Skaggs Graduate School
at Scripps Research

# Microbiology Course Syllabus

## Course Information

Course Number: IMS 530
Course Name: Frontiers in Microbiology
Term: SPRING 2022
Start Date: April 4, 2022
End Date: June 10, 2022
Credits: 3.0

## Meeting Days / Times – please also see the Course Calendar in Canvas

Introductory Topic Lecture: Monday 1:00 – 2:30 pm PT / 4:00 – 5:30 pm ET
Outside Speaker Seminar: Wednesday 1:00 – 2:30 pm PT / 4:00 – 5:30 pm ET
Paper Discussion: Friday 1:00 – 2:30 pm PT / 4:00 – 5:30 pm ET

## Locations

CA Campus: Graduate Office Dining Room
FL Campus: C304

## Course Managers

please also see the 'People' section of the Canvas course

| Role | Last Name | First Name | Intranet Page Link |
|---|---|---|---|
| Co-Instructor | Hang | Howard | https://www.scripps.edu/faculty/hang/ |
| Co-Instructor | Racki | Lisa | https://www.scripps.edu/faculty/racki/ |
| Co-Instructor | Constantinides | Michael | https://www.scripps.edu/faculty/constantinides/ |
| Co-Instructor | Lasker | Keren | https://www.scripps.edu/faculty/lasker/ |

## Course Description

The Scripps Research Microbiology course will cover fundamental mechanisms in microbes (bacteria, fungi, archaea and parasites), their interactions with each other and host organisms as well as therapeutics. The range of topics will include microbial cell division, nucleic acid and protein regulation, intra- and inter-cellular signaling, metabolism, virulence mechanisms, microbiota functions,

commensal and pathogenic interactions with hosts, and development of therapeutics and resistance mechanisms.

## Class Format

The format of the course will involve lectures from Scripps Research faculty (Mondays), seminars from leading experts in each respective topic (Wednesdays), paper discussions/journal club of related publications for each respective topic (Fridays) and development of original research proposals (2-page and oral presentation) from the students. The students will be evaluated on their attendance and participation in the seminars, paper discussions and written summaries as well as development of original research proposals. The original research proposal must be different from the students own research or rotation projects.

## Program Learning Outcomes

By the end of the program, students will have accomplished these objectives:

PLO1: Original Research – graduate students are expected to develop the skills critical for generating high-quality research output. This would include absorbing, recalling, and contextualizing scientific knowledge, evaluating scientific information and data, creating testable hypotheses and investigating hypotheses, mastering scientific tools and techniques, displaying ethical behavior, and receiving and giving feedback.
PLO2: Communication – graduate students are expected to demonstrate the oral, written, and media skills to effectively communicate the impact of a study or a body of work to the greater scientific community and to the public at large using a number of methods.
PLO3: Critical Thinking – graduate students are expected to develop a self-directed process to analyze information, form opinions or judgments, and use this process to improve the quality of their scientific thoughts, navigate problems, and make informed decisions.
PLO4: Intellectual Curiosity – graduate students are expected to acquire the capacity to build their intellectual curiosity and demonstrate problem solving approaches that serve their professional growth and ability to impact a field.
PLO5: Career and Professional Development – graduate students are expected to develop a variety of transferable skillsets throughout their graduate experience, including management and leadership, inclusiveness, resilience, scientific rigor, collaboration, accountability, time management, teamwork, networking, and career planning.

For a detailed description of each outcome and specific success indicators, please refer to this web page: https://education.scripps.edu/graduate/doctoral-program/.

## Course Learning Outcomes

Upon completion of this course students will be able to:

CLO1: Understand fundamental cellular processes in microbes from cell division, gene and protein regulation to small molecule metabolism and signaling.
CLO2: Learn about inter-microbial and host interactions involvement in symbiosis and infection.
CLO3: Understand the significance and impact of microbial functions on host physiology and disease.
CLO4: Learn fundamental mechanisms of antibiotics, resistance mechanisms and development of novel anti-infective therapeutics.

