparation of soundness certificate.

**Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 ,3and 4	100	20
Paper-II	5and 6	100	20
<b>Practical</b>			
Paper-I	1,2 ,3and 4	60	20
Paper-II	5and 6	60	20

## DEPARTMENT OF VETERINARY MEDICINE

### Veterinary Medicine

Credit Hours: 4+1

#### Theory

*Unit-I (General):* History and scope of Veterinary Medicine, concept of animal diseases. Concepts of diagnosis, differential diagnosis, treatment and prognosis. General systemic states, hyperthermia, hypothermia, fever, septicemia, toxemia, shock, allergy, anaphylaxis, oedema, coma, anaemia, common clinical poisonings and dehydration. Estimates of diseases, patterns of disease, disease monitoring and surveillance, herd health and quarantine.

*Unit-II (Systemic Diseases):* Etiology, clinical manifestations, diagnosis, differential diagnosis, treatment, prevention and control of the following diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry: Diseases of digestive, respiratory, cardiovascular, urinary, nervous, musculoskeletal, haemopoietic, and lymphatic systems, skin, sense organs including affections of peritoneum, liver and pancreas. Emergency medicine and critical care.

*Unit-III (Metabolic and Deficiency Disorders):* Diagnosis and management of diseases caused by deficiency of iron, copper, cobalt, zinc, manganese, selenium, calcium, phosphorus, magnesium, iodine, vitamin A, D, E, B complex, K and C. Diseases of neonates, Alternative or integrated or ethno veterinary medicine in animal disease management. Aetiology, clinical manifestations, diagnosis, differential diagnosis, treatment prevention and control of metabolic or production and endocrine diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry i.e. Milk fever, eclampsia, osteodystrophy fibrosa, lactation tetany, downer cow syndrome, ketosis, fat cow syndrome, hypomagnesaemia, Nutritional haemoglobinuria, azoturia, diabetes, hypothyroidism, Cushing syndrome, Addison's disease and Gout.

*Unit-IV (Zoo and Wild Animal Medicine):* Principles of zoo hygiene, public health problems arising from zoos. Prevention, control and treatment of infectious, parasitic, nutritional and metabolic diseases in zoo and wild animals including exotic birds. Acts and Rules related to Zoo and wild animals. National and international organizations and institutions interlinked to wild and zoo animals – role and functioning.

*Unit-V (Bacterial, Fungal and Rickettsial Diseases):* Aetiology, epidemiology, clinical manifestations, diagnosis, treatment, prevention and control of bacterial, fungal and rickettsial diseases of livestock: mastitis, hemorrhagic septicaemia, brucellosis, tuberculosis, Johne's disease, listeriosis, leptospirosis, campylobacteriosis, actinomycosis, actinobacillosis, bordetellosis, glanders, strangles, ulcerative lymphangitis, colibacillosis, fowl typhoid, pullorum disease, fowl cholera, avian mycoplasmosis, spirochaetosis, salmonellosis, swine erysipelas, contagious caprine pleuropneumonia, contagious bovine pleuropneumonia, anthrax, clostridial infections, ehrlichiosis, chlamydosis, Q fever, anaplasmosis, dermatophilosis, aspergillosis, candidiasis, histoplasmosis, sporotrichosis, coccidiomycosis, mycotoxicosis and rhinosporidiosis.

*Unit-VI (Viral and Parasitic Diseases):* Aetiology, epidemiology, clinical manifestations, diagnosis, treatment, prevention and control of viral and parasitic diseases of diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry: Foot and mouth disease, rinderpest, bovine viral diarrhoea, malignant catarrhal fever, infectious bovine rhinotracheitis, ephemeral fever, blue tongue, sheep pox, goat pox, PPR, classical swine fever, rabies, equine influenza, equine infectious anemia, equine rhinopneumonitis, canine distemper, infectious canine hepatitis, canine parvoviral disease, corona viral infection, adeno virus infection, feline



rhinotracheitis, feline pan leucopenia, feline infectious peritonitis, avian influenza, New Castle disease, Marek's disease, avian leucosis, infectious bronchitis, infectious laryngotracheitis, avian encephalomyelitis, chicken reo virus, fowl pox, infectious bursal disease, chicken infectious anemia, inclusion body hepatitis-hydropericardium syndrome, emerging and exotic viral diseases of global importance.

