COMMON POOL OF GENERIC ELECTIVES (GE) COURSES

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

GENERIC ELECTIVES (GE-14): Model Organisms in Research
Zoo-GE-14

Course title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Model Organisms in Research Zoo-GE-14	04	02	Nil	02	Passed Class XII with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- to make the students aware about the requirement of model organisms in biological research.
- to understand the simulation of human traits in model organisms.
- to familiarize the students about the suitability and availability of different model organisms.
- to aware students about the ethical issues involved in using animals for research in laboratories.
- to give insight about the database systems available of different model organism.

Learning Outcomes

By studying this course, students will be able to

- better understand the concept of model organisms and their advantages.
- appreciate various types of model organisms used in biological research.
- gain better knowledge of how the model organisms can be used for modelling of human diseases.
- have an insight on the ethical issues related to handling and maintaining laboratory animals and plants.
- design simple experiments with model organism.
- determine the type of model organisms that are suitable to answer the specific research questions.

SYLLABUS OF GE-14

UNIT- 1: Introduction **2 hrs**

Model organisms: Definition, requirement, characteristics and selection.

UNIT- 2: Commonly used Model Organisms **20 hrs**

Characteristics, establishment and maintenance, specific application of following model organisms in research:

Viruses (Bacteriophage λ-phage, T4); Bacteria (*Escherichia coli*); Fungi (*Saccharomyces cerevisiae*); Ciliates (*Tetrahymena*); Annelids (*Caenorhabditis elegans, Lumricusterrestris*); Arthropods (*Drosophila melanogaster*); Pisces (*Danio rerio*); Amphibians (*Xenopus laevis*); Mammals [Rodents (*Mus musculus*), *Rattus rattus* (Rat) and Primates]; Plants (*Arabidopsis thaliana*).

UNIT- 3: Model organism specific databases **6 hrs**

Saccharamyces genome Database, EcoCyc, Flybase, Xenbase, Wormbase, Zfin, Mouse genome informatics, Tetrahymena genome Database, The Arabidopsis Information Resource etc.

UNIT- 4: Ethical consideration **2 hrs**

Brief introduction about CPCSEA, IAEC and related regulatory bodies.

Practical **(60 hrs)**

(Laboratory periods: 15 classes of 4 hours each)

1. Preparation of culture medium for *E. coli* and study the growth kinetics of *E. coli*.
2. Preparation of culture medium for *Drosophila* and study different stages of life cycle of *Drosophila*.
3. Preparation of culture medium for ciliates and their growth kinetics.
4. Study different phases of cell cycle in ciliates.
5. Culturing of *C. elegans*/ earthworm and Zebra fish and perform eco-toxicological studies.
6. Demonstration of culturing of mammalian cell lines/ visit to eukaryotic cell culture facility.
7. Visit to animal house and/ or plant culture facility and prepare the report on maintenance of laboratories animal/plant.

Essential/recommended readings

1. Jarret, R. L. and McCluskey, K. (2021) The Biological Resources of Model Organisms, 1st Ed, CRC Press.

2. Ankeny, R. A. and Leonelli, S. (2020) Concept of Model Organisms; Cambridge University Press.
3. Emerging model organisms: A laboratory manual, Volume 2, lab manual edition (2010), New York, USA: Cold Spring Harbor Laboratory Press.

Suggestive readings

1. Wang, W., Rohner, N., Wang, Y. (2023) Emerging Model Organisms; SpringerLink.
2. Jarret, R. L. and McCluskey, K. (2021) The Biological Resources of Model organisms, Taylor and Francis group.
3. Carroll, P. M. and Fitzgerad, K. (2003) Model Organisms in Drug Discovery, Wiley.

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