IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinators, Dr. Natalie Sirisaengtaksin. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

Term and Year: **Fall 2025**

Course Number and Course Title:
GS03 1241: Current Methods in Molecular and Translational Biology Module 4: Cell, Tissue and Animal Model Systems

Credit Hour: 1

Prerequisites: The GSBS Core Course is a prerequisite for PhD students. While there is no other specific prerequisite for this course, registered students are expected to have a basic understanding of cell biology from undergraduate courses.

Meeting Location: UTHealth Houston
McGovern Medical School (or TBA)

Building/Room#: MSB 3.301 (or TBA)

Program Required Course: No

Approval Code: No

Audit Permitted: Yes

Classes Begin: October 31, 2025

Classes End: December 8, 2025

Class Meeting Schedule

Day	Time
Oct. 31 – Dec. 8, 2025 (M, W, F)	**3:00-4:00 p.m.**

Course Director

Name and Degree: **Mary C. Farach-Carson, PhD**

Title: Professor

Department: School of Dentistry

Institution: UTHealth Houston

Email Address Mary.C.Farachcarson@uth.tmc.edu

Contact Number: 713-486-4438

Instructors

1. **Mary C. Farach-Carson, PhD**
   Institution: UTHealth Houston
   Email Address: Mary.C.Farachcarson@uth.tmc.edu
2. **Daniel Harrington, PhD**
   Institution: UTHealth Houston
   Email Address: Daniel.Harrington@uth.tmc.edu

NOTE: Office hours are available by request. Please email me to arrange a time to meet. **Teaching Assistant**: N/A Name and Email Address	3. **Danielle Wu, PhD** Institution: UTHealth Houston Email Address: Danielle.Wu@uth.tmc.edu 4. **George T. Eisenhoffer, PhD** Institution: MDACC Email Address: GTEisenhoffer@mdanderson.org 5. **Hyun-Eui Kim, PhD** Institution: UTHealth Houston Email Address: Hyun-Eu.Kim@uth.tmc.edu 6. **Kartik Venkatachalam, PhD** Institution: UTHealth Houston Email: Kartik.Venkatachalam@uth.tmc.edu 7. **Dung-Fang Lee, PhD** Institution: UTHealth Houston Email Address: Dung-Fang.Lee@uth.tmc.edu 8. **Seung-Hee Yoo, PhD** Institution: UTHealth Houston Email Address: Seung-Hee.Yoo@uth.tmc.edu 9. **Kangho Kim, PhD** Institution: UTHealth Houston Email Address: Kangho.Kim@uth.tmc.edu

Course Description:

This module is a component of the course "Current Methods in Molecular and Translational Biology" that is designed to introduce students to methods they can apply to their own research and to evaluate the rationale and pros and cons of specific techniques that are employed in experiments they are exposed to at seminars and conferences. The module provides an overview of state-of-the-art methods and model systems used in modern studies of biological systems from the cell to the tissue and organ level in various organismal models. Both invertebrate and vertebrate models will be introduced, as well as primary and immortalized cell lines, iPS models, organoids, lab-on-a-chip, bioprinted, computational models and digital pathology using AI. Both dynamic and static models will be described. Depending on a student's project, this course can be taken as an elective to satisfy the 3-units Methods in Molecular Translational Biology (MTB) course required by MTB program students, in combination with any of the other three modules of the Course for 2-3 credits, or as a stand-alone 1-credit course by any GSBS student or students from affiliated institutions.

Textbook/Supplemental Reading Materials

- No specific, general-purpose textbook or supplementary material is recommended. However, instructors may recommend literature reading including reference books, review and primary research articles relevant for their specific lectures.

Course Objective/s:

Upon successful completion of this course, students will have acquired a basic understanding of the various options ranging from cell and tissue models to organismal models that can be used for experimental work in molecular and translational biology. A key objective is to provide the students with the basic concepts necessary and the key areas of applications of model systems to enable them to ask relevant research questions in their own projects, in collaborative work, or in scientific communications.

