

SEMESTER TEN				
1	ENGL	English- III (Technical Report Writing and Presentation)	2 (2-0)	
2	LEBM	Livestock Economics And Business Management	2(2-0)	
		INTERNSHIP		
		TOTAL	4 (4-0)	
		GRAND TOTAL	167(102-65) 297	

Note: Institutions can add upto 15 credit hour courses to match their circumstances and strengths.

DETAIL OF COURSES SEMESTER I

VETERINARY ANATOMY- I 3 (1-2)

Learning outcomes:

At the end of the course, students will be able to:

1. Define and describe directional terms and bone surface modifications
2. Describe structure and relationship of bones, joints, muscles, nerves and blood vessels of forelimb and hindlimb (Practical only).
3. Describe structure of components of common integument, lymphatic and nervous system.
4. Indicate topographical location of skeletal and associated soft structures on live animals (Practical only).

Theory:

Introduction to anatomy; definitions and branches, body points; general body points of horse, ox and dog, anatomical terminology; directional terms, planes, bone surface modifications, Osteology; structure of bone, classes of bones and comparative aspects, myology; types, structure, naming conventions of muscles and associated structures, and comparative aspects, arthrology; structural and functional classification of joints, structure of synovial joints, gait mechanics; statics and dynamics, types of natural gaits and comparative aspects, integumentary system; Skin and its modifications, mammary apparatus, hoof, claw, digital pads, horn & hair, lymphatic system; lymph centers, lymph nodes and lymphatic channels, CNS; brain and spinal cord, PNS; ganglia, nerves, autonomic nervous system, special senses; ear and eye.

Practical:

Introduction to anatomy, branches of anatomy, terminology, anatomical planes and directional terms, comparative anatomy of forelimb region (equine, ruminant, canine): osteology of forelimb, arthrology of forelimb, myology of shoulder, brachium, antebrachium and digital regions; blood vessels of the

forelimb, their scheme and identification; nerves of the forelimb, their scheme and identification, comparative anatomy of hind limb region (equine, ruminant, canine): osteology of hind limb, arthrology of forelimb, myology: myology of croup, thigh and leg regions; blood vessels of the hind limb, their scheme and identification; nerves of the hind limb, their scheme and identification, anatomy of equine distal limb, comparative anatomy of skull (equine, ruminant, canine), brain and spinal cord, udder, hoof & horn, topography/surface anatomy of forelimb and hind limb regions.

Textbook:

1. Koenig, H. E. and H-G. Liebich, 2009. Veterinary Anatomy of Domestic Animals, Text book and Colour Atlas. Schattauer, Germany.

Recommended Books:

1. Pasquini C., T. Spurgeon, and S. Pasquini, 2007. Anatomy of Domestic Animals –Systemic and Regional approach. Soudz, U.S.A.
2. Getty, R., S. Sisson and J. D. Grossman, 1986. The Anatomy of the Domestic Animals. W.B. Saunders Co. Philadelphia, U.S.A.
3. Miller, M.E., 2000. Guide to the dissection of the Dog. Edwards Brothers, I thaca, New York, U.S.A.
4. Philip, G.D., 1988. Guide to Ruminant Anatomy Based on the Dissection of the Goat. Iowa State University Press. Ames, U.S.A.
5. Haward., E. and D. Alexander, 2000. Guide to the Dissection of the Dog. W.B. Saunders Co. U.S.A.

GENERAL VETERINARY HISTOLOGY

2 (1-1)

Learning outcomes:

At the end of the course, students will be able to:

1. Describe the light and ultra-structure of cell.
2. Describe and identify the microscopic features of four basic tissues; epithelia, connective and supportive tissues, muscular tissue, nervous tissue.

Theory:

Ultrastructure of cell, epithelial tissue: morphology and classification of types of surface epithelia and glandular epithelia, connective and supportive tissue: cells and fibers of connective tissue, microscopic study of different types of supportive connective tissue, light microscopic study of avian and mammalian blood, muscular tissue: light and fine microscopic structure of skeletal, cardiac, smooth muscle fibers, nervous tissue: light and fine microscopic structure of nervous tissue cells, neuron, ganglion and nerve.

Practical:

Microscopy: different parts of microscope and practical use of microscope, slide preparation: practical demonstration of tissue processing techniques and staining procedures. identification of different cell organelles in electron micrographs, epithelium: identification of different types of surface and glandular epithelium, connective tissue: identification of different types of cells, fibers of connective tissue and different types of proper and supportive connective tissue, blood: identification of different types of blood cells, muscular tissue: identification of different tissue sections of skeletal, cardiac and smooth muscle fibers under light microscope, nervous system: identification of neuron, neuroglia, central and peripheral nervous system: brain, spinal cord and peripheral nerves.

