

# Biology 827: Biostatistics v. 1.6

## Spring 2013

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### Introduction

**Statistical tests are the crux of the Scientific Method.** Without the assessment of quantitative data no study can be scientific. Therefore, knowledge of statistical theory and practice is essential to being any kind of scientist, or teaching science. To put this different way, if a person does not know and understand statistics, one's ability to do, teach, or understand science is limited to descriptions and travelogues.

While it is true that in the days of Mendel counting proportions was enough to lead a researcher in the right direction, today multivariate, non-parametric, and longitudinal studies are needed to capture subtle and complex phenomena. In both case though, scientific knowledge advances *only* by numerical testing of data. I would point out there are inherent dangers in being able to test large, complicated experiments. I think a mechanism that is real should be seen in time-worn simple tests of one independent variable.

Because quantitative data is a foundation of science, statistics classes are necessary. And while they are necessary, I hope this class is not boring or unduly difficult. Rather, I hope that you are able to see that statistics are critical, informative, and not as difficult as many think. Also, I hope it becomes natural for you to examine the statistics of every paper and study you hear of, as well as think about their experimental design. The class should inform you as to how to design your own research project for the Master's Program.

In this class you will examine statistical tests in general, how to choose statistical tests, and some elements of experimental design. The class will cover the difference between parametric and non-parametric tests. The discussion of experimental design will briefly cover some field methods for both plants and animals. The software used will be Excel and GraphPad's InStat.

Finally, as this is part of the Master's Program I hope this class will increase your appreciation of their role in scientific research.

## **Objectives**

1. An understanding of basic descriptive statistics, types of distributions, and basic inferential statistical test.
2. Defining and understanding the ~~assumptions~~ requirements underlying these statistics.
3. The proper use and interpretation of parametric and non-parametric tests.
4. Familiarity with data input and test outputs from MS Excel and other software.
5. Knowing the definition of error types and statistical power.
6. Understanding use and basic mathematic operations of linear regression and ANOVA.
7. Introduction to sampling techniques and limiting factors on study size.
8. Introduction to experimental design concepts, and practice with design.

## **Required Material**

Required textbook:

Whitlock, MC and D Schluter. 2009. *The Analysis of Biological Data*. Roberts and Company. Greenwood Village, Colorado. 700 pp.

Suggested further reading:

Gonick, Larry and Woollcott Smith. 1994. *The Cartoon Guide to Statistics*. 1994. ISBN 0062731025.

## **Required Software**

Access to a computer with Internet access is required. You will download the lecture videos and other files for the class so fast Internet access is a plus. You can go to a library or workplace to download the larger files or put them on a flash drive. Office 2007 (minimum) is also required for this course. In addition *an optional component* of Office is needed for this class, install it from your MS Office DVD if it is not already on your machine:

Analysis Toolpak – this is part of Excel and may need to be installed if a full install was not done on your machine

- I require Microsoft Office, 2007 or newer version as they have features that you to use to do problems and I use mark your work. *No other formats, such as “.wpd”, will be accepted.*
- Microsoft Office 2010 Academic Version is available from the UNK computer store (called “UNK Connections”) for about \$99. A school ID, or other verification of enrollment is required, but I think this is a small investment to own an industry standard. The software is available for both PC and Mac. You can use LibreOffice if you wish, but any compatibility issues will need to be addressed by you.
- Adobe Shockwave in a browser or a standalone video player (e.g. Windows Media Player, VLC player) will be needed for viewing the lectures.

## **Course Grading**

Grading for this course will be as follows (*note Late Assignment Policy on page 2 of policy section*). Note that the Participation grade is based on 3 quality posts per week on Discussion Board (*see page 5*).