Course and Learning Objectives

- **Understand the Scope of Modern Biological Models**
  - Identify and describe key state-of-the-art experimental models used in molecular and translational biology.
  - Understand the value of invertebrate and vertebrate model systems.
- **Evaluate Experimental Approaches**
  - Assess the advantages and limitations of different biological models in research applications.
  - Critically analyze the rationale for choosing specific models for particular research questions.
- **Explore Advanced Model Systems**
  - Describe the characteristics and applications of primary and immortalized cell lines, iPS models, and organoids.
  - Examine emerging technologies, such as lab-on-a-chip, bioprinting, and computational models, in biological research.
  - Understand the role of digital pathology and AI in translational biology.
- **Differentiate Between Static and Dynamic Models**
  - Define and classify experimental models based on static and dynamic properties.
  - Evaluate how dynamic models contribute to understanding biological processes.

Student responsibilities and expectations:

Students enrolled in this course will be expected to perform the following activities during the period of the course:

1. Read, process, and review lecture materials, review and critically assess assigned articles.
2. Attend all lectures and participate in and contribute to course discussions during lecture sessions (10% of final grade).
3. Participate in a field trip and practical demonstrations.
4. Prepare for and take a final examination based on lecture and reading material.

Students are expected to complete all assigned reading material prior to class. While you may work and discuss all course materials and assignments in groups, all writing assignments must be your own unless otherwise instructed. Whenever relevant, specific guidelines will be provided on whether using AI-generated content is permitted. Plagiarism and failure to properly cite scientific literature and other sources will not be tolerated and are grounds for dismissal from the course and further GSBS disciplinary action. Cheating or engaging in unethical behavior during examinations will be grounds for dismissal from the course without credit and further GSBS disciplinary action.

Grading System: Letter Grade: (A-F)

Student Assessment and Grading Criteria:

Percentage	Description
Homework	At their discretion, Instructors may assign appropriate homework for grading. If homework is assigned for a specific lecture, the homework assignment will be in lieu of questions on that lecture subject matter on the exam.
Final Exam (90%)	Two (2) in-class exams will represent 90% of the total grade. The specific percent of the total grade assigned to each exam will be at the discretion of the course director. In-class exam 1 will cover all material presented prior to the exam. Exam 2 will cover material presented after Exam 1. All individual lectures will be assigned equal points on the exams. Homework may be assigned by a lecturer for a specific lecture in lieu of questions on the exam. Points awarded for the homework assignment will be added to the total points received for the in-class exam.
Participation and/or Attendance (10%)	The material covered in these lectures is likely new to many students. Therefore, attendance and participation in classroom discussions is considered critical. Attendance will be assessed toward 10% of final grade to encourage participation.

CLASS SCHEDULE

Date	Duration (Hour(s) taught by lecturer)	Lecture Topic	Lecturer/s
10/31	1	Invertebrate models: C. elegans	H.E. Kim
11/03	1	Vertebrate models: Zebrafish	Eisenhoffer
11/05	1	Invertebrate models: Drosophila	Venkatachalam
11/7	1	Vertebrate models: Rodent animals/Transgenics	Yoo
11/10	1	Vertebrate models: Large animals	Wu
11/12	1	Creating, Genotyping and Phenotyping Immortalized Cell Lines	Farach-Carson
11/14	1	Models Exam 1	
11/17	1	Primary Stem Cells/Organ Cultures/Tissue Slices	K. Kim
11/19	1	iPS Cell Models	D-F Lee
11/21		Organoids & Lab-on-a-Chip: Recreating Tissue Environment	Farach-Carson
11/24-28		Thanksgiving Break	
12/01	1	Bioprinting Tissue Field Trip: This lecture will include a visit to see 3D bioprinting demonstration	Harrington
12/03	1	Mechanical Stimulation of Tissues/Perfusion Models	Wu
12/05	1	Digital Pathology and Use of AI in Diagnostics	Guest lecture
12/08	TBD	Models Exam 2	

MCFC/jal