SEMESTER II

VETERINARY ANATOMY-II 3 (1-2)

Learning outcomes:

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

1. Identify and describe anatomical features of skeletal, muscular, articular, vascular and nervous components of head and neck region (Practical only).
2. Identify and describe anatomical features of Respiratory, Digestive, Urinary, Genital and Endocrine Systems (organs of thoracic, abdominal and pelvic cavities).
3. Identify and describe anatomical features of skeleton and viscera of domestic chicken.
4. Indicate topographical location of organs on live animals (Practical only).

Theory:

Comparative Respiratory System (Equine, Ruminant, Canine); nostrils, nasal cavity, nasopharynx, hyoid apparatus, larynx, trachea, lungs, Comparative Cardiovascular System (Equine, Ruminant, Canine); heart, vessels, Comparative Digestive System (Equine, Ruminant, Canine); oral cavity, pharynx, esophagus, stomach, small intestine, large intestine, peritoneum, omentum, liver, pancreas, spleen, Dentition; Teeth eruption and dental markings on equine teeth with age, Urinary System (Equine, Ruminant, Canine); kidneys, ureters, bladder, urethra, Male Genital System (Equine, Ruminant, Canine); descent of testis, scrotum, spermatic cord, testis, penis, prepuce, Female Genital System (Equine, Ruminant, Canine); peritoneal attachments and anatomy of female internal and external genitalia, Endocrine system, Avian anatomy, Topographic anatomy.

Practical:

Comparative Anatomy of Head & Neck Region (Equine, Ruminant, Canine): Osteology: Skull review, Mandible, Vertebrae. Axial Arthrology. Myology of Face, Neck and Trunk. Sagittal section of head and neck: Nasal and Oral cavities, Larynx (cartilages), Trachea, Esophagus, thyroid glands, contents of carotid sheath. Comparative Anatomy of Thorax, Abdomen and Pelvis (Equine, Ruminant, Canine): Osteology: Ribs and sternum. Boundaries and contents of thoracic cavity, Pleura, Mediastinum, Lungs and Bronchial tree, Heart and Blood Vessels cranial to the heart. Introduction to abdominal cavity, Peritoneum, Omentum, Stomach (Simple and Compound), Small and Large Intestine, Biliary System, Liver and Spleen, Abdominal Aorta. Urinary System, Kidneys, Ureters, Urinary bladder and Urethra. Male Genital System; descent of testis, Scrotum, Testes, Duct system, Penis, Prepuce, Accessory glands. Female Genital System; peritoneal attachments and modifications, Internal and External Genitalia, Endocrine Glands, Avian Anatomy (skeleton and organs), Topography of body organs.

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, Ithaca, New York, U.S.A.
4. Philiph, 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.

SYSTEMIC VETERINARY HISTOLOGY & EMBRYOLOGY

3 (2-1)

Learning outcomes:

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

1. Describe developmental stages of embryo and embryonic origin of each organ.
2. Describe and identify the microscopic features of different systems of body and their comparative histological features in domestic animals.

Theory:

Embryology: study of different developmental stages of embryo, Placentation in domestic animals and embryonic origin of each body organ. Integumentary System: Histology of thick and thin skin and epidermal appendages. Cardiovascular System: Histology of Heart and all major types blood vessels. Lymphatic System: Introduction to Lymphoid tissue and histology of Lymph Node, Spleen, Thymus and Tonsils. Digestive System: Histology of all parts of digestive system of Simple and Compound Stomach animals along with accessory glands of Digestive System. Respiratory System: Histology of extra-pulmonary and intra-pulmonary tissues of respiratory system. Urinary System: Histology of Kidney and excretory passage of urinary system. Male Reproductive System: Spermatogenesis. Histology of Testis, its associated ducts, copulatory organ and male accessory glands. Female Reproductive System: Oogenesis. Histology of Ovary, Fallopian Tubes, Uterus, Cervix and Vagina. Endocrine System: Histology of Pituitary Gland, Pineal Gland, Thyroid and Parathyroid Glands, Adrenal Gland.

