VETERINARY PHYSIOLOGY

1. General Requirements:

Level of programme	Nomenclature of qualification	Duration of the Course	Learning objectives	Eligibility	Components of the programme
Post-Graduation	M.V.Sc. in Veterinary Physiology	2 yrs	To impart specialized and advanced knowledge to the students so that they can integrate and critically evaluate principles for applicability at field level.	B.V.Sc. & A.H.	Course Work and Research
Ph.D.	Ph.D. in Veterinary Physiology	3yrs	The Ph.D. students should be able to discover, integrate, critically evaluate, interpret, understand, communicate and disseminate the knowledge in the field of Veterinary Physiology to apply in problem solving in frontiers of the field.	M.V.Sc. (Veterinary Physiology)	Course Work and Research
Diploma	Diploma in Veterinary Clinical Physiology	1 yrs	To make the student aware about general body functions and hands on training in various physiological techniques having application in clinics	B.V.Sc. & A.H.	Course Work and hands on practicals
Other (specify)	-	-	-	-	-

2. Infrastructure requirements: (To be submitted for each of the Departments separately)

Level of programme	For 03 seats in each department	For 05 seats in each department
Post Graduate	PG Teaching room Digestive Physiology Laboratory Cardiovascular Laboratory	PG Teaching room Digestive Physiology Laboratory Cardiovascular Laboratory

	Clinical Physiology Laboratory Endocrinology Laboratory	Clinical Physiology Laboratory Endocrinology Laboratory
Ph.D .	PG Teaching room Digestive Physiology Laboratory Cardiovascular Laboratory Clinical Physiology Laboratory Endocrinology Laboratory	PG Teaching room Digestive Physiology Laboratory Cardiovascular Laboratory Clinical Physiology Laboratory Endocrinology Laboratory
Diploma	-	-
Other (specify)	-	-

2. Manpower Requirements:

Level of programme	For 03 seats in each department					For 05 seats in each department					Remarks
	Asst. Prof.	Asso. Prof.	Prof.	Other (Specify)	Non-Teaching	Asst. Prof.	Asso. Prof.	Prof.	Other (Specify)	Non-Teaching	
Post Graduate PhD	1	1	-	-	Technician -1 Lab Attendant-1	1	1	-	-	Technician -1 Lab Attendant-1	
Diploma	-	-	-	-	-	-	-	-	-	-	
Other (specify)	-	-	-	-	-	-	-	-	-	-	

3. Equipments: (To be submitted for each of the Departments separately

Level of programme	For 03 seats in each department	For 05 seats in each department	Remarks
Post Graduate	**Digestive Physiology Laboratory**: Atomic Absorption Spectrophotometer, Flame Photometer, CO_2 Incubator, Laminar Air Flow, Inverted phase contrast microscope with fluorescent attachment **Cardiovascular Laboratory**: Electrocardiograph, Physiograph, Blood Gas Analyzer **Clinical Physiology Laboratory**: Fully Automatic Haematoanalyzer, Urinanalyzer, Digital Haemoglobinometer, Fully/semi-Automatic	**Digestive Physiology Laboratory**: Atomic Absorption Spectrophotometer, Flame Photometer, CO_2 Incubator, Laminar Air Flow, Inverted phase contrast microscope with fluorescent attachment **Cardiovascular Laboratory**: Electrocardiograph, Physiograph, Blood Gas Analyzer **Clinical Physiology Laboratory**: Fully Automatic Haematoanalyzer, Urinanalyzer, Digital Haemoglobinometer, Fully/semi-Automatic	

	Biochemistry Analyzer **Endocrinology Laboratory**: ELISA reader, Real-time PCR, Micro volume spectrophotometer (Nanodrop), Thermocycler, Gel Electrophoresis System (Horizontal and Vertical), Gel Documentation System, Refrigerated centrifuge, Refrigerator, Deep Freezer	Biochemistry Analyzer **Endocrinology Laboratory**: ELISA reader, Real-time PCR, Micro volume spectrophotometer (Nanodrop), Thermocycler, Gel Electrophoresis System (Horizontal and Vertical), Gel Documentation System, Refrigerated centrifuge, Refrigerator, Deep Freezer	
PhD	**Digestive Physiology Laboratory**: Atomic Absorption Spectrophotometer, Flame Photometer, CO_2 Incubator, Laminar Air Flow, Inverted phase contrast microscope with fluorescent attachment **Cardiovascular Laboratory**: Electrocardiograph, Physiograph, Blood Gas Analyzer **Clinical Physiology Laboratory**: Fully Automatic Haematoanalyzer, Urinanalyzer, Digital Haemoglobinometer, Fully/semi-Automatic Biochemistry Analyzer **Endocrinology Laboratory**: ELISA reader, Real-time PCR, Micro volume spectrophotometer (Nanodrop), Thermocycler, Gel Electrophoresis System (Horizontal and Vertical), Gel Documentation System, Refrigerated centrifuge, Refrigerator, Deep Freezer	**Digestive Physiology Laboratory**: Atomic Absorption Spectrophotometer, Flame Photometer, CO_2 Incubator, Laminar Air Flow, Inverted phase contrast microscope with fluorescent attachment **Cardiovascular Laboratory**: Electrocardiograph, Physiograph, Blood Gas Analyzer **Clinical Physiology Laboratory**: Fully Automatic Haematoanalyzer, Urinanalyzer, Digital Haemoglobinometer, Fully/semi-Automatic Biochemistry Analyzer **Endocrinology Laboratory**: ELISA reader, Real-time PCR, Micro volume spectrophotometer (Nanodrop), Thermocycler, Gel Electrophoresis System (Horizontal and Vertical), Gel Documentation System, Refrigerated centrifuge, Refrigerator, Deep Freezer	
Diploma	-	-	
Other (specify)	-	-	