<b>Graded Assignments</b>	<b>Points</b>
Plagiarism Assignment	10
Problem Assignments 7 @40 pts	280
Participation (Blackboard Discussion @ 10 pts per week, starts after first week, no points Spring Break or last 2 wks of class)	120
Paper	50
Final Exam	200
<b>Total</b>	<b>660</b>

Grading Scale: The following scale will be used: A (90-100%), B+ (88-89%), B (82-87%), B- (80-81), C+ (78-79%), C (72-77%), C- (70-71), D+ (68-69%), D (62-67%), D- (60-61), F (Below 60%)

### **Students with Disabilities**

Students with disabilities are encouraged to contact me for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska at Kearney to provide flexible and individualized reasonable accommodation to students with documented disabilities. To receive accommodation services, students must be registered with UNK Disabilities Services Coordinator, David Brandt, in the Academic Success Office, 163 Memorial Student Affairs Building, 308-865-8214 or by email [brandtdl@unk.edu](mailto:brandtdl@unk.edu).

## Syllabus for Biostatistics

Readings in both texts are specified, problems are given by chapter and number of problem to be completed. Problem sets are assigned for the week (for discussion board) and due Monday of the following week by 5:00 pm Central time.

Date	Week	Lecture	Readings	Assignments
Jan 7	1	Lecture 01	Painless Stats <a href="#">here</a>	
			Syllabus & Introduction	
Jan 14	2	Lecture 02	Chp 1 Statistics & Samples	HM1) 1.10, 1.13
		Lecture 03	Chp 2 Displaying Data	2.14, 2.19
Jan 21	3	Lecture 04	Chp 3 Describing Data	
		Lecture 05	Chp 4 Estimating with Uncertainty	
Jan 28	4	Lecture 06	Using Excel with Statistics	HM 2) 3.12, 4.10
			Assigned Readings	D&W 1.1, 3.7
Feb 4	5	Lecture 07	Chp 5 Probability	
		Lecture 08	Using Graphpad Instat	
Feb 11	6	Lecture 09	Chp 6 Hypothesis Testing	HM 3) 5.20, 5.24,
		Lecture 10	Chp 7 Analyzing Proportions	6.12, 7.21
Feb 18	7	Lecture 11	Chp 8 Fitting Probability models	
		Lecture 12	Chp 9 Contingency analysis	
Fed 25	8	Lecture 13	Chp 10 The Normal Distribution	HM 4) 8.11, 8.14,
		Lecture 14	Chp 11 Inference for Normal Population	9.11, 10.12, 11.16
Mar 4	9	Lecture 15	Chp 12 Comparing Two Means	
		Lecture 16	Chp 13 Handling Assumption Violations	
Mar 11	10	Lecture 17	Expt Design and Stats Heath readings	
Mar 18	11	Spring Break	Here at UNK	
			<a href="#">Paper 1 assignment, due April 5<sup>th</sup></a>	
Mar 25	12	Lecture 18	Expt Design II	HM 5) 12.6, 13.17,
		Lecture 19	Chp 14 Designing Experiments	14.15, 14.20

Date	Week	Lectures	Readings	Assignments
Apr 1	13	Lecture 20	Chp 15 Comparing means > 2 groups	
		Lecture 21	Chp 16 Regression & Correlation	
Apr 8	14	Lecture 22	Chp 17 Regression	HM 6) 15.13, 15.23, 16.12, 17.14
			<b>**Final Exam assigned**</b>	
Apr 15	15	Lecture 23	Final Exam Lecture	
		Lecture 24	Chp 18 Multiple Explanatory Variables	
Apr 22	16	Lecture 25	Chp 21 Meta-analysis	HM 7) 18.9, 18.13, 21.8, 21.10
Apr 29	17		<b>Final Exam Due April May 1<sup>st</sup> by 5:00 pm Central Time</b>	

# Orientation to Albrecht Blackboard Use

## Version 1.8 Spring 2013

### UNK Biology Department

#### **Introduction:**

The UNK Biology Distance Master's program has a number of faculty participating. Part of the experience and challenge of the program is that, as in other professional situations, faculty are different from each other. Different faculty have different lecture styles, different discussion board expectations, different grading priorities, and even different methods to deliver class material. I realize this might be confusing for people, but hopefully the various methods will demonstrate what works and what does not for you in your own future careers. Please read this section as I try to clarify how I use Blackboard in this class.

