F.Y.B.Sc Zoology (CBCS – Autonomy 23 Pattern)

Course Title	TOOLS AND TECHNIQUES IN ANIMAL SCIENCE		
Course Code	23SBZO111SC		
Semester: I			**No. of Credits: 02**
Course Type: SEC (MN)			**Total Teaching Hours: 30**

Course Objectives	
1.	To make the learner understand working principles, basic operation, and application of various microscopes.
2.	To make the students culture few invertebrates and study them.
3.	To make the student familiar with microtomy machine and let him apply the knowledge in preparing permanent slides of various mammalian organs.
4.	To familiarize the students with various insect collection and preservation techniques.
5.	To extend to the knowledge about working principle, basic operation and application of instruments used in Animal science studies

Course Outcome	
1.	The learner will get knowledge about working principles, basic operation, and application of various microscopes.
2.	The student will be able to culture invertebrates in laboratory and study them.
3.	The learner will be able to handle microtomy machine and prepare permanent slides of various mammalian organs
4.	The learner will be able to collect various insect and preserve them for further studies.
5.	The student can apply the knowledge about working principle, basic operation, and application of instruments in Animal science studies

	Syllabus
Sr. No	**Title with Contents**
1.	Microscope and its practical use: Simple, compound, binocular, phase contrast and electron microscope
2.	Use of Stereo microscope to observe, measure and take photographs of slides and live organisms using image analysis software.
3.	General method of whole mount preparation.
4.	Culturing of *Paramoecium* / *Hydra*
5.	Observation of food and feeding habit of *Paramoecium* / *Hydra*
6.	Preparation of permanent stained slides (Study of living invertebrate animals)
7.	Insect collection and preservation methods
8.	Study of gut microflora of any insect.
9.	Practical Taxidermy: Collection, Preservation, and setting up laboratory specimens
10.	Preparation of fixatives, stains and laboratory reagents
11.	Isolation of plasma and blood cells using centrifugation technique.
12.	Working principles, basic operation and application of weighing balance, , autoclave, Oven, Water Baths and Pipettes
13.	Working principles, basic operation and application of laminar air flow, Shaking Incubators, Hot Air Ovens, Bio-Safety Hoods, Fume Hoods, and MiliQ water system
14.	Working principles, basic operation and application of Microtome
15.	Estimation of pH of various samples using pH meter
16.	Estimation of protein in sample using colorimeter
17.	Observation of nucleic acid separation using agarose gel electrophoresis
18.	Separation of amino acids using paper chromatography.

F.Y.B.Sc Zoology (CBCS – Autonomy 23 Pattern)

Course Title	PRANISHASTRA IN ANCIENT INDIA		
Course Code	23SBZO111IK		
Semester: I			**No. of Credits: 02**
Course Type: IKS (MN)			**Total Teaching Hours: 30**

Course Objectives	
1.	To know the brief introduction of Animals research in India.
2.	To know use of animals for various purpose in ancient India.
3.	To know development of traditional medicine and physiology in India.
4.	To know about important Zoologists involved in natural history research in India.
5.	To know the animal and human interaction during different Indian civilizations.

Course Outcome	
1.	The student will be able to know the economic reforms and prosperity in Ancient Indian civilization due to the development of Traditional science on Zoology
2.	The student will be able to appreciate Indian civilization as a vast conglomeration of intellectuals, thinkers, and universities in many fields of knowledge.
3.	The student will be able to understand the traditional study of the science of mythology in ancient Indian civilization.
4.	The students will understand that since the beginning of ancient civilization animals were used for the benefit of mankind as a source of food, clothing, transportation, military and recreation.
5.	The learner will get rich information related to the ancient Indian medical science and its relevance in modern times.

