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 the Graduate School's 504 Coordinator, Natalie Sirisaengtaksin, PhD. 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: **Spring 2027** Course Number and Course Title: **GS04 1253: Principles in Genetics & Epigenetics** **Credit Hours: 3** **Prerequisites:** Not applicable Meeting Location**: UT-MDACC/Basic Science Research Building (BSRB)** **B**uilding/Room #: **BSRB S3.8367 (Gallick Classroom)**	**Program Required Course:** Yes **Approval Code:** No **Audit Permitted:** Yes **Classes Begin:** January 11, 2027 **Classes End:** April 30, 2027 **Final Exam Week:** May 3 – May 7, 2027; Final Presentation on May 4th and May 6th (No final exam)

Class Meeting Schedule

Day	Time
Tuesday & Thursday (Regular Sessions)	**10:00 -11:30 am**
Tuesday and & Thursday (Sessions with additional Application Workshops)	**10:00 am -12:00 pm**

Course Director Name and Degree: **Rachel K. Miller, PhD** Title: **Professor** Department: **Pediatrics (Research Center)** Institution: **McGovern Medical School at UTHealth** Email Address: Rachel.K.Miller@uth.tmc.edu Contact Number: **713-500-6537** **Course Co-Director/s:** (if any) Name and Degree: **Abhinav Jain, PhD** Title: **Associate Professor** Department: **Epigenetics and Molecular Carcinogenesis** Institution: **MDACC** Email Address: AJain@mdanderson.org	**Instructors** (see the end of the document)

Contact Number: **713-745-2640**
Name and Degree: **Jlenia Guarnerio, PhD**

Title: **Assistant Professor**

Department: **Genetics**

Institution: **MDACC**

Email Address: JGuarnerio@mdanderson.org

Contact Number: **832-693-5418**

NOTE: Office hours are available by request. Please email me to arrange a time to meet.

Teaching Assistant:

Name and Email Address: **TBD**

Course Description:
Principles in Genetics and Epigenetics (PIGE) is designed for students who have a major interest in the aspects of experimental and human genetics, epigenetics, and genomics as they relate to human disease, including Mendelian disorders, complex diseases, cancer, and experimental model systems. This class will provide in-depth instruction in three areas:

1) Experimental genetics
2) Human genetics and genomics
3) Epigenetics and epigenomics

This course *fulfills a requirement of the Genetics & Epigenetics Graduate Program*.

Prerequisites: *Not applicable*

Didactic Lectures

Didactic lectures follow a natural progression and provide in-depth instruction on topics related to (1) experimental genetics, (2) human genetics and genomics, and (3) epigenetics and epigenomics.

Application Lectures

Short application lectures (3-4; 30 min each) by trainees, including senior graduate students and post-doctoral fellows in laboratories of participating faculty will follow selected lectures to highlight specific techniques and applications to the material covered in the primary lecture.

Course Format

The class will be held two times a week, generally for one and a half hours each class:
Tuesday & Thursday, 10:00-11:30 am in BSRB S3.8367 (Gallick Classroom). On days when an additional **Application Lecture (30 min; 10:00 am-12:00 pm)** is included, there will be a brief break (5-10 min) between the primary lecture and the application lecture by a senior trainee in the lab of the primary lecturer also **in BSRB S3.8367 (Gallick Classroom)**.

Textbook/Supplemental Reading Materials

Lectures will draw from recommended and suggested readings, including landmark historic and contemporary papers, as well as review articles. *No textbook is required.*

Course Objective/s:

As a *foundational course*, this course is designed to *introduce students to the basic principles in genetics and epigenetics* and *prepare the student to generate novel hypothesis-driven projects* as part of their own research in the areas of genetics and epigenetics inside and outside of G&E laboratories. The course *emphasizes active learning* through a combination of didactic lectures, selected application lectures and journal clubs to discuss and navigate a breakthrough paper.

***Specific Learning Objectives*:**

1. Obtain foundational knowledge in experimental and human genetics, epigenetics and genomics, and understand how to address specific questions in these broad areas using suitable experimental designs and techniques and applying relevant bioinformatic tools.

2. Understand how to utilize, design, generate and use genetically engineered model organisms to answer specific research questions.

