

**IMPORTANT:** This syllabus form should be submitted to OAA ([gsbs\\_academic\\_affairs@uth.tmc.edu](mailto: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 Coordinator 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.

| <p>Term and Year: <b>Summer 2025</b></p> <p>Course Number and Course Title:<br/><b>GS12 1442: Principles of Experimental Mouse Pathology</b></p> <p>Credit Hours: <b>2</b></p> <p>Meeting Location: <b>GSBS Schissler Library</b></p> <p>Building/Room#: <b>BSRB S3.8351</b></p> <p>WebEx/Zoom Link: <b>N/A</b></p>  | <p>Program Required Course: <b>No</b></p> <p>Approval Code: <b>No</b></p> <p>Audit Permitted: <b>Yes</b></p> <p>Classes Begin: <b>May 23, 2025</b></p> <p><b>Classes End: July 25, 2025</b></p> <p><b>Final Exam Week: August 1, 2025</b></p>   |      |                |                      |  |
|--|---|------|----------------|----------------------|--|
| <b>Class Meeting Schedule</b>  |   |      |                |                      |  |
| <table border="1"><thead><tr><th>Day</th><th>Time</th></tr></thead><tbody><tr><td><b>Fridays</b></td><td><b>10am-12nn CST</b></td></tr></tbody></table>  | Day   | Time | <b>Fridays</b> | <b>10am-12nn CST</b> |  |
| Day  | Time  |      |                |                      |  |
| <b>Fridays</b>   | <b>10am-12nn CST</b>  |      |                |                      |  |
| <p><b>Course Director</b></p> <p>Name and Degree: <b>Fernando Benavides, DVM, PhD</b></p> <p>Title: <b>Professor</b></p> <p>Department: <b>Epigenetics and Molecular Carcinogenesis</b></p> <p>Institution: <b>MDACC</b></p> <p>Email Address: <a href="mailto:fbenavid@mdanderson.org">fbenavid@mdanderson.org</a></p> <p>Contact Number: <b>832-750-0136</b></p> <p><b>NOTE:</b> Office hours are available by request. Please email me to arrange a time to meet.</p> | <p><b>Instructors</b></p> <p>1. <b>Fabien Delerue, PhD</b><br/>Institution: MDACC<br/>Email Address: <a href="mailto:fdelerue@mdanderson.org">fdelerue@mdanderson.org</a></p> <p>2. <b>Manu Sebastian, PhD</b><br/>Institution: MDACC<br/>Email Address : <a href="mailto:mmsebastian@mdanderson.org">mmsebastian@mdanderson.org</a></p> <p>3. <b>Carlos Perez, PhD</b><br/>Institution: MDACC<br/>Email Address: <a href="mailto:cjperez@mdanderson.org">cjperez@mdanderson.org</a></p> <p>4. <b>Fernando Benavides, DVM, PhD</b><br/>Institution: MDACC<br/>Email Address: <a href="mailto:fbenavid@mdanderson.org">fbenavid@mdanderson.org</a></p> <p>5. <b>Rajneesh Pathania, DVM, PhD</b><br/>Institution: MDACC<br/>Email Address: <a href="mailto:rpathania@mdanderson.org">rpathania@mdanderson.org</a></p> |      |                |                      |  |

**Course Description:**

This 2-credit course is taught during the Summer Semester. A two-hour class will be given on Fridays from 10:00 a.m. to 12:00 p.m. at the MD Anderson in Houston. The online learning tool Canvas will be used to distribute presentations and reading assignments. Individual lectures will be limited to 50 minutes. All classes will have 10 minutes break after the first lecture. Some classes include a short video demonstration (e.g., microscopy, necropsy, or imaging procedures), peer discussions, and literature review.

**Textbook/Supplemental Reading Materials**

- N/A

**Course Objective/s:**

Upon successful completion of this course:

A challenge for the graduate student is to find and apply the best experimental in vivo approach to investigate and solve a research problem. The purpose of this course is to convey fundamental knowledge needed to perform valid and interpretable research using mouse models. The course will feature a diverse group of instructors covering a wide variety of subjects necessary to understand the importance of the appropriate use of mouse models and how to collect and interpret the results. Each instructor has a strong background on the subject presented. A veterinary pathologist and a veterinary mouse geneticist are included as instructors.

***Specific Learning Objectives:***

1. Students will have learned the basic concepts of mouse biology, embryology, and genetics needed to design in vivo studies.
2. Students will have learned about the advantages and disadvantages of the use of the laboratory mouse as an animal model.
3. Students will have learned how to responsibly design, conduct, and interpret results using mouse models and will be familiar with the influence of genetic background, strain-related lesions, and environment.
4. Students will have been exposed to the state-of-the-art techniques used for the pathological characterization of mouse models.

**Student Responsibilities and Expectations:**

Students enrolled in this summer course will be expected to perform the following activities each week.