Textbook:

1. Eurell, J. A., and B. L. Frappier, 2007. Dellmann's Textbook of Veterinary Histology, Blackwell Publishing, UK.

Recommended Books:

1. Samuelson, D.A., 2007. Textbook of Veterinary Histology, Saunders Elseviers, USA.
2. Bacha, W.J. and L.M. Bacha, 2012. Color Atlas of Veterinary Histology, 3rd Ed., Wiley Blackwell, USA.
3. Qureshi, A. S. and M.N. Chaudhry, 2007. Illustrated Vet. Histology, MAS Publishers, Faisalabad.
4. McGaedy, T.A., P.J. Quinn, E.S. Fitzpatrick, and M.T. Ryan, 2006. Veterinary Embryology, Blackwell Publishing, UK.
5. Kuehnel, W., 2003. Color Atlas of Cytology, Histology and Microscopic Anatomy, 4th Ed., Thieme Stuttgart, New York.
6. Eroschenko, V.P., 2012. diFiore's Atlas of Histology: with Functional Correlations, 12th Ed., Lippincott Williams & Wilkins, USA.

VETERINARY PHYSIOLOGY-I**3 (2-1)****Learning outcomes:**

At the end of the course, students will be able to:

1. Describe the basic physiological principles and techniques related to processes of adaptation, homeostasis and feedback control systems.
2. Describe the relationship of structure to function focusing cardiovascular, circulatory and respiratory systems and their regulation with reference to nervous system.
3. Describe the pathophysiology of selected disorders of cardiovascular, circulatory and respiratory systems.

Theory:

Homeostasis and Feed Back Control: Cell and cell membrane transport system, Neuron, Action potential, Synapse and synaptic transmission, Neurotransmitters, Neurophysiology of skeletal and smooth muscles, Excitation-contraction coupling mechanism, Nervous system: Central and

peripheral nervous systems, Upper and lower motor neurons, Physiology of Reflex Arc, Autonomic nervous system; Parasympathetic and sympathetic divisions, Types of receptors and their properties, Anatomical divisions of brain and functions of each part. **Cardiovascular System:** Blood composition, blood cells genesis and differentiation, Structure and synthesis of hemoglobin, its types and iron metabolism, Functions of Neutrophils, Basophils, Eosinophils, Monocyte- Macrophage system and their role against infection, Reticulo-endothelial system, Resistance of body to infection, Lymphocytes and immunity (Humoral and cell mediated immunity), Blood groups, Blood transfusion and its complications, Mechanism of blood coagulation, Fibrinolytic system, Clinical correlations (Anemia, polycythemia, allergy and hypersensitivity, jaundice, hemophilia). **Circulatory Physiology:** Circulation and its characteristics, Biophysics of hemodynamics, Circulation: General; systemic and regional circulation; Coronary, skeletal muscle, splenic, Fetal and Pulmonary Circulation, Microcirculation and fluid exchange. Blood Pressure, neural and hormonal control of blood pressure and blood volume, Local control of blood pressure and flow. Physiology of Lymphatic system channel of body, formation of lymph; Role of lymphatic system in controlling interstitial fluid protein, volume and pressure. Cardiac cell properties and energy requirements, physiological basis of cardiac cycle; Relationship to heart sounds to heart pumping, Regulation of cardiac activity. Rhythmical excitation of heart; electrophysiology of heart; Characteristics of normal electrocardiogram. Clinical correlations (edema formation, circulatory shock, electrocardiographic interpretation of cardiac muscle and coronary blood flow abnormalities). **Respiratory system:** Functional anatomy of respiratory system, Mechanism of Pulmonary ventilation, Pulmonary volume and capacities, Physical principles of gas exchange, Respiratory membrane and diffusion of different gases through it, Fetal gas exchange, Factors affecting rate of gas diffusion, Role of surfactants, Pleural cavity, Regulation of transport of Oxygen and Carbon Dioxide in blood, lungs and tissues, Neural and hormonal control of respiration. Clinical correlations (pulmonary edema, emphysema and hypertension, CO poisoning, hypoxia)

Practical:

Methods of handling and restraining of different animals for blood collection, body temperature, pulse. Sites of Blood collection in different animal species, precautions while blood collection. Blood Collection. Different type of anticoagulants used routinely and their mechanism of actions. Practical demonstration of measurement of body temperature, pulse, respiration rate in different domestic animals. Determination of Total Red Blood Cell count (animal or human source). Determination of Total White Blood Cell count (animal source). Determination of Packed Cell Volume, Haemoglobin concentration, Coagulation and bleeding time, Erythrocyte Sedimentation Rate, Differential Leukocyte Count, Blood Groups. Determination of lung capacities and volumes. Identification of reflexes in frog, Pithing and stunning of frog, Nerve muscle preparation.