Parasitic diseases: Trematodes, cestodes, nematodes, protozoan infections and external parasites of clinical importance.

*Unit-VII (Jurisprudence, Ethics, and Animal Welfare):* Legal duties of veterinarians, laws related to medicine, evidence, common offences against animals and laws related to these offences. Examination of living and dead animals in criminal cases. Cruelty to animals and bestiality. Legal aspects of: Examination of animals for soundness, examination of injuries and post-mortem examination. Causes of sudden death in animals. Collection and despatch of materials for chemical examination, detection of frauds-doping, alternation of description, bishoping etc. Cattle slaughter and evidence procedure in courts. Provincial and Central Acts relating to animals. Glanders and Farcy Act 1899 (13 of 1899). Dourine Act 1910 (5 of 1910), Laws relating to offences affecting Public Health. Laws relating to poisons and adulteration of drugs. Livestock importation act, liability and insurance. Code of conduct and ethics for veterinarians - the regulations made under the Act. Animal welfare organizations and its role in animal welfare, welfare assessment, behaviour and animal welfare, principles and philosophy of animal welfare, animal welfare ethics, improving animal welfare through legislation and incentives, assessment of physiological, behavioural, disease and production measures of animal welfare, assessing welfare in practice, environment enrichment, euthanasia, welfare of animals used in education and research and transportation, religion and animal welfare, human and animal welfare conflict, veterinary disaster management, human-animal interactions, economics and animal welfare and veterinarians as animal welfare educators

## **Practical**

*Unit-I (General):* Collection of history and general clinical examination. Collection, preservation, packing and dispatch of samples from clinical cases. Nasogastric and orogastric intubation in animals. Oxygen therapy in veterinary practice. Gastric and peritoneal lavage. Collection and examination of cerebrospinal fluid. Blood transfusion .

*Unit-II (Systemic Diseases):* Special examination of cardiovascular system. Examination of urinary system. Special examination of respiratory system. Special examination of gastrointestinal system. ECG, Echocardiography, Ultrasonography, Endoscopy. Special examination of sense organs. . Examination of eye and ear. Collection and examination of peritoneal fluid. Peritoneal dialysis. Neurological examination in animals. Lymph node biopsy and bone marrow aspirate. Methods of medication. Disease Estimation

*Unit-III (Zoo and Wild Animal Medicine):* Management and restraint of zoo and exotic animals. Drug delivery in zoo and wild animals. Visit to Zooor Sanctuary. Examination of veterolegal cases.

*Unit-IV (Bacterial, Fungal and Rickettsial Diseases):* TB, JD and Mallein testing in animal. Brucellosis testing in animals. Physical and chemical tests for detection of mastitis. Application of molecular and serology techniques on clinical samples for disease diagnosis. Pen-side diagnostic tests for infectious diseases. Practical approaches to disease outbreak investigation and its control.

*Unit-V (Viral and Parasitic Diseases):* Collection and examination of skin scrapings-Parasitic, fungal, bacterial. Examination of blood for parasites. Dark field microscopy. Application of Molecular and serological techniques on clinical samples for diagnosis of viral and parasitic diseases.

**Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1,2 ,3and 4	100	20
Paper-II	5,6 and7	100	20
<b>Practical</b>			
Paper-I	1,2 and 3	60	20
Paper-II	4 and 5	60	20

## DEPARTMENT OF VETERINARY GYNAECOLOGY AND OBSTETRICS

### Veterinary Gynaecology and Obstetrics

Credit Hours 2+1

#### Theory

*Unit- I (Veterinary Gynaecology):* Bovine : Applied clinical anatomy and embryology of female reproductive tract - Hereditary and congenital anomalies of female reproductive tract – Puberty and sexual maturity and their endocrine control- Delayed puberty- Its causes, clinical approach, treatment and prevention of delayed puberty- Applied reproductive physiology and endocrinology of oestrous cycle- Oestrous cycle and factors affecting the length of the oestrous cycle- Aberrations of oestrus and their clinical management and problems in oestrus detection and oestrus detection aids – Transportation and survivability of gametes in female reproductive tract- Follicular Dynamics and its clinical impact on fertility improvement- ovulation and aberrations of ovulation- Incidence causes, diagnosis treatment and prevention of ovulatory failures- Fertilization and aberrations of fertilization- Fertilization failures - embryonic mortality- incidence, causes, diagnosis, treatment and prevention – Pathological affections of ovary, uterine tubes, uterus, cervix, vagina and external genitalia – Clinical management of specific and non-specific forms of infectious infertility- Role of nutrition, climate and stress on reproductive efficiency - Managemental causes of infertility- Anoestrus and repeat breeding syndrome - Diagnostic procedures in infertility investigation – Clinical uses of hormones and drugs in the management of infertility- Surgical procedures for correction of abnormalities of the female reproductive tract. Herd reproductive health management and fertility parameters in individual animals and in herds.