Please contact me with any questions, also note that the UNK e-Campus website does provide both Video Tutorials and Atomic Learning Tutorials on using Blackboard, email, and MS Word see [this page](#).

#### **A note about Expectations:**

I approach this program with the goal of providing, as closely as possible, the level of experience I was fortunate enough to experience in my graduate career at some very good universities. This means that generally my expectations are high. I will do my best to find, present, and interpret material I think is important and appropriate for the subject area of classes. I will also do my best to explain how the process of science works including experimental design, statistical testing, writing, and thought processes. I will also work to be as available as possible, and turn around Blackboard, emails, and graded work as quickly as I can. Unfortunately I often have lots going on like everyone does. Two busy parties trying to communicate can be frustrating.

There is responsibility on your part as well to meet both the letter and spirit of assignments. It is my hope and expectation that everyone in this program is here because they enjoy biology and wish to become more knowledgeable and proficient at teaching or researching.

Let me give a checklist of what this means to me, based on my experience as a graduate student and professor:

1. **Have you prepared for class?** Have you read the material, not just once but twice? Have you looked up authors, concepts, or words you were not familiar with before the reading? Do you understand how this reading fits into the discipline in general, and why it was assigned? Have you noticed the author, date, and author's institution of the paper in addition to the data, statistical tests, and concepts in the paper?
2. Before asking an entire class what a word means **have you tried to look it up?** Did you try to find the word from appropriate, professional, recognized sources? Have you used the assignment itself, an

index book section (if present), another biology text you own? Wikipedia is also a good place to start, but not a good place to end. **Never** use Wikipedia as a reference in a paper in this class.

3. Is the work you are turning in **reflective of you** as the professional you are working towards? Is the work well-researched? Do you have all the important concepts covered in your work? Is the organization of the paper clear and useful? Have you put in thought and work on the figures and tables to make them clear, professional, and are they referenced correctly? Has the work been proofread for grammatical, factual, spelling, and formatting errors? Do you know what formatting is desired by the professor and done it?

## **Blackboard:**

The Blackboard Classroom software suite is the main portal for the class work in the UNK Biology Distance Master's program. Being familiar with this program is helpful for success in the program. To be more precise, the following components are the ones I use the most:

### 1. Course Documents:

- a. This is where I place pdf files and wmv files that are the lectures for classes
- b. These files should be **downloaded** (not streamed) for viewing or printing out
- c. Some of these files are large and should be downloaded on fast internet connections
- d. I may post other papers here as well as book sections or links to other sites, these are class materials and should be read and have notes made on them.

### 2. Discussion Board:

- a. This section of Blackboard is how you will communicate with me and each other in the class.
- b. In my classes Discussion Board is an important part of the class experience, there are lot of points associated with participation on Discussion Board
- c. Typically each discussion board is opened Monday around 9:00 am Central Time, and closed Sunday night around 10:00 pm Central Time (I reserve the right to change these times).
- d. Because discussion boards are important, posts will be graded.
  - i. I expect at least three (3) useful postings each week and not all on Sunday night.
  - ii. *The quality of your contribution.* This is a somewhat subjective category, but the more thoughtful your comments the better the quality of discussion will be. Your comments should be at least a few sentences. Conciseness and clarity are necessary to keep the work load for this class to a reasonable level, i.e.: page long postings are discouraged. Your comments should be supported with information, file attachments or web sites, and should be relevant to the current topic of discussion. References are encouraged.
  - iii. *How well you interact as classmates.* Your responses should demonstrate that you are aware of the discussion that has been taking place. Go beyond stating "I agree" with someone with someone by stating your reasoning. But be polite and constructive in your responses to other students and me.