Practical:

Embryology: Different stages of Embryo. Integumentary System: Tissue Sections of Skin and epidermal appendages. Cardiovascular System: Sections of Heart, and arteries and veins. Lymphatic System: Tissue Sections of Lymph node, Spleen, Thymus and Tonsils. Digestive system: Tissue Sections of Oral

Cavity, Esophagus, Simple stomach in horse, dog, cat and Compound Stomach in Ruminants and small and large intestine, Accessory glands of Digestive System. Respiratory system: Tissue Sections of Nasal Cavity, Nasal Sinus, Naso-pharynx and Oropharynx, Larynx and Trachea, Lungs, Bronchi, Bronchioles, Respiratory Bronchioles, Alveoli, Alveolar duct and alveolar sacs. Urinary system: Tissue Sections of Kidney: Nephron, Juxtaglomerular Apparatus, Collecting tubules and collecting ducts and excretory passages. Male Reproductive System: Tissue Sections of the Testes and their associated ducts, Penis and male accessory glands. Female Reproductive System: Tissue Sections of the Ovary, Uterine tube and Uterus, Cervix and Vagina. Endocrine System: Tissue Sections of Pituitary gland, Thyroid gland, Parathyroid gland, Adrenal gland and Pineal body.

Textbook:

1. Eurell, J. A., and B. L. Frappier, 2007. Dellmann's Textbook of Veterinary Histology, 6th Ed., 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 Veterinary 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-II 4 (3-1)

Learning outcomes:

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

1. Describe basic terminologies related to endocrinology, digestive physiology, lactation and renal physiology.
2. Describe relationship of structure to function addressing digestive, renal, lactation and endocrine systems.
3. Describe pathophysiology of selected disorders of digestive, renal, lactation and endocrine systems.

Theory:

Endocrine Physiology: An overview of endocrine system, integration of endocrine and nervous system, Classification and transport of hormones, Hormone-cell interaction and feedback mechanisms, Pituitary Gland, its structure, secretions and function, Thyroid gland, its physiological anatomy, synthesis, release, functions of thyroxin and triiodothyronin, Endocrine pancreas; role of insulin and glucagon in regulation of glucose metabolism,

Parathyroid gland: Physiological anatomy; synthesis, release, functions and abnormalities of parathormone and calcitonin. **Digestive Physiology:** Introduction to gastrointestinal physiology, Feeding behavior, prehension and mastication, enteric nervous system, Physiological mechanism of deglutition, Saliva secretion, composition and regulation, Eructation mechanism, emesis and its control, Ruminant stomach, anatomy and physiology, concept of functional ruminal epithelium, Esophageal groove and concepts of nutrient-by-pass, Microbial ecosystem of digestion in ruminants, Fermentation of carbohydrates, proteins and fats in rumen, Production and absorption of volatile fatty acids, nitrogen in ruminants, Physiologic anatomy of simple stomach, gastric motility, factors affecting gastric motility, Gastric secretion, composition, regulation, factors influencing the gastric secretion, Digestion and absorption of carbohydrates, proteins, fats, Absorption of vitamins end electrolytes, Role of Pancreas and liver indigestion. Clinical cases like ulcer, ruminal acidosis, urea toxicity, diarrhea; Protected nutrients and enzymes, selected antibiotics in feed, probiotic and prebiotics. **Lactation Physiology:** Functional anatomy of mammary glands, Physiology of mammogenesis, lactogenesis and galactopoesis, Milk synthesis and secretion, Biological functions of milk, its nutritive value, Lactation performance, physiological factors affecting lactation, Mammary biotechnology. **Renal Physiology:** Anatomy and physiology of Nephron, Urine formation, Glomerular filtration, Physiological control and auto-regulation of Glomerular Filtration Rate, Tubular Reabsorption and processing of Glomerular Filtrate, Mechanism of tubular re-absorption and regulation, Regulation of extra-cellular fluid osmolarity, balance of Sodium and Potassium by Kidney, Renal absorption of bivalent ion. Renal blood flow, renal clearance, filtration fraction, regulation of urine volume and concentration, Act of micturition and its regulation, Introduction to acid–base Physiology, Renal mechanisms for maintaining hydrogen ion concentration in body fluids; Regulation of acid–base balance, Clinical correlations (acidosis, alkalosis). Clinical cases related to Endocrine, Digestive, Lactation and Renal Physiology.

