Microbiology: Syllabus

I. Instructor & GEs

- **Instructor**: **Avinash D Singh Bala**, Ph.D. (avinash@uoregon.edu)
  - *Office Hours*: Wed 2 to 3 PM; *Location*: Esslinger 138
- **GEs**
  - **Dom Granville** (dgranvil@uoregon.edu)
    - *Office Hours:* Wednesday, 7:30-8:30am; *location* TBD
  - **Avika Sharma** (avikas@uoregon.edu)
    - *Office Hours:* Friday, 10:00-11:00am; *location* TBD

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II. Lecture Details

When: 08:30 AM, Wed and Fri

Where: 123 Pacific

This is an in-person course: that means that, unlike asynchronous online, or ASYNC WEB courses, we will meet during scheduled class meeting times in PAC 123. This course emphasizes in-class engagement. Some classes will be partially flipped - short videos will uploaded to Canvas *for viewing **prior** to class,* while class time will be used for consolidation of information and concepts, as well as in-class assessments and discussion based on these videos. Content videos will be ≤20 min. Lecture summaries, notes, videos and relevant readings will all be available on the Canvas page for each lecture.

III. Course Description

The discovery of microbes by Anton van Leeuwenhoek captured public interest, because the sudden realization that teeming hordes of creatures, too small to see, exist everywhere including inside and on our bodies, was the stuff of nightmares. The discovery sparked a technological burst, where people peered into home-made microscopes to see this omnipresent life. They found microbes everywhere, at a scale that hadn't been considered before! Many brilliant scientists helped us learn about microorganisms – their varied structure and biology, that they don't appear out of thin air, and that they impact our lives directly, by changing the earth to make it more habitable for aerobes like us, by fermenting foods like naan, sauerkraut, wine or cheese, or by causing disease. This course introduces students to the cell biology, physiology, evolution and health impact of these various microorganisms.

IV. Course Details and Learning Objectives

The course will be organized into 4 modules detailed below, based largely on textbook content, and other readings that are also online and available for free. However, significant parts of the textbook will not be covered: please pay careful attention to the Canvas '**Schedule and Readings**' page to make sure that your energy, time and attention are focused on material that we will be covering. Students will learn about classical experiments as well as recent discoveries to gain an appreciation for the diversity and elegance of microbial life strategies, the role of microorganisms in global processes, and microbial interactions with macroorganisms. We will explore how the scientific process is applied in microbiology and become familiar with modern experimental methods for studying microorganisms in the laboratory and in their natural habitats.

Course Modules

Part 1: Microbial Cell biology

This section introduces microbes and forms the foundation for the rest of term.

- Introduces the structure and function of microbial cells, and the practical applications of that knowledge.

- Students will learn how microbes reproduce, how populations grow, and how this growth can be controlled.
- The simpler genetic structure of bacteria lends itself to genetic analysis, and has helped elucidate function and behaviors of microbial species, including their ability to communicate, move, and sense their environment.

Part 2: Acellular Microorganisms

Not all microorganisms fit with the cell theory of life – some make do without most of the mechanisms of living cells!

- What are acellular microorganisms, and how many kinds do we know about?
- How can viruses be classified? The easiest way is based on how their genome is encoded and replicates
- Prokaryotic viruses, and bacterial defenses against viral infections
- Eukaryotic viruses

Part 3: Physiology and functional diversity

The third part of the class focuses on the functional and metabolic diversity of microorganisms.

- We will study the metabolic strategies used by different classes of microorganisms that live in remarkable environments and use remarkably limited resources – including light and different inorganic compounds.
- You will learn how these different strategies complement one another to structure microbial communities.
- These strategies for existence in some amazing environments, using some amazing biochemistry, has much larger implications: we will take a short look at biogeochemical cycles, where microorganisms create regional and global effects.

Part 4: Microorganisms and Health

The final portion of the class focuses on pathogens and their impact.

- How do microorganisms cause disease?
- What methods have we developed to deal with microbe-caused diseases?
- Microorganisms and epidemics.

Prerequisites

The *prerequisites for this course are BI214 or BI252*. The course assumes knowledge of biologically important macromolecules and familiarity with basic cellular processes such as DNA replication, transcription, translation, and regulation of gene expression. To refresh your understanding of the required basics, please read appendices A - D prior to term.

Student Workload and Commitment

One undergraduate *credit* hour equals 30 *real* hours of student work, typically 10 hours in class and 20 hours outside of class. This is a 3 credit course which means you will be spending a significant amount of time in preparing for class, review, self-study and learning

through explorations and assignments (see UO Student Handbook, section Academic Success). Viewing video content, diligent attention to reading material, participation in class discussion and activities, and using opportunities to interact with instructional staff are all critical to your chances of success in this class.