Textbook:

1. Cunningham, J.G. and B. G. Klein, 2007. Textbook of Veterinary Physiology. 4th Edition. WB Saunders Company, USA.

Recommended Books:

1. Dukes, H.H., M.J. Swenson and W.O. Reece, 2004. Duke's Physiology of Domestic Animals. 12th Edition, Comstock Publishing, USA.
2. Costanzo, L., 2008. Physiology. 4th Edition, Elsevier Publishing, USA.
3. Guyton, A.C. and J.E. Hall., 2006. Textbook of Medical Physiology. 11th Edition. WB Saunders Company, USA.
4. Barrelet, K.E., S.M. Barman, S. Boitano and H.L. Brooks, 2006. Ganong's Review of Medical Physiology. 23rd Edition. Appleton & Lange, USA.

BIOCHEMISTRY**4 (3-1)****Learning outcomes:**

At the end of the course, students will be able to:

1. Describe structure and function of essential biological molecules (e.g., proteins, lipids, carbohydrates) and metabolic & regulatory pathways.
2. Prepare solutions and buffers
3. Detect bio-molecules in various samples.

Theory:

Introduction to Biochemistry, pH & its importance, Buffer, Henderson-Hasselbalch equation, **Carbohydrates**: Introduction to carbohydrates, Classification of carbohydrates, Glycosidic linkages & Glycosides, Isomers, Optical activity & rotations, Chemical properties of monosaccharides, structure and functions of important monosaccharide, Homopoly saccharide, Heteropoly saccharides, **Proteins**: Introduction to Proteins, Classification of proteins, Structure and Classification of amino acids, Amphoteric properties of amino acids, concept of Isoelectric pH Peptide Linkage, Primary, Secondary, Tertiary and Quaternary structure of proteins, **Enzymes**; General Characteristics and classification of enzyme, Enzyme Kinetics **Lipids**: Introduction to Lipids, structure & classification of fatty acids, nomenclature of fatty acids, Physical properties of fatty acids and triglycerides, Chemical Properties of fatty acids and triglycerides, Sterols and cholesterol, Prostaglandin and their physical role, **Carbohydrate metabolism**: Glycolysis, regulation, energy production, Kreb's Cycle, regulation, energy production, Electron Transport Chain, Pentose phosphate shunt, Gluconeogenesis, **Protein metabolism**: Degradation of Proteins and amino acids, Urea cycle and its importance, urea toxicity, Regulation of urea cycle, Bioenergetics of protein metabolism, **Lipid metabolism**: Beta oxidation of even and odd chain fatty acids, Biosynthesis of fatty acids, Biosynthesis of triglycerides, Biosynthesis of Cholesterol, Biosynthesis of Ketone bodies, **DNA metabolism**: Biosynthesis and Degradation of nucleic acids, Comparative features among animal species of particular relevance, metabolism of mono-gastric and poly-gastric animals, and comparison of metabolism of mono and poly-gastric animals.

Practical:

Preparation of solutions: Preparation of Percentage, Molar and Normal solutions, Preparation of Buffer, Carbohydrate Analysis: Group Identification Test, Identification of mono, di and polysaccharides, Identification of reducing sugars, Identification of ketose sugar and their confirmation by phenylhydrazine test, Identification scheme for carbohydrates, Estimation of glucose in blood sample by glucose oxidase method, Estimation of amino acids by spectrophotometry, Biuret Test and Ninhydrin Test, Precipitation tests of proteins: Precipitation of casein at isoelectric point, salt saturation tests, Serum protein fractionation by electrophoresis, Separation of the colour pigments of Berseem/ alfa alfa by paper chromatography, Identification of lipids, Salkowski's test

Textbook:

1. Nelson, D.L. and M.M. Cox., 2013. Principles of Biochemistry, 3rd Edition, Worth Publishers.

Recommended Books:

1. Boyer, R.F., 2014. Modern Experimental Biochemistry. 3rd Edition. The Benjamin / Cummings Publishing Co., USA
2. Stryer, L., 2012. Biochemistry, 7th Edition, W. H. Freeman and Co.
3. Lab Manual in Biochemistry, Immunology and Biotechnology, Arti Nigram, Archana Ayyagari. Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Murray, R., Bender, D., Botham, K.M., Kennelly, P.J., Rodwell, V., P.A. Weil, 2012. Harper's Illustrated Biochemistry, 29th edition. The McGraw-Hill companies Inc. USA.
5. Voet D. and J.G. Voet 2004. Biochemistry 3rd Edition John Wiley & Sons. USA.

