Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Empowered Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

SYLLABUS FOR M.Sc-II.

SEMESTER : III & IV

PROGRAM : M.SC. ZOOLOGY

PROGRAM CODE : RJSPGZOO

NATIONAL EDUCATION POLICY (NEP 2020)

LEVEL 6.0

(CBCS 2024-2025)

SEMESTER- III

OPEN ELECTIVE -I
ANIMAL PHYSIOLOGY

SEMESTER III		
OPEN ELECTIVE COURSE: Animal Physiology(Theory)	**L**	**Cr 02**
PAPER CODE: RJSPGZOOE301	**60 Hrs**	
Unit I: Physiology of Respiration		
1.1 Respiratory mechanisms in invertebrates: Respiration across the cell membrane, gills of crustacean, tracheal system. 1.2 Respiratory pigments a) Chlorocruorin b) Haemerythrin c) Haemocyanin 1.3 Regulation of lung breathing in vertebrates. 1.4 Transport of gases in the blood: Diffusion of gases in the lungs, Haldane effect-Partial pressure of gases. 1.5 Dissociation of Oxyhaemoglobin and factors affecting it- temperature, electrolytes, CO_2 and carboxyhemoglobin), Oxygen equilibrium curve and its significance.		
Unit II: Physiology of Excretion		
2.1Intracellular and extracellular fluids: Composition and Intracellular regulation. 2.2 Integrated functioning for nitrogen excretion and osmoregulation- contractile vacuole, flame cells, green gland, Malpighian tubules, coelomoducts, nephridia in invertebrates. 2.3 Comparative physiology of vertebrate kidney (pisces, amphibians, reptiles, birds and mammals) 2.4 Ammonotely, Ureotely, Purinotely, uricotely, Storage excretion. 2.5 Ammonia Toxicity in fish. 2.6 Kidney stones and kidney transplants in humans. 2.7 Haemodialysis and peritoneal dialysis- a human perspective		
UNIT III: Sensory and Effector Physiology		
3.1 Sensory Physiology:General properties of sensory reception and Classification of sensory receptors. 3.2 Types of Reception: Chemoreception, Mechanoreception, Electroreception, Thermoreception, Photoreception 3.3 Physiological Effectors: Cnidoblasts, Bioluminescent systems, Chromatophores, Electric organs.		

UNIT IV: Neuro-endocrine and Reproductive Physiology		
4.1 Vertebrate stress response: Activation of sympathetic nervous system, Stimulation of adrenal medulla by sympathetic nervous system and of adrenal cortex by hypothalamo-pituitary axis. 4.2 Reproductive hormones of vertebrates: Comparative account of vertebrate gonadotropins, estrogens, progesterone and androgens 4.3 Physiology of human contraception 4.4 Deleterious effects of chronic stress in mammals.		

References:

1. R. Eckert & D. Randall (1982): Animal Physiology: 2nd Ed., W. H. Freeman & Co.
2. W. A. Hoar (1982): General & Comparative Animal Physiology, 3rd Ed. Prentice Hall Inc.
3. C. L. Prosser (1973): Comparative Animal Physiology, W. B. Saunders.
4. C. Ladd Prosser Ed. (1991): Neural & Integrative Animal Physiology Comparative Animal Physiology", 4th Ed. Wileg – Liss Publ.
5. C. Ladd Prosser Ed. (1991):Environmental & Metabolic Animal Physiology in Comparative Animal Physiology 4th Ed. Wileg – Liss Publ.
6. Withers, P.C. (1983): Comparative Animal Physiology International Ed.Saunders College Publishing.
7. K. Schmidt – Nielson (1983): Animal Physiology: Adaptation & Environmental, 3rd Ed.Cambridge Univ. Press.
8. R. W. Hill (1978): Comparative Physiology of Animals :An Environmental Approach, Harper & Row Publ.
9. P. W. Hochachka & G. M. Somero (1973): Strategies of Biochemical Adaptation
10. P. W. Hochachka & G. M. Somero (2002): Biochemical adaptation: mechanism and process in physiological evolution, Oxford University Press
11. J. G. Philips (1975):Environmental Physiology, Blackwell Scientific Publ.
12. J. R. Bernstein (1972): Biochemical Responses to Environmental Stress, Academic Press
13. Introduction from Rac Silver & Karvey Feder: Hormones & Reproduction Behaviour Scientific Americal (Readings from) W. H. Freeman & Co.
14. Marie A. Moisio & Elmer W. Moisio: Understanding Laboratory & Diagnostic Tests (1998) Delmar Publishers
15. Sujit K. Chaudhuri: Concise Medical Physiology, 2nd Ed. (1993) New Central Book, Agency (P) Ltd., Calcutta
16. Thomas G. M. Schalkhammer (Ed.) Indian Reprint 2004: Analytical Biotechnology – Methods & Tools in Biosciences and Medicine Rajkamal Electric Press, Delhi
17. Praful B. Godkar (1994) Textbook of Medical Laboratory Technology Bhalani Publishing House, Bombay
18. Biswajit Mohanty & Sharbari Basu (2006): Fundamentals of Practical Clinical Biochemistry B. I. Publications (Pvt.) Ltd., New Delhi
19. Guyton and Hall (2015): Textbook of Medical Physiology 13th Ed
20. Richard W. Hill, Gordon A. Wyse, Margaret Anderson (2016) Animal Physiology Sinauer Associates, Oxford University Press.
21. Christopher D. Moyes, Patricia Schulte (2014) Principles of Animal Physiology, Pearson
22. Edmunds, Leland N (1988) Cellular and molecular bases of biological clocks. 1988 by Springer-Verlag New York Inc.

