# DISCIPLINE SPECIFIC CORE COURSE -20
# Comparative Physiology of Vertebrates
# Zoo-DSC-20

## CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lectures | Tutorial | Practical/ Practice | | |
| **Comparative Physiology of Vertebrates**<br><br>**Zoo-DSC-20** | **4** | **2** | **0** | **2** | **As per the Program Eligibility** | **Basic understanding of Zoology** |

**Learning objectives:**

This course focuses on:

- Understanding the physiological mechanisms that enable vertebrates to adapt and evolve over time.
- Exploring how different vertebrates, from fish to mammals, have developed unique physiological adaptations to meet the demands of their environments.

**Learning outcomes:**

At the end of this course students should be able to:

- Learn the significance of variations in the digestive system based on different diets.
- Understand the mechanisms of extracting oxygen from the environment using different respiratory structures.
- Appreciate the design of the cardiovascular system in different vertebrates as an efficient gas transport mechanism.
- Appreciate the variations in the reproductive strategies in accordance with the environment.
- Understand the various strategies for maintaining a steady physiological state and respond to extreme environmental conditions.

**SYLLABUS**

**THEORY** **30 hrs**

**UNIT 1: Physiological Processes** **10 hrs**

Digestion: Monogastric, digastric and polygastric digestive systems**;** Respiration: Gills, swim bladder, skin and lungs as respiratory organs; Circulation: Single-circuit and double-circuit circulatory designs**.**

**UNIT 2: Reproduction** **6 hrs**

Reproductive Cycles in seasonal and non- seasonal breeders.

**UNIT 3: Homeostasis** **10 hrs**

Osmoregulation in freshwater, marine and terrestrial vertebrates. Thermoregulation in poikilotherms and homeotherms.

**UNIT 4: Adaptations** **4 hrs**

Physiological responses to specific environmental challenges, like desert conditions, high altitude and starvation.

**PRACTICALS** **60 hrs**

**(Laboratory periods: 15 classes of 4 hours each)**

1. Physiological Response of *Drosophila*/fish/stored grain pests to environmental stressors like temperature extremes/starvation.
2. Comparison of Hemoglobin content of fish blood in fish kept in normal and low-oxygen water.
3. Comparison of blood cells in a blood smear of a fish and human.
4. Study of the Estrous cycle of rats through permanent slides of vaginal smears during different phases of the cycle.

PROJECT WORK
Project report (group activity) on effect of exercise/ yoga/meditation/adequate sleep/excessive mobile gaming on cardiovascular health (Heart rate, BP and SpO2 using pulse oximetry) to be submitted at the end of the semester.

**Essential/Recommended Readings:**

1. How Animals work by Knut Schmidt-Nielsen, Cambridge University Press
2. Animal Physiology: Adaptation and Environment by Knut Schmidt-Nielsen, Cambridge University Press

**Suggested Readings:**

1. Animal Physiology by Hill et al, Sinauer Associates Inc.
2. Environmental Physiology of Animals by Willmer et al, John Wiley (original)
3. Principles of General and comparative physiology by Carpenter, W B, Forgotten Books.
4. Experiments with *Drosophila* for Biology courses (ebook) by Lakhotia, SC, Indian National Academy of Sciences.
5. Manual of Experimental Ichthyology by Gahlawat, SK et al, Daya Publishing House.
6. Cardiopulmonary Exercise testing and cardiovascular health by Karlman Waserman, Wiley-Blackwell.

**NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**