GS07 1015 Microbial Genetics and Physiology– Spring semester

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 2023 **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:** Yes **(If yes,** the Course Director or the Course Designee will provide the approval code.) **Audit Permitted:** No **Classes Begin: January 9** **Classes End: April 28** **Final Exam Week: N/A**

Class Meeting Schedule

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

Course Director Name and Degree: Anna Konovalova, PhD Title: Department: Microbiology and Molecular Genetics Institution: *UTH* Email Address: anna.konovalova@uth.tmc.edu Contact Number: 713-500-5469 **Course Co-Director/s:** (if any) Name and Degree: Title: Department: Institution: *UTH* *MDACC*	**Instructor/s** (Use additional page as needed) 1. Name and Degree Heidi B. Kaplan, PhD Institution: UTH Email Address : Heidi.B.Kaplan@uth.tmc.edu 2. Name and Degree Nayun Kim, Ph.D. Institution: UTH Email Address : Nayun.Kim@uth.tmc.edu 3. Name and Degree William Margolin, Ph.D. Institution: UTH Email Address: William.Margolin@uth.tmc.edu

Email Address: Contact Number: **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. Name and Degree: Peter J. Christie, Ph.D. Institution: UTH Email Address: Peter.J.Christie@uth.tmc.edu 5. Name and Degree: Anna Konovalova, Ph.D. Institution: UTH Email Address: Anna.Konovalova@uth.tmc.edu 6. Name and Degree: Ambro van Hoof, Ph.D. Institution: UTH Email Address: Ambro.van.Hoof@uth.tmc.edu 7. Name and Degree: Ziyin Li, Ph.D. Institution: UTH Email Address: Ziyin.Li@uth.tmc.edu 8. Name and Degree: Nicholas R. De Lay, Ph.D. Institution: UTH Email Address: Nicholas.R.DeLay@uth.tmc.edu 9. Name and Degree: Michael C. Lorenz, Ph.D. Institution: UTH Email Address: Michael.Lorenz@uth.tmc.edu 10. Name and Degree: J. Christian Perez, Ph.D. Institution: UTH Email Address: Jose.C.Perez@uth.tmc.edu 11. Name and Degree: Jennifer Walker, Ph.D. Institution: UTH Email Address: Jennifer.N.Walker@uth.tmc.edu 12. Name and Degree: Anne-Marie Krachler, Ph.D.

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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, and active learning exercises. 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, question/answer sessions etc.
Writing assignments (50%)	Two pre-class writing assignments are based on primary research articles, due at 8 am on the day of the class.
Homework (25%)	Weekly assessment tool in lieu of a final examination, due on Monday the following week.

CLASS SCHEDULE

Block I

Week 1: Bacterial genetics (Kaplan) Jan 09-13

- Screens, Selections, and Inheritance
- Genetic Analysis of the lac Operon
- Mapping mutations

Week 2: Yeast genetics I: classical approaches (Kim) Jan 17-20 (MLK Monday)

- *S. cerevisiae* as a genetic model system
- Forward and reverse genetics of yeast

Week 3: Bacterial Duplication and Differentiation (Margolin) Jan 23-27

- Cell cycle and cytokinesis
- Cell differentiation
- Sporulation

Week 4: Bacterial cell envelope (Konovalova) Jan 30 - Feb 03

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

Week 5: Bacterial secretion/molecular machines (Christie) Feb 06-10

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

Block II

Week 6: Bacterial gene expression regulation (De Lay) Feb 13-17

- Transcription and its regulation;
- Posttranscriptional regulation by small RNAs;
- Regulated proteolysis
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Week 7: Signal Transduction (Kaplan) Feb 20-24

- Two-component systems and chemotaxis
- c-di-GMP signaling and quorum sensing
- Multicellular development and biofilm formation

Week 8: Yeast Genetics II: genomic approaches (van Hoof) Feb 27- Mar 03

- High-throughput genetic analysis in yeast

Week 9: Protein folding and homeostasis (Morano, Hu) Mar 06-10

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

March 13 - 17 Spring Break (no classes)

Week 10: Wonderful world of parasites (Li) Mar 20-24

- Parasite life cycle and biology
- Genetic methods in parasites

Block III

Week 11: Microbial virulence – what is it, and how do we study it? (Lorenz (.50), Perez (.4)) Mar 27-31

- Defining and measuring virulence
- Genetic and genomic approaches to study virulence (fungal focus)

Week 12: Virulence mechanisms (Walker (.40), Krachler (.6)) Apr 03-07

- Approaches to study virulence (bacterial focus)
- Bacterial virulence mechanisms. Toxins.
- Adhesion and anti-adhesion therapies

Week 13: Microbiome (Krachler) Apr 10-12

- Microbial diversity;
- Microbiome;
- Methods for study microbial communities

April 13-14 MMG/MID retreat (no classes)

Week 14: Mechanisms for combatting microbial infections (Flores) Apr 17-21

- Antimicrobials and resistance
- Antivirulence approaches
- Phage therapy

Week 15: Antimicrobial immunity (Garsin) Apr 24-28

- Model host systems
- Innate immunity
- Vaccination and adaptive immunity