Syllabus		
Unit I	**Introduction**	**02 hours**
	1. History of zoological research in India 2. Advent of the Aryans	
Unit II	**Ancient India: Zoologists and Animal Classification**	**04 hours**
	1. Shalihotra, Palkapya, Bhoja Parmara, Sunandaka, Cakra and Hamsadeva 2. Basis of numbers in the Brihat Vishnu Puran 3. Basis of anatomy 4. Charak's Classification	
Unit II	**Traditional knowledge on Animal Science in Ancient Indian Civilization**	**06 hours**
	1. Neolithic, Indus Valley Civilization 7000 BCE-600 BCE, Iron Age India 500 BCE-200 BCE, Epic Age 1000 BCE-400 BCE 2. Maurya Period (322-185 BCE), Ashoka Period (300 BCE), 3. Early Common Era 200-1200 CE	
Unit III	**Attitude and Conservation Measures**	**04 hours**
	1. Background, Protection and Conservation Measures 2. Asoka on Protection and Conservation 3. Manu and Vishnu on Animals	
Unit IV	**Animal Keeping in Ancient India**	**04 hours**
	1. Paintings of cave men and animals, Animal husbandry in Harappan culture, Vedic age and animal ayurveda 2. Epic period-Cow husbandry in Mathura during Krishna's era 3. Animal Keeping in Mauryan age, Ashoka period, Chalukya period, Mughal period, Colonial period 4. Graeco-Roman accounts on Indian animal world	
Unit V	**Veterinary Medicine in Ancient India**	**06 hours**
	1. Animal surgery, Cure of animal diseases, Ethno-veterinary medicine, Snake venom as a valuable medicine, Combating parasitic diseases 2. Elephant medicine or Gaja Ayurveda, Equine medicine or Haya Ayurveda, Cow: prosperity, protection Medicinal importance and legends 3. Value of animals- Buffalo, Goat, Sheep, Fowl 4. Meat science	
Unit VI	**Medical science in ancient India (ayurveda & yoga)**	**02 hours**
	1. Varahamihira, Susruta, Charak, Yoga & Patanjali 2. Ancient medical practices 3. Glimpses of ancient Indian medicine	

Unit VII	Post-Independence (1947–1970)	02 hours
	1. Ornithologists, Entomologists, Ichthyologists, Herpetologists 2. Scientists from other disciplines 3. Popularizers & Conservationist	

Suggested Readings:

1. Indus Age: The Beginnings. Philadelphia, Possehl GL (1999) Univ. Pennsylvania Press.
2. Mehrgarh Neolithic. Jarrige JF (2008) Pragdhara 18: 136–154
3. The first farmers in Western Pakistan: the evidence of the Neolithic agropastoral settlement of Mehrgarh. Costantini L (2008) Pragdhara 18: 167–178
4. Agricultural origins and frontiers in South Asia: a working synthesis. Fuller DQ (2006) J World Prehistory 20: 1–86
5. The figurines of the first farmers at Mehrgarh and their offshoots. Jarrige C (2008) Pragdhara 18: 155–166
6. Theory of Optimum Utilisation of Resources in agriculture during the Gupta Period, Agarwal, Ankit (2011), History Today.
7. Studies in the History of the Sangam Age, Balambal, V. (1998), Kalinga Publications.
8. The Near-Eastern Roots of the Neolithic in South Asia, Gangal, Kavita; Sarson, Graeme R.; Shukurov, Anvar (2014), PLOS ONE, 9 (5): e95714
9. Agricultural Growth and Diversification since 1991, Gulati, A. (2006), Encyclopedia of India (vol. 1) edited by Stanley Wolpert, pp. 14–17, Thomson Gale,
10. Origin of agriculture and domestication of plants and animals linked to early Holocene climate amelioration, Gupta, Anil K. (2004) Current Science, 87 (1), Indian Academy of Sciences.
11. The origins and spread of agriculture and pastoralism in Eurasia, Harris, David R. & Gosden, C. (1996), Crops, Fields, Flocks And Herds, Routledge.
12. Mehrgarh, Possehl, Gregory L. (1996), Oxford Companion to Archaeology edited by Brian Fagan, Oxford University Press.
13. Bihar Peasant Life, George A. Grierson (1885), Bengal Secretariat Press, Calcutta.
14. Graeco-Roman accounts on Indian animal world, Arora, U.P. (1994) Yavanika 4:31–76.
15. Pre-historic Rock Paintings of Bhimbetka, Mathpal, Y. (1984) Abhinav Publications, Delhi 110 007, India. 234 pp.
16. A History of Agriculture in India Randhawa, M.S. (1980). Volume 1. Indian Council of Agricultural Research, New Delhi 110 001, India. 541 pp.
17. Cattle, Priests and Progress in Medicine Schwabe, C.W. (1978). University of Minnesota, Minnesota, USA.

