AC – 20/04/2024
Item No. – 6.6 Sem.-I (14a)

As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE Life Sciences	
Board of Studies in Life Sciences	
UG First Year Programme	
Semester I	
Title of Paper	**Credits 2/ 4**
I) Model Organisms in Biology	**2**
From the Academic Year	**2024 – 2025**

I. Name of the course: Life Sciences - Model Organisms in Biology

Sr.No.	Heading	Particulars	
1	**Description the course : Including but Not limited to:**	This course aims at describing molecular and metabolic similarities and differences between plants, animals and humans. It also aims at emphasizing the merits and demerits of studying model systems in biological research.	
2	**Vertical :**	Open Elective	
3	**Type :**	Theory	
4	**Credits :**	2 credits (1 credit = 15 Hours for Theory)	
5	**Hours Allotted :**	30 hours	
6	**Marks Allotted:**	50 Marks	
7	**Course Objectives(CO):** The course aims to: CO1 Introduce the concept of model organisms. CO2 Bring in similarities and differences between model organisms and humans. CO3 Emphasize the use of model organisms		

8	**Course Outcomes (OC):** The learner would be able to: OC 1. Understand the concept of model organisms and their significance in biological research. OC 2. Identify and describe commonly used model organisms such as *Drosophila melanogaster, Caenorhabditis elegans, Escherichia coli, Saccharomyces cerevisiae, and* Zebra fish. OC 3. Apply knowledge of model organisms to address specific biological questions or problems in research or practical applications, especially to humans. OC 4. Analyze the versatility of model organisms for studying various aspects of microbiology, genetics, and molecular biology, etc, including its applications in biotechnology, medicine, and environmental science. OC 5. Communicate scientific concepts effectively through written reports, oral presentations, and other forms of scientific communication, demonstrating clarity, accuracy, and professionalism. OC 6. Apply knowledge to address specific research questions or challenges, demonstrating the ability to generate hypotheses, design experiments, and analyze results in a research context.	
9	**Module 1**	**Lectures 15**
	Model Organisms Definition, historical context and evolution of model organism studies. Basic principles of experimental design and research methodologies **Characteristics of Model Organisms** Common traits and features shared by model organisms Criteria for selecting suitable model organisms for research purposes Importance of genetic tractability (lineage), ease of maintenance, and experimental manipulability **Advantages and Limitations of Model Organisms:** Correlation/ application to human studies**,** challenges of maintenance and application. Ethical Considerations: Humanitarianism and animal testing and ethics in animal testing.	

	Module 2	**Lectures 15**
	1. ***E. coli***: a. Growth curve of *E. coli* b. Simplicity of *E. coli* genome c. *E. coli* as a bioreactor **2. *Saccharomyces cerevisiae* (Yeast)** a. Characteristics of Saccharomyces cerevisiae as a model organism b. Applications in molecular biology and genetics c. Role in biotechnology and industrial processes **3. *Caenorhabditis elegans* (Roundworm)** a. Introduction to *Caenorhabditis elegans* as a model organism b. Study of developmental biology and neurobiology using *C. elegans* c. Use in drug discovery and aging research **4. *Drosophila melanogaster* (Fruit Fly)** a. Introduction and overview of *Drosophila* as a model organism b. Genetics and developmental biology research using Drosophila c. Applications in understanding human diseases **5. *Danio rerio* (Zebrafish)** a. Introduction to the zebrafish model system b. Advantages of zebrafish model organism c. Importance of zebrafish as a versatile research and education model	

10 and 11.	**Text and Reference Books:** **1.** Model Organisms in Drug Discovery" by Pamela M. Carroll and Mark Fishman **2.** “Model Organisms: A Laboratory Guide" by Michael W. Klymkowsky and David L. Stern **3.** “Model Organisms in Evolutionary Biology: From Genomics to Morphology" edited by Ralf J. Sommer and Michael M. Shifman **4.** "Model Organisms in Biological Research" edited by David L. Stern		
12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**	
13	**Continuous Evaluation through:** Quizzes, class test, presentation, project, role play, creative writing, assignment etc.: 15 marks Attendance and Participation: 05 marks. Total 20 marks.	Theory evaluation: 30 marks.	
14	**Format of Question Paper:** Details given at the end of the document.		

Evaluation for Open Elective Course: 50 Marks

The evaluation of these courses would include continuous evaluation (internal assessment) and Semester end examinations (External assessment). The evaluation pattern would be as follows:

Internal Assessment: 20 marks.

Theory Component: 20 marks.

Quizzes, class test, presentation, project, role play, creative writing, assignment etc: 15 marks

Attendance and Participation: 05 marks.

External Assessment: 30 marks.

Theory Component: 30 marks.

- Duration: **1 Hour**
- Theory question paper pattern:

Question No.	Unit	Question	Marks
Q1.	I	Any 1 out of 2 (1 or 1a, b)	12
Q2	II	Any 1 out of 2 (2 or 2a, b)	12
Q3.	I and II	Any 2 out of 4 (3: a, b, c, d)	06
		Total	30

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