Practical:

Demonstration of location of endocrine glands in rats and rabbits, Isolation of rat uterus and effect of oxytocin, Glucose tolerance test, Farm visits for observations on rumination and deglutition; Salivary secretion in ruminants, Tests for saliva of different animals, Motility of ruminant stomach, Rumen fistula/cannulation, Biochemical experiments on bile, Determination of composition of milk, Determination of pH and specific gravity of milk, Determination of total solid in milk, Urinalysis.

TextbBook:

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. Barreet, K.E., S.M. Barman, S. Boitano and H.L. Brooks, 2006. Ganong's Review of Medical Physiology. 23rd Edition. Appleton & Lange, USA.
5. Jafri, S.A., M. Rabbani and H. Rehman, 2002. Manual of Digestive Physiology. *Muktaba-i-Danwasharian,* Lahore, Pakistan.
6. Chruch D.C., 1993. The Ruminant Animal: Digestive Physiology and Nutrition. Waveland Press, Inc, USA.

ENGLISH-II (COMMUNICATION SKILLS) 2 (2-0)

Objectives: Enable the students to meet their real life communication needs.

Course Contents:

Paragraph writing

Practice in writing a good, unified and coherent paragraph

Essay writing

Introduction

CV and job application

Translation skills

Urdu to English

Study skills

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

Academic skills

Letter/memo writing, minutes of meetings, use of library and internet

Presentation skills

Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

Recommended Books:

Communication Skills

a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).

2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

c) Reading

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
2. Reading and Study Skills by John Langan
3. Study Skills by Richard York.

GENERAL VETERINARY MICROBIOLOGY 3 (2-1)

Learning outcomes:

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

1. Describe general characteristics of bacteria, fungi and virus
2. Elaborate physico-chemical requirements for microbial growth
3. Describe preliminary identification of micro-organisms.

Theory:

Introduction of Microbiology, Definition and branches of Microbiology, Historical introduction including works of Pasteur, Koch and Lister etc, Recent developments in microbiology, Prokaryotes v/s Eukaryotes, Growth medium, types of culture media, preparation of the medium in the lab, Bacterial growth and multiplication, Bacterial multiplication and growth curve, continuous culture, Physico-chemical requirements (pH, temperature and oxidation reduction potential), Physico-chemical requirements (gaseous and nutritional requirements), Bacterial genetics: Mutation and mutagenesis, Transposons, Plasmid in mutation and mutagenesis, Conjugation, Transformation, Transduction, Lysogeny, Introduction to genetic engineering, antibacterials, Introduction to fungi: Molds and yeasts, Growth requirements and mode of replication of molds and yeasts, Isolation and identification of molds and yeasts, Classification of molds and yeasts, Clinical diagnosis of different fungal diseases, antifungal drugs, Fundamental characteristics of viruses (Definition and history of virology), General properties of viruses, viroids and prions, Bacteriophages and its typing, Methods of studying viruses; Purification of viruses and determination of virus size, Virus classification, Virus replication: Adsorption-receptor/ligand, entry mechanisms, uncoating, biosynthesis of virus components, Virus transcription, translation, assembly and release, Replication of RNA and DNA viruses and their comparison analysis, Replication of Retroviruses and defective viruses, Properties of animal viruses at cellular levels (infection of cell with multiple viruses), Recombination , Exaltation, dormancy and reactivation, Interference, Mechanisms of interference, Interferon (Properties, types, mode of action, biological significance, antibodies vs interferon), Haemadsorption and elution, Viral vaccines and factor affecting success/ failure of viral vaccines, Physico-chemical characteristics of viruses, antiviral agents, Methods for isolation and identification of viruses, algae.