CLO5: Acquire knowledge of techniques in the analysis of microbes such as microbiology, genetics, nucleic, protein and metabolite analysis methods.
CLO6: Identify specific experimental results; formulate them into important new questions; Design experiments to answer these questions and devise alternative approaches to each definitive conclusion. Paper/journal club discussion lectures will be designed to meet these criteria.
CLO7: Develop succinct presentation skills; describe the background, questions addressed, approach, conclusions, as well as strengths and weaknesses of scientific papers

## Assignments and Modules

Final grades will be determined as follows based on the points obtained in the following categories:

| **Assignment Categories** | **% of Grade** |
|---|---|
| General Assignments | 25 |
| Participation | 25 |
| Final Presentation | 50 |

The course is divided into the following modules:

### Module 1

| Module Name | |
|---|---|
| Introductory Lecture: Mechanisms in Microbes I – Lisa Racki | |
| Lecture Date | Description |
| April 4, 2022 | Microbial gene expression |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Mechanisms in Microbes I – Carol Gross (UCSF) | |
| Lecture Date | Description |
| April 6, 2022 | Microbial gene expression |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| April 8, 2022 | Microbial gene expression | General Assignments | TBD |

### Module 2

| Module Name | |
|---|---|
| Introductory Lecture: Mechanisms in Microbes II – Keren Lasker | |
| Lecture Date | Description |
| April 11, 2022 | Microbial cell division |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Mechanisms in Microbes II – Christine Jacobs-Wagner (Stanford University) | |
| Lecture Date | Description |
| April 13, 2022 | Microbial cell division |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| April 15, 2022 | Microbial cell division | General Assignments | TBD |

## Module 3

| Module Name | |
|---|---|
| Introductory Lecture: Mechanisms in Microbes III – Lisa Racki | |
| Lecture Date | Description |
| April 18, 2022 | Microbial metabolism/signaling |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Mechanisms in Microbes III - Dominique Limoli (University of Iowa) | |
| Lecture Date | Description |
| April 20, 2022 | Microbial metabolism/signaling |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| April 22, 2022 | Metabolism/signaling | General Assignments | TBD |

## Module 4

| Module Name | |
|---|---|
| Introductory Lecture: Mechanisms in Microbes IV – Keren Lasker | |
| Lecture Date | Description |
| April 25, 2022 | Microbial metabolism/signaling |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Mechanisms in Microbes IV – Amy Schmid (Duke University) | |
| Lecture Date | Description |
| April 27, 2022 | Microbial metabolism/signaling |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| April 29, 2022 | Metabolism/signaling | Special Lecture – Nina Salama (Fred Hutchinson Institute) | TBD |

## Module 5

| Module Name | |
|---|---|
| Introductory Lecture: Gram-positive bacteria pathogenesis – Howard Hang | |
| Lecture Date | Description |
| May 2, 2022 | Gram-positive bacteria pathogenesis |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Gram-positive bacteria pathogenesis - Aimee Shen (Tufts University) | |
| Lecture Date | Description |
| May 4, 2022 | Gram-positive bacteria pathogenesis |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| May 6, 2022 | Gram-positive bacteria | General Assignments | TBD |

## Module 6

| Module Name | |
|---|---|
| Introductory Lecture: Gram-negative bacteria pathogenesis – Howard Hang | |
| Lecture Date | Description |
| May 9, 2022 | Gram-negative bacteria pathogenesis |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Gram-negative bacteria pathogenesis – Jorge Galan (Yale University) | |
| Lecture Date | Description |
| May 11, 2022 | Gram-negative bacteria pathogenesis |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| May 13, 2022 | Gram- negative bacteria | General Assignments | TBD |

## Module 7

| Module Name | |
|---|---|
| Introductory Lecture: Mycobacteria pathogenesis – Howard Hang | |
| Lecture Date | Description |
| May 16, 2022 | Mycobacteria pathogenesis |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Mycobacteria pathogenesis – Sloan Siegrist (UMass – Amherst) | |
| Lecture Date | Description |
| May 18, 2022 | Mycobacteria pathogenesis |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| May 20, 2022 | Mycobacteria | General Assignments | TBD |