5. Veterinary Clinical Complex: NA

Level of programme	For 03 seats in each department	For 05 seats in each department	Remarks
Post Graduate			
PhD			
Diploma			
Other (specify)			

6. Livestock Farm Complex: NA

Level of programme	For 03 seats in each department	For 05 seats in each department	Remarks
Post Graduate			
PhD			
Diploma			
Other (specify)			

7. Syllabus: Attached as Annexure-I

Annexure-I

Credit requirements

	Master's Programme	**Doctoral Programme**
Course work		
Major Courses	22	12
Minor Courses	08	06
Supporting Courses	05	05
Deficiency Course (NC)	04	-
Seminar	01	02
Research	30	75
Total	66+4NC=70	100

PROGRAMME
1. M.V.Sc.
2. Ph.D.

M.V.Sc.

Field of specialization	Veterinary Physiology
Compulsory Courses	Core courses marked as *
Minor Fields	Veterinary Anatomy, Veterinary Biochemistry, Veterinary Pharmacology and Toxicology, Animal Nutrition, Veterinary Medicine, Veterinary Pathology, Veterinary Microbiology, Livestock Production Management, Veterinary Gynaecology and Obstetrics, Animal Genetics and Breeding and Animal Biotechnology
Supporting Courses	Statistical Methods for Applied Sciences and other related courses from subject matter fields (other than minor) relating to area of special interest and research problem
Deficiency Courses	Library and Information Services (0+1) Technical Writing and Communications Skills (0+1) Intellectual Property and Its Management in Agriculture (1+0) Basic Concepts in Laboratory Techniques (0+1) and other courses as recommended by students Advisory Committee

Ph.D.

Field of specialization	Veterinary Physiology
Required Courses	As decided by Advisory Committee
Minor Fields	Veterinary Anatomy, Veterinary Biochemistry, Veterinary Pharmacology and Toxicology, Animal Nutrition, Veterinary Medicine, Veterinary Pathology, Veterinary Microbiology, Livestock Production Management, Veterinary Gynaecology and Obstetrics, Animal Genetics and Breeding and Animal Biotechnology
Supporting courses	Courses from subject matter fields (other than minor) relating to area of special interest and research problem

Course Content: M.V.Sc. in Veterinary Physiology (600 Series)

Course Code: *VPY 601
Course Title: Physiology of Digestion
Credit Hours: 2+1
Aim of the course: To teach comparative physiology of digestive system of monogastric animals, ruminants and birds, and to learn basic techniques used in digestive physiology.
Theory
UNIT I
Basic characteristics and comparative functional anatomy of digestive system of domestic animals. General functions of Gastrointestinal tract and its regulation. Gastro-intestinal motility, Rate of gastric emptying, interdigestive motility patterns, migrating myoelectric complex, emesis or vomiting.
UNIT II
Secretory functions of gastro-intestinal tract, their regulation and gastro-intestinal hormones. Absorption and metabolism of various nutrients. Appetite and control of feed intake, hunger contractions, thirst, constipation, defecation and diarrhoea
UNIT III
Development of ruminant system and rumen environment. Rumen microbiology, its classification and role in ruminant digestion. Ruminant microbial digestion, its advantages and disadvantages. Rumino-reticular motility, its significance and control.
UNIT IV
Functional anatomy of avian digestive system. Secretory functions and gastro-intestinal motility in birds. Digestion, absorption and metabolism in birds.
Practical
- Collection of saliva and its enzymatic studies
- Activity of pepsin and trypsin enzymes
- Gastric and intestinal motility, Rate of passage of digesta and its estimation
- Rumino-reticular movements
- Estimation of digestive metabolites such as glucose and ketone bodies, triglycerides, cholesterol, urea nitrogen and total proteins
- Liver function tests
- Pancreatic function tests
- Methods of collection of rumen liquor, merits and demerits
- Determination of pH, total volatile fatty acids in rumen liquor
- Determination of ammonia-nitrogen and total-nitrogen in strained rumen liquor

