

## BIOMETRY

- Instructor:** Professor Mark Butler  
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**Office Hrs:** I prefer to meet by appointment so we can meet when it is most convenient for both you and me, and so we can meet as long as is necessary. Email me, call me, or see me after class about setting up an appointment.  
**Text:** *Biostatistical Analysis*, 5th Edition, J.H. Zar (required)  
*SPSS Base User's Guide*, SPSS Inc. (recommended)  
**Class Hrs & Room:** Tuesday and Thursday, 4:20 PM – 6:00 PM; room 352 MGB

### Course Objectives

At the conclusion of this course students will understand the essential components of experimental design and will be familiar with the basic statistical techniques most commonly employed in the biological sciences. Students will recognize the assumptions and data requirements for these statistics, and will learn how to analyze and interpret biological data with these techniques. Much of this course requires work outside the classroom. If nothing else, I hope that you will come to appreciate that: "... *the main function of that section of statistics that deals with tests of significance is to prevent people from making fools of themselves ... by claiming that their favorite theory is substantiated by observations that do nothing of the sort.*" - D. Colquhoun (1971), *Lectures on Biostatistics*

### Computer Use

We will be using a windows-based statistical program called SPSS to analyze data. SPSS is one of the most widely used and powerful statistical analysis systems for the PC. It is relatively simple and offers lots of on-line help menus, but like any program it takes some getting used to. The SPSS User's Guide manual is a recommended text and available at the ODU bookstore or the ODU Tech Store; this and other SPSS manuals are also available in the Reserve section of the Library. I'll also pass out lots of "how to" handouts for specific analyses. **We will also meet for 2hrs in one of the computer teaching classrooms after class the second week of class (Jan 22 and Jan 24) from 6:30 – 8:30PM for "hands-on" instruction on the basics of the SPSS program; optional computer help sessions will also be scheduled from time to time during the semester. Locations and times for these sessions will be announced in class.**

SPSS is available to you on all of the computers in the University's Computer rooms once you have a university Local Area Network (LAN). Check the university's website for computer room locations and hours of operation (<http://occs.odu.edu/labs/locations/>). If you would like to use SPSS at home on your own computer, you can purchase: (a) the less complete but less expensive student version of SPSS, or (b) the complete "Grad Pak" version of SPSS for a bit more from the University Tech Store. **You must have a LAN Account for our SPSS instruction sessions and to use SPSS on university computers. Obtain a LAN Account ASAP if you do not have one.** Students automatically obtain a LAN account when they activate their MIDAS (Monarch Identification and Authorization System) ID account. To activate your MIDAS account go to: <http://occs.odu.edu/accounts/midas/>

## Grading

I follow the University's grading scale; "+" and "-" grades will be assigned. Your final grade will be calculated as follows:

Homework	45% (3 @ 15% each)
Independent Project	15%
Midterm Exam	20%
Final Exam	20%

**A Note on Original Work:** Students in this course may assist each other in learning and operating SPSS, but may not help one another on the homework problems! Determination of the appropriate statistical procedures as well as data interpretation, writeup, and discussion must be each student's own original work! I will deal with infractions of these rules in strict accordance with university policy. Also please note that in cases of conflict that can not be resolved by student-instructor dialog, the student and instructor should contact the department chair as early in the semester as possible.

### Description of Assignments and Exams

**Homework:** Three homework assignments will be given. In each, students will ascertain the appropriate analysis, analyze the data, and interpret the results. Homework will generally be due 1 week after the assignment is given; tentative assignment and due dates are in the schedule below. The structure of the homework reports should follow that shown in the example homework answer found on the Biometry class website (<http://www.odu.edu/~mbutler/biometry%20webpage/index.html>).

**Practice Homework Questions:** On the Biometry class website you will also find practice questions and answers similar to those assigned for homework.

**Late homework:** 10% will be deducted from your homework grade for each day late.

**Exams:** The midterm exam will be open-book and open notes; it will be given **during class on Tuesday, March 4<sup>th</sup>**. The final exam will be a comprehensive, take-home test similar to the homeworks; you must deliver a hardcopy to my faculty mailbox in room 110 MGB by **5PM on Thursday, May 1<sup>st</sup>**. The exams will not be returned to you, but you will have the opportunity to review them.

**Independent Project:** You will employ what you learn about experimental design and statistical analyses to design, execute, analyze, and interpret the results of a small experiment that you devise. This must be completed on your own and need not be a biological study. You'll have about two weeks to complete this assignment, which includes both a short paper describing the study and results and an informal oral presentation to the class. I'll give you detailed instructions later. **Presentations will be given on Tuesday, April 29<sup>th</sup>; reports are due in class that day as well.**

**Reading Assignments:** On the Biometry class website you will find a few scientific papers (pdf files) on experimental design issues and philosophy that I encourage you to read. Biometry class website: (<http://www.odu.edu/~mbutler/biometry%20webpage/index.html>).

### Course Outline & Tentative Schedule

Wk	Dates	Topic	Book Chapters
1	1/15 & 1/17	Types of data & studies, review of descriptive statistics	1 – 4
2	1/22 & 1/24	Hypothesis testing, 1-sample t-test <b>Computer Instruction after lecture</b>	7
3	1/29 & 1/31	Paired t-test, 2-sample t-tests <b>Optional computer help session after lecture on 1/29</b> Homework #1 assigned	8 & 9
4	2/5 & 2/7	Evaluating parametric assumptions & data transformations	13
5	2/12 & 2/14	1-Factor ANOVA <b>Homework #1 due on 2/12</b>	10
6	2/19 & 2/21	Multiple comparison tests Homework #2 assigned	11
7	2/26 & 2/28	Experimental Design <b>Homework #2 due on 2/26</b>	
8	3/4 & 3/6	Experimental Design <b>In-class MIDTERM EXAM Tuesday 3/4</b>	
9	3/11 & 3/13	Spring Break - No Class	
10	3/18 & 3/20	Randomized-Block & Repeated Measures ANOVA 2-factor ANOVA	12, 14
11	3/25 & 3/27	Multifactorial ANOVA	14
12	4/1 & 4/3	Split-plot ANOVA & Nested ANOVA Homework #3 assigned Independent Project Planning	15
13	4/8 & 4/10	Correlation & Regression <b>Homework #3 due on 4/8</b>	16 – 18
14	4/15 & 4/17	Correlation & Regression Analysis of Covariance	12, 17
15	4/22 & 4/24	Categorical Analysis Take-home final exam assigned	21 – 22
16	4/29	<b>Independent Project Presentations &amp; Project Report Due</b>	
	5/1	<b>TAKE-HOME FINAL EXAM DUE BY 5PM</b> (hardcopy in Dr. Butler's faculty mailbox in room 110 MGB)	

#### Classroom Requirements of the Department of Biological Sciences

1. There is to be no consumption of food or drink in the laboratory or lecture rooms. If you require food or drink for medical reasons, please move to the lobby.
2. If you are in conflict with a faculty or staff member, your first point of contact is the Biology chairman. The chairman's office is located in room 110 of MGB.
3. Inform the instructor of any medical conditions or needs you may have.
4. Turn off electronic devices (cell phones, hand palms, etc.) during the lecture and laboratory periods.
5. Read the document "Safety in the Biology Teaching/Research Labs", which is located in each laboratory. For laboratory courses, fill out and sign the Emergency Information Sheet, which will be provided for you.

Refer any questions concerning these requirements to the Department of Biological Science Chair, Room 110 MGB.