3. Gain a multifaceted understanding of advanced human genetics and genomics, including aspects of clinical genetics.

Student responsibilities and expectations:

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

1. Participate in and contribute to course discussions during the didactic lectures.
2. Process and review material from each lecture and read 1 or 2 recommended seminal reviews related to the week's topic.
3. Read 1-2 recommended primary research articles before and/or after each lecture.
4. Attend and participate in the Application lectures.
5. Prepare, attend and actively participate in Journal club discussions

Students are expected to complete all assigned reading material (reviews and research literature). While you may work and discuss all course materials and assignments in groups, all writing assignments must be your own. *The use of AI-based resources (e.g., ChatGPT) is acceptable only for editing. If you elect to use them, you must clearly indicate when and where you used them and include references.* 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 for any assignments 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**
Journal Club Homework (30%)	For the two journal clubs, students are expected to submit questions about the paper preceding the journal club and submit a one-page reflection after the journal club. For example, one or more of the following can be addressed: a) One key scientific insight they gained. b) One remaining question or future direction. c) Relevance to genetics, genomics, or epigenetics.
Attendance (40%)	Students are required to attend at least 85% of the classes (4 pre-approved absences allowed). Students are expected to attend and actively participate in the course.
Final Presentations (30%)	There will be a final presentation during the week of finals (*There is no final exam).* Students will generate and present creative content (e.g., a slide, video, or social media post) describing something they have learned in the course.

2027 Date, Day	Class #	Wk	Lecture Topic	Lecturer	Email
January 12, Tu	1	1	Gene structure & expression	Peggy Lee	SLee42@mdanderson.org
January 14, Th	2		Molecular basis of disease phenotype-genotype	Paul Trainor	Paul.Trainor@uth.tmc.edu
January 19, Tu	3	2	Next generation DNA sequencing and its applications	Kadir Akdemir	KCAkedemir@mdanderson.org
January 21, Th	4		Chromosomes and aneuploidy	Francesca Cole	FCole@mdanderson.org
January 26, Tu	5	3	Medical genetics services & clinical risk assessment	Claire Singletary	Claire.N.Singletary@uth.tmc.edu
January 28, Th	6		Current Human Genetic Approaches to Gene Discovery and Their Application to Health Outcomes in Multifactorial Disorders	Miriam Fornage	Myriam.Fornage@uth.tmc.edu
February 2, Tu	7	4	Non-coding genome variation	Ashish Kapoor	Ashish.Kapoor@uth.tmc.edu
February 4, Th	8		Functional validation of variants in disease candidate genes	Georgios Karras	GKarras@mdanderson.org
February 9, Tu	9	5	CRISPR technologies	Traver Hart	GHart1@mdanderson.org
February 11, Th	10		AAV Gene Therapy	William Lagor	William.Lagor@bcm.edu
February 16, Tu	11	6	Genetic basis of cancer	Yejing Ge	YGe1@mdanderson.org
February 18, Th	12		Oncogenes, tumor suppressor genes and cancer pathways	Aria Vaishnavi	AVaishnavi1@mdanderson.org
February 23, Tu	13	7	Cancer Microenvironment	Jlenia Guarnerio	JGuarnerio@mdanderson.org
February 25, Th	14		Tumor Heterogeneity and Spatial Approaches	Lulu Shang	LShang@mdanderson.org
March 2, Tu	15	8	Bulk and single-cell RNA-Seq, and applications	Ye Zheng	YZheng8@mdanderson.org
March 4, Th	16		Journal Club #1		
March 9, Tu	17	9	Model systems: genetic manipulation of mice	Richard Behringer	RRB@mdanderson.org
March 11, Th	18		Epigenetics: Overview and Bench Techniques	Abhinav Jain	AJain@mdanderson.org
March 15-19		10	Spring Break – No class		
March 23, Tu	19	11	Model systems: non-rodent animal models	George Eisenhoffer	GTEisenhoffer@mdanderson.org
March 25, Th	20		DNA methylation	Angela Ting	AHTing@mdanderson.org
March 30, Tu	21	12	Genomic imprinting and X chromosome inactivation	Taiping Chen	TChen2@mdanderson.org
April 1, Th	22		Histone code: Readers, Writers & Erasers	Min-Gyu Lee	MGLee@mdanderson.org
April 6, Tu	23	13	Genome organization and gene expression regulation	Wenbo Li	Wenbo.Li@uth.tmc.edu
April 8, Th	24		Chromatin RNAs and gene expression regulation	Wenbo Li	Wenbo.Li@uth.tmc.edu
April 13, Tu	25	14	Chromatin ATP-dependent remodelers & histone variants	Blaine Bartholomew	BBartholomew@mdanderson.org
April 15, Th	26		Journal Club #2		
April 20, Tu	27	15	Epigenetic regulation of cell plasticity	Yuan-Hung Lo	YLo1@mdanderson.org
April 22, Th	28		Epigenetic regulation of cardiovascular diseases	Priyatansh Gurha	Priyatansh.Gurha@uth.tmc.edu
April 27, Tu	29	16	Clinical applications of epigenetic discoveries	Hussein Abbas	HAbbas@mdanderson.org
April 29, Th	30		Non-coding RNAs	George Calin	GCalin@mdanderson.org
May 4, 6			Finals Week – Final Presentations (No Final Exam)	Students	