CMMB 563 Course Profile

The course description and Fall 2019 syllabus of Cellular, Molecular and Microbial Biology 563, **Microbial Diversity**, can be found here.

Generally offered in: Fall semesters

Prerequisite(s): CMMB 343 or consent of the Department.

Antirequisite(s): None

Interview with Dr. Peter Dunfield

How would you describe what this course is about?

Microbiology has tradionally focused on the study of model microorganisms, most notably *E. coli*, which has provided great insight into genetics and biochemistry. However, we now know that there are between ten million and one trillion species of bacteria and that many diverge from those model organisms. The vast majority (99.9%) of them cannot be grown using regular culture techniques. That leaves us with questions like **"What is the scope of the diversity of microbes?"**, **"What do uncultured microbes do in their environments?"**, **"How can we study these organisms if we cannot culture them?**". These are the questions asked throughout this course. A lot of what we cover is methods-based; describing methods that can be used to determine which microbes are in a certain environment and what those microbes are doing. Most of these methods are DNA based so we cover a lot of environmental genetics and environmental genomics.

What are the main skills or concepts you think are important for students to take away from this course?

There is **no lab component to this course** but we do in-class bioinformatics exercises. In those exercises, we explore **microbial genomes databases** as well as **databases for understanding microbial species diversity**. That allows students to get a hands-on expertise on using those databases. I strongly wish for students to develop their **soft skills**, specifically their presentation and writing abilities. To accomplish that, there is a writing component to the course and each student is to prepare and deliver a presentation at some point in the semester.

What you think students struggle the most with in CMMB 563?

Students typically do very well with their soft skills demonstrations, delivering great presentations. Some have trouble with the exams which are **solely made of long-answer and short-answer questions (no multiple choice)**. Having to take care of both the content and organization of their answers, as both are assessed, under time pressure can be a challenge for students.

What types of notes do you provide?

I provide slides that have most of the information on them. Students should not have to take a great amount of notes during class though coming to class is still very important and valuable. I also provide review papers on the topics we are covering.

There is no required textbook for this class, what are other texts you would suggest students students use for support?

Since this field is growing at a rapid pace, there is **no textbook** that is able to adequatly keep up with its developments. Therefore, my lecture notes and the review papers I provide are the resources students are to use.

What are things students can do to be successful in this class besides attending lectures?

I definitely encourage doing the suggested readings. In this class, there are assigments on the bioinformatics exercises, there is a term paper and there is often a take-home portion to the final exam. **Time management** is critical to meet the deadlines and do well on the various assignments throughout the term.

Are there sets of practice questions provided on a certain basis?

About a week before exams, I upload **sample exams** so students have an idea of what I've asked in the past. I also provide **sample term papers**, they are submissions I really liked of previous students, again to give students an idea of what I'm looking for.

What does the term paper entail?

It is in the **form of a grant proposal**; laying out how you would go about solving a certain problem, supporting your claims with existing research findings. That format allows students to practice their critical thinking skills rather than simply summarize research papers. Examples of topics are provided but students get to choose the subject of their paper. The topic simply has to have a diversity aspect, students have chosen a wide variety of subjects in the past including environmental topics like bioremediation and medical topics like gut microbiota. They start working on their paper from the start of the term and to ensure they are putting in work towards their final project, they have to submit a one-page-long **letter of intent** about a month into the class. In the letter of intent, they are to present an area of microbial ecology that is of interest to them, research that has been done within it and how they would advance it. That provides a basis for their term paper for which a template is provided.

What can students do to prepare for the in-class exercises?

Reviewing the practice examples covered during lecture is very helpful. So is practicing with the take-home example questions that are not marked and for which answers are provided in lecture. During the exercises, students are **allowed to dicuss their problems in groups** but everyone gets an individual, slightly different, exercice.

What part of the course are you most looking forward to teach?

I really enjoy the hands-on portions of the class, the exercises. In the past, I've asked each student to **bring an environmental sample to class** that I then get sequenced. Afterwards, we analyze the data from the samples in class and it's all a great amount of fun. If time allows, we do assignments on that activity.

Are there any classes you would recommend students to take afterwards if they greatly enjoyed CMMB 563?

The most related courses I can think of at the moment are **CMMB 543**, Environmental Microbiology, and **CMMB 545**, Petroleum Microbiology *(the BSA has also completed a course profile on CMMB 545)*. Those courses tend to focus more on the processes that take place in the environment while my class focuses on the how we study those processes and the microbes that perform them.

This interview transcript was edited for clarity and brevity.