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, Cheryl Spitzenberger or 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: **Spring 2024** Course Number and Course Title: **GS07 1015: Microbial Genetics and Physiology** **Credit Hours: 5** Meeting Location: **Medical School Building** Building/Room#: **MSB 1.180** WebEx/Zoom Link: N/A	Program Required Course: **Yes** Approval Code: **No** **(If yes,** the Course Director or the Course Designee will provide the approval code.) Audit Permitted: **No** Classes Begin: **January 8, 2024** Classes End: **April 26, 2024** **Final Exam Week: N/A**

Class Meeting Schedule

Day	Time
Monday - Friday	9:00 – 10:30 am

Course Director Name and Degree: **Nicholas De Lay, PhD** Title: Associate Professor Department: Microbiology and Molecular Genetics Institution: *UTH* Email Address: nicholas.r.delay@uth.tmc.edu Contact Number: 713-500-6293 **Course Co-Director/s:** (if any) Name and Degree: Title: Department: Institution: *UTH* *MDACC* Email Address: Contact Number:	**Instructor/s** 1. **Heidi B. Kaplan, PhD** Name and Degree Institution: UTH Email Address : Heidi.B.Kaplan@uth.tmc.edu 2. Jahun Lee, PhD Name and Degree Institution: UTH Email Address : Jayhun.Lee@uth.tmc.edu 3. **William Margolin, PhD** Name and Degree Institution: UTH Email Address: William.Margolin@uth.tmc.edu

NOTE: Office hours are available by request. Please email me to arrange a time to meet. **Teaching Assistant**: (if any) Name and Email Address Name and Email Address	4. **Peter J. Christie, PhD** Name and Degree Institution: UTH Email Address: Peter.J.Christie@uth.tmc.edu 5. **Anna Konovalova, PhD** Name and Degree Institution: UTH Email Address: Anna.Konovalova@uth.tmc.edu 6. **Ambro van Hoof, PhD** Name and Degree Institution: UTH Email Address: Ambro.van.Hoof@uth.tmc.edu 7. **Ziyin Li, PhD** Name and Degree: Institution: UTH Email Address: Ziyin.Li@uth.tmc.edu 8. Nicholas R. De Lay, PhD Name and Degree Institution: UTH Email Address: Nicholas.R.DeLay@uth.tmc.edu 9. **Michael C. Lorenz, Ph D** Name and Degree Institution: UTH Email Address: Michael.Lorenz@uth.tmc.edu 10. **J. Christian Perez, PhD** Name and Degree: Institution: UTH Email Address: Jose.C.Perez@uth.tmc.edu 11. **Jennifer Walker, PhD** Name and Degree Institution: UTH

	Email Address: Jennifer.N.Walker@uth.tmc.edu 12. **Anne-Marie Krachler, PhD** Name and Degree Institution: UTH Email Address: Anne.Marie.Krachler@uth.tmc.edu 13. **Danielle A. Garsin, PhD** Name and Degree Institution: UTH Email Address: Danielle.A.Garsin@uth.tmc.edu 14. **Bo Hu, PhD** Name and Degree Institution: UTH Email Address: Bo.Hu@uth.tmc.edu 15. **Kevin A. Morano, PhD** Name and Degree: Institution: UTH Email Address: Kevin.A.Morano@uth.tmc.edu 16. **Anthony R. Flores, MD, MPH, PhD** Name and Degree Institution: UTH Email Address: Anthony.R.Flores@uth.tmc.edu

Course Description:

This course will provide our second-semester, first-year students with a broad knowledge of prokaryotic and eukaryotic microbial biology. Topics covered include genetics, gene expression, signal transduction and stress responses, cell biology, pathogenesis, host responses and antimicrobial therapy. The course is divided into 15 one-week units composed of at least two faculty-led lectures and two roundtable discussions of the primary literature. Letter grades are based on participation (25%), writing exercises focused on the papers discussed in class (50%), and a weekly problem set (25%).

Textbook/Supplemental Reading Materials (if any)

N/A; individual class reading materials will be provided weekly.