Assisted reproductive techniques: Synchronization of estrus and ovulation and its principle. methodology and implications- Multiple ovulation and Embryo transfer technology- In vitro fertilization.

*Equines:* oestrous cycle- Seasonality- breeding management- Aberrations of oestrous cycle and ovulations- Techniques of Pregnancy diagnosis- Clinical management of specific and non-specific forms of infectious infertility- Diagnostic procedures in infertility investigation

*Ovines and caprines:* oestrous cycle- Seasonality- Control of oestrous cycle and infertility

*Swines :* oestrous cycle- breeding management- Techniques of Pregnancy diagnosis and infertility

*Canines and Felines :* oestrous cycle- breeding management- Phantom pregnancy- Medical termination of pregnancy – Aberrations of oestrous cycle- Medical and surgical management of affections of ovary, uterine tubes, uterus, cervix, vagina and external genitalia – Methods of Population control by medical and surgical techniques. Comparative reproductive events in camel

Principle, procedure and application of ultrasonography in farm and pet animal reproduction

*Unit-II (Veterinary Obstetrics):* Farm and pet animals - Maternal recognition of pregnancy – Applied Endocrinology of pregnancy – Pregnancy diagnosis- Duration of pregnancy - Factors affecting gestation length- Care and management of pregnant animals Implantation, Placentation- Classification, functions – Wandering of ovum- Telegony- Superfetation and Superfecundation – Clinical management of specific and non specific causes of abortion, extra uterine pregnancy, dropsy of fetal membranes and fetus, mummification, maceration, cervicovaginal prolapse, uterine torsion and hysterocele. Parturition- Signs of approaching

parturition - Stages of parturition - Initiation and induction of parturition - lactational disorders - Puerparium and factors affecting puerparium - Postpartum care of the dam and neonate in different species of farm and pet animals - Dystocia – Classification - Clinical signs and diagnosis - Handling of Fetal and maternal dystocia – Obstetrical interventions - Mutation – Forced extraction – Fetotomy – Cesarean section in small and large animals – Maternal obstetrical paralysis - Retention of fetal membranes, Total uterine prolapse and common metabolic diseases of puerperal period – Post partum hemorrhage – Sub involution of placental sites - Injuries incidental to parturition - Post partum uterine infections – Post partum resumption of ovarian activity .

*Unit-III (Veterinary Andrology and A.I.):* Farm and pet animals - Comparative clinical reproductive anatomy and endocrinology of the male reproduction - Common congenital and genetic defects of the male reproductive tract – Puberty and sexual maturity and factors affecting them - Sexual behaviour and libido - Sperm transport, erection and ejaculation - Coital injuries and vices in male animals - Semen and ejaculate – Semen collection techniques- Structure of Spermatozoa - Semen evaluation - Semen extenders, dilution, preservation and post thaw evaluation - Artificial insemination techniques in farm and pet animals - Forms of male infertility - Impotentia coeundi and impotentia generandi – Affections of the scrotum, testis, accessory sex glands, penis and prepuce - Breeding soundness evaluation of bull – In vitro tests for evaluation of male fertility - Medical and surgical techniques for population control of the male reproduction – Surgical procedure on the male reproductive tract in farm and pet animals.

### **Practical**

*Unit- I (Veterinary Gynaecology):* Study of female genital organs using slaughter house specimens Oestrus detection aids - Techniques of rectal palpation of female reproductive tract - Gynaecological equipment and instruments -Vaginal exfoliative cytology and vaginoscopy Ultrasonography of female reproductive tract - Surgical procedures on the vulva, vagina and uterus-Study of pathological specimens of female genital tract- Demonstration and practice of ovario-hysterectomy and panhysterectomy- Diagnostic procedures in investigation of infertility in female animals

*Unit-II (Veterinary Obstetrics):* Study of pelvis and pelvimetry- Pregnancy diagnosis-Study of foetal membranes of domestic and pet animals -and identification of normal and abnormal foetal membranes-Approaching signs of parturition- Stages of parturition Approach to an obstetrical case- Obstetrical anaesthesia - obstetrical instrument and equipment - Manipulation of foetal malpresentation in phantom boxes - Maternal causes of dystocia and its management- Fetotomy in cadavers, Demonstration of forceps delivery and Caesarean section in small and large animal clinical cases. Handling of prolapse of genitalia.