Course materials

Textbook & iClickers are required.

Textbook: Microbiology (an OpenStax textbook), 2020.
https://openstax.org/details/books/microbiology

iClickers: these in-class feedback tools are a vital component of the course, and will be used to assess participation and attendance. Please remember to bring one to class each day and to register these on Canvas (*Canvas→iClicker→iClicker Registration*); in a large class, it is not possible to manually add attendance and participation grades for individual students.

Other course resources

Website. Canvas (canvas.uoregon.edu) will be used to post all announcements, lecture notes, additional readings, media, and practice problems. It will also be the dominant method for contacting GEs and the instructor, for discussions with peers, and for completing assignments. Please ensure browser compatibility with UO requirements.

Lecture content. Weekly content will comprise in-class lectures with slideshows, and short (up to 20 minute) videos**. All content will be located** on the corresponding Lecture pages in the **Modules** part of the course site on Canvas.

Lecture notes. Lecture notes, containing content likely to be covered in each lecture will be uploaded prior to class, These notes are merely an outline of what is to be discussed in class and during pre-class videos; they are not a substitute viewing lecture materials. After the lecture, notes will be updated with iClicker slides, on-screen drawings, etc.

Readings and media: Additional materials required for the class, if any, will be posted with the lecture notes on Canvas. Quizzes, discussion topics, and problem sets will also be posted each week to help guide learning and self-assessment in preparation for weekly quizzes.

V. Course Policies

Accessibility

The University of Oregon is working to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please let me know as early as possible, in person or via email. For accommodations to aid in your participation, please contact Accessible Education Services as early as possible, in 164 Oregon Hall, by phone at (541) 346-1155 or uoaec@uoregon.edu. I welcome the chance to help you learn, and will work with you, even in this unusual term.

Academic integrity

All students are expected to conform to the Student Conduct Code. Unless otherwise instructed, or for group projects, assignments are to be completed alone. Please note that Instructors are required to report academic misconduct with the Director of Student Conduct and Community Standards. Students are encouraged to discuss class material with one another. However, all submitted work including the weekly homework and the writing assignment must be the original work of each student. Distribution of course materials, including exams, problem sets, quizzes, outside of those enrolled in the Spring 2020 Microbiology BI330 class is strictly prohibited.

Out of Class – Office Hours, and Email Etiquette:

Instructor and GEs will be available during posted Office Hours, and will make accommodations for students whose schedules preclude office hour attendance. The best method of holding office hours in the Spring 2023 term will be determined by our collective experience, but in general, there will be in-person office hours, and at least one hour of GE availability in the evenings, via Zoom. In general, longer questions are best asked live, where comprehensive and specific answers are possible.

Emails: We will respond to emails as expediently as possible during working hours (M-F, 9 to 5), and will respond to the majority of emails within a working day. **In general, please send emails via Canvas, and include BI330** in the subject line. Emails to instructors are an academic interaction, must therefore be respectful and professional in tone. Students are assigned to a GE, to whom emails must be addressed.

Questions requiring comprehensive (or just long) answers will be answered during office hours.

VI. Grading

Grading will be based on a set of assessments worth 100 points. All students will have equitable access to address missed in-class activities and assessments. As detailed below, some of the assignments will be dropped to give you the best chance for a higher grade:

1. 20 points: 7 weekly in-class or Canvas Quizzes. Lowest 2 will be dropped.
2. 60 points: 3 exams (Wk 4, Wk 7, Wk 10). Each is worth 20 points.
3. 10 points: In-class group activities (groups must upload to Canvas)
4. 10 points: Attendance and engagement, assessed using iClickers

Higher-stakes Assessments

Weekly Canvas Quizzes (weekly; 20 pts = best 5 of 7) will be administered over Canvas or on Fridays in class. Weekly tests will cover material from previous week's lectures, and will be higher order learning assessments, and may require longer answers. Make-up tests will not be offered, since the 2 lowest scoring quizzes will be dropped - missed quizzes will grade a 0, and will count among your dropped quizzes. Quizzes will be posted on Friday afternoons at 1:01 PM, and must be completed in 24 hrs (Sat 1:00 PM).

Exams (60 pts total; 20 pts each) : There will be 3 in-class exams lasting 70 min each, during Weeks 4 (Wed 4/26) , 7 (Wed 5/17) and 10 (Fri 6/9). Weekly problem sets will help

you prepare for higher order assessments like the Weekly Quizzes and Exams. There will be a 1-hr GEs-run review session on the Friday prior to each exam. Exams will test your ability to apply knowledge and to synthesize concepts learned throughout term. Students who miss any *one* of the exams can take a makeup exam (cumulative) on the day and time at which the Final Exam was scheduled. Students who miss *more than one* exam would have missed a significant proportion of the assessments of the class, and should consider taking the class at another time (also see '**Absences'** policy below).