SEMESTER-III (PRACTICALS)

Paper Code: RJSPGZOOEP301

1. Determination of Urea, Creatinine in blood/ urine.
2. Determination of serum content of uric acid.
3. Influence of sub-lethal (5 ppm) ammonia (as ammonium hydroxide/ ammonium chloride) on a suitable fish exposed to ammonia stress for 3/7/15 days with reference to the following parameters:
   a. Level of excretory ammonia.
   b. Level of activity of hepatic and brain glutamate dehydrogenase.
4. Influence of sub-lethal (5 ppm) ammonia (as ammonium hydroxide/ ammonium chloride) on a suitable fish exposed to ammonia stress for:
   a. Level of amino acid content of muscle, gill, brain and liver.
   b. Level of transaminases in liver.
5. Identification of sensory organs.

SEMESTER- IV

OPEN ELECTIVE -I
ANIMAL PHYSIOLOGY

SEMESTER IV		
OPEN ELECTIVE COURSE: Animal Physiology(Theory)	**L**	**Credits**
PAPER CODE: RJSPGZOOE401	**60 hrs**	**02**
Unit I: Physiology of Biological Rhythms		
1.1 **Biological clocks**- Circadian, circa tidal, circannual, ultradian 1.2 **Circadian Rhythms**- general properties, entrainment of circadian clocks, molecular organization of circadian clocks- clock genes, examples: drosophila, unicellular algae and mammals, circadian rhythms and human pathologies. 1.3 **Photoperiodism**- in animal kingdom, influence of photoperiodism on behaviour, hormones and immunity 1.4 **Diapause in Insects**- induction, factors affecting and termination of diapause **Case study:** Human chronotypes, Diapause in pest control		
Unit II: Physiology of Aging		
2.1 **Aging at cellular level**-finite lifetime of cultured cells, senescence of cultured and normal cells, mechanisms of cell aging: special reference to telomere. 2.2 **Aging at the molecular level**- Quantitative changes in the nucleic acids, changes in information content, changes in protein regulatory mechanisms, changes in enzyme and hormonal activity, accumulation of modified proteins. 2.3 **Genes for aging**- gerontogenes. **Case study :** Progeria and Werner's syndrome		
UNIT III: Sports Physiology		
4.1 **Muscles in Exercise**-strength, power, and endurance of muscles, metabolism 4.2 **Effect of Athletic Training on Muscles and Muscle Performance**- Importance of maximum resistance training, muscle hypertrophy, fast-twitch and slow-twitch muscle fibers 4.3 **Respiratory and Cardiovascular system in Exercise-** changes in pulmonary ventilation, oxygen diffusing capacity of the athletes, changes in cardiac output, stroke volume and heart rate 4.4 **Drugs Abuse** - Physiology of misused and other performance enhancing drugs, non-nutritional ergogenic aids banned by WADA and IOC **Case study: Drug abuse cases in the field of Sports in India**		

UNIT IV: Biopharmaceutics		
4.1 Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug through non oral routes. **4.2 Distribution** Tissue permeability of drugs, binding of drugs, plasma and tissue protein binding of drugs, factors affecting protein-drug binding, Clinical significance of protein binding of drugs **4.3 Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs. **4.4 Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bio- availability, measurement of bioavailability, Case study: ADME of Alcohol, Paracetamol		

References:

1. R. Eckert & D. Randall (1982): Animal Physiology: 2nd Ed., W. H. Freeman & Co.
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    a. Saunders College Publishing.
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    a. Biochemistry B. I. Publications (Pvt.) Ltd., New Delhi
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21. Christopher D. Moyes, Patricia Schulte (2014) Principles of Animal Physiology, Pearson
22. Edmunds, Leland N (1988) Cellular and molecular bases of biological clocks. 1988 by Springer-Verlag New York Inc.

SEMESTER-IV (PRACTICALS)
Paper Code: RJSPGZOOE401
1.Effect of exercise on blood pressure in human 2.Effect of exercise on heart rate and oxygen consumption in humans. 3. Design a questionnaire to determine the human chronotypes.

M.Sc. Part -II ZOOLOGY (OPEN ELECTIVE-ANIMAL PHYSIOLOGY)

SEMESTER- III

PRACTICAL EXAMINATION

Duration: 3 HRS **Total Marks: 50**

Q.1 Determine the influence of sub-lethal (5 ppm) ammonia on the activity of any one of the following enzyme: **15**

hepatic glutamate dehydrogenase **OR** brain glutamate dehydrogenase **OR** aspartate amino transferase **OR** alanine amino transferase

Q.2 Determine the influence of sub-lethal (5 ppm) ammonia on the activity of any one of the following parameter: **10**

Level of excretory ammonia

OR

Level of amino acid content of muscle / gill/ brain /liver.

Q.3 Determination of Urea /Creatinine/ Uric acid content in blood/ urine. **08**

Q.4 Identify and describe the sensory receptors **07**

Q.5 Viva voce **05**

Q.6 Journal **05**

SEMESTER IV: TO BE ADDED.