18. Zoological remains. In: Mohenjà-daro and the Indus Civilization Sewell, R.B.S. and Guha, B.S. (1931). (Marshall, S.J., ed.). A. Probsthain, London, UK. pp. 649–673.
19. The insignia of the Veterinary Council of India adopted from Emperor Ashoka's edict. In: Third Convocation of National Academy of Veterinary Sciences (India) and National Symposium on Historical Overview on Veterinary Sciences and Animal Husbandry in Ancient India (Vedic and Ashokan Period), 16–17 April 2002, Singh, C.M. (2002a). Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India. pp. 1–3.
20. Animal surgery or Pashu Shalya Chikitas in ancient India. In: Third Convocation of National Academy of Veterinary Sciences (India) and National Symposium on Historical Overview on Veterinary Sciences and Animal Husbandry in Ancient India (Vedic and Ashokan Period), 16–17 April 2002, Singh, G.R. (2002b) Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India. p. 12.
21. Prachin Bharat main Pashu Palan evum Pashu Chikitsha Vigyan (In Hindi). Part I. Somvanshi, R. (1993). Rajbhasha Anubhag, Indian Veterinary Research Institute, Izatnagar,Uttar Pradesh, India.
22. Legends of cow-bulls in coins of ancient India. In: Third Convocation of National Academy of Veterinary Sciences (India) and National Symposium on Historical Overview on Veterinary Sciences and Animal Husbandry in Ancient India (Vedic and Ashokan Period), 16–17 April 2002, Somvanshi, R. (2002). Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India. p. 20.
23. Snake venom as a valuable medicine in ancient India. In: Third Convocation of National Academy of Veterinary Sciences (India) and National Symposium on Historical Overview on Veterinary Sciences and Animal Husbandry in Ancient India (Vedic and Ashokan Period), 16–17 April 2002, Srivastava, A.K. (2002). Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India. p. 7.

F.Y.B.Sc Zoology (CBCS – Autonomy 23 Pattern)

Course Title	PREVENTIVE HEALTHCARE		
Course Code	23SBZO111OE		
Semester: I			**No. of Credits: 02**
Course Type: OE (MN)			**Total Teaching Hours: 30**

Course Objectives	
1.	To understand the concept of health and its importance.
2.	To understand the basic knowledge of human anatomy and physiology.
3.	To understand the types of various common diseases.
4.	To be able to understand lifestyle and daily nutritional requirement
5.	To understand common mistakes in food habit and daily routine.
6.	To understand the importance of first aid during emergency.

Course Outcome	
1.	The student will be able to understand basic organs of human body and physiology
2.	The student understands the importance of nutrition and supplements at various stages of life.
3.	The student knows the symptoms of common diseases and preventive measures.
4.	The student can understand the basic medical test and its importance.
5.	The student understands the effects of unhealthy food habit and is motivated to accept healthy lifestyle.

Syllabus		
Unit I	**General organization of human body**	**2 hours**
	1. Digestive system, Respiratory system, Circulatory system Reproductive system, Nervous system, Endocrine system, Skeleton system	
Unit II	**Common diseases**	**4 hours**
	1. Viral diseases- symptoms, prevention, and control measures- Common viral fever and cold, Covid, Flu, Mumps, Measles, Chickenpox, Herpes, Viral Hepatitis 2. Bacterial diseases, symptoms, and control measures – UTI, Strep throat, Pneumonia, Tetanus 3. Protozoan diseases- Giardia, and Toxoplasmosis 4. Fungal diseases- Athlete's foot, Yeast infection, Jock itch, Ringworn	
Unit III	**Introduction to Parasitology**	**3 hours**
	1. Types of parasites and their relationship with host 2. Common parasites – life cycle, prevention, control and treatment Round worm, Tape worm, Liver fluke, *Plasmodium, Wuchereria*, Head louse, Tick	
Unit IV	**Epidemic diseases**	**4 hours**
	1. Tuberculosis, Typhoid, Cholera, Dengue, Malaria, Seasonal Influenza, Leptospirosis, Chikungunya, Enteric fever	
Unit V	**Veneral diseases (Sexually transmitted diseases)**	**2 hours**
	1. Syphilis, Aids, Gonorrohea, Genital and anal warts, vaginitis	
Unit VI	**Disorder common conditions and lifestyle diseases**	**4 hours**
	1. Disorder common conditions of eye, ear, nose and throat **2.** Asthma and Allergies, Arthritis, Spondylitis, Thyroid diseases, **3.** Diabetes, Obesity, Parkinson's, Common cancers, Hypertension	
Unit VII	**Nutrition and supplements**	**2 hours**
	1. Balanced diet, Carbohydrate, Protein, Fats, Vitamins, Minerals	
Unit VIII	**Diet requirement and exercise**	**2 hours**
	1. Infant, Children, Teenage, 2. Adult, Pregnancy, Post partum, Menopause, Old age	

