

## **BASIC INFO AND SYLLABUS (2018)**

**LECTURER:** Tim S. Baker, Natural Sciences NSB 4-105, 534-5845, tsb@ucsd.edu

**ADMIN. ASSIST.:** Robyn Swanland: Pacific Hall 6223B, 534-4466, rswanland@ucsd.edu

**WHERE & WHEN:** Solis 104; Tue/Thu 11:00am-12:20 pm; April 3 through June 12, 2018.

### **COURSE GOALS**

This course gives a broad introduction to the structural biology of viral pathogens. Viruses, which are sometimes referred to as 'infection nano-machines', are the subject of intense interest in the scientific, medical, and agricultural communities in large part owing to their direct impact on human health, the food supply, and environment, but also because they provide an outstanding means to explore and understand fundamental biological processes.

Virus structure has evolved to facilitate all stages of the viral life cycle, beginning with recognition and binding to host cell receptors, uptake, genome release, replication, assembly and maturation of progeny viruses, budding/lysis/release, transmission from host to host, and host defense mechanisms (*e.g.* immune recognition). Hence, structure lies at the heart of understanding the mechanisms by which viral nano-machines infect cells.

The composition and basic structures of viruses will be discussed. This will include viruses that are deemed simple (*i.e.* spherically or helically symmetric) to those that are complex or pleomorphic. Overviews of some of the primary methods by which structural information on viruses is derived will be given and include transmission electron cryo-microscopy, three-dimensional image reconstruction, electron cryo-tomography, and X-ray crystallography.

### **GRADING**

The course includes two midterms (150 points each) and a comprehensive final exam (300 points) and five or six homework assignments (totaling ~75 points).

The eight students in **CHEM 264** and **BGGN 264** with the highest cumulative score on the two midterm exams will be offered the choice to give an oral presentation **in place of or in addition to the final exam**. These talks are scheduled during the last four lecture periods of the course. **Every student in the class** is expected to attend each of these eight oral presentations and fill out an evaluation sheet in class immediately following each presentation. Each of the first six completed evaluation forms will receive **6 points** credit towards the course grade. Bonus points will be awarded to those students who attend 7 or 8 presentations and turn in complete critiques for those presentations. More details about the oral presentations and the critiques will be given sometime soon after the second midterm exam.

There are **NO MAKE-UP EXAMS** in this class. Only your best midterm exam score will count toward your total points for the course.

### **CLASS HANDOUTS AND OTHER MATERIALS**

Pre-lecture PowerPoint presentations will be posted as PDF files on the UCSD TritonEd website at least 12-15 hours before class and a final version will be posted generally within a few hours after each class. This should reduce the need to take detailed notes during lecture and allow you to listen carefully and concentrate on understanding the principles being presented. Most announcements, including any required homework assignments, will be included in the PowerPoint presentations and/or posted on TritonEd. **Note: each student is responsible for checking all announcements and completing homework assignments on time.**

In addition to the PowerPoint slides, supplementary reading materials will be posted as PDF documents on the class TritonEd web site. These provide important enhancements to the lectures and are intended to provide a deeper understanding of the topics covered and discussed in lecture. Material presented in class lectures will be the **primary** source for formulating midterm and final exam questions.

**SYLLABUS (Tentative Topics and Schedule for 2018)**

Date(s)	Lec #	Topic(s)
Apr 3 Apr 5	1,2	Course introduction and overview; The virus life cycle; Classifications of viruses; Virus composition; Principles of protein primary (1°), secondary (2°), super-secondary, tertiary (3°), and quaternary (4°) structure; Virus composition, size, and mass; Virus morphology and symmetry
Apr 10 Apr 12 Apr 17	3-5	Virus structure: Principles of icosahedral symmetry; Triangulation symmetry; Quasi-equivalence Viruses with helical and mixed symmetries; Pleiomorphic viruses Naked (non-enveloped) versus enveloped viruses DNA versus RNA viruses Genome organization
<b>Apr 17</b>		<b>Optional help session to prepare for midterm exam #1</b>
<b>Apr 19</b>		<b>Midterm #1 Exam (150 pts) – Covers material through lecture #5 (April 17)</b>
Apr 24 Apr 26 May 1 May 3 May 8	6-10	Virus structure determination: Basics of transmission electron microscopy (TEM) Specimen preparation and TEM of viruses 3D image reconstruction of viruses X-ray crystallography of whole viruses and viral components; VIPER database Cryo-electron tomography of viruses
<b>May 8</b>		<b>Optional help session to prepare for midterm exam #2</b>
<b>May 10</b>		<b>Midterm #2 Exam (150 pts) – Covers material through lecture #10 (May 8)</b>
May 15 May 17	11-12	Virus assembly and maturation
May 22	13	Virus attachment, entry, and genome delivery
May 24	14	Virus budding, exit, and transmission
May 29	15	<i>Oral presentations by CHEM 264 or BGGN 264 students</i>
May 31	16	<i>Oral presentations by CHEM 264 or BGGN 264 students</i>
Jun 5	17	<i>Oral presentations by CHEM 264 or BGGN 264 students</i>
Jun 7	18	<i>Oral presentations by CHEM 264 or BGGN 264 students</i>
<b>Jun 8</b>		<b>Optional help session to prepare for final exam</b>
<b>Jun 12</b>		<b>Comprehensive final exam (300 pts)</b>

**OFFICE HOURS:** Tuesday and Thursday 12:40-1:40 pm in NSB 4-105

If you can't make either of these office hour times, contact Tim Baker or Robyn Swanland to set up a different appointment time.

**FINAL (IMPORTANT) NOTES**

- Lectures begin **promptly** at 11:00 a.m. and end as close to 12:20 p.m. as possible to maximize the learning experience of all participants. The time allotted to cover concepts that are likely new to most students is very limited. Being seated and ready to proceed at 11:00 a.m. sharp will minimize disruptions and be appreciated by all.
- As obvious as it sounds, come to class well prepared. For example, complete any assigned homework or supplementary reading and be ready with questions, especially if something from a previous lecture or in the class notes needs clarification.
- Out of common courtesy to others in the class, please turn off all electronic devices (e.g. cell phones, iPhones, iPods, iPads, cameras, etc.) that are **NOT** used for note taking during class.