## Module 8

| Module Name | |
|---|---|
| Introductory Lecture: Microbiota-host interactions - Michael Constantinides | |
| Lecture Date | Description |
| May 23, 2022 | Microbiota-host interactions |

| Module Name | |
|---|---|
| Outside Speaker Lecture: Microbiota-host interactions – Ken Cadwell (NYU) | |
| Lecture Date | Description |
| May 25, 2022 | Microbiota-host interactions |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| May 27, 2022 | Microbiota-host interactions | General Assignments | TBD |

## Module 9

| Module Name | |
|---|---|
| Introductory Lecture: Antibiotics or Synthetic biology – Ahmed Badran | |
| Lecture Date | Description |
| May 30, 2022 | Antibiotics or Synthetic biology |

| Module Name | |
|---|---|
| Outside Speaker Lecture: - Chemical biology of Plasmodium parasites - Emily Derbyshire (Duke University) | |
| Lecture Date | Description |
| June 1, 2022 | Chemical biology of Plasmodium parasites |

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| June 3, 2022 | Antibiotics or Synthetic biology | General Assignments | TBD |

## Module 10

Assignments

| Due Date | Description | Category | Point Value |
|---|---|---|---|
| June 10, 2022 | Oral presentation and review of original research proposals | Final Presentation | TBD |

## Background Preparation (Prerequisites)

Bachelor's degree in science.

## Required Course Materials

| **Type** (e.g. Required, Useful to consult) | **Title** | **Author** | **Edition** | **ISBN** |
|---|---|---|---|---|
| Useful to consult | Bacterial Pathogenesis | Brenda A. Wilson, Malcolm Winkler, Brian T. Ho | 4th | 978-1-555-81940-8 |

## Expectations and Logistics

Attend seminars and ask questions. Prepare for paper/journal club discussions. Write and present excellent original research proposals.

## Class preparation

Review Bacterial Pathogenesis: A Molecular Approach, 4th Edition

## Attendance Statement

Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an "incomplete" for the course. If a student has to miss a class, they should arrange to get notes from a fellow student and is strongly encouraged to meet with the teaching assistant to obtain the missed material.

## Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others'

work and your own, ask the course professor who will give you clear guidance. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Graduate Program.

## Technology Requirements and Support

For issues related to Canvas, please contact the Graduate Office by email at: gradprgm@scripps.edu or by phone at: 858-784-8469.

## Course Grading

Grading is in accordance with the academic policies of the Skaggs Graduate School.

| Grade Point | Letter Grade | |
|---|---|---|
| 4.00 | A | Outstanding achievement. Student performance demonstrates full command of the course subject matter and evinces a high level of originality and/or creativity that far surpasses course expectations. |
| 3.67 | A- | Excellent achievement. Student performance demonstrates thorough knowledge of the course subject matter and exceeds course expectations by completing all requirements in a superior manner. |
| 3.33 | B+ | Very good work. Student performance demonstrates above-average comprehension of the course subject matter and exceeds course expectations on all tasks as defined in the course syllabus. There is notable insight and originality. |
| 3.00 | B | Satisfactory work. Student performance meets designated course expectations and demonstrates understanding of the course subject matter at an acceptable level. |
| 2.67 | B- | Marginal work. Student performance demonstrates incomplete understanding of course subject matter. There is limited perception and originality. |
| 2.33 | C+ | Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree. |
| 2.00 | C | Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree. |
| 0.00 | I | Incomplete is assigned when work is of passing quality but is incomplete for a pre-approved reason. Once an incomplete grade is assigned, it remains on student's permanent record until a grade is awarded. |
| 0.00 | P | Satisfactory work. Student performance demonstrated complete and adequate understanding of course subject matter. Course will count toward degree. |
| 0.00 | F | Unacceptable work/Failure. Student performance is unacceptably low level of knowledge and understanding of course subject matter. Course will not count toward degree. Student may continue in program only with permission of the Dean. |

| | | |
|---|---|---|
| 0.00 | W | Withdrew from the course with Dean's permission beyond the second week of the term. |

- All courses will be recorded and maintained in the student's permanent academic record; only courses that apply towards the degree will appear on the academic transcript. Non-credit or audited courses will not appear on the transcript.
- 4 core courses taken for a letter grade (pass = A or B for a core course)
- 2 elective courses taken pass/fail (pass = A, B, C for an elective)
- Because students are encouraged to take electives outside their area of expertise, a "C" letter grade is passing.