Unit IX	**General diagnostic test and interpretation**	**2 hours**
	1. CBC, TSH, fasting sugar and pp, Hba1c, Calcium, Vitamin D, 2. Uric acid, creatinine and protein, Cholesterol, LFT, KFT, 3. Urine R/M analysis, Electrolyte profile,	
Unit X	**Type of food intake and its effect**	**3 hours**
	1. Processed sugar, Antioxidants, Processed food, Refined oil 2. Packaged food and ingredient, Effects of fast food on health. 3. Food preparation methods and effect- pressure cooker, microwave, 4. Mealtime table 5. Intermittent fasting and its importance	
Unit XI	**Management of common conditions and emergencies**	**2 hours**
	1. First aid kit, Acidity, High fever, Heart attack 2. Minor cut and bleeding, Minor burn	

Suggested Readings:

1. Textbook Of Medical Parasitology, Kamble (2018), Orient Blackswan Pvt. Ltd.
2. Parasitology 5th , C P Baveja & V Baveja (2021), APC Publishers
3. Common Medical Emergencies, Shivaprakash Shirale (2022), Clever Pen Publishing
4. https://www.indianredcross.org/publications/FA-manual.pdf
5. First Aid For The Usmle Step 1 (Indian Edition), Tao Le, Vikas Bhushan, Matthew Sochat , Caroline Coleman, Connie Qiu (2022), McGraw Hill
6. The Food Effect Diet: Eat More, Weigh Less, Look and Feel Better, Michelle Braude (2017) Piatkus publications
7. The Art of Ayurvedic Nutrition: Ancient Wisdom for Health, Balance, and Dietary Freedom, Susie Colles (2020) Skyhorse publications
8. Indian Superfoods, Rujuta Diwekar (2016), Juggernaut publications
9. Wallach's Interpretation of Diagnostic Tests, Dr. L Michael Snyder M.D. (2020) Wolters Kluwer Health pulication
10. Essentials Of Nutrition, Sunil Natha Mhaske (2015) Published Year 2015, CBS Publishers & Distributors
11. Vitamins, Minerals, And Nutrition: Health Media Of Nutrition Series, Heber D (2015)
12. Nutrition and Dietetics 5th Edition, Shubhangini A Joshi (202) McGraw Hill
13. The Essential Guide to Vitamins, Minerals and Herbal Supplements, Sarah Brewer (2010) Robinson publication.

F.Y.B.Sc. Zoology (CBCS – Autonomy 23 Pattern)

Course Title	INTRODUCTION TO NON-CHORDATES -I		
Course Code	23SBZO121MN		
Semester: II			**No. of Credits: 02**
Course Type: MN			**Total Teaching Hours: 30**

Course Objectives	
1.	To understand the Invertebrate animal diversity around us.
2.	To understand the underlying principles and terminology needed in classification of animals.
3.	To understand the differences and similarities in the various aspects of classification.
4.	To be able to understand the possible group of the invertebrates observed in nature and classify them.
5.	To understand our role as a caretaker and promoter of life around us.
6.	To understand the economic importance of various invertebrates

Course Outcome	
1.	The student will be able to understand classify and identify diverse invertebrates.
2.	The student understands the importance of classification can effectively use the six levels of classification.
3.	The student knows the general characters of kingdom Animalia, phylum Protozoa, Porifera, Coelenterata, and Platyhelminthes.
4.	The student can describe habit, habitat, external morphology, feeding and reproduction in *Paramoecium.*
5.	The student understands the economic importance of various invertebrates and can use it judiciously for the betterment of mankind.

Syllabus		
Unit I	**Principles of Classification:**	**06 hours**
	1. Taxonomy & Systematics- Taxonomy: Basic terminology and Introduction- Alpha, Beta and Gamma levels of taxonomy, Microtaxonomy, Macro taxonomy, Classical taxonomy and Experimental taxonomy, Significance of Taxonomy, Systematics: Definition and introduction 2. Linnaean system of classification (Six levels of classification: Phylum, class, order, family, genus, species) 3. Concept of Species: Biological and Evolutionary concept 4. Nomenclature: Introduction to Binomial nomenclature, Trinomial nomenclature, Rules of Zoological nomenclature 5. Introduction to Five kingdom system- General Features of kingdom Animalia	
Unit II	**Kingdom Protista (Phylum: Protozoa)**	**08 hours**
	1. Introduction and salient features to Phylum Protozoa 2. Classification of Phylum Protozoa up to classes- Rhizopoda, Mastigophora, Ciliate, Sporozoa. 3. Locomotion in Protozoa: Amoeboid, Ciliary and Flagellar 4. Type Study: *Paramoecium caudatum:* Classification, Habit and Habitat, External morphology, Feeding and digestion, Excretion. Reproduction (binary fission and conjugation) 5. Economic importance of Protozoa	
Unit III	**Organization, symmetry, body wall and coelom in metazoa**	**02 hours**
	1. Grades of organization, Symmetry and Body wall: Diploblastic, Triploblastic 2. Coelom: Acoelomate, Pseudocoelomate, Eucoelomate	
Unit IV	**Phylum Porifera**	**05 hours**
	1. Introduction and salient features of Phylum Porifera 2. Classification of Phylum Porifera up to classes- Calcarea, Hexactinellida, Demospongiae 3. Canal system in sponges: Ascon, Sycon, Leucon, Rhagon 4. Skeleton in sponges: Spicules: Microscleres & Megascleres, Monoaxon– monactinal, diactinal,Amphidiscs, Triaxon, Polyaxon, Spongin fibres. 5. Regeneration in sponges. 3. Economic importance of Phylum Porifera.	
Unit V	**Phylum: Cnidaria**	**04 hours**
	1. Introduction and salient features of Phylum Cnidaria 2. Classification of Phylum Cnidaria up to class- Hydrozoa, Scyphozoa, Anthozoa, 3. Polymorphism in Hydrozoa 4. Economic importance of Cnidarians with reference to	