Practical:

Safety in microbiological laboratory, study of principles and application of laboratory equipment, Microscope and microscopy (bright field; dark field; Phase contrast; fluorescent microscopes, Sterilization (moist heat, dry heat, irradiation, filtration), Disinfectants and their efficacy evaluation (how to calculate phenol coefficient against a bacteria), Preparation and demonstration of various bacteriological media (general and selective, Differential and Enrichment media. Demonstration of staining techniques (negative, simple and Gram's staining), Zeihl-Neelsen and spore staining techniques. Methods of bacterial cultivation and growth measurement, Identification of bacterial characteristics (colony, morphology, shape and arrangement), Biochemical tests, Sugar fermentation tests, Micrometry and motility, Antibiotic susceptibility testing, Isolation and identification of common fungi and molds, Purification of viruses (ultracentrifugation; precipitation and ultra-filtration), Cultivation of viruses (animal inoculation, egg inoculation), isolation and enumeration of bacteriophages from sewerage water and calculation of antiviral activity of disinfectants against a virus, Cell culture preparation, Demonstration of cytopathic effects (CPE), Virus identification methods (electron microscopy through simulation and images, serology, precipitation test, virus neutralization test etc.). Virus titration (determination of EID_{50}, LD_{50} and $TCID_{50}$), cultivation and identification of algae.

Textbook:

1. Tortora, G.J.,B.R. Funke and C.L. Case, 2012. Microbiology: An Introduction. 11th Edition. Benjamin Cummings Publisher.

Recommended Books:

1. Quinn, P.J., M.E. Carter, B.K. Markie and G.R. Carter, 1994. Clinical Veterinary Microbiology. Wolf, London. (As practical manual)
2. Anonymous, 1999. A laboratory manual for the isolation and identification of avian pathogens. 6th Ed. American Association of Avian pathologists, Iowa State University Press, Ames, Iowa.
3. Burleson, F.G., T.M. Chanbes and D.I. Wiedranks, 1992. Virology-A laboratory Manual Academic Press, London
4. Castro, A.E. and W.F. Henschele, 1992. Veterinary Diagnostic Virology. Mosby yearbook, Inc., Baltimore.
5. Fenner, F.J., E.P. Gibbs, F.A. Murphy, M.J. Studdert and D.O. White, 1993. Veterinary Virology 2nd Ed., Academic Press London.
6. Merchant, I.A. and R.A. Packer, 1984. Veterinary Bacteriology and Virology. 7th Ed., Iowa State University Press, Ames, Iowa.
7. OIE, 2014. Manual of Standards for diagnostic tests and vaccines. Off. Intl. Des. Epiz., Paris.
8. Rabbani, M. and M.A. Muneer, 2001. Techniques in Virology. 1st Ed., UVAS Press, Lahore
9. Talaro, K. and A. Talaro, 1996. Foundation in Microbiology. 2nd Ed., Win C. Brown Publ., owa.
10. Virella, G., 1997. Microbiology and Infectious Disease. 3rd Ed., Williams and Wilkins, Baltimore.

INTRODUCTION TO POULTRY PRODUCTION 1(1-0)

Learning outcomes:

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

1. Describe various production systems and housing-types in poultry production.
2. Describe strategies to benefit rural poultry producers, hobby farmers/fanciers.
3. Provide technical guidance about organic farming, non-traditional poultry and companion birds.
4. Describe methods of disease prevention and their importance in poultry production.

Theory:

Overview of Poultry Industry; Production Systems for broiler and laying hens; Introduction to village and backyard poultry production; Alternative systems of poultry production and its effects on health and disease; Organic and free-range poultry production; Technology and programs for sustainable improvement of rural poultry; Production systems for Waterfowl; Game bird breeding, brooding and rearing - Health and Welfare; Furnished cages for laying hens; Performance, welfare, health and hygiene of laying hens in non-cage systems in comparison with cage systems; Turkey production and management; Alternative systems for meat chickens and turkeys: Quail production; Commercial duck farming; Ostrich farming; Production and management of companion and fancy birds.

