Quantitative Methods for biologists
Course Syllabus Fall 2013

Instructor: Dr. Rachel Cartwright

Lecture times: Section 1 – Mon / Wed 6– 7.15 pm
Section 2 - Tues / Thurs 10.30 – 11.45 am

Classroom: Aliso Hall 134

Office: Manzanita 1116

Office hours: Mondays; 4.45 – 5.30 pm. Tuesdays; 12.15 – 1 pm, other times by arrangement.

Contact: Via email at rachel.cartwright@csuci.edu

Statistical methods in practice: Lecture Notes - by R. Cartwright.
Available for purchase from the Biology club

Cost $20.00 for both booklets. Please note both items are required.

Course Overview:

This course introduces students in the biological sciences to the quantitative skills and technological tools necessary to evaluate scientific literature and carry out original research in the discipline. Topics include the principles of biological sampling design, hypothesis generation for biological experiments, collection of observational and experimental data, statistical analysis and interpretation of biological data, and the presentation of results.

Practical, problem solving sessions will provide hands on experience and ensure that students are able to understand, apply and interpret results obtained from the range of statistical software applications, which are now widely used in the biological sciences.

Student learning Objectives:

On completion of this course students will be able to:

- choose an appropriate sampling scheme and/or experimental design for a given biological question
- select and apply the appropriate analytical methods to biological data
- demonstrate the necessary computer skills for biological data management, analysis and graphical presentation
- evaluate critically the primary literature in observation and experimental biology

Course Assessment:

Testing in this course will include three assessment tests, each based on specific portions of the course covered in class. In each of these tests students will be presented with a data set and asked to apply the statistical techniques and skills covered in the course.
Assessment will also include a selection of written exercises, assignments, group projects and related coursework. Full details of these will be presented during the course.

The final project will require students to assemble, organize and analyze data independently, applying the range of skills that they have acquired through the course. Submission of this project is due on the scheduled final exam date and time, all data sets for use in the project must be submitted for approval, prior to the last class. At the final, students will present their study to the class.

Points will be allocated as follows: Points

Assessment tests (3 @150 each)…………………450
Assignments…………………200
Completion of the Workbook…………………100
Group project…………………50
Final project…………………200

**Total points**…………………1000

Grading System:

The final grade will calculated based on the breakdown of tests and assessments as described. The absolute grade will be the grade assigned, no curve based grading.

Grades are as follows: -

A = 900 and above
B = 800 – 899
C = 700 - 799
D = 600 - 699
F = below 600.

Extra credit options may be offered throughout the semester, at the instructor’s discretion.

Missed Tests:

Make – up of missed tests is very challenging, as students require computer access to complete the tests. Please make every effort to be present for the scheduled tests. Make-up of tests will be on a case specific basis and only at the instructor’s discretion.

Dates will be set based on the progress of the class. Where scheduling conflicts arise students will be encouraged to attend the alternate class to cover any material they may miss, or tests that they cannot take on schedule. You should make every effort to attend every class. You will find that any missed classes will impact your progress and your grade on the course, but most importantly, absences impact your comprehension and understanding of the course content.

Extra help:

Students progress through this course at very different rates and a little extra help along the way can often have remarkable results. I would like to actively encourage you to come to my office during my office hours, or to arrange for study time with our student tutors. Their contacts may be found on the announcements page.
Instructor’s advice:

Attendance at every lecture is mandatory and expected. It is also the single best method of ensuring a good grade in this class. You will need to make every attempt to ensure that you do not miss classes, as this will impede your progress. If you have extenuating circumstances that cause you to miss class, please inform me so that we can make arrangements for you to catch up.

Some assignments will require that you work on your own, out of class. This is an essential component of the course and you will need to have access to the PASW program that we will be using, to complete this work. You are welcome to work in the computer lab, during other class sessions. PASW is also available on library computer terminals, in the tech center study room and on the dormitory computers. You will need to decide where and when you will access the program, to complete your assignments.

Deadlines for coursework must be adhered to. Time management is a key skill that students must master over the course of their studies. Late submissions will only be accepted in extremely extenuating circumstances, so please keep up with the course work as it is set in class. The final project due date is set as the date of the final exam for the course. Extensions to this date would only be granted to extreme and unusual circumstances. Please keep this in mind and manage your time carefully at the end of the semester.

Please make every effort to be punctual to class, out of courtesy to your fellow students, so that classes can begin and finish on schedule, and don’t forget to turn off mobile phones during class.

You will be working independently on computer terminals during these classes. However please resist the temptation to be distracted. If you wish to check your email, do so before the class starts. Surfing the internet during class times is prohibited and students in the class will be expected to adhere to this rule. Face book, my space and instant messaging are all prohibited activities / websites during class sessions. Five point penalties will be awarded for each infringement of this rule.

Please note that while you will be encouraged to work together in class, plagiarism, in any form, at any point in the course, will result in the assignment of a failing grade.

Finally, I sincerely hope that you find this course useful and interesting. Please don’t hesitate to ask for extra help as and when you need it. I am happy to provide extra help out of class, either during scheduled office hours, or at other times by arrangement.

*This is a tentative schedule and may be changed at the instructors’ discretion.*

*Students with any degree of disability should inform the instructor and every effort will be made to fully accommodate the student. The instructor maintains the right to drop students however students themselves are responsible for withdrawing from this class in a timely manner. Plus or minus grades will only be awarded at the discretion of the instructor, in exceptional circumstances. All students are expected to adhere to university standards of behavior, attitude and academic honesty.*
Course outline:

Lecture 1: Recognizing patterns, Classifying data
Worksheet: An unusual Incident
Trip to the Movies

Lecture 2: Defining Normal
Worksheet: Old Faithful

Lecture 3: The Exploratory Data Analysis
Worksheet: Student Study habits

Lecture 4: Probability
Worksheet: Probability trees

Lecture 5: Z scores
Worksheet: Rising birth rates?

Review / skills checklist 1 / Assessment test 1.

Lecture 6: Introduction to hypothesis testing
Worksheet: Are Americans shrinking?
One sample t test

Lecture 7: Significance and probability
Worksheet: When is a witch a witch?

Lecture 8: Differences between two samples
Worksheet: Blood cell counts
The two sample t test

Lecture 9: ANOVA
Worksheet: Do blondes have more fun?

Review / skills checklist 2 / Assessment test 2.

Lecture 10: Detecting trends – Correlation
Worksheet: Crawling babies

Lecture 11: Determining the strength of relationships
Intro to regression
Worksheet: Cancer and climate

Lecture 12: Comparing categorical data sets - Chi squared tests, goodness of fit.
Worksheet: Popular kids

Review / skills checklist3 / Assessment test 3.

Final projects – Due at scheduled time and day of the final exam.