- Counting of protozoa and bacteria in rumen liquor

Course Code : *VPY 602
Course Title : Cardiovascular and Respiratory Physiology
Credit Hours : 2+1
Aim of the course: To teach function and regulation of heart and lungs in different animals and to learn basic techniques used in heart and lung functioning.
Theory
UNIT I
Heart muscle, heart as pump, origin and propagation of heart beat. Electrophysiology of heart, rhythmic excitation of heart, cardiac cycle, heart sound and dynamics of valvular and congenital heart defect.
UNIT II
Cardiac output and its measurements, factors affecting cardiac output.Venous return and its regulation. Control of the heart. Normal electro-cardiogram, electrocardiographic interpretation in cardiac myopathies and cardiac arrhythmias.
UNIT III
Circulation and hemodynamics, coronary, systemic and pulmonary circulation, their regulation, energetics of circulation, pathophysiology of circulation.
UNIT IV
Respiration, mechanism of ventilation, hemoglobin, oxygen and carbondioxide transport. Respiratory gas exchange. Respiratory adjustment at high altitude and deep swimming. Neural and chemical control of respiration, Respiration in birds.
Practical
- Determination and recording of cardiac output
- Measurement of blood pressure by sphygmomanometer
- Recording of heart rate by physiograph
- Recording and interpretation of normal ECG
- Recording and interpretation of cardiac disorders by ECG
- Determination of blood volume
- Estimation of cardiac marker enzymes
- Effect of exercise on heart rate and pulse rate
- Determination of lung volumes and capacities by spirometry
- Estimation of blood gases
- Estimation of blood pyruvate and blood lactate
- Effect of exercise on respiration rate

Course Code : VPY 603
Course Title : Renal Physiology and Body Fluid
Credit Hours : 2+1
Aim of the course: To impart knowledge regarding excretory system of mammals and birds, maintenance of body fluid homeostasis and to learn basic techniques used in renal functioning.
Theory
UNIT I
An overview of nephron structure and function. Renal homeostatic function and renal excretory function.
UNIT II

Glomerular filtration- its mechanism and measurement. Permeability and selectivity of the glomerular capillary wall, structural basis of GFR, tubular reabsorption and tubular secretion.

UNIT III

Physiology of micturition, endocrine control of renal function. Non excretory functions of kidney. Excretory system in birds.

UNIT IV

Compartments and composition of body fluids and their regulation. Body fluid pH and its regulation. Acid-base balance and imbalances in body and methods for their correction.

Practical

- Collection and preservation of urine
- Determination of specific gravity of urine by refractometer
- Qualitative analysis of physiological constituents of urine
- Qualitative analysis of pathological constituents of urine
- Quantitative analysis of BUN and creatinine in blood
- Quantitative analysis of phosphate and glucose in blood and urine
- Determination of imprtant electrolytes in blood serum like sodium, potassium, calcium, chloride etc.
- Demonstration of various kidney function tests- glomerular filtration rate, creatinine clearance rate, urea clearance rate and glucose tolerance test

Course Code : *VPY 604

Course Title : Haematology

Credit Hours : 2+1

Aim of the course: To acquaint the students about blood and its components of different animals under normal and different disease conditions.

Theory

UNIT I

Blood and its components, Properties and functions of blood, Development of Red blood cells, polymorphism in haemoglobin, anaemia, different types of anaemia, polycythemia and their effect on circulation in mammals and birds.

UNIT II

Development of leukocytes, role of leucocytes in resistance of the body against infections, tissue macrophage system and inflammation.

UNIT III

Different types of Immunity in body, Role of immunoglobulins, immunogenetics etc. Changes in blood picture during commonly encountered diseases. Iatrogenic blood diseases, hemorrhagic diathesis, hemophilias.

UNIT IV

Hemostasis and coagulation factors, role of platelets, fibrinolysis. Blood groups, transfusion of blood. Tissue and organ transplantation. Conditions causing bleeding disorders.

Practical

- Estimation of Hb, PCV and ESR
- Enumeration of RBC, WBC and platelets
- Enumeration of differential leucocytes
- Determination of erythrocyte indices for diagnosis of anaemias
- Complete Haemogram by automated blood cell counter
- Blood viscosity and RBC fragility determination

- Activated partial thromboplastin time and Prothrombin time
- Avian blood: haemogram-I (erythrocyte relates parameters using special stain)
- Avian blood-haemogram-II (leucocyte relates parameters using special stain)

Course Code : VPY 605
Course Title : Vitamins and Minerals in Animal Physiology
Credit Hours : 1+0
Aim of the course: To teach the importance of vitamins and minerals in normal body functions and in disease conditions.
Theory
UNIT I
Introduction and brief history, definition, general properties and overview of functions of vitamins and minerals.
UNIT II
Fat soluble vitamins, their functions and deficiency diseases.
UNIT III
Water soluble vitamins and vitamin-like compounds, their functions and deficiency diseases.
UNIT IV
Physiological functions of macro and micro elements, their role in metabolism, toxicity and deficiency diseases.