	Coralsand Coral reefs.	
Unit VI	**Phylum Platyhelminthes**	**03 hours**
	1. Introduction and salient features of Phylum Platyhelminthes 2. Classification of Phylum Platyhelminthes up to classes- Turbellaria, Trematoda, Cestoda 3. Economic importance of Platyhelminthes	
Unit VII	**Model organisms**	**02 hours**
	1. Introduction and salient features of model organisms 2. *Hydra* as a model organism	

References:

1. Anderson, D.T (Ed): Invertebrate Zoology 1988, Oxford University Press
2. Barnes, R.D.: Invertebrate Zoology, V Edition 1982, Holt Saunders International Edition
3. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I.: The Invertebrates: A New Synthesis, III Edition 2002, Blackwell Science
4. Barrington, E.J.W.: Invertebrate Structure and Functions. II Edition 1979, E.L.B.S. and Nelson
5. Boradale, L.A. and Potts, E. A: Invertebrates: A Manual for the use of Students, Asia Publishing Home.
6. Brusca, R.C and Brusca, G. J: Invertebrate (2nd ed.) 2003, Sinauer Associates Inc., Publishers Sunderland.
7. Hadzi, J: The Evolution of Metazoa. 1963, Macmillan New York.
8. Hyman, L. H: Invertebrates Vol I, Protozoa through ctenophore. 1940, McGraw Hill, New York
9. Hyman. L. H: The Invertebrates Vol: IV, Echinodermata, the coelomate, Bilateria, 195 McGraw Hill, New York.
10. Kotpal, RL: Modern Text-Book of zoology, Vertebrates, Rastogi and Co., Meerut
11. Nigam H.C.: Zoology of Chordates, Vishal Publication, Jalandhar-144008.
12. Kotpal, R.L.: Phylum Protozoa to Echinodermata (series), Rastogi and Co., Meerut
13. Parker T.J and W.A Haswell: A textbook of Zoology, Vol –I (7th edition by Marshall and Williams (1972), Macmillan Press Ltd.
14. Jordan, E.L. and P.S. Verma: Invertebrate ZoologyS. Chand and Co., Ltd. Ram Nagar, New Delhi.
15. Russel Hunter : A Biology of higher invertebrates Macmillan and Co., Ltd., London

F.Y.B.Sc. Zoology (CBCS – Autonomy 23 Pattern)

Course Title	INTRODUCTION TO CELL BIOLOGY AND GENETICS
Course Code:	23SBZO122MN
Semester: II	**No. of Credits: 02**
Course Type: MN (Minor)	**Total Teaching Hours: 30**

Course Objectives	
1.	To know the basic concepts of cell biology, its branches and application in recent world.
2.	To know the cellular components, their functions, and interrelations.
3.	To know the recent techniques used in cell biology research.
4.	To link knowledge of cell biology with histopathology and cell physiology.
5.	To understand the cellular components, mechanism of cell division and cause of abnormal cell growth.
6.	To know the basic concepts of genetics, and importance of Mendelian genetics.
7.	To be able to understand sex determination mechanism in different animals.
8.	To able to apply knowledge of genetics in recent world.

