Course description: This course examines how animals co-exist with microorganisms. We will investigate the molecular mechanisms by which animal cells and associated microorganisms communicate, and how these communications affect the biology of the host and the structure of its associated microbial communities. The course is based on primary research literature, drawing on examples of different bacterial-host interactions in a number of model systems to illustrate basic principles about the molecular and cellular natures of these interactions. The course will emphasize critical reading of the literature and critical thinking. Students will be required to complete regular homework assignments on the readings. During the course, students will develop original research proposals that address unanswered questions in the field, using experimental approaches covered in the course, which they will present orally and submit as final written research proposals.

Learning Objectives:
• Gain a sophisticated understanding of the emerging field of bacterial-host interactions in biology.
• Gain a working knowledge of modern molecular genetic experimental approaches using model eukaryotes and prokaryotes and gnotobiology.
• Become a critical reader of scientific research articles in the biomedical literature.
• Develop the ability to formulate hypotheses about the mechanistic bases for biological phenomena.
• Become proficient at designing experimental strategies to test hypotheses about the mechanistic bases for biological phenomena.
• Learn to give a concise and compelling oral presentation that identifies a scientific question, proposes a hypothetical answer to this question, and lays out a novel strategy to test this hypothesis.
• Learn to write a compelling research proposal that identifies a scientific question, proposes a hypothetical answer to this question, and lays out a novel strategy to test this hypothesis.

Course website: All course material will be available through Canvas (canvas.uoregon.edu).

Assigned reading: For each topic covered, the assigned reading will consist of a combination of current review articles by leaders in the field and impactful original research articles. These will be posted, organized by week, in Canvas.

Homework assignments: Homework questions on the assigned reading for each class period will be posted as quizzes in Canvas. These will consist primarily of multiple choice questions that encourage students to read the assigned material carefully and critically. The homework questions will be due at 1:45 PM before the start of class and will typically be posted two days before class. Students may save their answers and return to the questions as many times as they wish, but they must submit their answers by 1:45 PM on Canvas. Students are permitted to discuss the reading material with each other, but their answers to the homework questions must be their own independent work.

Lecture notes: The course format will be a combination of lectures, class exercises, and discussions. I will post my lecture notes on Canvas AFTER the lecture. These notes are NOT a substitute for
coming to class. If you must miss class, it is your responsibility to obtain detailed notes of the class discussion from a classmate.

Office hours and communications: My office hour will be held on Mondays 2:00-3:00 PM in Klamath 249C. If you are not free at this time, you may schedule an appointment to meet with me at another time. You may also email me with questions or comments (kguilem@uoregon.edu). Please send messages from your uoregon account or Canvas and include BI433 in the header. Your email correspondences are an extension of your class participation, so please maintain a professional tone. I will generally respond to email messages within one or two days.

Students with disabilities: The University of Oregon is working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Grading policy:

Homework: 30%. There will be 11 homework assignments, which will be available as quizzes on Canvas. No late homework assignments will be accepted, but your lowest homework assignment score will automatically be dropped when calculating your grade.

Proposal assignments: 50%. Each student will be required to write and present an original research proposal that uses approaches covered in the course to address an unanswered question in the field of bacterial-host interactions. Students will develop their proposal throughout the course, as indicated on the class schedule. The components of this proposal development process will be contribute to the final course grade as follows:

Abstract draft, abstract revision, experimental design draft: each 5%
Oral presentation: 15%
Written research proposal: 20%

Class participation: 20%. Class participation is crucial for the success of this course. Students will be expected to come to class having read and thought about the assigned material and to participate in all class activities. Much of the assigned reading is recent and by no means accepted dogma. Students should read the papers critically and continually question how the authors derive their conclusions, what assumptions they made, and what future experiments could support or refute their conclusions. Such critical thinking will be required for the original research proposal.

Attendance and class participation: 5%
Written feedback on group member abstract, experimental design, and oral presentations: each 5%

Grading for undergraduates versus graduate students: Undergraduate and graduate students will be graded separately, based on different expectations of their background knowledge in scientific approaches. The expectations for the research proposal and scope of the project will be different for the undergraduate and graduate students. The expectation for the undergraduate research proposal will be that the student describes a single experimental strategy to address an unanswered question. The graduate students will be required to write a proposal that employ several independent approaches to address a well-defined research question, similar in scope to a professional predoctoral research fellowship proposal. The graduate students will be expected to lead group discussions in their assigned proposal writing groups, which will constitute part of their class participation grade.

