CMMB 461 Course Profile

The course description and Fall 2019 syllabus for CMMB 461 (**Functional Genomics and Molecular Networks**) can be found here.

Generally offered in: Fall semester

Prerequisite(s): Biology 331

Antirequisite(s): None

Answered by Dr. Gordon Chua

In your own words, can you give a brief summary about what this course is about?

CMMB 461 is an introduction to the field of functional genomics, covering genome sequencing platforms and technologies for high-throughput determination of gene function. DNA is the code of life and **the goal is to understand how each one of us is phenotypically different from our unique nucleotide (ACGT) sequence**. In order to accomplish this task, we have to sequence the genome and identify the genes that determine our phenotypes or traits.

The sequence of the human genome was completed in 2001 at a cost of over 3 billion dollars. Now, it only cost less than a $1,000 to sequence the human genome, so what are the advances in sequencing technologies that accomplished this. **Once we identify the genes, how do we figure out their functions?** Gene function can be determined by various ways including how, when and where the mRNA and protein of a gene is expressed, what type of interactions (physical and genetic) occur and what is the phenotypic consequence when gene function is perturbed. **Most of the course covers genomic technologies that can use these assays to determine the function of all the genes** in the genome simultaneously. For example, transcriptomic platforms can determine the expression level of every type of RNA encoded by the genome in a single experiment while proteomic platforms accomplish the same with proteins.

The outcomes of these genomic technologies are the generation of vast amounts of data and knowledge on how genes and other macromolecules in the cell (RNA, proteins, lipids and metabolites) interact with one another in complex biological networks to produce a specific cellular phenotype. **The course is taught in a methodology-based approach** to increase fundamental knowledge and concepts in genomics, molecular biology and genetics.

What is the main skill you want students to take away from this course?

Students should acquire fundamental knowledge and concepts in current functional genomic approaches and their significant contribution to a systems level of understanding of the cell. Also, students should **gain skills handling and analyzing large scale microarray data,** as well as learning how to critically read and analyze a scientific paper on functional genomics.

What aspect of the course do you think students struggle with the most?

Most of the **course material is new to students and requires a decent background in molecular biology and genetics**. Students that have taken the course prerequisite (BIOL 331) two to three years ago and no other CMMB courses may need to spend additional time and effort reviewing the fundamentals in molecular biology and genetics to grasp a good understanding of the material.

What can students do to be successful in this course besides attending lectures?

There is a considerable amount of material for the course and almost all of it is new. Therefore, it is crucial to keep up with the material and approach the instructor if there are any questions. Also, **the learning objectives of each topic are a good guide of what the student needs to know** and a sample of the midterm and final exam with the rubric are posted on the course website.

Does this course have a lab or tutorial component?

No, there is not.

What should students expect from the laboratory component of the course?

Although there are no labs or tutorials for the course, **there are two take-home assignments worth a total of 30% of the course.**

(1) The first assignment involves c**omputational analysis of DNA microarray data.** Students learn how to handle, analyze and interpret large scale microarray data using clustering, gene set enrichment and DNA motif searching algorithms.

(2) The second assignment involves **the critical reading of a scientific paper covering a functional genomic topic**. Students are asked to answer several questions to test their understanding of the assigned paper including detailed explanations of selected figures.

What do you think is the most effective way that students can prepare for an examination in the course?

Attend all lectures, keep up with the course material and ask the instructor if not sure. Because most of the material is new, and **there is no textbook for the course**, it is likely challenging to learn the material on your own.

Do you have any stand-out memories while teaching this course?

Comments from past students that they appreciated the interesting material and the way it was taught to understand the applications of the functional genomic platforms in real life examples and where the field is going in the future. **For some students, the course was very useful to them when they went on to do research in graduate school** and in the area of molecular biology and genetics.