VIJAYANAGARA SRI KRSIHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

BACHELOR OF SCIENCE IN ZOOLOGY

SYLLABUS FOR III and IV SEMESTER

2024-2025 Onwards

B.Sc. Zoology
III SEMESTER

Course Title: Biochemistry, Physiology and Comparative anatomy	Course Code: 24MJZOOL3L
Total Contact Hours: 56	No. of Credits: 4
L:T:P	4:0:0
Internal Assessment Marks: 20	Duration of SEE: 3 Hours
Semester End Exam Marks:	80

Course Outcomes (CO's):

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

1. Basic structure of biomolecules through model making.
2. Develop the skills to identify different types of blood cells.
3. Enhance basic laboratory skill like keen observation, analysis and discussion.
4. Learn the functional attributes of biomolecules in animal body.
5. Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

Unit	Description	Hrs
	BIOCHEMISTRY	
1	**Structure and Function of Biomolecules:** Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). Lipids (saturated and unsaturated Fatty acids, Tri-acylglycerols, Phospho lipids, Glycolipids and Steroids) Structure, Classification and General Properties of amino acids; Essential and non-essential amino acids. **Metabolism of Carbohydrates and Lipids** Metabolism of Carbohydrates: glycolysis, citricacid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids Biosynthesis of palmitic acid; Ketogenesis, **Metabolism of Proteins and Nucleotides** Catabolism of amino acids: Trans-amination, De-amination, Urea cycle, Nucleotides and vitamins.	14
	PHYSIOLOGY	
2	**Digestion and Respiration in humans** Structural organization and functions of gastrointestinal tract and associated glands. Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it;	14

	Control of respiration. **Circulation and Excretion in humans** Structure of mammalian heart. Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation Structure of kidney and its functional unit; Mechanism of urine formation	
3	**Nervous System and Endocrinology in humans** Structure of neuron, resting membrane potential(RMP), Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse. Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them. **Reproduction** Physiologic Anatomy of the Male and Female Sexual Organs, Spermatogenesis and Oogenesis, Testosterone and Other Male Sex Hormones, Functions of the Ovarian Hormones-Estradiol and Progesterone, Abnormalities of Male Sexual Function, Pineal Gland—Its Function in Controlling Seasonal Fertility in Some Animals. Placental hormones and functions	14
COMPARATIVE ANATOMY OF VERTEBRATES:		
4	**Integumentary System:** Structure of skin and its derivatives. Skeletal System. Comparative account of Axial Skeletal system in vertebrates; Skull- Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). Comparative account of Appendicular skeletal system invertebrates- Pectoral and Pelvic girdles of Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Respiratory system** Comparative account of respiratory system in vertebrates: Pisces (Scolidon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Circulatory System** Comparative account of heart and aortic arches in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Excretory System** Succession of kidney in vertebrates. **Nervous system** Comparative account of brain in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man).	14

References:

1. Nelson & Cox: Leininger‘s Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols l & 2: Wiley (2004)
4. Murray et al: Harper‘s Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume l & 2, 11th edition, CBS Publishers (20 I 6).

Question Paper Pattern for UG Semester Major

Paper Code:	**Paper Title:**		
Duration of Exam	**3Hours**	Max Marks	**80**
Instruction:	**Answer all the sections**		

Section-A

I. Answer any TEN of the following questions 10x2	**20 Marks**
. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	

Section-B

Answer any **FIVE** of the following questions (5X4=20)	**20 Marks**
13. 14. 15. 16. 17. 18.	