Course Code : VPY 606
Course Title : Growth and Environmental Physiology
Credit Hours : 1+0
Aim of the course: To teach the Growth process and its regulation and influence of environmental conditions on homeothermy
Theory
Unit I
Growth - Introduction and Concepts. Hormonal regulation of growth. Growth promoters.
Unit II
Pre and post natal growth and factors affecting it
Unit III
Environment - Introduction and concepts. Weather and climate. Homeothermy, Poikilothermy. Hibernation and estivation.
Unit IV
Thermoregulation, thermal stress. Effect of environment on production and reproduction. Physiological responses of animals to heat and cold stress. Temperature regulation in birds.

Course Code : *VPY 607
Course Title : Physiology of Animal Reproduction
Credit Hours : 2+1
Aim of the course: To impart knowledge of male and female reproductive system of different species of animals including birds.

Theory
UNIT I
Functional histomorphology of male and female reproductive system, development of male and female sex organs. Endocrine and neuroendocrine relation in male and female reproductive function in different domestic animals.
UNIT II

Puberty, Sexual cycles and mating behaviours in females, oogenesis, folliculogenesis and ovulation. Secretions of female reproductive tract in different species of animals. Ovarian hormones.

UNIT III

Male mating behaviour, spermatogenesis, spermiogenesis, Seminiferous, epithelial cycles. Spermatozoa- structure and composition, maturation and transportation. Secretions of male reproductive tract. Gonadal hormones.

UNIT IV

Transport of male and female gametes, fertilization, implantation. Pregnancy and parturition. Post-partum recovery in different species of domestic animals.

Practical

- Palpation of reproductive organs
- Methods of heat detection in different species of domestic animals
- Examination of fern pattern in cervical mucus
- Semen evaluation – Gross, Microscopic and Biochemical evaluation
- Demonstration of preservation of semen
- Estimation of reproductive hormones
- Demonstration of estrus and mating behaviour
- Demonstration of parturition
- Demonstration of oviposition in birds

Course Code : *VPY 608

Course Title : Clinical Physiology

Credit Hours : 2+1

Aim of the course: To teach physiological basis of clinical conditions in domestic animals.

Theory

Unit I

Introduction and basic concepts of understanding of alteration in system functions. Relationship of cardiovascular, renal and respiratory systems in healthy domestic animals and compensatory mechanisms during failure/ disorder of one or other systems

Unit II

Metabolism of carbohydrate, protein, and lipid in health and disease conditions of domestic animals.

Unit III

Clinical Haematology, clinical enzymology and Clinico-immunological evaluation of immune responses.

Unit IV

Clinical evaluation of Gastrointestinal tract and liver disorders Clinical evaluation of Special Senses, Neuromuscular disorders and clinical correlation

Practical

- Electrocardiography and interpretations in diseased animals
- Sphygmomanometry and interpretations in diseased animals
- Physiograpic studies of various body parameters in diseased animals
- Respiratory function tests of diseased animals
- Renal function tests of diseased animals
- Hematological analysis of commonly encountered clinical conditions in domestic animals

- Estimation of diagnostic serum enzymes
- Liver function tests in clinical samples of domestic animals
- Digestive function tests in clinical samples of domestic animals
- Quantitative determination of blood metabolites of commonly encountered clinical conditions in domestic animals

Course Code : VPY 609
Course Title : Neuromuscular Physiology
Credit Hours : 2+0
Aim of the course: To impart knowledge of coordination of body functions and regulation of brain functions and sense organs.
Theory
UNIT I
Types and classification of muscles. Skeletal muscle fibers, membrane and action potential at myoneuronal junction. Molecular characteristics of contractile filaments, molecular mechanism of muscle contraction, relationship between actin and myosin filaments, overlap and tension developed by the contracting muscles. Contractile process of smooth muscles and cardiac muscles
UNIT II
Organization of nervous system- Mechanism of information processing, 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
UNIT III
Major functional system- sensory, consciousness, emotion, motor and visceral control, Higher function of brain, limbic system, learning, memory, sleep and wakefulness, spinal reflexes, Functions of autonomic nervous system.
UNIT IV
Special senses: Eye, Ear and Nose. Receptor physiology and somaesthetic senses.

