Week 1:

Sep 9: Why do we have circadian rhythms?

Start Coursera course by Martha Merrow and Till Roenneberg. This should be completed by Week 6. Audit the course – no need to apply for the certificate.

Sep 11: What makes a strong research plan?

Papers:

My summary of this method:
1. What is the research question?
   a. Is this a question no one knows the answer to?
   b. Are you curious about this question?
   c. Will answering this question move the field of biological rhythms forward in important ways?
      i. Phrase your question as “Why…?” or How…?”
      ii. Specify: “Upon answering this question, we will newly be able to…..”
2. Think about the many ways you might answer this question. Get creative!
   a. List as many possible research hypotheses as you can.
   b. Keep at this step for a while, and later keep coming back to it.
   c. Does each hypothesis offer a satisfactory explanation for the research question?
   d. To avoid falling deeply in love with one idea, do not proceed until you have at least two plausible research hypotheses that can answer your research question.
3. For each hypothesis, list predictions that arise.
   a. List as many predictions of that hypothesis as you can think of. Come back to this step multiple times.
   b. Write each prediction in an “If……., then…..” format.
   c. For each prediction, note if it is a critical prediction, meaning that if that prediction fails, you will need to discard that hypothesis. These are the predictions you will want to test in your research.
4. Plan tests of critical predictions in such a way that you can confidently draw conclusions from the results.
   a. Be explicit in thinking through your potential conclusions prior to conducting the test. Describe each possible outcome with an “If I get outcome. . . then I will conclude…..” statement.

Week 2:

Sep 16: How can we measure circadian rhythms?

- Be sure to complete Coursera week 1 by Sep 16
- Module 1 UCSD course – Watch the “Time memory in bees” video and explain how the experiments with bees used or didn’t use the system of multiple competing hypotheses.

Sep 18: How does the brain control circadian rhythms? The role of the SCN.
Reading reflection: Submit by Moodle prior to class your reactions to all the readings, points of confusion, aspects you found interesting. Papers posted on Moodle

Week 3:

Sep 23: How can we apply circadian rhythms to improve athletic performance?

Be sure to complete Coursera weeks 2 and 3 by Sep 23
We will read several papers and will discuss several recent lectures (posted on Moodle).
Reading reflection: Submit by Moodle your reactions to the lectures and readings, points of confusion, aspects you found interesting.
Week 4:

**Sep 30 – Skype call with Dr. Esser**

**Oct 2: How does circadian disruption impact health?**
Reading reflection: Submit by Moodle prior to class your reactions to the readings, points of confusion, aspects you found interesting. Papers on Moodle

Week 5:

**What is your research question?**
Oct 7: Time to declare your research question! We will spend class time this week honing the questions and helping you identify good background readings.

Oct 9: Workshop time. Form peer feedback teams.

by Oct 10 post a journal article for your class discussion of one background reading related to your question.

Week 6:

**How will you answer that research question?**
Oct 14: Fall break!!!
Oct 16: Student-led class 1. Also – Discuss sources for data.

Week 7:

**Let’s get started!**
{Mary will be out of town this week}
Oct 21: Finding data
Oct 23: Analysis begins

Week 8:

**Student-led classes**
Nov 4 & 6: Student-led classes 2 & 3

Week 9:

**Time for research and outreach**
{Mary will be out of town this week}
Nov 11, Nov 13 – work in peer feedback teams

Week 10-11:

**Student-led classes and working on grant proposals**
Nov 18 – student led class 4
Nov 20 & 25 -Time to work on research projects and grant proposals

Week 12-13:

**Wrap up**
Dec 2 & 4 – Present Posters in class; Draft grant proposals due Dec 2
Dec 9 &11 - Grant Ideas
General Info

This is a research seminar where student-generated research combines with critical reading and discussion of primary literature. Research will include preparing and critiquing research project proposals, analysis of data, and presentation of ideas and results as posters and as a final paper. Everyone will take a different path through the research seminar. Some students will be new to the field and will be designing their first study, whereas others will be working on an on-going project or writing up a newly completed research project.

We will meet weekly to discuss readings and projects. We will begin with a broad-based survey of the field, and later readings will address the interests of the students in the class. Our weekly meetings will also serve to build your data analysis skills.

You are expected to enter this research seminar with background that prepares you for this level of advanced study. Background in statistics and research methods is essential, and some experience working in a laboratory is helpful.

Each week you are expected to spend ~3 h in meeting with the class as well as approximately 9-10 h outside of class, either reading, researching, or preparing presentations.

**Academic Accommodations:** If you have a disability and would like accommodations in this course, please contact the Office of Disability Services in College Hall 104 or at ods@smith.edu as soon as possible to ensure that we can implement accommodations in a timely manner. Please come talk to me during office hours if you have suggestions for how I might alter this course to better help you learn.

Assignments

**Goal:** Work effectively to carry out a research project (60% of your final grade).
1. Research group meetings: If possible, each of you will participate in a research interest group and will meet regularly to discuss progress and to troubleshoot.
2. Project proposal: Detailed proposal for a research focus, incorporating the “strong inference protocol” approach (see articles by Platt (1964) and Hiebert (2007)). (draft: Oct 7; Final: Oct 16)
3. Week 13: Poster presentation of ideas and results, in class
4. Throughout the semester: Carry out your research project! Keep a detailed lab notebook in a shared google doc and folder with associated files. Your lab notebook should include summaries of articles you have read that are related to your topic, and your thoughts. Clearly specify where your computer files are kept and what they contain.

**Goal:** Gain professional background in the field of circadian rhythms by reading original research articles (10%).
1. Weeks 2-4: Reading reflections on assigned readings
2. Weeks 5-10: Lead a short discussion of a related paper. Actively participate in discussions of other papers.

**Goal:** Develop knowledge, writing, and ideas to a level appropriate for a grant to fund graduate school studies.
- Week 12: draft due
- By midnight Dec 20: Two page summary of future research ideas (20%).

**Goal:** Develop knowledge and skills by outreach for a non-scientific audience on a topic related to this class (10%).
- By the end of finals period: One page summary of your outreach activity related to the class.

**Grading:**
10% Class discussion and reading reflections
10% Class discussion leader
10% Research proposal (5%: draft; 5% final)
20% Research process documentation (lab notebook, computer files)
20% Final product (poster and presentation) (week 13)
20% Plans for future research: 2 page paper in format for NSF “Graduate Research Plan Statement”, final version due by end of finals period. {graded by fit to NSF guidelines, originality of ideas, likely scientific impact of research).
10% Outreach component {one page summary of your outreach activity}