*Unit-III (Veterinary Andrology, AI and Assisted Reproductive Techniques):* Study of male genital organs using slaughter house specimens- Techniques of rectal palpation of the male reproductive tract- Andrological and AI equipment -Vasectomy and castration -Surgical procedures on penis, prepuce and scrotum Planning and organization of AI centre-Preparation of teaser animals -Selection, care, training and maintenance of male animal used for breeding purpose-Techniques of semen collection-Semen evaluation techniques -Sterilization, storage of equipment used for semen collection and Artificial insemination-Preparation of extenders and extension of semen Preservation of semen-Thawing of semen and technique of AI-Handling and maintenance of LN2 containers. Diagnostic procedures in investigation of infertility in male animals-Breeding soundness evaluation of bulls- Oestrus synchronization procedures- Multiple Ovulation and Embryo Transfer- In Vitro Fertilization.

**Annual Examination**

<b>Papers</b>	<b>Units</b>	<b>Maximum Marks</b>	<b>Weightage</b>
<b>Theory</b>			
Paper-I	1	100	20
Paper-II	2 and 3	100	20
<b>Practical</b>			
Paper-I	1	60	20
Paper-II	2 and 3	60	20

## Syllabus for Internship Programme

(Final assessment of interns will be based on the objective of having achieved following core competency)

Restraint of cow, sheep, horse, dog and pig; Haltering, snaring, muzzling, tail switch, bandaging of horse for exercise and stable bandaging; animal identification, dentition and ageing of animals; housing layout or requirements of livestock and poultry; computation of ration of livestock of different breeds and age groups in health and disease; fodder management and interpretation of feed quality evaluation; physical evaluation of livestock health parameters (auscultation, percussion, recording of temperature, pulse, heart rate, respiration rate etc.); recording and interpretation of cardiovascular response; testing of milk and milk products for quality, clean milk production; carcass quality evaluation (ante-mortem & post-mortem examination); specific diagnostic tests for zoonotic diseases; sample collection, handling and dispatch of biological materials for laboratory examination; staining techniques for routine clinico-pathological examinations; relating post-mortem lesions to major livestock diseases; haematological evaluation (total leukocyte count, differential leukocyte count, haemoglobin, packed cell volume, erythrocyte sedimentation rate etc.) and interpretation; tests and their interpretation for haemoprotozoan diseases; body fluids collection, examination and interpretation as an aid to diagnosis; urine evaluation procedures and interpretation as indicators for diagnosis of diseases; fecal examination- procedures and interpretation; examination of skin scrapings and interpretation; interpretation of blood chemistry profile in diseases; deworming procedures and doses for different species of animals or birds; managing an outbreak of infectious or contagious disease; approach to diagnosis of a given disease condition; pre-anesthetic administration and induction, maintenance of general anaesthesia and dealing with anesthetic emergencies; local anaesthetic administration; nerve blocks- sites, functional application; suture material, suture pattern and tying knots; common surgical procedures including dehorning, docking, caesarian section, ovariohysterectomy, castration, rumenotomy; application of plaster castorsplint for fracture immobilization and other bandaging procedure in large and small animals; soundness in horses; rectal examination- palpation of pelvic or abdominal organs in cattle or horses or buffaloes, detection of oestrus, artificial insemination, pregnancy diagnosis; management of vaginal or uterine prolapse and dystocia; andrological examination of bull, handling, preservation and evaluation of semen; vaccination procedures, vaccination schedules and vaccine types for different diseases; handling of radiograph, interpretation of a given radiograph of large and small animals; client management; managing a clinical practice, ambulatory van, transporting a sick animal requirements, etc.; dosage regimens of important drugs; drug administration techniques in different species of animals-oral, parenteral, rectal, intra-peritoneal and intra-uterine; identification of major livestock or poultry breeds; measuring climatic parameters and their interpretation; communication technology tools.