### 3. Assignments:

- a. Many, if not all the assignments in the class will appear here, so please find this area of Blackboard
- b. There are two types of assignment functions I use most:
  - i. Tests: these are timed tests, typically multiple choice tests that are available for a limited amount of time. That time frame is **usually** Friday at 5:00 pm to Monday at 10:00 pm Central Time. These tests are to be completed online within a time limit (e.g. 30 minutes) once started.

- ii. Papers: I use the 'assignment function' to create a link through which you can upload your documents. This system has the distinct advantage over email in that papers go directly to a 'space' that is specific to one person for one assignment. Users will see a green exclamation point in the Gradebook for the assignment when you have uploaded the document.
  1. This function also can be set to be available for a limited amount of time. Papers are typically due Mondays at 10:00 pm Central Time. Typically I post the assignments at least 1 week ahead of the deadline.

4. Gradebook:

- a. This is the area of Blackboard where grades are recorded and displayed, these are the actual grades I use, so check your grades often.
- b. Note the symbols in Blackboard. The responsibility is yours to make sure assignments are in on time, uploaded correctly, and that the correct file is uploaded. If the wrong file is uploaded, or the file is late, penalty of at least 10% will be assessed.
  - i. Empty assignment: this means no file has been uploaded, or test taken according to Blackboard. You **do not** want see this if you have taken a test or uploaded a file.

Student Help	UNK Library
Final paper outl	29.00
--	28.00
	33.00
	38.00
	34.00

- ii. Green exclamation point: this means that Blackboard has received a file, or that a test has been taken. A file that is uploaded may still be corrupt, or a person could still have uploaded the wrong file, but whatever it is, Blackboard has it. This is fine, with the two exceptions given above, and it means I have to grade the assignment before you will see a grade. Any paper, and any tests with subjective questions (such as fill-in, short answer) will have this symbol until I graded.

Prob set 6	Extra Credit 2
14.50	--
14.50	!
14.00	--
12.00	--
12.50	--
14.00	--



- iii. Red exclamation point: this symbol is **bad**. This symbol means that a file failed to upload correctly, or a test failed while being taken. This symbol means that you and I need to talk by email, phone and figure out a solution. This needs to be done **before** the due date of the assignment. If you do not contact me before the due date, late penalties will be assessed of 10% of grade if late, and 10% per 24 hour period after that.



## 5. Announcements:

- a. These are the text entries you see just below the title for the class when you enter Blackboard
- b. I will post class information here, such as changes to the syllabus or answering a question that is coming up repeatedly.
- c. Please check this area several times a week on your way to Discussion Board, Assignments, or Gradebook.

## 6. Other Features:

- a. There are other features of Blackboard that I use from time to time so please look around at the program.

## 7. Scientific Writing

- a. I will include documents in Blackboard/Course Documents folder to help with scientific writing.
- b. I encourage everyone to work on improving their writing skills, as I continue to work on mine. Everyone in the program should have at least a few papers from primary journals from other classes or your own reading. If not, get a few from the UNK library collection that you have access to as a UNK student. Recent papers from a major journal should be read for style, voice, formatting. Such examples will show you how to build sentences, tables, figures, paragraphs, references and abstracts. Everything you need to know is there. Also, you can always ask!

# Dr. Albrecht Class Policies

## Version 1.6 Spring 2013

### Introduction:

Every institution has its rules and policies and UNK and the Biology Department have them too. Because of the distance education environment the degree of communication between student and faculty can be difficult, and misunderstandings do happen. Please keep in mind “talking” over the computer is not the same as face to face – several types of communication are lost. Please be patient and allow more time than you might otherwise to get the solution you need. Here are the policies that will be in place for this class.