Academic integrity: All students will be expected to adhere to the University’s guidelines on academic integrity as outlined in the Student Conduct Code:
http://studentlife.uoregon.edu/programs/student_judi_affairs/conduct-code.htm
Students are encouraged to discuss class material with one another, including the reading and class exercises. However, all submitted written work, including answers to homework questions and components of the research proposal, must be the original work of each student. Proper citation of sources is required in all written work and oral presentations.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading Material</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept 25</td>
<td>Motivations for studying microbiota: the Disappearing Microbiota Hypothesis</td>
<td>Review article: Blaser and Falkow, 2009</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sept 27</td>
<td>Promise of translating knowledge of microbiota</td>
<td>Review article: Ozdemir, et al., 2018</td>
<td>Homework 1 due 1:45 PM</td>
</tr>
</tbody>
</table>
| 2    | Oct 2   | Bacterial modulation of animal morphogenesis (squid model)            | Review article: McFall-Ngai, et al., 2013  
Research article: Koropatnick, et al., 2004 | Homework 2 due 1:45 PM |
| 2    | Oct 4   | Bacterial modulation of animal metabolism (fly model)                 | Review article: Leulier, et al., 2017  
Research article: Matos, et al., 2017 | Homework 3 due 1:45 PM |
| 3    | Oct 9   | Bacterial modulation of animal behavior (mouse model)                | Review article: Sampson and Mazmanian, 2015  
Research article: Hsiao, et al., 2013 | Homework 4 due 1:45 PM |
| 3    | Oct 11  | Bacterial modulation of animal immunity  
Proposal writing overview and brainstorming specific aims | Research article: Atarashi, et al., 2011 | Homework 5 due 1:45 PM |
| 4    | Oct 16  | Methodologies for analyzing microbial communities                     | Proposal abstract and specific aims due 1:45 PM  
Review article: Lozupone, et al., 2012 |            |
| 4    | Oct 18  | Dietary determinants of microbiota assembly                            | Review article: Turnbaugh, 2017  
Research article: Turnbaugh, et al., 2008 | Homework 6 due 1:45 PM |
| 5    | Oct 23  | Host genetic determinants of microbial community assembly             | Review article: Goodrich, et al., 2017  
Research article: Goodrich, et al., 2016 | Homework 7 due 1:45 PM |
| 5    | Oct 25  | Bacterial determinants of microbial community assembly                 | Review article: Dantas, et al., 2013  
Research article: Goodman, et al., 2009 | Homework 8 due 1:45 PM |
| 6    | Oct 30  | Pathologic shifts in microbial communities: invasion by pathogens      | Review article: Stecher and Hardt, 2011  
Research article: Winter, et al., 2010 | Homework 9 due 1:45 PM  
Revised abstracts and specific aims due 1:45 PM |
| 6    | Nov 1   | Proposal writing workshop: refining specific aims and brainstorming experimental design | Feedback (using template) on group member abstracts and specific aims due Wed Nov 2 at 9 PM. |            |
| 7    | Nov 6   | Microbiome-mediated therapies against enteric infection                | Review article: McKenney and Pamer, 2015  
Research article: Buffie, et al., 2015 | Homework 10 due 1:45 PM  
Outline of experimental design due 1:45 PM |
| 7    | Nov 8   | Proposal writing workshop: refining experimental design and outcomes  | Feedback (using template) on group member experimental design due Wed Nov 7 at 9 PM |            |
| 8    | Nov 13  | Microbiome-mediated therapies against malnutrition                    | Review article: Blanton, et al., 2016  
Research article: Subramanian, et al., 2014 | Homework 11 due 1:45 PM |
| 8    | Nov 15  | Research proposal oral presentations: 533 students                    | Review article: Thaiss and Elinav, 2017  
Feedback (using template) on oral presentations in your group due Nov 15 by 11:55 PM |            |
| 9    | Nov 20  | Research proposal oral presentations: 433 students group 1           | Feedback (using template) on oral presentations in your group due Nov 20 by 11:55 PM |            |
| 9    | Nov 22  | Thanksgiving holiday: no class                                       | Feedback (using template) on oral presentations in your group due Nov 27 by 11:55 PM |            |
| 10   | Nov 27  | Research proposal oral presentations: 433 students group 2           | Feedback (using template) on oral presentations in your group due Nov 29 by 11:55 PM |            |
| 10   | Nov 29  | Research proposal oral presentations: 433 students group 3           | Feedback (using template) on oral presentations in your group due Nov 29 by 11:55 PM |            |
| 11   | Dec 5   | Written research proposals due at 5 PM Wednesday December 5          |                                                                           |            |