Course Code : VPY 610
Course Title : Endocrinology of Domestic Animals
Credit Hours : 3+0
Aim of the course: To acquaint the students about different endocrine glands of the body and their relationship with production and reproduction.
Theory
UNIT I
Hormonal relationship in animal production. Concepts in hormone function, classification and methods of study. Hormonal assay, mechanism of hormone synthesis, release and transport. Mechanisms of hormone action, target cell interactions.
UNIT II
Regulation, functions and metabolism of hypothalamic, hypophyseal, thyroid and adrenal hormones.
UNIT III
Hormones in fertility regulation and production augmentation. Gonadal and placental hormones, their regulation and mechanism of action. Hormonal principles of pineal gland and its role in reproduction.
UNIT IV

Endocrine control of metabolism and calcium homeostasis. Hormones and adaptation to stressful environment. Hormonal regulation of gastro-intestinal activity. Prostaglandins. Avian endocrinology.

Course Code : *VPY 611
Course Title : Instrumentation and Research Techniques in Veterinary Physiology
Credit Hours : 0+2
Aim of the course: To impart training in various techniques for application in research in animal physiology.
Practical

- Design and types of research laboratory
- Maintenance of research equipments
- Preparation of various solutions for estimations
- Basic principles and concepts of pH
- Determination of pH of various solutions and biological samples
- Basic principles and concepts of ECG and Recording of ECG in animals
- Basic principles and concepts of physiograph and its accessories for various body parameters
- Recording of blood pressure by physiograph and sphygmomanometer
- Recording of respiratory volumes by spirometer
- Neuro muscular experimental physiology using physiograph
- Physical and chemical principles of chromatography
- Protein separation and isolation methods – basic concepts and methods of protein determination
- Vertical and horizontal Electrophoresis
- Thin layer chromatography
- Gas liquid chromatography
- Basic concepts of mineral estimation:Flame photometry, Colorimetry and Spectrophotometry
- Enumeration of ruminal microflora
- Estimation of VFA, ammonia nitrogen and total nitrogen
- Cell culture techniques in research
- Blood biochemistry analysis
- Complete blood study using haematoanalyzer
- Urinanalysis
- Immunohistochemistry
- ELISA and RIA techniques for estimation of various hormones

Course Code : VPY 612
Course Title : Physiology of Wild Life
Credit Hours : 1+0
Aim of the course: To impart the knowledge on physiology of wild animals.
Theory
Unit I
Overview of Indian forests. Identification of sex in wild animals and birds. Blood collection methods in wild animals and Hematology. Common clinical biochemical estimations.
Unit II
Body temperature measurement techniques. Measurement of stress. Measuring senescence.
Unit III

Reproduction management in wild animals. Understanding sound mechanics and communication methods. Ethology of wild animals

Unit IV

Government policies for wild life protection

VPY 613 Master's Seminar 1+0
VPY 614 Master's Research 0+30

Course Content: Ph.D. in Veterinary Physiology (700 Series)

Course Code : VPY 701
Course Title : Applied Physiology of Body Fluids and Electrolytes
Credit Hours : 2+1

Aim of the course: To teach physiological and clinical implication of changes in electrolytes and body fluids.

Theory

UNIT I

Volume and composition of body fluids, exchange of water and electrolytes between body compartments, blood and external environment. Osmolarity of fluid.

UNIT II

Regulation of volume and osmolarity of extra cellular fluid. Regulation of pH and acid base balance. Formation and composition of cerebrospinal fluid and lymph.

UNIT III

Clinical implications of change in electrolytes and body fluids. Structural and functional consideration of plasma and its composition. Diuresis and endocrine control of renal functions.

UNIT IV

Clinical feature in fluid and electrolyte imbalance, clinicopathological indictors of fluid and electrolytes imbalance.

Practical

- Estimation of pH of different body fluids and evaluation of acid base status
- Determination of sodium and potassium in serum sample of farm animals
- Determination of bicarbonate and chloride in serum sample of farm animals
- Determination of Calcium and phosphate in serum sample of farm animals
- Determination of Magnesium in serum sample of farm animals
- Determination of total body water
- Determination of blood volume
- Determination of plasma volume
- Determination of Interstitial Fluid Volume
- Estimation of osmolarity and osmolality of urine of farm animals
- Estimation of osmolarity and osmolality of milk
- Estimation of osmolarity and osmolality of blood of farm animals
- Evaluation of dehydration in animal and choosing the fluid type, its volume and rate for fluid therapy

Course Code : VPY 702
Course Title :Physiology of Animal Behaviour
Credit Hours : 2+0

Aim of the course: To impart knowledge on various aspects of animal behaviour viz. communication in animals, sexual behaviour, feeding behaviour etc.

Theory

UNIT I

Introduction to animal ethology. Neurophysiological basis of animal behaviour.

UNIT II

Behaviour in relation to changes in the environment. Feeding behaviour, grazing, stall feeding and rumination.

UNIT III

Sexual behaviour in the female and male. Maternal behaviour. Milk let down.

UNIT IV

Social behaviour, communication in animals, animal temperament. Response of dogs and horses to training.