Course Objective/s:

Upon successful completion of this course, students will:

1. gain a thorough understanding of the core concepts in prokaryotic and eukaryotic microbial biology;
2. be able to analyze and interpret results from a variety of microbiology and molecular biology methods;
3. develop critical thinking skills through the reading and analysis of primary scientific literature;
4. be able to develop a research hypothesis and design experiments to test the hypothesis using appropriate methods;
5. gain written and oral scientific communication skills and should be able to present and discuss scientific ideas and methodology.

Student Responsibilities and Expectations:

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

1. Attend all classes;
2. Review all nessesary class materials (distributed weekly);
3. Actively participate in all learning activities and contribute to discussions during every class;
4. Read at least two research articles and complete two corresponding graded writing assigments.
5. Complete weekly Homework assignments.

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. 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.

Grading System: Letter Grade (A-F)

Student Assessment and Grading Criteria : *(May include the following:)*

Percentage	Description
Class Participation (25%)	Based on active participation in class discussions, questions/answers session etc.
Writing assigments (50%)	Two pre-class writing assigments are based on the primary research articles.
Homework (25%)	Weekly assessment tool in leu of final examination, due on Monday the following week.

CLASS SCHEDULE

Block I

Week 1: Bacterial genetics (Kaplan) Jan 08-12

- Screens, Selections, and Inheritance
- Genetic Analysis of the Lac Operon

- Mapping mutations
- Learning activity: Three-factor crosses and complete Table 4 Mapping by Hfr and co-transduction

Week 2: Yeast genetics I (classical approaches, van Hoof) Jan 16-19 (MLK Monday)
- Yeast as a model eukaryote
- Forward and reverse genetics of yeast

Week 3: Bacterial Cell Cycle, Division, and Differentiation (Margolin) Jan 22 - 26
- Cell cycle and cytokinesis
- Cell differentiation
- Sporulation

Week 4: Bacterial cell envelope (Konovalova) Jan 29 - Feb 02
- Bacterial cell envelope structure and biogenesis
- Bacterial cytoskeleton, cell wall biogenesis, and cell shape

Week 5: Bacterial secretion/molecular machines (Christie) Feb 05-09
- General secretory pathways
- Dedicated protein/DNA transfer systems
- Post-secretory protein modification

Block II

Week 6: Bacterial gene expression regulation (De Lay) Feb 12-16
- Transcription and its regulation;
- Posttranscriptional regulation by small RNAs;
- Regulated proteolysis
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Week 7: Signal Transduction (Kaplan) Feb 19-23
- Two-component systems and chemotaxis
- c-di-GMP signaling
- quorum sensing

Week 8: Protein folding and homeostasis (Morano, Hu) Feb 26- Mar 01
- protein folding and heat shock response
- protein methods: pulse-chase labeling, protein gels etc
- approaches of structural biology to study protein folding

Week 9: Uni-cellular parasites (Li) Mar 04, 05, 06, and 08 (Mar 07 is MBID retreat)
- Parasite life cycle and biology
- Genetic methods in parasites

Week 10: Multi-cellular parasites (Lee) Mar 11-15
- Biology of mutlicellular parasites
- Genetic and cell biology approaches to studying multicellular parasites.

March 18 - 22 Spring Break (no classes)

Block III

Week 11: Microbial virulence – what is it, and how do we study it? (Lorenz (.50), Perez (.4)) Mar 25-29
- Defining and measuring virulence
- Genetic and genomic approaches for identifying virulence factors (fungal focus)

Week 12: Virulence mechanisms (Walker (.40), Krachler (.6)) Apr 01-05
- Bacterial virulence mechanism
- Toxins
- adherence and invasion

Week 13: Microbiome (Krachler) Apr 08-12
- Microbial diversity;
- Microbiome;
- Methods for study microbial communities

Week 14: Mechanisms for combatting microbial infections (Flores, confirmed) Apr 15-19
- Antimicrobials and resistance
- Antivirulence approaches
- Phage therapy

Week 15: Antimicrobial immunity (Garsin) Apr 22-26
- Model hosts systems
- Innate immunity systems
- Adaptive immunity and vaccination