Course Outcome	
1.	The learner will understand the importance of cell as a structural and functional unit of life.
2.	The learner understands the dynamism of bio membranes and its working mechanism responsible for our performance in life.
3.	The learner understands the cellular mechanisms its functioning that depends on endo-membranes and structures. They are best studied with microscopy.
4.	The learner will understand the importance of genes and its role in inheritance of characters.
5.	The learner understands the importance of Mendelian inheritance in human population.
6.	The learner understands role of the sex chromosomes and genetic disorders.
7.	The learner knows the new and emerging areas in human genetics

Syllabus		
CELL BIOLOGY		
Unit I	**Introduction:**	**02 hours**
	1. Introduction cell biology 2. Importance of Cell Biology and its applications in industry. 3. Introduction to Prokaryotic and Eukaryotic cells.	
Unit II	**Techniques in Cell Biology:**	**02 hours**
	1. Microscopy and principle of various microscopes: Phase contrast microscope**,** Confocal microscopy**,** Electron microscopy (EM)- Scanning EM and Scanning transmission EM (STEM)**,** Fluorescence microscopy. 2. Analytical tools and techniques: Flow cytometry-Fluorochromes, Separation-Sub-cellular fractionation-Differential and Density gradient centrifugation.	
Unit IV	**Nucleus: Structure and function**	**02 hours**
	1. Structure of Nucleus: Nuclear envelope**,** Nuclear pore complex**,** Nucleoplasm**,** Nucleolus 2. Chromatin: Eu-chromatin and Hetero-chromatin	
Unit V	**Endomembrane System**	**02 hours**
	1. Introduction, Structure, location and functions: Endoplasmic Reticulum**,** Golgi apparatus, Lysosomes.	
Unit VI	**Mitochondria**	**02 hours**
	1. Mitochondria: ultrastructure and function of mitochondrion.	
Unit VII	**Cell Division**	**04 hours**
	1. Cell cycle (G1, S, G2, M phases), 2. Mitosis. 3. Meiosis.	
	GENETICS	
Unit I	**Introduction to Genetics:**	**02 hours**
	1. Classical and Modern concept of Gene 2. Mendel's laws of Inheritance	
Unit II	**Exceptions to Mendelian Inheritance:**	**03 hours**
	1. Incomplete dominance and Co-dominance. 2. Multiple alleles: Concept, characteristics, and importance of multiple alleles. 3. ABO & Rh - blood group system and its medico legal importance 4. Lethal alleles	
Unit III	**Sex-determination**	**02 hours**
	1. Types of sex determination: -XX-XY, ZZ-ZW, XX-XO 2. Parthenogenesis, Hypodiploidy, Gynandromorphism	

	3. Sex determination in *Drosophila*	
Unit IV	**Sex- linked Inheritance in Human**	**02 hours**
	1. Colour – blindness, Haemophilia, Hypertrichosis	
Unit V	**Application of genetics**	**03 hours**
	1. Genetic counselling, Prenatal diagnosis, Gene therapy 2. Diagnostics & Genetic engineering in farm animals	
Unit VI	**Introduction to New and Emerging Areas in Human Genetics**	**04 hours**
	1. Proteomics, Bioinformatics, Pharmacogenomics, Stem Cell Research	

Suggested Readings:

1. Karp, G.: Cell and Molecular Biology: Concepts and Experiments. VI Edition 2010, John Wiley and Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F.: Cell and Molecular Biology. VII Edition. 2006, Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E.: The Cell: A Molecular Approach. V Edition. 2009, ASM Press and Sunderland, Washington, D.C.; Sinauer Associates
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P.: The World of the Cell. VII Edition. 2009, Pearson Benjamin Cummings Publishing, San Francisco.
5. Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson Jame: Molecular Biology of the Cell, V Edition, 2008, Garland publishing Inc., New York and London
6. US Department of Health Sciences: Inside the cell 2005, NIH Publication No. 05-1051
7. Lodish, H. Baltimore, D. Berk, A. Zipursky, S. L. Matsudaira, P and Darnell, J.: Molecular Cell Biology, Eds. 3, Scientific American & W. H. Freeman. New York.
8. Powar C B.: Cell Biology, Himalaya Publication, Meerut
9. Principles of Genetics, 1997, P. D. Snustad, M. L. Simmons J. B. Jenkins, John Wiley & Sons, USA
10. Genetics, 2014, 9th Edn., Verma P. S. and Agarwal V. K., S. Chand and Co., New Delhi.
11. Genetics, 2014, 4th Edn. Gupta P. K., Rastogi Publications, Meerut.
12. Principles of Genetics, Gardner, E. J. et al. (2006), John Wiley and Sons Inc.
13. Genetics: A Molecular Approach, 3rd Edn, Russell, P. J., Benjamin Cummings.
14. Principles of Genetics 8th Edition, Gardner, E. J., Simmons, M. J., Snustad, D. P. (2008). John Wiley and Sons Inc.
15. Concepts of Genetics, 10th Edn. Benjamin Cummings. Klug, W. S., Cummings, M. R. and Spencer, C. A. (2012).
16. An Introduction to Genetic Analysis, 11th Edn. Carroll S. B.; Doebley J., Griffiths, A. J. F. and Wessler, S. R. (2018) W. H. Freeman and Co. Ltd
17. Principle of Genetics By Sinnott, Dunn and Dobzhansky, Tata McGraw Hill Edition, New Delhi
18. Genetics By Gupta, PK., Rastogi Publication, Meerut
19. Genetics By Sarin,C., Tata McGraw Hill, New Delhi
20. Cytology and Genetics By Dyanasagar VR., Tata McGraw Hill Pub. Co.Ltd.,New Delhi

