Streamlined Syllabus: BIOL 420: Statistics for Biomedical Research
Instructor: Dr. Kathy Denning
1 credit hour
Spring 2023; Mondays, Thursdays 11-11:50 AM
Military Science Rm 104

Course Description and Objectives

The broad goals of this course are to familiarize students with basic statistical analyses they will encounter as they pursue biomedical careers, to introduce students to the use of the R programming environment and language for visualizing data and conducting statistical analyses, and to challenge students to analyze their own datasets and present their results to their peers. This class is *optional* for all scholars participating in diversity training programs in KU's Office for Diversity in Science Training.

Course Textbooks

Main text: Crawley, MJ. *Statistics: An introduction using R, Second Edition*
Supplemental: Crawley, MJ. *The R Book*

Statistical Software

We will be using the R language and environment in class. We may also use Microsoft Excel to create and visualize data at various points in the class.

Course Grades

Students' grade in the course will be determined by the percentage of points accumulated and will follow the standard scale: A = 90% - 100%, B = 80% - 89%, C = 70% - 79%, etc. The percentage of points will be assigned in the following way:

Final Project	60 pts
Data Lab Writeups (12 writeups x 5pts each)	60 pts
Class Participation (29 classes x 2pts each)	58 pts

Final Project

For the final project, each student will analyze a data set of their choosing and present their objectives, methods, analyses (including appropriate statistical tests and visualization of the data) and results to the class in a 15 minute oral presentation format. Examples of appropriate data sets include data generated by students' PREP/MARC research project, a data set used with permission from the student's lab, or a data set from a published scientific research article. I am available to help students choose an appropriate data set. The grading rubric will be provided prior to the presentations.

Course Timeline
(subject to change; see Canvas for updates)

Week	Topic	Stats Using R	Assignment
Week 1: Thu, Jan 19	Introduction: Everything Varies	Ch 1, 3, 4	Writeup 1--Stats Definitions Due 1/23 Install RStudio Due 1/23
Week 2: Mon, Jan 23	Introduction: Framework for Statistics	Ch 1, 3, 4	
Thu, Jan 26	*Data Lab 1: Visualizing Data*		No homework assigned
Week 3: Mon, Jan 30	T-test Part I	Ch 5, 6	
Thu, Feb 2	*Data Lab 2*		Writeup 2 (Reaction and Petal datasets): Due 2/6
Week 4: Mon, Feb 6	T-test Part II	Ch 5, 6	
Thu, Feb 9	*Data Lab 3: Visualizing Data from T-tests*		Writeup 3 (Quiz Questions Exercise): Due 2/13
Week 5: Mon, Feb 13	Paired sample t-tests and Nonparametric alternatives	Ch 5, 6	
Thu, Feb 16	*Data Lab 4*		Writeup 4 (Quorum Sensing, GRE, Mental Health Survey datasets): Due 2/20
Week 6: Mon, Feb 20	ANOVA Part I Live Zoom Lecture	Ch 8	
Thu, Feb 23	*Data Lab 5*		Writeup 5 (Beta Barrels dataset): Due 2/27
Week 7: Mon Feb 27	ANOVA Part 2	Ch 8	
Thu, March 2	*Data Lab 6*		Writeup 6 (Chick weights dataset): Due 3/6
Week 8: Mon, March 6	Two-Way ANOVA	Ch 8	
Thu, March 9	*Data Lab 7*		Writeup 7 (Therapy Effectiveness dataset): Due 3/20
Week 9: Mon, March 20	Regression: Live Zoom Lecture	Ch 7	
Thu, March 23	*Data Lab 8*		Writeup 8 (Choose Your Own Regression Activity): Due 3/27
Week 10: Mon March 27	Multiple Regression	Ch 7,10	
Thu March 30	*Data Lab 9*		Writeup 9 (Bacterial Media Dataset): Due 4/3
Week 11: Mon, April 3	Multiple Regression	Ch 7,10	
Thu, April 6	*Data Lab 10* Live Zoom Lecture		Writeup 10: Due 4/17
Week 12: Mon, April 10	individual meetings to discuss final projects		
Thu, April 13			
Week 13: Mon April 17	GLMs		
Thu April 20	*Data Lab 11*		Writeup 11 (Gene Expression dataset): Due 4/24

Week 14: Mon April 24	GLMs		
Thu April 27	*Data Lab 12*		Writeup 12: Due 5/1
Week 15: Mon May 1	Final Presentations		
Thu May 4	Final Presentations		