COMPULSORY MATHEMATICS
(FOR STUDENTS NOT MAJORING IN MATHEMATICS)

1. MATHEMATICS I (ALGEBRA) 3 (3-0)

Learning outcome:

At the end of the course, students will be able to apply the algebraic concepts and techniques in their respective disciplines.

Theory:

Preliminaries: Real-number system, complex numbers, introduction to sets, set operations, functions, types of functions. *Matrices:* Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule.

Quadratic Equations: Solution of quadratic equations, qualitative analysis of roots of a quadratic equations, equations reducible to quadratic equations, cube roots of unity, relation between roots and coefficients of quadratic equations.

Sequences and Series: Arithmetic progression, geometric progression, harmonic progression. *Binomial Theorem:* Introduction to mathematical induction, binomial theorem with rational and irrational indices. *Trigonometry:* Fundamentals of trigonometry, trigonometric identities.

Recommended Books:

1. Dolciani MP, Wooton W, Beckenback EF, Sharron S, *Algebra 2 and Trigonometry*, 1978, Houghton & Mifflin.
2. Kaufmann JE, *College Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th edition), 1986, PWS-Kent Company, Boston

2. MATHEMATICS II (CALCULUS) 3 (3-0)

Prerequisite(s): Mathematics I (Algebra)

Learning outcome:

At the end of the course, students will be able to apply the newly learnt concepts and the techniques in their respective disciplines.

Theory:

Preliminaries: Real-number line, functions and their graphs, solution of equations involving absolute values, inequalities. *Limits and Continuity:* Limit of a function, left-hand and right-hand limits, continuity, continuous functions.

Derivatives and their Applications: Differentiable functions, differentiation of polynomial, rational and transcendental functions, derivatives. *Integration and Definite Integrals:* Techniques of evaluating indefinite integrals, integration by substitution, integration by parts, change of variables in indefinite integrals.

Recommended Books:

1. Anton H, Bevens I, Davis S, *Calculus: A New Horizon* (8th Edition), 2005, John Wiley, New York
2. Stewart J, *Calculus* (3rd Edition), 1995, Brooks/Cole (suggested text)

3. Swokowski EW, *Calculus and Analytic Geometry*, 1983, PWS-Kent Company, Boston
4. Thomas GB, Finney AR, *Calculus* (11th Edition), 2005, Addison-Wesley, Reading, Ma, USA

3. MATHEMATICS III (GEOMETRY) 3 (3-0)

Prerequisite(s): Mathematics II (Calculus)

Learning outcome:

At the end of the course, students will be able to apply the newly learnt concepts and the techniques in their respective disciplines.

Theory:

Geometry in Two Dimensions: Cartesian-coördinate mesh, slope of a line, equation of a line, parallel and perpendicular lines, various forms of equation of a line, intersection of two lines, angle between two lines, distance between two points, distance between a point and a line. *Circle:* Equation of a circle, circles determined by various conditions, intersection of lines and circles, locus of a point in various conditions. *Conic Sections:* Parabola, ellipse, hyperbola, the general-second-degree equation

Recommended Books:

1. Abraham S, *Analytic Geometry*, Scott, Freshman and Company, 1969
2. Kaufmann JE, *College Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th Edition), 1986, PWS-Kent Company, Boston

ENGLISH-I (FUNCTIONAL ENGLISH) 2 (2-0)

Objectives: Enhance language skills and develop critical thinking.

Course Contents:

- Basics of Grammar
- Parts of speech and use of articles
- Sentence structure, active and passive voice
- Practice in unified sentence
- Analysis of phrase, clause and sentence structure
- Transitive and intransitive verbs
- Punctuation and spelling

Comprehension

Answers to questions on a given text

Discussion

General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

Listening

To be improved by showing documentaries/films carefully selected by subject teachers

Translation skills

Urdu to English

Paragraph writing

Topics to be chosen at the discretion of the teacher

Presentation skills

Introduction

Note: Extensive reading is required for vocabulary building

Recommended Books:

1. Functional English

a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension

1. Reading. Upper Intermediate. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking