Maharani Lakshmi Ammanni College for Women Autonomous
Affiliated to Bengaluru City University
Accredited by NAAC (IV Cycle) with "A" Grade,
Recognised by UGC under Section 2(f) and 12(b) of the UGC Act 1956
Conferred the Status of 'College with Potential for Excellence' by UGC

DEPARTMENT OF ZOOLOGY

B.Sc. Zoology Semester III

THEORY PAPER: ANATOMY AND HISTOLOGY

Program Name	**B.Sc.**	**Semester:**	**III**
Course Title	**Anatomy and Histology**		
Course Code:	**ZOO-S-301T**	No. of Credits:	**3**
Contact hours:	**60 Hours**	Duration of SEA/Exam:	**3 hrs.**
Formative Assessment Marks:	**20**	Summative Assessment Marks:	**80**

mLAC SYLLABUS	**60 hrs**
Unit I	**15 hrs**
Human Anatomy - 1 • Anatomy of Digestive system - Structure of alimentary canal and accessary glands (Liver and Pancreas). • Anatomy of Respiratory system – outline of conducting part and respiratory zone. • Anatomy of Circulatory system - V.S of Heart, blood vessels – arteries, veins and capillaries. • Anatomy of Excretory system - L.S of kidney, structure of nephron. • Components of Nervous system – CNS: outline of brain and spinal cord, PNS: types of neurons and glial cells (astrocytes, ependymal cells, microglia, oligodendrocytes, Schwann cells and satellite cells), structure of multipolar neuron.	
Unit II	**15 hrs**

Human Anatomy – 2 and Osteology • Anatomy of Reproductive system – structure of male and female reproductive systems. • Sense organs - Eye and Ear • Skeletal system - Types of bones, Axial and appendicular skeletal system (except bones of hand and foot). • Joints and their types – Immovable joints, slightly movable joints and freely movable (synovial joints).	
Unit III	**15 hrs**
Comparative Anatomy • Respiratory organs in Fishes (gills and swim bladders), Amphibians, Birds and Mammals (human). • Comparative anatomy of heart and aortic arches in vertebrates (fishes, Amphibians, reptiles Birds and Mammals). • Evolution of kidneys in vertebrates - Pronephros, Mesonephros and Metanephros of vertebrates. • Comparative anatomy of the brain in vertebrates (fishes, Amphibians, Birds and Mammals)	
Unit IV	**15 hrs**
Histology • Introduction to histology - Tissues and its types - Epithelial tissues; connective tissue (loose and dense); skeletal tissue and muscular tissue. • Micro-technique - Steps in histological techniques (fixation, dehydration, embedding, sectioning, mounting and staining); Common fixatives and stains; Uses of alcohol, xylene and DPX. • Histological features of mammalian organs - Tongue, Stomach, Small intestine, Thyroid, Pancreas, Liver, Spleen Kidney, Adrenal, Testis and Ovary.	

PRACTICAL PAPER: ANATOMY AND HISTOLOGY

Course Title:	**Anatomy and Histology**	Practical Credits:	**2**
Course Code:	**ZOO-S-301P**	Contact Hours:	**45 hrs**
		Hours / Week:	**03 hrs**
Formative Assessment:	**10 Marks**	Summative Assessment:	**40 Marks**

Sl. no	**Practical Contents**	**15 Units**
1	**Human Anatomy:** Virtual Display **/** Model / Photos: Structure of Lung, Heart, and Kidney	2
2	**Human Osteology:** Skull, Lower jaw, vertebral column, pectoral and pelvic girdles, limb bones (except bones of hand and foot).	3
3	**Comparative Anatomy:** Comparative anatomy of skin of Vertebrates – Fish, Frog and Rat.	1
4	Study of derivatives of integument in Vertebrates - Carapace and Plastron of Tortoise/Turtle, horn of Sheep/Goat/Cow, Contour and quill feather, hoof of Sheep/ Goat/Cow.	2
5	Comparative anatomy of heart of Vertebrates: Fish (Shark), Amphibian (Frog), Bird, (Pigeon) and Mammal (Rat).	1
6	Comparative anatomy of brain of Vertebrates: Fish (Shark), Amphibian (Frog), Bird (Pigeon) and Mammal (Rat).	1
7	**Histology:** Permanent slides of sections of mammalian organs - Tongue, Stomach, small intestine, Pancreas, Spleen, Liver, Thyroid, Kidney, Adrenal, Ovary and Testis. (Any 8)	4
8	Micro-technique: Preparation and Staining.	1

References:

1. Gerard J Tortora and Nicholas P. Anagnostakos. 13th Ed. Principles of Anatomy and Physiology.
2. Clemente C D. 1981. Anatomy- A Regional Atlas of The Human Body, Urban and Schwarzenberg Publications 2nd Edition.
3. Chaurasia B D. 1986. Human Anatomy- Regional and Applied Upper Limb and Thorax, Cbs Publishers and Distributors.
4. Preves M, Lysenkov N, Bushkovich V. 1985.Human Anatomy, Mir Publications.
5. Vimala C.M, 2006. Introductory Zoology Vol. IV, Interline Publishing, Bangalore.
6. Grove & Newell, 1990. Animal Biology, Universal Book Stall, New Delhi, 9th Ed.
7. Hilderbrand. 1988 Analysis of Vertebrate Structure John Wiley and Sons, New York, 3rd Ed.
8. Kotpal R.L.1991.Vertebrates, Rastogi Publications, Meerut
9. Kotpal R.L.1993. Zoology Phylum Series, Rastogi Publications, Meerut
10. Kulshrestha S.K.1999.Comparative Anatomy of Vertebrates, Anmol Publications.
11. Vimala C.M, 2006. Introductory Zoology Vol. IV, Interline Publishing, Bangalore.
12. Frederick R. Bailey. Bailey's Textbook of Histology
13. Vimala C.M. 2006. Introductory Zoology Vol. V, Interline Publishing, Bangalore.
14. Brijesh kumar. 2013. Histology: Text & Atlas.

III Semester B.Sc., Zoology Elective - 1 Syllabus

THEORYPAPER: BIOLOGY OF PARASITES AND DISEASES

ProgramName:	**B.Sc.**	**Semester**	**III**
Course Title:	**Biology of Parasites and Diseases**		
Course Code:	**ZOO-S-301E**	No. ofCredits	**2**
Contact hours:	**30 Hours**	Durationof SEA/Exam	**1.5 hrs**
		Hours / Week	**2**
FormativeAssessment Marks:	**10**	SummativeAssessmentMarks	**40**

Syllabus	**Hrs.**
Unit - I	**15**
Parasites • Definition and scope of parasitology • Types of parasites and parasitoids • Types of hosts: definitive, intermediate, reservoir, paratenic, accidental • Host-parasite relationships • Zoonoses and emerging parasitic infections • Occurrence, disease caused, Symptoms, mode of transmission and control measures of the following parasites: *Mycobacterium tuberculosis,* Human papilloma virus (HPV), SARS Covid-2**.** **Protozoa parasite** • Study of morphology, occurrence, disease caused, Symptoms, mode of transmission and control measures of *Leishmania donovani* and *Plasmodium vivax*. **Helminthes parasite** • Study of morphology, occurrence, disease caused, Symptoms, mode of transmission and control measures of *Taenia solium* and *Fasciolopsis buski*	
Unit – II	**15**
Parasitic Nematodes, Arthropods- parasites and Vectors • Study of morphology, occurrence, disease caused, mode of transmission and control measures of *Ascaris lumbricoides* and *Wuchereria bancrofti*. • **Parasitic Arthropods:** Biology, Importance and Control measures of Lice (*Pediculus*), Bug (*Cimex*), Parasitoid (Wasps). • **Parasitic vertebrates:** Cookiecutter shark, Hood mocking bird and Vampire bat.	

Laboratory Diagnosis of Parasitic Diseases	
• Diagnostic methods of parasitology: Introduction, Examination of the human samples for parasitic isolation and identification: Blood, Stool and Sputum. • Laboratory diagnosis: microscopy, serology, molecular tools • Antiparasitic drugs and mechanisms (e.g., metronidazole, albendazole, artemisinin) • Drug resistance in parasites • Sanitation, vector control, and public health strategies • Role of WHO and global parasitic disease control program • Diagnostic techniques for HPV (Pap Smear and RT – PCR) and SARS Covid (viral nucleic acid detection by RT-PCR).	

References:

1. Essentials of Medical Parasitology: Apurba Sankar Sastry and Sandhya Bhat K, Jaypee Brothers Medical Publishers, 2014.
2. Paniker's Textbook of Medical Parasitology: CK Jayaram Paniker and Sougata Ghosh, 8th Edition, Jaypee Brothers Medical Publishers, 2018
3. Introduction to Animal Parasitology (2nd Edition.): Smith D G. John Willey Sons, NY. 1997
4. Parasitology: Sood R. C.B.S. publishers, New Delhi, 1995.
5. Foundations of Parasitology (2nd Edition): Roberts L S and Janovy J (Jr) McGraw Hill Publ. 2000.