1. Read, process, and review (study) material from 1 or 2 seminal reviews relating to the week's cancer biology topic.

2. Participate in and contribute to course discussions during lectures.
3. Prepare for and take a midterm and final examination based on the lecture and some reading materials.

Students are expected to complete all assigned reading material (reviews and research literature) prior to class. 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 (quizzes and final) 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 :** *(May include the following:)*

| Percentage            | Description  |
|-----------------------|--|
| Midterm Exams ( 50 %) | 6/27 – midterm exam will cover materials from the 5 classes.   |
| Final Exam ( 50 %)    | 8/1 – final exam will cover materials from the last 4 classes. |

## CLASS SCHEDULE

### PRINCIPLES OF EXPERIMENTAL MOUSE PATHOLOGY SUMMER SEMESTER, 2025 (May 23-August 1) **CLASSES ON FRIDAYS 10am-12pm**

| DATE |  | SUBJECT                        | INSTRUCTOR   | LECTURE   |
|------|--|--------------------------------|--|---|
|      |  |                                |  |   |
| 5/23 |  | Introduction<br>Rodent biology | <b>Benavides</b> (40 min)<br>Discussion (10 min)<br>Break (10 min) | Introduction to the 2025 Course<br><br>Rodent biology, mouse anatomy, biology, and physiology |

|      |  |                                     |  |   |
|------|--|-------------------------------------|--|---|
|      |  | Rodent Genetics                     | <b>Benavides</b> (50 min)<br>Break (10 min)      | Basic concepts of rodent genetics and systematic<br><br>Concepts of mouse genetics and mutations  |
|      |  |                                     |  |   |
| 5/30 |  | Histology                           | <b>Sebastian</b> (50 min)<br>Break (10 min)      | Basic concepts of histopathology  |
|      |  | Mouse develop Biology               | <b>Sebastian</b> (50 min)<br>Break (10 min)      | Basic concepts of mouse developmental biology   |
|      |  |                                     |  |   |
| 6/6  |  | Genetically engineered mouse models | <b>Delerue</b> (50 min)<br>Break (10 min)        | Transgenic mice and inducible systems<br><br>Targeted Mutagenesis using ES-cells (KOs, KIs)<br><br>Conditional mutant alleles (Cre/loxP and Flp/FRT systems)) |
|      |  |                                     | <b>Delerue</b> (50 min)<br>Discussion (10 min)   | Gene editing using ZFN, TALEN, and CRISPR/Cas9  |
|      |  |                                     |  |   |
| 6/13 |  | Genetic Background considerations   | <b>Benavides</b> (45 min)<br>Break (10 min)      | Standardized genetic nomenclature<br><br>Genetic drift and substrains<br><br>Influence of genetic background  |
|      |  |                                     | <b>Benavides</b> (45 min)<br>Discussion (20 min) | Modifier genes and passenger mutations  |
|      |  |                                     |  |   |

|            |  |                                       |   |   |
|------------|--|---------------------------------------|---|---|
| 6/20       |  | Animal Care                           | <b>Pathania</b> (50 min)<br>Discussion (10 min)   | Animal Care and Use Program   |
|            |  | Regulations                           | <b>Pathania</b> (50 min)<br>Discussion (10 min)   | Regulations and IACUC requirements  |
|            |  |                                       |   |   |
| 6/27       |  | EXAM #1                               |   |   |
| Thu<br>7/3 |  |                                       |   |   |
|            |  | Databases and genome browsers         | <b>Benavides</b> (50 min)<br>Break (10 min)<br><b>Benavides</b> (50 min)<br>Discussion (10 min) | Databases (e.g., Mouse Genome Informatics; Ensembl; Mouse Phenome Database)   |
|            |  |                                       |   |   |
| 7/11       |  | Imaging & Digital Pathology           | <b>Perez</b> (50 min)<br>Break (10 min)<br><b>Perez</b> (50 min)<br>Discussion (10 min)         | Digital pathology and In vivo imaging systems   |
|            |  |                                       |   |   |
| 7/18       |  | Spontaneous lesions on inbred strains | <b>Sebastian</b> (50 min)<br>Break (10 min)<br><b>Sebastian</b> (50 min)<br>Break (10 min)      | Toxicology studies<br>Mouse Phenotyping<br>Background lesions in C57BL/6 mice<br>Background lesions in FVB/N mice<br>Background lesions in 129 mice |
|            |  |                                       |   |   |
| 7/25       |  | Mouse Models of Human Disease         | <b>Benavides</b> (50 min)<br>Break (10 min)   | Mouse models of cancer  |

|     |  |         |   |                                   |
|-----|--|---------|---|-----------------------------------|
|     |  |         | <b>Pathania</b> (50 min)<br>Discussion (10 min) | Mouse Models of<br>Oncoimmunology |
|     |  |         |   |                                   |
| 8/1 |  | EXAM #2 |   |                                   |
|     |  |         |   |                                   |