Section-C

III. Answer any Four of the following questions (4X10=40)	**40 Marks**
19. **20.** **21.** **22.** **23.**	

Department Name: Zoology Practicals

Semester - III

Course Title: Biochemistry, Physiology and Comparative anatomy	**Course Code:** 24MJZOOL3P
Total Contact Hours: 56	**No. of Credits:** 2
L:T:P-	**0:0:2**
Internal Assessment Marks: 10	**Duration of SEE:** 3 Hours
Semester End Exam Marks:	**40**

Course Outcomes (CO's):

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

1. Understand the Basic structure of biomolecules through model making.
2. Develop the skills to identify different types of blood cells.
3. Enhance basic laboratory skill like keen observation, analysis and discussion.
4. Learn the functional attributes of biomolecules in animal body.
5. Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

List of Experiments

1. Qualitative analysis of Carbohydrates, Proteins and Lipids.
2. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid.
3. Separation of amino acids or proteins by paper chromatography.
4. Action of salivary amylase under optimum conditions.
5. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer.
6. Counting of RBC in blood using Hemocytometer.
7. Counting of WBC in blood using Hemocytometer
8. Differential staining of human blood corpuscles using Leishman stain.
9. Recording of blood glucose level by usingglucometer.
10. Study of pulse rate and blood pressure in normal and exercised conditions in human being.
11. Study of the T.S. of mammalian testis and accessory reproductive organs.
12. Study of mammalian ovary and accessory reproductive organs.
13. Preparation of models of nitrogenous bases- nucleosides and nucleotides.
14. Preparation of models of amino acids and dipeptides.
15. Preparation of models of DNA and RNA.
16. Skeletal System in man: Skull, vertebrae, girdles and limb bones (Except hands and feet)
17. Comparative account of skin in shark, frog, calotis, pigeon and Man.
18. Comparative account of heart in shark, frog, calotis, pigeon and Man.
19. Comparative account of brain in frog, calotis, pigeon and Man.

Virtual Labs (Suggestive sites)

1. https://www.vlab.co.in
2. https://zoologysan.blogspot.com
3. www.vlab.iitb.ac.in/vlab
4. www.onlinelabs.inwww.powershow.com
5. https://vlab.amrita.edu
6. https://sites.dartmouth.edu

References:

1. Nelson & Cox: Leininger‘s Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols l & 2: Wiley (2004)
4. Murray et al: Harper‘s Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press.
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G. J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume l & 2, 11th edition, CBS Publishers (20 I 6).

BIOCHEMISTRY, PHYSIOLOGY AND COMPARATIVE ANATOMY LAB

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Test/Presentation/Project/Seminars	5
Laboratory Performance/Participation	5
Total	**10 Marks**

B.Sc. III Semester Practical Examination

Time: 3 hours **Max. Marks: 40**

1. Major Experimentation 12 marks
2. Minor experiment 08 marks
3. Spotting/Identification 10 marks
4. Record Book 5 marks
5. Viva 5 marks

B.Sc. III Semester- Skill Compulsory paper

Course Title: Poultry	Course Code: 24MJZOOL3S
Total Contact Hours: 28	No. of Credits: 2
L:T:P	1:0:2
Internal Assessment Marks: 10	Duration of SEE: 1.5 Hours
Semester End Exam Marks:	40

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

1 The importance and contribution of poultry in meat sector in India as well as whole world.

2 Recognized different characteristics of Indian and foreign breeds of chicken.

3 Learn different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.

4 Learn about various environmental conditions and different equipment used to maintain those conditions.

5 understand different housing system their advantages and disadvantages.

6 Know about various disease and vaccination which are used for poultry at different stage of their life.

SI No.	Description	Hours
	Unit-1 Aim, Scope and importance of poultry farming, development and management in India. Present status and future prospectus of poultry Industry Classification of poultry based on genetics Utility Poultry breeds in India; rearing of house equipments; Modern breeds of Chicken Present day egg production lines- meat production lines Mini breeds- dwarfism in mini-Leghorns	**14**
	Unit-II Indigenous breeds and economical aspects of desi chicken Indigenous breeds-Aseel-Chittagong-Kadaknath-Bursa Improved varieties in Gramapriya, Swarnandhra Poultry feed & its composition; broiler& layers; rearing; nutritive value of egg and meat; a note on diseases-viral, bacteria, protozoan, helminthes, genetic, ecto-parasites, nutritional deficiency diseases of poultry birds, symptoms, remedies and their control.	**14**

REFERENCES

1.Harbnas Singh and Earl.N. Moore, Livestock and poultry production, Prentice Hall of India, New Delhi.

