

CSAT 6005
Rigor & Reproducibility
Fall 2019

CLASS DAYS and TIME: Mondays and Wednesdays, 9:00 – 11:00 am

CLASSROOM: AL&TC, 3.302

COURSE FACULTY: Wouter Koek, Ph.D., Course Director

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READ THIS DOCUMENT CAREFULLY - YOU ARE RESPONSIBLE FOR ITS CONTENTS.

COURSE DESCRIPTION AND OBJECTIVES

This course will focus on two of the cornerstones of science advancement, which are rigor in designing and performing scientific research and the ability to reproduce biomedical research findings. The course will also emphasize the application of rigor that ensures robust and unbiased experimental design, methodology, analysis, interpretation, and reporting of results. The notion that when a result can be reproduced by multiple scientists, it validates the original results and readiness to progress to the next phase of research will be covered in this course. This is especially important for preclinical studies that provide the basis for rigorous clinical trials in humans.

In recent years, there has been a growing awareness of the need for rigorously designed published preclinical studies, to ensure that such studies can be reproduced. The aim of this course is to help attendees acquire the skills necessary to meet the need to enhance rigor and reproducibility in preclinical scientific research.

Pre-requisites – This course builds on the skills to design experiments and to analyze data statistically that attendees learn in CSBL 5095 – Experimental Design and Data Analysis. Thus, having successfully taken CSBL 5095, or an equivalent approved by the rigor & reproducibility course director, is a prerequisite for this course.

Semester credit hours – 1

The overall goal of this course is for each attendee to be able to apply rigor in designing, performing, and reporting scientific research, as described by the National Institutes of Health (NIH; <https://www.nih.gov/research-training/rigor-reproducibility>).

Specifically, by the end of this course, each attendee should be able to achieve the following objectives:

- Evaluate published and preliminary data
- Select a well-controlled experimental design that is appropriate to answer the research question
- Consider all relevant biological variables to include in the experimental design
- Authenticate key biological and chemical resources used in the experiment
- Perform statistical analyses appropriate for the experimental design
- Manage data
- Use transparency in reporting and publishing results, so that others may reproduce and extend the findings

COURSE ORGANIZATION

The main teaching modalities used in this course include:

1) conventional didactic lectures in which information is delivered to the class, and that make use of available NIH and Society for Neuroscience (SfN) training modules; **2) small group activities** involving solving assigned problems and reporting the results to the class; **3) attendee presentations** of the scientific premise for the experiments they plan to conduct, as well as their experimental design and statistical analysis.

Materials – Software: 1) to conduct statistical analyses: R Commander (i.e., point-and click interface to R) and R, both freely available from <https://cran.r-project.org/>, and 2) to conduct power analysis to determine sample size: GPower – free download at <http://www.gpower.hhu.de/en.html>

Computer Access – Exercises during class require access to a computer with R Commander, R, and G*Power.

ATTENDANCE

In order to achieve the expected level of competency, attendees must be fully engaged. Therefore, attendance for every class session is expected.

TEXTBOOKS

Recommended:

Harris, Richard. Rigor Mortis: how sloppy science creates worthless cures, crushes hope, and wastes billions. Basic Books, 2017

Lazic, Stanley E. Experimental Design for Laboratory Biologists: maximizing information and improving reproducibility. Cambridge University Press, 2016

Fox, John. Using the R Commander: a point-and-click interface for R. CRC Press 2017

GRADING POLICIES AND EXAMINATION PROCEDURES

A maximum of 100 points can be obtained by attendance and participation in the discussions (maximum 70 points) and by presenting the premise, design, and analysis of an experiment (maximum 30 points).

Grading System

Grading scale used to determine final grades: A = 90-100% B = 80-89% C = 70-79% F = < 69%

REQUESTS FOR ACCOMODATIONS FOR DISABILITIES

In accordance with policy 4.2.3, **Request for Accommodation Under the ADA and the ADA Amendments Act of 2008 (ADAAA)**, any attendee requesting accommodation must submit the appropriate request for accommodation under the American with Disabilities Act (ADA, form 100) to his/her appropriate Associate Dean of their School and a copy to the ADA Coordinator. Additional information may be obtained at <http://uthscsa.edu/eeo/request.asp>.

ACADEMIC INTEGRITY AND PROFESSIONALISM

Any attendee who commits an act of academic dishonesty is subject to discipline as prescribed by the UT System Rules and Regulations of the Board of Regents. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an exam for another person, signing attendance sheets for another attendee, and any act designed to give unfair advantage to an attendee or the attempt to commit such an act. Additional information may be obtained at

<http://catalog.uthscsa.edu/generalinformation/generalacademicpolicies/academicdishonestypolicy/>

TITLE IX AT UTHSCSA

Title IX Defined:

Title of the Education Amendments of 1972 is a federal law that prohibits sex discrimination in education. It reads “no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.”

University of Texas Health Science Center San Antonio’s Commitment:

University of Texas Health Science Center San Antonio (UTHSCSA) is committed to maintaining a learning environment that is free from discriminatory conduct based on gender. As required by Title IX, UTHSCSA does not discriminate on the basis of sex in its education programs and activities, and it encourages any attendee, faculty, or staff member who thinks that he or she has been subjected to sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to immediately report the incident to the Title IX Director.

In an emergency, victims of sexual abuse should call 911. For non-emergencies, they may contact UPD at 210-567-2800. Additional information may be obtained at <http://students.uthscsa.edu/titleix/>

EMAIL POLICY

Every attendee is issued a University e-mail address and account at the time of enrollment. As a matter of University Policy, communications between attendees and faculty that occur using the attendee’s University e-mail address is considered official business. Therefore, attendees are expected to check their university email inboxes on a regular basis so that any announcements, instructions, or information regarding this course will be received in a timely way.

USE OF RECORDING DEVICES

Recording of lectures and other learning activities in this course by any means (e.g., video, audio, etc.) is only permitted if approved by the instructor or required for compliance with Americans with Disabilities Act (ADA).

ELECTRONIC DEVICES

Cell phones must be turned off during all class meetings and exams. Computers and electronic tablets are allowed only for participating in classroom activities (e.g., viewing slides presented in lecture or conference materials). No texting, tweeting, emailing, web-surfing, gaming, or any use of electronic devices that is not directly connected with classroom activities is permitted.

TENTATIVE CLASS SCHEDULE
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WEEK	DATE	TOPIC	Presenter
Week 1, Day 1	7/8/2019	Scientific Premise: evaluation of published and preliminary data	Wouter Koek
Week 1, Day 2	7/10/2019	Rigorous Experimental Design (sample size, blocking, randomization, blinding)	Wouter Koek
			attendees
Week 2, Day 3	7/15/2019	Consideration of Relevant Biological Variables (sex, age)	Wouter Koek
			attendees
Week 2, Day 4	7/17/2019	Authentication of Key Resources (biological, chemical)	Christi Walter
			attendees
Week 3, Day 5	7/22/2019	Data Analysis and Statistics	Jonathan Gelfond
			attendees
Week 3, Day 6	7/24/2019	Reporting and Publication	Alan Frazer
			attendees
Week 4, Day 7	7/29/2019	Data Management	William Sanns
			attendees
Week 4, Day 8	7/31/2019	Premise, Design, and Analysis of Experiments	attendees