Course Code : VPY 703

Course Title : Advances in Rumen Microbiology and Metabolism

Credit Hours : 2+1

Aim of the course: To teach functional development of rumen and its microflora and various rumen manipulation techniques.

Theory

UNIT I

Functional development of ruminant stomach. Rumen motility and its control.

UNIT II

Salivary secretion and its regulation. Intraruminal environment, rumen metabolites and their assimilation, NPN feeding, nitrogen recycling.

UNIT III

Synthesis of microbial proteins and vitamins. Rumen dysfunctions. Comparative efficiency of rumen function in different species. Stoichiometry of carbohydrate fermentation.

UNIT IV

Manipulation of rumen fermentation, protected nutrients feeding, probiotics supplementation etc. Rumen flow rate and rumen volume.

Practical

- Reticulo-ruminal motility
- Total volatile fatty acids and Individual VFA by GLC
- Culture of rumen bacteria
- Protozoal counting
- Culture of rumen bacteria
- Demonstration studies and its effect on ruminant animal
- Flow rates of ruminal contents
- Artificial rumen techniques

Course Code : VPY 704

Course Title : Advances in Neuro-Endocrinology

Credit Hours : 2+1

Aim of the course: To acquaint the students about neuro-endocrine integrating mechanism in animals and birds.

Theory

UNIT I

Neuroendocrine integrating mechanism. Structure of hypothalamus, pituitary gland, limbic and other neural pathways and endocrine functions.

UNIT II
Neural control of oxytocin, adrenocorticotropic hormone, aldosterone, thyrotropic hormone, growth hormone, gonadotrophins etc. Hypothalamic releasing factors and the neuro-vascular link between brain and anterior pituitary.
UNIT III
Role of afferent impulses from genitals and other regions in reproductive system. Influence of hormones on brain activity.
UNIT IV
Effects of drugs on neuro-endocrine system. Neuro-endocrine mechanisms in birds. Interaction of nervous, endocrine and immune system in animal production and reproduction.
Practical

- Extraction of hormones
- Immunohistochemistry of hormones
- Radio-immuno assay of hormones
- Enzyme linked immunosorbent assay of hormones
- Induction of atherosclerosis
- Induction of hypoglycemia in laboratory models by allaxon and streptozotocin
- Induction of hyperglycemia in laboratory models by administration of epinephrine and glucagon, etc.
- In-vitro effects of certain hormones such as adrenaline, histamine and acetyl choline on excised intestine
- Hormone assay in fecal samples

Course Code : VPY 705
Course Title : Myophysiology and Kinesiology
Credit Hours : 2+0
Aim of the course: To impart the knowledge regarding exercise and work physiology, molecular basis of muscle contraction.
Theory
UNIT I
Structure of muscle, chemical composition, muscle contraction and irritability. Mechanical properties of skeletal muscle, cardiac and smooth muscle.
UNIT II
Thermal properties of muscles. Chemical correlates of contraction.
UNIT III
Molecular basis of muscular contraction of skeletal muscle. Pathophysiology of muscles and myocardium.
UNIT IV
Lever systems of body joints, Synovial fluid formation and its physiology. Principles of Kinesiology and its application in work physiology.

Course Code : VPY 706
Course Title : Avian Physiology
Credit Hours : 2+1
Aim of the course: To impart complete knowledge about physiology of domestic fowl and comparative physiology of other birds.

Theory

UNIT I

Digestive and urinary system

UNIT II

Blood, cardiovascular and respiratory system

UNIT III

Reproductive and endocrine system

UNIT IV

Nervous system and musculo-skeletal system

Practical

- Collection of blood from the birds and blood processing
- Determination of Haemoglobin concentration, Packed cell volume (haematocrit) and Erythrocyte sedimentation rate
- Study of blood cells: RBC count,WBC count, Thrombocyte count and DLC
- Enzymatic profile under various physiological states of birds
- Collection of semen and its evaluation
- Determination of glucose and calcium in blood
- Determination of uric acid and urea in blood
- Electrophoretic separation of plasma proteins and egg proteins
- Localization of different endocrine glands

Course Code : VPY 707

Course Title : Physiology of Lactation

Credit Hours : 2+1

Aim of the course: To acquaint students with lactation physiology and mechanism of lactation

Theory

UNIT I

Functional anatomy, histology and cytology of mammary gland in domestic animals.

UNIT II

Development of mammary gland, hormonal control of mammary gland growth.

UNIT III

Process of lactation, initiation of milk secretion, hormonal control of lactation. Biochemical and histological changes in mammary gland during lactation. Mechanism of galactopoiesis.

UNIT IV

Neural control of lactation, milk let down, milk ejection and inhibition of milk ejection. Induced lactation. Composition of milk in different species of animals.