IV SEMESTER B.SC., ZOOLOGY THEORY SYLLABUS

THEORY PAPER: CELL BIOLOGY, IMMUNOLOGY AND GENETICS

Program Name:	**B.Sc., Zoology**	**Semester:**	**IV**
Course Title:	**Cell Biology, Immunology and Genetics**		
Course Code:	**ZOO-S-401T**	No. of Credits:	**3**
Contact hours:	**60 Hours**	Duration of SEA/Exam:	**3 hrs.**
		Hours / Week:	**4 hrs.**
Formative Assessment Marks:	**20**	Summative Assessment Marks:	**80**

New Syllabus	**Hrs.**
	15
Cell Biology – 1 • Ultrastructure of Animal Cell. • Plasma membrane: Structure, Chemical composition and Fluid mosaic model. • Transport across cell membrane: Passive transport (simple and facilitated diffusion; osmosis) and active transport (Na^+- K^+ pump), bulk transport (exocytosis and endocytosis). • Components of Cytoplasm, Ultra structure and functions of- Mitochondrion Golgi apparatus, Endoplasmic reticulum, Ribosomes and Lysosomes. • Ultrastructure and functions of Nucleus. • Structural organization of eukaryotic chromosome. • Chromatin Organization - Nucleosome model.	
Unit – II	**15**

Cell Biology – 2 • Base composition of DNA and RNA. • Structure of DNA (Watson and Crick model) • Types and functions of DNA and RNA • Cell cycle and its regulation • Cell division: Meiosis and its significance, synaptonemal complex. • Apoptosis: Definition, and significance. • Cancer Biology: Definition, types with examples, Benign and Malignant, General properties of cancer cells, Carcinogens – Types (Environmental, chemical and viral). Cancer Diagnosis (Biopsy, imaging) and treatment (radiotherapy and chemotherapy in brief).	
Unit - III	**15**
Immunology • Definition, types of immunity (innate and acquired), First, Second and third line (Role of B and T lymphocytes) of immunity. • Antigen Processing and Presentation. • Primary and Secondary Immune response. • Functional aspects of organs of the Immune system - Spleen, Lymph node, Small intestine (Peyer's patches) and Liver (Von Kupffer cells). • Immunoglobulins: Structure of IgG antibody, Types and functions of immunoglobulins. • Major histocompatibility complex - Structure of MHC I and II. • Vaccines: Types and Uses - Immunization schedule for children • Transplantation immunology: Transplantation of organ- Types, graft rejection and Immuno-suppressors	
Unit - IV	**15**
Genetics – 1 • Genes and Environment: phenocopy, Norm of reactions (Fur colour in Himalayan Rabbit, human twins). • Mendelian Genetics: Terminologies, Mendelian Laws of inheritance - monohybrid and dihybrid, test cross, back cross. • Incomplete Dominance. **Genetics – 2** • Sex Determination: a. Chromosomal basis of sex determination: Types with examples	

b. Environmental sex determination c. Free martins • Patterns of inheritance: Autosomal Dominant (Eg. polydactyly), Autosomal recessive (Eg. Albinism), X-linked Dominant (Eg. Hypophosphatemia) and X-linked recessive (Eg. Duchene muscular dystrophy). • Chromosomal aberrations: Aneuploidy - Autosomal (Down's syndrome and Cri-du-Chat syndrome) and Allosomal (Turner's syndrome and Klinefelter's syndrome). • X – linked inheritance: Eye colour in Drosophila, Colour blindness and Haemophilia in Man. Y – linked inheritance: Hypertrichosis in man. • Eugenics: Definition, positive and negative eugenics. Euthenics and Euphenics.	

IV Semester B.Sc., Zoology Practical Syllabus

Zoo-S-401p: Cell Biology, Immunology and Genetics

Program Name:	**B.Sc.**	**Semester:**	**IV**
Course Title:	**Cell Biology, Immunology and Genetics**		
Course Code:	**ZOO-S-401P**	No. of Credits:	**2**
Contact hours:	**45 Hours**	Duration of SEA/Exam:	**3 hrs.**
		Hours / Week:	**3 hrs.**
Formative Assessment Marks:	**10**	Summative Assessment Marks:	**40**

Course Outcomes: After the successful completion of the course, the student will be able to:

CO1- To recall the basic concepts of staining technique, mitotic and meiotic division.

CO2- Understand and apply the knowledge of cells permeability and human karyotyping

CO3-Evaluate the study of inheritance pattern by genetic problem solving and pedigree construction.

