

Course Description and Policies for Pharm 8350: Independent Study (Rigorous and Reproducible Biomedical Experimental Design)

Instructor

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Office Hours

Tuesdays 10:00 am – 12:00 pm

Course Objectives and Description

The overall goal of this course is to understand the theory and practice of rigorous and reproducible experimental design in the biomedical sciences. It is expected that by the end of this course, students will be able to:

1. Describe and apply the philosophical foundations of the scientific method;
2. Articulate well formulated research questions and hypotheses;
3. Assess the measurement properties of scientific tests;
4. Describe how sampling procedures influence the internal and external validity of an experiment;
5. Define the forms of experimental control required to establish the internal and external validity of an experiment;
6. Describe the relationship of biostatistics to the experimental design;
7. Access campus and other resources related to rigor and reproducibility; and
8. Describe discipline-specific needs for control for relevant biological variables and biological or chemical resource authentication.

We will address these learning objectives using a mixture of independent learning activities (out-of-class video presentations, online discussion groups and quizzes, and readings); in class presentations, discussions, and practical exercises; and homework. I expect the total instructional time to be about 36 hours, of which eight will be performed on your own and 24 will be performed as a group.

Class Meeting Times

Thursdays 3:00-5:00 pm
436 Robinson Research Building (Bass Conference Room)

Required Materials

The assigned texts are *Experimental Design for the Life Sciences*, 3rd Ed., by G.D. Ruxton and N. Colegrave and *Experimental Design for Biologists* by D. Glass. In addition, there will be required video presentations, readings from scientific journals, and use of other electronic resources that are freely available to Vanderbilt students through the library system. Finally, you will need to establish an account and a user profile on REDCap.

Class Topics and Readings

A syllabus of class topics and reading assignments is attached. This schedule is subject to change.

Student Performance Evaluation Policies

The first thing that you need to know is that I do not give grades; I assign the grade that you have earned. Work will be graded anonymously and as consistently as humanly possible on raw content, integration and application of ideas, relevance to the question/assignment, and clarity of communication. Evaluation mechanisms include: in-class and out-of-class assignments; an exam; and class participation. Specific policies pertaining to each evaluation mechanism are found below:

- *In-class exercises*: On most class days, there will be an in-class exercise. These activities will constitute 20% of your final grade.
- *Class participation*: To encourage and reward positive class participation, 10% of the final grade will be determined from the frequency and level of positive contribution of your in-class comments and questions.
- *Biostatistics clinic visit*: You will form a group of 3-4 persons. You will bring some data¹ that you or group member have acquired to one of the Biostatistics Department's walk-in clinics and receive the advice of the biostatistician about how best to analyze your data. You will present your data and the comments from the clinic to the class. This assignment will constitute 10% of the final grade.
- *Research quality enhancement project*: You will write out 1) a protocol summary and 2) a detailed protocol for an experiment that you are currently conducting. The summary will follow a rubric that we develop in class and the detailed protocol will be similar to a published protocol in a methods journal such as the *Journal of Visualized Experiments* or *Nature Protocols*. You will critically evaluate both protocols using the information from this class and the input of your mentor and other faculty. This assignment will constitute 30% of the final grade.
- *Exam*: A closed-note/closed-book final exam will be administered on the last day of class. The exam will constitute 30% of the final grade.

Honor Code and Collaborative Work

You are bound by all provisions of the Honor Code. The Honor Code is found in Chapter 2 of the Vanderbilt Student Handbook and is available online at:

http://www.vanderbilt.edu/student_handbook/chapter-2-the-honor-system

Other pertinent material may be found at the Honor Council's website:

<http://studentorgs.vanderbilt.edu/HonorCouncil/>

In particular, I strongly urge you to read and be familiar with the Student Handbook's information and examples concerning plagiarism. I expect that you will read and understand these documents and that you will come to me if you have any questions about how the Honor Code is to be implemented in this class. Specific comments follow:

- *For exercises designated as individual efforts*: You and your classmates may discuss possible approaches to solving problems, the meaning and interpretation assigned

¹ The data will be treated with confidence by all members of the class. However, if the data are from human subjects then you should be careful not to include any protected health information in your uploaded file. Also, please be certain to obtain the permission of your PI before you upload data, especially if the data have not yet been published.

readings, or how to complete the exercises. In the end, however, you must formulate your own answers to the questions. Copying answers or text from another source is unacceptable, regardless of the nature of the source. This is true whether or not you have obtained the permission of the source.

- *For exercises designated as group efforts:* The group will turn a single written project and/or give a single presentation to the class. I expect that each person in the group will contribute an equal amount of effort to the assignment, but you are free to divide the work in any way that it sees fit. The group members should work together to ensure that all persons share a similar understanding of the material and contribute equally to the final product. All members of the group will receive the same grade.
- *Exams:* These must reflect entirely your own work and will administered in closed-note/closed-book format.

If you have questions or concerns about Honor Code issues in this class, please ask me.

Disabilities

I personally and Vanderbilt as an institution are committed to equal opportunity for students with disabilities. If you need course accommodations due to a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please discuss this with me as soon as possible.

Emergency Evacuation Plan

In the event of a fire or other emergency, you should collect your personal belongings and leave the building through the exits closest to the classroom. The class should gather at the red sculpture in front of the Eskind biomedical library. *NB* Vanderbilt policy forbids reentry into a building in which an alarm has occurred prior to authorization by Vanderbilt security.

Questions

If you have questions about any of these issues, please see me.