### Policies:

1. Paper formatting: All work turned in for this class should have the following formatting
  - a. Size 12 font, 1” margins all around the page, page numbers present, no right justification
  - b. Header information on the first page: name, class, date, assignment
  - c. All text double-spaced with proper English spelling and grammar used. The writing should be simple, clear, scientific writing style. At the least this means: subject-verb-direct object structured sentences.
  - d. Tables must be labeled at the top and have captions that explain them.
  - e. Figures must be labeled below and have captions that explain them.
  - f. All needed citations must be (author year) format in text (including figures and tables) and fully cited at the end of the paper. See Section 2 below for more information on this.
    - i. Citations **are** needed if textbook or lecture material is used (or especially quoted!). This is both the legal necessity and good practice for work beyond class.
    - ii. Full citations should be in a References section at the end of each paper and follow these formats, reverse indented, and alphabetical by author:
  - g. **Failure to do any of these can result in immediate letter grade reductions.** This stems from me being worn out by seeing and having to grades these sorts of mistakes every term.

### Citation Style Examples

#### Books:

Darling D. 2001. Life Everywhere: The maverick science of astrobiology. Basic Books. New York. 206 pp.

#### Computer Program:

Microsoft. 2010. Microsoft Excel Version 14.06112.5000. Redland, WA.

#### Journal Article:

Chekalyuk A C, and M Hafez. 2008. Advanced laser fluorometry of natural aquatic environments. Limnological

Website:

Food and Agriculture Organization of the United Nations. 2006. Livestock impacts on the environment. URL: <http://www.fao.org/ag/magazine/0612sp1.htm>. Accessed Feb 26, 2012.

2. Plagiarism and Cheating:

- a. Please see and complete [this page](#) - I require everyone in the class has visited this site, take the quiz and send me a completion certificate (Test & Certificate section) by the 5:00 pm Central Time on the **second Friday** of the semester. Every semester, even if you have done it before. Send a scan to the column in Blackboard - Assignments, secondarily fax it to the Biology Department (call Judy for fax number). The reason? So everyone knows exactly what plagiarism is. **ALL** sources in **anything** turned in for this class must be cited, including figures and anything taken from class texts (such as copying the text of problems), every time!
- b. Also see the [UNK Student Handbook](#) for UNK policy statement on plagiarism
- c. I consider plagiarism a scourge and a stain on science and detrimental to the progress of humanity. I will treat any plagiarism seriously including giving zeros on questions, or entire tests (which often drops a student one letter grade or more), or failing the class outright in addition to letters in the permanent files here at UNK
- d. Citation information for APA style is given at the UNK eCampus website [here](#)
- e. A quick rule: **more than 3 words in a row from any source must be referenced**
- f. Do not communicate with outside experts to answer tests. Assignments are meant to assess your knowledge, not that of others.
- g. Work individually unless directed into groups. Your work should be your own.

3. Late work/technical difficulties:

- a. Late work will be subject to the following grade reductions:
  - i. 10% reduction of grade for any work submitted after stated deadline until 24 hours after the stated deadline
  - ii. A further 10% grade reduction for each 24 hour period past the stated deadline
- b. I understand that online classes demand attention to deadlines on top of those already present. However, this graduate program is not a self-paced one. This program is structured to academic terms and time frames (such as breaks) as the brick and mortar University of Nebraska system. In general I am impressed at the dedication of students in this program and hope this tradition continues.
- c. Technical difficulties are part of the reality of the online world. Given that truism, do NOT wait to submit assignments until the last minute or hour of a deadline. Both you and I cannot be responsible for failures of power, computers, computer networks, or even Blackboard. Do not procrastinate; turn assignments in early, so there is time to resubmit if there are any problems.
- d. Important: please install and run some sort of anti-virus and anti-malware software on your computer. This is for all of us in the class, so that viruses are not spread through the class:
  - i. Microsoft Security Essentials
  - ii. (recommended): other maintenance software such as System Mechanic (my favorite), Symantec System Works

#### 4. Online etiquette:

- a. **Please be respectful of others in the class, and me.** It is easy to be more confrontational via electronic post than in person. I understand conversations may become heated, and irony, even sarcasm may at times be used to make a point; however, please try to remain civil at all times.
- b. Posts I deem as offensive or inflammatory towards others, or me, will be removed from the discussion boards. If this becomes a continuing problem, grade reductions may result. I will keep copies of such posts.