Sl. No.	Practical Contents	15 Units
1.	Isolation and observation of buccal epithelial cells or Liver Parenchyma cells.	1
2.	Mitochondrial staining in Yeast cells using Janus Green stain.	1
3.	Squash preparation to study the different stages of Mitosis in root tip of *Allium cepa*.	2
4.	Squash preparation to study the different stages of Meiosis in grasshopper testis or flower buds of *Allium cepa* (virtual/ slides).	2
5.	To check the permeability of RBC's using different concentrations of NaCl solution.	1
6.	Blood typing in humans.	1

7.	Study of human Karyotype: Normal and Abnormal – Down's syndrome, Klinefelter's syndrome, Turner's syndrome, cri-du-chat syndrome.	2
8.	Pedigree symbols, pedigree construction and analysis - polydactyly, albinism, blindness and haemophilia in Man.	2
9.	Genetic problems: Monohybrid cross, Dihybrid cross, multiple alleles, gene interaction.	3

References:

1. Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. &
2. Martin, K., (2016). Molecular Cell Biology, 8th ed., W.H. Freeman & Co., New York.
3. Alberts et al: Molecular Biology of the Cell: Garland (2002).
4. Cooper: Cell: A Molecular Approach: ASM Press (2000).
5. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
6. Verma, P.S. and V.K. Agarwal: Genetics, 8th edition, S. Chand & Co, New Delhi (2013)
7. Vimala C.M: Introductory Zoology Vol. V, Interline Publishing, Bangalore. (2006)
8. Dubey: Text book of Biotechnology S. Chand & Co. New Delhi. (2006)
9. Brooker, R.J., (2017). Genetic analysis and principle, 6th ed., Mc Graw Hill.
10. Cooper & Sinauer G.M., (2019). The Cell: A Molecular Approach, International 8th ed.,
11. Karp, G., Iwasa, J. & Marshall W., (2016). Cell and Molecular Biology: Concepts and
12. Powar C.B (2019). Cell Biology 3rd edition. Himalaya Publishing House, Mumbai.
13. Gupta, P.K. (2019) Genetics, 5th Ed., Rastogi Publication, Meerut, India
14. Tamarin, R. (2017). Principles of Genetics, 7th ed., Mc-Graw – Hill Publication.
15. Janis Kuby (2018). Immunology 6th Edition
16. Nandini Shetty (1993) Immunology: Introductory Textbook.
17. Latha, Madhavee P. (2012), A Textbook of Immunology, S. Chand Publishing.

IV Semester B.Sc., Zoology Elective - 2 Syllabus

THEORY PAPER: FOOD, NUTRITION AND HEALTH

Program Name:	**B.Sc.**	**Semester:**	**IV**
Course Title:	**Food, Nutrition and Health**		
Course Code:	**DSEZOO-2**	No. of Credits:	**2**
Contact hours:	**30 Hours**	Duration of SEA/Exam:	**1.5 hrs**
		Hours / Week:	**2 hrs**
Formative Assessment Marks:	**10**	Summative Assessment Marks:	**40**

Syllabus Content	Hrs
Unit – I	15
Nutrition and dietary nutrients • Basic concept of Food: Components of nutrients. Concept of balanced diet. • Macronutrients: Carbohydrates, Lipids, Proteins- Definition, Classification, their dietary source and role. • Micronutrients: Vitamins- Fat-soluble (A, D, E, &K) and water-soluble vitamins (B Complex-B1, B2 and B12, C)- their sources and importance. • Important minerals, sources and their biological functions- Iron, Calcium, • Nutrient requirements and dietary pattern for different groups viz., infants children, adolescent, adults, pregnant, nursing mothers, and elderly people	
Unit – II	15
Malnutrition and Deficiency diseases • Definition and concept of health: Common nutritional deficiency diseases- Protein Malnutrition (e.g., Kwashiorkor and Marasmus). • Disorders due to deficiency of Vit A, (X, Night blindness). Vit B complex (Beri Beri), Vit D (Rickets) • Iron and Iodine– (Anemia, Hypothyroidism, Goiter) their symptoms, treatment, preventions and government initiatives. • Lifestyle disorders: Introduction, types - hypertension, Type II -Diabetes mellitus, sleep disorder, obesity, cancer -causes and prevention • Social health problems- Smoking, Alcoholism, Drug abuse, AIDS; Treatment and Rehabilitation.	

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment

References:

1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; New Age International Publishers
2. Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
3. Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd.
4. Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5. Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.
6. Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill.
7. Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; First Ed; Academic Excellence.
8. Manay, M.S. and Shadaksharaswamy, M. (1998). Food-Facts and Principles; New AgeInternational (P) Ltd.
9. Gibney, M.J. et al. (2004). Public Health Nutrition; Blackwell Publishing.