Lower-stakes assessments

These in-class assessments are based on (1) iClicker responses, and (2) in-class group discussions. None of these will be counted during Lecture 1, or during exam days. Of the remining **16 lectures**, the **top 12** assessments below will count for credit. All students are expected to participate in learning activities by sharing ideas and contributing to the learning environment. This entails preparing, following instructions, and engaging respectfully and thoughtfully with others. Although this is a large class, we will make every effort to make it interactive and create ways for active learning with peers.

In-class activities (15 points)

In-class discussions (10 pts): During each lecture, we will devote time to activities in small groups (5 people each). Groups will be formed during week 1. Each group will upload their answers or discussion outcomes to Canvas for the grade. Only one upload is required per group. Group members who were absent from class will not receive credit for this activity.

*iClicker Attendance and Engagement***.** (10 pts): . This grade will reflect responses during iClicker-based questions during class During lectures, you will be asked to respond to multiple-choice questions during class. You must respond with clicks to more than 3/4th of the possible opportunities during each lecture to get credit for participation.

Ungraded activities

Practice Problem Sets will not be graded by instructors, BUT peer-reviewing answers to problem sets is encouraged, and is a good way to earn extra credit. Peer-reviewing another student's practice problems is also an excellent wat to review material twice: once during completion, and next during review. Problem sets are composed of example questions to prepare you for higher-order assessments in quizzes and exam. Answers to problems will be posted the following week, and any clarifications addressed during office hours.

Pre-exam review: Prior to each exam, there will be an hour-long review session hosted by GEs. Location and timing TBD.

Course Grade

Letter grade assignments will approximate standard cutoffs (90% A-, 80% B-, 70% C- (also P)…), but will ultimately be determined by gaps in the grade distribution. Grade totals displayed in Canvas through term are a good estimate of your current performance at any time. NOTE: Typically, grades are not curved. However, I reserve the right to relax (but not stiffen) this criterion for final grade assignments, depending on the actual distribution of scores in the class.

What about extra-credit? Consistent effort and application will be awarded extra-credit. There are multiple opportunities to earn extra credit in this class:

- Completing the 'Welcome' quiz during week 1 (0.5% points)
- Completing all weekly quizzes with a grade of 50% or higher (0.5% point).
- Peer-review of others' Problem Set answers (max 1% points)

Absences

This class has an equitable, reason-neutral policy for a small number of absences. Students can miss up to 4 classes through the term without missing any in-class assessments (no need to email your GE or instructor if you are unwell for a class). While quizzes are online, only the top 5 will count towards the quiz grade, so students may miss up to two. Exams are required. If you need to miss *one* of the exams, you can take a cumulative make-up exam on the day and time the Final Exam was scheduled. We know our UO community will still be navigating COVID-19, and some students will need to use some of their four absences to isolate and rest if they get COVID. The absence policy was designed with this in mind, so please be sure to use your absences with forethought and care so the opportunity is available for you if any absences are needed. Students with COVID are encouraged to seek guidance and resources at UO's COVID-19 Safety Resources webpage. Any absences beyond those outlined above will impact your class participation score and your ability to continue in this course. Students who need extended absence (more than 4 consecutive classes), or miss more than one of the exams should contact the instructor or academic advisors to get support from the Dean of Students care team, and seek advising help for options like grade-change , withdrawals, incompletes, etc.

VII. Technology

1. **iClickers**: these in-class feedback tools are a vital component of the course. Please remember to bring one to class each day; in a large class, it is not possible to manually add attendance and participation grades for individual students.
2. **Canvas site**: this will be the primary source of course content, as well as the main mode of communication. Please do ensure that your browser and computer can access Canvas content prior to class. There will be an extra-credit 'Welcome to BI330' quiz, which is recommended for all students, to be sure that quiz content is accessible to all.
    a. *Website.* Canvas (canvas.uoregon.edu) will be used to post all announcements, lecture notes, additional readings, media, and practice problems. It will also be the dominant method for contacting GEs and the instructor, for discussions with peers, and for completing assignments. Please ensure browser compatibility with UO requirements.
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d. *Readings and media:* Additional materials required for the class, if any, will be posted with the lecture notes on Canvas. Quizzes, discussion topics, and problem sets will also be posted each week to help guide learning and self-assessment in preparation for weekly quizzes.