Practical

- Examination of normal udder of cow and buffalo
- Histological examination of udder in cows
- Milk letdown response in dairy animals
- Composition of colostrum
- Composition of milk during different phases of lactation
- Artificial induction of lactation
- Estimation of lactogenic hormones

Course Code : VPY 708

Course Title : Advances in Environmental Physiology and Growth

Credit Hours : 2+1

Aim of the course: To acquaint the students about co-relation of various environmental factors on growth and performance of animals.

Theory

UNIT I

Ecology of farm animals, biological rhythms, mammalian circadian rhythms, their regulation. Components of physical environment, biometeorology and principles of thermoregulation in mammals and birds.

UNIT II

Physiological response of farm animals to heat and cold. Effect of various climatic components on health and production (growth and egg production), reproduction and climatic adaptation.

UNIT III

Concept and definitions of cellular, prenatal and postnatal growth- patterns in different species of domestic animals.

UNIT IV

Factors affecting live weight growth viz. nutrition, hormones, vitamins, antibiotics, environment. Ageing and senescence. Growth anomalies.

Practical

- Meteorological instruments for various climatic variables
- Recording of temperature in animal house, poultry house, and laboratory
- Calculation of RH and THI
- Calculation of Heat Loading index
- Measurement of sweating rate in cattle
- Weather forecast models followed in India
- Assessing impact of different shades and houses on milk production in the college farms
- Measurements of growth rate and chart of crossbred calves, native breed calf, etc.
- Visit to meteorology stations

Course Code : VPY 709

Course Title : Cellular and Molecular Physiology

Credit Hours : 2+0

Aim of the course: To impart knowledge of body functions at cellular and molecular levels.

Theory

Unit I

Cell membrane, Organelles and their functions. DNA synthesis and replication.

Unit II

Physiology of cell signaling. Basic classification and characterization of membrane receptors. Intracellular/ nuclear receptors.

Unit III

Major signaling pathways: Signaling pathways associated with second messengers; Cell signaling and apoptosis.

Unit IV

Cell cycle and Checkpoints in Cell Cycle Regulation. Regulators of the Cell cycle, Signaling defects. Modern methods to study signaling.

Course Code : VPY 710

Course Title : Advances in Immunophysiology

Credit Hours : 2+1

Aim of the course: To study cells and organs of immune system, its development and role in physiological functions and immunomodulation.

Theory

UNIT I

Introduction, history, body defence, organs of immune system, ontogeny and phylogeny of immune system, vertical transmission of immunity and difference between vertebrates and invertebrates

UNIT II

Immunoglobulins-basic structure and functions, hematopoiesis, T-cell and B-cell-evolution, development and their functions, species specific immunity, cytokines-sources and actions, MHC, genetic organization of immunoglobulin, MHC and complement system.

UNIT III

Immune-endocrine interactions, immune system in reproduction, ageing, stress and other physiological functions, immunomodulation.

UNIT IV

Hypersensitivity, diseases related to immune system, dysfunction, autoimmune disorders and their genesis, immunodeficiency.

Practical

- Isolation of lymphocytes from blood by density gradient centrifugation
- Determination of live and dead lymphocytes in the separated sample
- Hyperimmune seum production
- Haemagglutination test
- Haemagglutination inhibition assay
- Immunoprecipitation test
- Complement fixation test
- Qualitative and quantitative analysis of immunoglobulins in body fluids
- ELISA and RIA methodology and diagnostic test
- Cytotoxicity assays
- Immunofluorescence and Immunohistochemistry
- Western blotting methodology

Course Code : VPY 711

Course Title : Physiology of Stress

Credit Hours : 2+1

Aim of the course: To teach the mechanism and effect of stress on production and reproduction in domestic animals.

Theory

UNIT I

Definition of stress, various types of stresses, their effect on animal production and reproduction.

UNIT II

Physico-chemical changes of blood composition due to exercise and work. Energy utilization and requirement of muscles during work and exercise.

UNIT III

Capacity of work under field and controlled laboratory conditions and factors regulating it. Effect of various stresses on endocrine status of animals, endurances in animals.

UNIT IV

Energy partitioning in lactating animals under stress, Physiological basis of ameliorative measures to combat stress in lactating animals.

Practical

- Haematological analysis during stress and/or exercise in animals
- Measurement of various biochemical parameters during stress and /or exercise in animals
- Measurement of various hormones during stress in animals
- Measurement of cardio-respiratory reactions during stress

Course Code : VPY 712
Course Title : Special Problem
Credit Hours : 0+2
Aim of the course: To provide expertise in handling practical research problem(s).
Practical: Short research problem(s) involving contemporary issues and research techniques.

VPY 713 Doctoral Seminar I 1+0
VPY 714 Doctoral Seminar II 1+0
VPY 715 Doctoral Research 75

Non-credit compulsory courses for M.V.Sc.