Textbook:

1. Sandiland, V. and P. Hocking, 2012. Alternative systems for poultry: health, welfare, and productivity. CAB International, Wallingford, Oxon, U.K.

Recommended Books:

1. Sreenivasaiah, P.V., 2006. Scientific Poultry Production. 3rd edition. International Book Distributing Co., UP India.
2. Austic and Nesheim, 1990. Poultry Production.13th edition. Lea and Febiger, Philadelphia, Pennsylvania.

FUNDAMENTALS OF LIVESTOCK PRODUCTION 2 (1-1)

Learning outcomes:

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

1. Define and describe Taxonomy and domestication of farm animals
2. Identify types and breeds of farm animals.
3. Describe principles of farm animal housing, feeding and behavioral management.
4. Elaborate equitation, welfare, transportation and marketing of animals.

Theory:

Role of livestock in national economy; Domestication and taxonomy of farm animals; Types and breeds of farm animals; Identification and handling of livestock; Principles of farm animal management; Farm structures and equipment; Management of different types and classes of farm animals; Characteristics, body conformation and capacity of draught animals; Camel as a dairy, meat and draught animal; Farm animal vices and their control; Deworming and vaccination schedule and biosecurity for various farm animals, Principles of equitation; Welfare of farm animals; Transportation and marketing.

Practical:

Regions and body points of farm animals; Approaching, handling and restraining of animals; Identification and use of management tools; Grooming and cleaning; Animal identification and transportation systems; Body measurements for weight estimation; Maintenance of various farm records; Design and layout plans for livestock building; Demonstration of body conformation and defects; Determining age; Marking camel and horses; Care of foot; Use and care of harness and saddles; Equitation practices.

Textbook:

1. Banerjee, G.C., 2009. A textbook of Animal Husbandry. 8th Edition. Oxford and IBH Publishing Co. New Delhi, India.

Recommended Books:

1. Verma D.N., 2006. A Textbook of Livestock Production Management in Tropics. Kalyani Publishers Delhi India.
2. Mackintosh, J.B., 1993. Sheep production in Pakistan Agricultural Research Council, Islamabad.
3. Kacker, R.N. and B.S. Panwar, 1996. Textbook of Equine Husbandry. Vikas Publications Pvt. Ltd., New Delhi.
4. Wilson, R.T.. 1998. Camels. Mc Millan Education London.
5. Khan, B.B., M. Yaqoob, M. Riaz, M. Younas and A Iqbal, 2004. Livestock Management Manual for Introductory Courses. Dept. of Livestock Management University of Agriculture, Faisalabad.

PAKISTAN STUDIES 1 (1-0)

Introduction/Objectives

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline

1. **Historical Perspective**
   a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
   b. Factors leading to Muslim separatism

c. People and Land
    i. Indus Civilization
    ii. Muslim advent
    iii. Location and geo-physical features.

2. **Government and Politics in Pakistan**
   Political and constitutional phases:
   a. 1947-58
   b. 1958-71
   c. 1971-77
   d. 1977-88
   e. 1988-99
   f. 1999 onward

3. **Contemporary Pakistan**
   a. Economic institutions and issues
   b. Society and social structure
   c. Ethnicity
   d. Foreign policy of Pakistan and challenges
   e. Futuristic outlook of Pakistan

Recommended Books:

1. Burki, Shahid Javed. *State & Society in Pakistan,* The MacMillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy.* Karachi: Oxford University Press, 2000.
3. S. M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development.* Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Bangladesh,* Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota,* Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno - National Movement in Pakistan,* Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development.* Kent England: Wm Dawson & sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh.* Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan,* Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan.* Boston: Houghton Mifflin, 1967.
12. Aziz, K. K. *Party, Politics in Pakistan,* Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, Pakistan Under Martial Law, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective.* Islamabad: National Commission on Historical and Cultural Research, 1993.