F.Y.B.Sc. Zoology (CBCS – Autonomy 23 Pattern)

Course Title	HAEMATOLOGY AND TOXICOLOGY		
Course Code	23SBZO121VC		
Semester: II			**No. of Credits: 02**
Course Type: VSC (MN)			**Total Teaching Hours: 30**

Course Objectives	
9.	To provide basic training of laboratory experiments in haematology and toxicology
10.	To acquaint students to understand principal and applications of basic instruments used in haematology and toxicological studies.
11.	To make the students understand importance of various blood tests in human.
12.	To extend to the knowledge about antigen antibody reaction and effects of toxic chemicals.

Course outcome	
1.	The learner will be able to prepare various anticoagulants.
2.	The learner will be familiarized with working of instruments used in haematology and toxicology.
3.	The learner will be able to identify various CBC parameters and pathology
4.	The learner will be able to determine LC50 after exposure of toxic chemical to test sample.
5.	The learner will be able to take down observation of morphological changes due to toxic chemicals on organism.

	Syllabus
Sr. No	**Title with Contents**
1.	Preparation of anticoagulants, EDTA, sodium citrate oxalate with fluoride.
2.	Familiarization and working of haemocytometer.
3.	Colorimeter-Principle, components, working and applications.
4.	Estimation of Haemoglobin (Hb) in blood using Sahli's instrument.
5.	Preparation of blood smear and identification of normal blood cells.
6.	Differential count (DC) of Leucocytes (WBCs) and their significance using Leishman staining technique.
7.	Total count (TC) of RBCs in Man.
8.	Determination of Bleeding time and Clotting time in human.
9.	Understanding of the various parameters of the CBC panel and understanding various pathologies related to abnormal CBC results.
10.	Study of antigen-antibody reaction using ouchterlony double immunodiffusion method
11.	Study of ABO blood group and Rh factor system in human using antigen-antibody reaction.
12.	To determine LC_{50}, 96 hours value of hypothetical toxicant by using aquatic (E) organism as test animals.
13.	Effect of EDTA on the assessment of copper toxicity.
14.	Estimation of Dissolved Oxygen (DO) in water by Winkler's method.
15.	Estimation of Dissolved Carbon dioxide in water.
16.	Study of different phases Mitosis using onion root tip cells.
17.	Effect of Cholchicine on growth of onion root cells.
18.	Observation of morphological changes in *Hydra* due to toxicity.

F.Y.B. Sc. Zoology (CBCS – Autonomy 23 Pattern)

Course Title	PET CARE MANAGEMENT		
Course Code	23SBZO121SC		
Semester: II			**No. of Credits: 02**
Course Type: SEC (MN)			**Total Teaching Hours:** 30

Course Objectives	
1.	To know the basic information about different pets
2.	To know the diet and healthcare practices of different pets
3.	To know about different diseases caused by pets to its owner
4.	To link knowledge of diseases caused by pets with prevention and control practices.
5.	To apply the knowledge gained to open pet shop.

Course outcome	
1.	The learner understands the basic information about different pets.
2.	The learner uses the gained knowledge to take care of diet and health of pets.
3.	The learner understands different diseases caused by pets to its owner
4.	The learner applies the knowledge of diseases caused by pets and guides pet owners regarding its occurrence, prevention and control
5.	The learner applies knowledge gained to open pet shop.