Course No.	Course title	Credit hours	Semester
PGS 501	Library and information services	0+1	I and II
PGS 502	Technical writing and communication skills	0+1	I and II
PGS 503 (e-course)	Intellectual property and its management in Veterinary and animal husbandry	1+0	I and II
PGS 504	Basic concepts in laboratory techniques	0+1	I and II
PGS 505 (e-course)	Disaster management	1+0	I and II

Syllabus of Common Courses for PG programmes

PGS 501 LIBRARY AND INFORMATION SERVICES (0+1)

Objective

To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines, etc.) of information search.

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/ Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e- resources access methods.

PGS 502 TECHNICAL WRITING AND COMMUNICATIONS SKILLS (0+1)

Objective

To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English (verbal as well as writing).

Practical (Technical Writing)

- Various forms of scientific writings- theses, technical papers, reviews, manuals, etc.;
- Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature,

material and methods, experimental results and discussion);

- Writing of abstracts, summaries, précis, citations, etc.;
- Commonly used abbreviations in the theses and research communications;
- Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations;
- Writing of numbers and dates in scientific write-ups;
- Editing and proof-reading;
- Writing of a review article;
- Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks);
- Error analysis (Common errors), Concord, Collocation, Phonetic symbols and transcription;
- Accentual pattern: Weak forms in connected speech;
- Participation in group discussion;
- Facing an interview;
- Presentation of scientific papers.

Suggested Readings

1. Barnes and Noble. Robert C. (Ed.). 2005. Spoken English: Flourish Your Language.
2. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
3. Collins' Cobuild English Dictionary. 1995.
4. Harper Collins. Gordon HM and Walter JA. 1970. Technical Writing. 3rd Ed.
5. Holt, Rinehart and Winston. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.
6. James HS. 1994. Handbook for Technical Writing. NTC Business Books.
7. Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.
8. Mohan K. 2005. Speaking English Effectively. MacMillan India.
9. Richard WS. 1969. Technical Writing.
10. Sethi J and Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed. Prentice Hall of India.
11. Wren PC and Martin H. 2006. High School English Grammar and Composition.

    S. Chand & Co.

PGS 503 (e-course) INTELLECTUAL PROPERTY AND ITS

MANAGEMENT IN VETERINARY AND ANIMAL HUSBANDRY (1+0)

Objective

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge- animal health and production based economy.

Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of animal breeds/strains and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

1. Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC and Aesthetic Technologies.
4. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol.

   V. Technology Generation and IPR Issues. Academic Foundation.
5. Rothschild M and Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
6. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.

The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; The Biological Diversity Act, 2002.

PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES (0+1)

Objective

To acquaint the students about the basics of commonly used techniques in laboratory.

Practical

- Safety measures while in Lab;

- Handling of chemical substances;
- Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel,condensers, micropipettes and vaccupets;
- Washing, drying and sterilization of glassware;
- Drying of solvents/ chemicals;
- Weighing and preparation of solutions of different strengths and their dilution;
- Handling techniques of solutions;
- Neutralisation of acid and bases;
- Preparation of buffers of different strengths and pH values;
- Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oil-bath;
- Electric wiring and earthing;
- Preparation of media and methods of sterilization;
- Cell/Tissue cultures
- Description of animal species and breeds

Suggested Readings

1. Furr AK. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
2. Gabb MH and Latchem WE. 1968. A Handbook of Laboratory Solutions. Chemical Publ. Co.

PGS-505 (e-course) Disaster management **1+0**

Objectives:

To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

Theory

UNIT I: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.

UNIT II: Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT III: Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Readings

Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient

Blackswan.
Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.
Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.

Compulsory course for Ph.D. students from all disciplines

RPE 700 RESEARCH AND PUBLICATION ETHICS (1+1) Semester I and II

I. Theory

RPE 01: Philosophy and Ethics

- Introduction to philosophy: definition, nature and scope, concept, branches
- Ethics: definition, moral philosophy, nature of moral judgements and reactions

RPE 02: Scientific Conduct

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
- Redundant publications: duplicate and overlapping publications, salami slicing
- Selective reporting and misrepresentation of data
- Publication ethics: definition, introduction and importance
- Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
- Conflicts of interest
- Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
- Violation of publication ethics, authorship and contributorship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

II. Practical

RPE 4: Open Access Publishing

- Open access publications and initiatives
- SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies

- Software tool to identify predatory publications developed by SPPU
- Journal finder/ journal suggestion tools, viz., JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

RPE 05: Publication Misconduct

A. Group Discussions

- Subject specific ethical issues, FFP, authorship
- Conflicts of interest
- Complaints and appeals: examples and fraud from India and abroad

B. *Software tools*

- Use of plagiarism software like Tumitin, Urkund and other open source softwaretools

RPE 06: Databases and Research Metrics

A. Databases

- Indexing databases
- Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

- Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, CiteScore
- Metrics: h-index, g index, i10 index, altmetrics