

**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 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.

<b>Term and Year: Spring 2024</b>  <b>Course Number and Course Title:</b> <b>GS07 1015: Microbial Genetics and Physiology</b>  <b>Credit Hours: 5</b>  <b>Meeting Location: Medical School Building</b>  <b>Building/Room#: MSB 1.180</b>  <b>WebEx/Zoom Link: N/A</b>	<b>Program Required Course: Yes</b>  <b>Approval Code: No</b>  <b>Audit Permitted: No</b>  <b>Classes Begin: January 13, 2025</b>  <b>Classes End: May 2, 2025</b>  <b>Final Exam Week: N/A</b>				
<b>Class Meeting Schedule</b>					
<table border="1"><thead><tr><th>Day</th><th>Time</th></tr></thead><tbody><tr><td>Monday - Friday</td><td>9:00 – 10:30 am</td></tr></tbody></table>	Day	Time	Monday - Friday	9:00 – 10:30 am	
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<b>Course Director</b>  <b>Name and Degree: Nicholas De Lay, PhD</b> <b>Title: Associate Professor</b> <b>Department: Microbiology and Molecular Genetics</b> <b>Institution: UTH</b> <b>Email Address: <a href="mailto:Nicholas.R.Delay@uth.tmc.edu">Nicholas.R.Delay@uth.tmc.edu</a></b> <b>Contact Number: 713-500-6293</b>  <b>NOTE:</b> Office hours are available by request. Please email me to arrange a time to meet.	<b>Instructors</b>  <b>1. Heidi B. Kaplan, PhD</b> Institution: UTHH Email Address : <a href="mailto:Heidi.B.Kaplan@uth.tmc.edu">Heidi.B.Kaplan@uth.tmc.edu</a>  <b>2. Jahun Lee, PhD</b> Institution: UTHH Email Address : <a href="mailto:Jayhun.Lee@uth.tmc.edu">Jayhun.Lee@uth.tmc.edu</a>  <b>3. William Margolin, PhD</b> Institution: UTHH Email Address: <a href="mailto:William.Margolin@uth.tmc.edu">William.Margolin@uth.tmc.edu</a>  <b>4. Peter J. Christie, PhD</b> Institution: UTHH Email Address: <a href="mailto:Peter.J.Christie@uth.tmc.edu">Peter.J.Christie@uth.tmc.edu</a>				

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**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 necessary 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 assignments.
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 assignments (50%)	Two pre-class writing assignments are based on the primary research articles.
Homework (25%)	Weekly assessment tool in lieu of final examination, due on Monday the following week.

## CLASS SCHEDULE

### Block I

#### Week 1: Bacterial genetics (Kaplan) **Jan 13-17**

- 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 20-24** (MLK Monday)

- Yeast as a model eukaryote
- Forward and reverse genetics of yeast

#### Week 3: Bacterial Cell Cycle, Division, and Differentiation (Margolin) **Jan 27-31**

- Cell cycle and cytokinesis
- Cell differentiation
- Sporulation

#### Week 4: Bacterial cell envelope (Konovalova) **Feb. 03-07**

- Bacterial cell envelope structure and biogenesis
- Bacterial cytoskeleton, cell wall biogenesis, and cell shape

Week 5: Bacterial secretion/molecular machines (Christie) **Feb 10-14**

- General secretory pathways
- Dedicated protein/DNA transfer systems
- Post-secretory protein modification

## **Block II**

Week 6: Bacterial gene expression regulation (De Lay) **Feb 17-21**

- Transcription and its regulation;
- Posttranscriptional regulation by small RNAs;
- Regulated proteolysis
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Week 7: Signal Transduction (Kaplan) **Feb 24-28**

- Two-component systems and chemotaxis
- c-di-GMP signaling
- quorum sensing

Week 8: Protein folding and homeostasis (Morano, Hu) **Mar 03 - 07** (No class Mar 4, MS Retreat)

- protein folding and heat shock response
- protein methods: pulse-chase labeling, protein gels etc
- approaches of structural biology to study protein folding

**March 10-14 Spring Break (no classes)**

Week 9: Uni-cellular parasites (Li) **Mar 17-21**

- Parasite life cycle and biology
- Genetic methods in parasites

Week 10: Multi-cellular parasites (Lee) **Mar 24-28**

- Biology of multicellular parasites
- Genetic and cell biology approaches to studying multicellular parasites.

## **Block III**

Week 11: Microbial virulence – what is it, and how do we study it? (Lorenz (.50), Perez (.4) **Mar 31-Apr 04**

- Defining and measuring virulence
- Genetic and genomic approaches for identifying virulence factors (fungal focus)

Week 12: Microbiome (Krachler) **Apr 07-09**

- Microbial diversity
- Microbiome
- Methods for study microbial communities

Week 13: Virulence mechanisms (Walker (.40), Krachler (.6) **Apr 14-18**

- Bacterial virulence mechanism
- Toxins
- adherence and invasion

Week 14: Mechanisms for combatting microbial infections (Flores, confirmed) **Apr 21-25**

- Antimicrobials and resistance
- Antivirulence approaches
- Phage therapy

Week 15: Antimicrobial immunity (Garsin) **Apr 28-May 02**

- Model hosts systems
- Innate immunity systems
- Adaptive immunity and vaccination