Syllabus		
Unit I	**Introduction to pet animals**	**02 hours**
	1. Types of pets 2. Importance of pets	
Unit II	**Care and management of dogs as pet**	**06 hours**
	1. The best kid-friendly dog breeds in India 2. How to take care of a puppy: a step-by-step guide 3. Dog grooming tips 4. Vaccination and deworming 5. Puppy food and feeding practices. 6. Selection of training toys for dogs 7. Tips on care of pets during Diwali 8. Common health problems in dogs 9. Health issues to dog owners	
Unit II	**Care and management of cats as pet**	**05 hours**
	1. Selection of cat breed 2. Handling and grooming 3. Food and feeding 4. Vaccination and deworming 5. Care and management - Bengal cat, Persian cat 6. Common diseases and infections in cats 7. Health issues to cat owners- Cat scratch disease	
Unit III	**Fish care and maintenance**	**06 hours**
	1. Common ornamental fishes 2. Benefits of keeping ornamental fishes 3. Aquarium fabrication and maintenance 4. Aqua scaping and setting of aquaria. 5. Maintenance and feeding of aquarium fishes. 6. Breeding of ornamental fishes 7. Water quality management in aquarium 8. Common disease in ornamental fishes	
Unit IV	**Pet Birds: Management and Common Diseases**	**02 hours**
	1. Popular Indian pet birds 2. Breeding, cage cleaning and diet for birds 3. Health care and management of pet birds 4. Government regulations for keeping exotic birds in India & SOP for import of exotic birds	

Unit V	**Reptilians as pet**	**03 hours**
	1. Chameleons: Caring for a Pet Chameleon 2. Indian star tortoise: Myth, care and management 3. Red-eared slider turtle- Care and management	
Unit VI	**Care and management of guinea pigs as pets**	**04 hours**
	1. Introduction, biology and husbandry of guinea pigs 2. Feeding and management 3. Infectious Diseases in guinea pig 4. Metabolic and Nutritional Disorders	
Unit VIII	**Care of Pet Rabbits at Home**	**02 hours**
	1. Some Basic Facts about rabbit 2. Diet and nutrition in pet rabbits 3. Common Rabbit myths	

Suggested Readings:

1. A hand book of pet care management Ranjan, Amit (2012), Satish Serial Publishing House.
2. The Complete Book Of Pets & Petcare: The Essential Family Reference Guide To Pet Breeds And Pet Care, David Alderton, Alderton Publications
3. Dogs their Care and Treatment 4th edition, Chakrabarti Amlendu (2014), Kalyani Publications
4. The Book of Indian Dogs, S. Theodore Baskaran (2017), Aleph Book Company
5. Handbook of Dogs and Cats for Care and Treatment, Dr Tej pratap Yadav (2023), Bluerose Publishers Pvt. Ltd.
6. Complete Cat Care: How to Keep Your Cat Healthy and Happy, DK (2014) DK; UK ed. Publications
7. Complete Cat Care Manual: The Essential, Practical Guide to All Aspects of Caring for Your Cat Andrew Edney, Bruce Fogle (2006).
8. Persian Cats as Pets: Pet Owner's Guide, Lolly Brown (2022) Nrb Publishing
9. Keeping Pet & Aviary Birds, The Complete Practical Guide to: How to keep pet birds, with expert advice on buying, housing, feeding, handling, breeding and exhibiting, David Alderton (2019), Lorenz Books
10. Preventative Health Care for Pet Birds: The Essentials for a Healthy Bird, Greg Burkett (2020) Bublish Publications
11. Complete Guide to Bird Care (Practical Handbook), David Alderton (2003), Lorenz Books
12. The Ultimate Encyclopedia of Caged Aviary Birds, David Alderton (2000) Publisher : Lorenz Books.
13. The Simple Guide to Freshwater Aquarium, David E. Boruchowitz (2001)
14. The Discus – An Owners Guide to a Happy Healthy Fish, Mic Hargrove, Maddy Hargrove, David Brown (2008) Howell Books

15. Freshwater Aquariums (Animal Planet Pet Care Library), David E. Boruchowitz (2006), Tfh Publications Inc
16. Setting Up an Aquarium – A Complete Pet owner's manual, Barron's Educational Series
17. Turtles and Tortoises – A Complete Pet Owner's Manual, R.D. Bartlett, Patricia P. Bartlett (2006), Sourcebooks
18. Turtle Care: A Comprehensive Guide and Manual on How to Take Care of Your Turtle. Nola Dick.
19. The Everything Pet Rabbit Handbook: Your Ultimate Guide to Pet Rabbit Ownership, Training, and Care Sarah Martin (2014), Amazon Digital Services.
20. Guinea Pig Care Book: A Definitive Guide, Saurav A
21. Chameleon Care: The Complete Guide to Caring for and Keeping Chameleons as Pets Tabitha Jones (2019).