Question Paper Pattern for UG Semester Skill compulsory paper

Paper Code:	**Paper Title:**	Poultry	
Duration of Exam	**1.5 Hours**	Max Marks	**40**
Instruction:	**Answer all the sections**		

Section-A

I. Answer any Five of the following questions 5x2	**10 Marks**
1. 2. 3. 4. 5. 6.	

Section-B

Answer any **Two** of the following questions (2X5=10)	**10 Marks**
7. 8. 9.	

Section-C

III. Answer any **Two** of the following questions **(2X10=20)**	**20 Marks**
10. **11.** **12.** **13.**	

B.Sc. Zoology
IV SEMSTER

Course Title: Evolutionary biology and Developmental biology	Course Code: 24MJZOOL4L
Total Contact Hours: 56	No. of Credits: 4
L:T:P	4:0:0
Internal Assessment Marks: 20	Duration of SEE: 3 Hours
Semester End Exam Marks:	80

Course Outcomes(COs):

After the successful completion of the course, the students will be able to:

- Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.
- Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.
- Understand how the single cell formed at fertilization forms an embryo and then a full adult organism.
- Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.
- Understand a variety of interacting processes, which generate an organism's heterogeneous shapes, size, and structural features.
- Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.

Contents	56 hrs
Unit-I	**14**
Theories of Organic Evolution: Lamarkism and neo lamarkism, Darwin Wallace theory of natural selection, synthetic theory of evolution. Darwinism (Natural, Sexual and Artificial selection), Modern synthetic theory of evolution, Adaptive radiations: Patterns of evolution (Divergence, Convergence, Parallel, Co-evolution). **Population Genetics:** Microevolution and Macroevolution: allele frequencies, genotype frequencies, Hardy- Weinberg equilibrium and conditions for its maintenance, Forces of evolution: mutation, selection, genetic drift.	
Unit-II	**14**

Species Concept and Extinction: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric), Mass extinction (Causes, Names of five major extinctions. **Direct Evidences of Evolution:**Relationship among organisms, Morphological and Anatomical evidences, Embryological evidences, Paleontological evidences, Bio-geographical evidences, Biochemical/Physiological evidences, Cytological evidences, Taxonomical evidences and Current evidences. Types of fossils, Incompleteness of fossil record, Dating of fossils, Orgin and evolution of human and horse. **Geological Time Scale**/ Stratographical Scale.	
Unit-III	
Developmental Biology: Scope and theories of developmental biology, Gametogenesis, Fertilization: external (amphibians), internal (mammals), Mechanism of fertilization significance of fertilization. monospermy and polyspermy; parthenogenesis, Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo. Environmental regulation of development	**14**
Unit-IV	
Late Embryonic Development: Structure of mature spermatozoon, Graafian follicle, Estrous cycle and Human menstrual cycle. Ovulation, fertilization, morula, blastocyst, implantation and placentation. Developmental control genes (Homeobox genes) **Placenta:** Histological and morphological classification of mammalian placenta with examples. **Foetal membranes:** Development, structure and functions of amnion, chorion, yolk sac and allantoises. Processes of Development of eye, kidney, limb in amphibian. **Modern trends in human reproduction** : Invitro fertilization ,cloning, sperm and egg banks, sexually transmitted diseases (AIDS, syphilis and gonorrhea). Late Developmental Aging: the biology of senescence.	**14**

Department Name: Zoology

Semester – IV (Practical)

Course Title: Evolutionary biology and Developmental biology	**Course Code:** 24MJZOOL4P
Total Contact Hours: 56	**No. of Credits:** 2
L:T:P-	**0:0:2**
Internal Assessment Marks: 10	**Duration of SEE:** 3 Hours
Semester End Exam Marks:	**40**

Practical Content
1. Study of fossils from models/pictures.
2. Study of homology and analogy from suitable specimens
3. Study and verification of Hardy-Weinberg Law by chi square analysis.
4. Graphical representation and interpretation of data of height/ weight of a sample of 100 humans in relation to their age and sex.
5. Types of eggs based on quantity and distribution of yolk: Sea urchin, insect, frog, Chick.
6. Study of adaptive radiations in feet of birds and mouth parts of insects.
7. Study of aquatic, arboreal and volant adaptations with suitable examples: Shark and Turtle; Chameleon and Loris; Exocoetus, Bat, Pigeon and Draco
3. Vestigial organs: Vermiform appendix, Wisdom teeth, Coccyx (tail bone), Tonsils, Body hairs, Nipples on males, Nictitating membranes of eye (Any three)
4. Study of stages of development of Frog: Cleavgestages, Blastula, Gastrula, Neurula stages (whole mount) and various stages of tadpole
5. Study of permanent slides of Chick embryo -18 hrs, 24 hrs,36 hrs,48 hrs (whole mount and T.s of 18hrs and 24 hrs chick embryo)
6. Evolution of Man and Horse (Charts and models)
7. Study of Mesozoic Reptiles (Charts or models); Study of adaptive radiations in feet of birds and mouth parts of insects
8. Any other practical's related to this paper may be added based on the feasibility

Question Paper Pattern for UG Semester Major

Paper Code:	**Paper Title:**		
Duration of Exam	**3Hours**	Max Marks	**80**
Instruction:	**Answer all the sections**		

Section-A

I. Answer any TEN of the following questions 10x2	**20 Marks**
. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	

Section-B

Answer any **FIVE** of the following questions (5X4=20)	**20 Marks**
13. 14. 15. 16. 17. 18.	

Section-C

III. Answer any Four of the following questions (4X10=40)	**40 Marks**
19. **20.** **21.** **22.** **23.**	

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Test/Presentation/Project/Seminars	5
Laboratory Performance/Participation	5
Total	**10 Marks**

B.Sc. IV Semester Practical Examination

Time: 3 hours **Max. Marks: 40**

1. Major Experimentation 12 marks
2. Minor experiment 08 marks
3. Spotting/Identification (5 Specimens x 2 Marks) 10 marks
4. Record Book 5 marks
5. Viva 5 marks

Course Title: Fisheries	Course Code: 24MJZOOL4S
Total Contact Hours: 28	No. of Credits: 2
L:T:P	1:0:2
Internal Assessment Marks: 10	Duration of SEE: 1.5 Hours
Semester End Exam Marks:	40

Course Outcomes: After completion of the course students will be able to

1. Know the handling of fresh fish and principles of fish preservation and processing
2. Perform various preservation techniques of fish and shellfish
3. Demonstrate skills for the preparation of various fish by-products.
4. Learn to conduct professional activities in an ethical manner.

SI No.	Description	Hours
	Unit1. Principle; Scope; techniques and importance of culturing, economically important aquatic organism; brief account of culturing of Indian major exotics carps &induced breeding of major carps and seed fish.(brief note) composite fish culture (polyculture) Major species cultured, production trends and prospect in different parts of the world. Freshwater aquaculture resources-ponds, tanks, lakes, reservoirs etc. **Unit 2** Food and feeding of larval stages of important shellfishes. Health management in hatcheries. Food and feeding of larval stages of important shellfishes. Health management in hatcheries. Fresh water, marine and brackish water culture Fish diseases: Bacterial, viral, fungal, parasitic diseases Indian status on fisheries.	28

Question Paper Pattern for UG Semester Skill compulsory paper

Paper Code:	**Paper Title:**	Fisheries	
Duration of Exam	**1.5 Hours**	Max Marks	**40**
Instruction:	**Answer all the sections**		

Section-A

I. Answer any Five of the following questions 5x2	**10 Marks**
1. 2. 3. 4. 5. 6.	

Section-B

Answer any **Two** of the following questions (2X5=10)	**10 Marks**
7. 8. 9.	

Section-C

III. Answer any **Two** of the following questions **(2X10=20)**	**20 Marks**
10. **11.** **12.** **13.**	