



AMBROSE
UNIVERSITY COLLEGE

COURSE OUTLINE

Winter 2010

BIO 310 QUANTITATIVE METHODS for the BIOLOGICAL SCIENCES

Instructor: Don Liteplo

Contacting the Instructor

Office: Room L2052

Office Telephone: (403) 410-2000 (Extension 6907)

E-mail Address: dliteplo@ambrose.edu

Term: January 5th to April 12th, 2010

Times: Laboratory Session (Group A): Monday 11:15 to 12:30 am **Room:** A2141

Laboratory Session (Group B): Monday 2:30 to 3:45 pm **Room:** A2141

Lecture Session (All): Wednesday 11:15 to 12:30 noon **Room:** A2212

Lecture Session (All): Friday 11:15 to 12:30 noon **Room:** A2212

Course Description

This course provides an introduction to descriptive and inferential statistical techniques used in biological research. The course content includes the study and application of procedures for analyzing data and for making inferences based on the analysis. Major topics include: tabulation and graphic representation of data, summary statistics, probability, normal curve applications and z-scores, confidence intervals, hypothesis tests (t-tests, ANOVA, Chi-Square), and correlation/regression analysis.

Course Objectives

The primary objective of this course is to develop students' understanding of the basic statistical concepts and procedures that are used to analyze research data and to aid students in the interpretation and evaluation of research findings reported in scientific journals, newspapers, and other forms of media. These goals are pursued through a combination of classroom instruction and laboratory practice. Students are provided with the opportunity to improve critical thinking skills (through the application of statistical procedures and the interpretation of statistical results) and to enhance computer literacy skills (through hands-on use of statistical software, SPSS).

In addition to the successful completion of prerequisite courses (see Calendar), students are required to be competent in the use of personal computers and must have a good working knowledge of basic mathematics (e.g., fractions, percentages, decimals, algebraic equations) in order to complete the course successfully. No statistical software experience is expected. To aid students whose math skills are a bit rusty, the text includes a basic math review (see Appendix A).

Course Organization

There are two components to this course: lecture and lab. Lecture time is used to explain and illustrate statistical theory, techniques, and rationale. Lab time is devoted to practice exercises and to the completion of assignments. In general, material that is covered in lecture sessions will be followed up with lab work which covers the same material – but, at the instructor’s discretion, portions (or all) of some lab sessions may be used for lecturing and/or quizzes. Lab attendance is **not** optional. Half of the students registered in this course will have been allocated to a specific lab session each week, and the other half to a different specific lab session. One of the objectives of the lab sessions is the provision to the students of some “one-on-one” assistance, so for the sake of efficient access to the instructor and to computers, students **must** attend the *specified* lab session.

Required Texts (must be possessed by each student)

Essentials of Statistics for the Behavioral Sciences, Sixth Edition, Gravetter, F. & Wallnau, L. (2008), Wadsworth.

SPSS Demystified, Yockey, Ronald D., (2008), Pearson Prentice Hall

Other Materials

Each student is required to have a Computer Account and a USB Thumb-Drive (or other suitable media which can be used to **save** work being done in the lab sessions).

A hand-held electronic calculator *with statistical functions* is required. The calculator must be able to accept the input of raw statistical data and provide the student with at least the following output: $\sum x$, $\sum x^2$, mean, variance, and standard deviation. Students will find that using such a tool will considerably reduce time spent in calculations. This is especially valuable when handling complex assignments and writing quizzes and examinations. While a particular calculator (make and model) cannot be specified, it is recommended that any such calculator purchased should have statistical capabilities similar to the TI BA II Plus. Students who do not already possess such a calculator may wish to obtain information from the instructor during the first week of classes before deciding on the make and model to acquire. Note that the course instructor will endeavour to assist students with calculator applications, and can provide considerable assistance with the above-named calculator but, because of the wide variety of calculators in use, each student is ultimately responsible for knowing how to use the calculator that he/she brings to the course.

Optional: Study Guide for Essentials of Statistics for the Behavioral Sciences, Sixth Edition, Gravetter, F. (2008).

Note that there is a book companion website for your text at:

<http://www.thomsonedu.com/psychology/gravetter>

or <http://www.academic.cengage.com/psychology/gravetter>

Course Schedule

A *Detailed Course Schedule* will be handed out in the first week of the semester. This schedule will set out the topics, dates, and times for the lecture and lab sessions. It will also show the dates and times for practice exercises, assignments,

quizzes, and the mid-term examination. The dates and times are subject to change at the instructor's discretion as the course progresses; changes, if any, will be few and will be communicated in advance.

Broad Course Schedule

TOPIC	TEXT REFERENCE
Introduction to Statistics	Chapter 1
Frequency Distributions	Chapter 2
Central Tendency	Chapter 3
Variability	Chapter 4
Standardized Distributions	Chapter 5
Probability	Chapter 6
Distribution of Samples Means	Chapter 7
Introduction to Hypothesis Testing	Chapter 8
Introduction to the t Statistic	Chapter 9
The t-Test for Independent Samples	Chapter 10
The t-Test for Dependent Samples	Chapter 11
Confidence Intervals	Chapter 12
Analysis of Variance	Chapter 13
Nonparametric Tests of Significance	Chapter 16
Correlation and Regression	Chapter 15

We will be covering most of the content of the above chapters. There will be no coverage of the material in chapter 14.

Course Requirements and Grading

Student performance will be evaluated in a combination of classroom participation and graded assignments, quizzes, mid-term examination, and final examination. Mark allocation is as follows:

Participation	5%
Assignment #1 (take-home)	5%
Quiz #1 (in-class)	5%
Assignment #2 (take-home)	5%
Mid-Term Examination	20%
Assignment #3 (take-home)	5%
Quiz #2 (in-class)	5%
Assignment #4 (take-home)	5%
Assignment #5 (take-home)	5%
Quiz 3 (in-lab)	5%
Final Examination	<u>35%</u>
	100%

Lab practice exercises are not graded, but students are required to complete them in order to be eligible to write the mid-term and final examinations. The completed exercises (in the student's own handwriting and computer output) are to be shown to the instructor at the end of the relevant lab session for entry in a "completion" record.

Students need not receive a passing grade on all components of term work and examinations in order to pass the course. However, failure to submit an assignment or write a quiz/examination, without the prior approval of the instructor, may result in an F grade for the course.

Marks for classroom participation are based on the instructor's impression (cumulative through the semester) of:

- the student's efforts to review and comprehend text readings, assigned work, and class handouts,
- the student's classroom attitude, quality of responses to questions asked by the instructor, and quantity/quality of contributions to classroom discussion.

As well, absences from lecture and lab sessions can negatively impact marks for *participation*.

Students are required to read the above-listed chapters in the textbook in order to be prepared for the classroom lectures, discussion, and problem-solving.

Assignments/Quizzes

The quizzes will typically be written in-lab or in-class. The assignments will typically be take-home tasks (usually due one week after handout). Deadlines for completion and submission of the assignments will be clearly indicated in advance. Take-home assignments submitted after the due date will be penalized by 50%, but if submitted after answer keys have been posted, or after any graded materials have been returned to any students, a grade of 0% will be awarded. All assignment and quiz papers must include the student's name.

Note that in order for a student to be eligible to write the mid-term and the final examinations, he/she must have completed/submitted all work due by the date of the examination – this includes all lab exercises, all take-home papers, and all quizzes. The mark for a quiz which is *missed with a legitimate reason* (typically illness, evidenced by a Doctor's note) will normally be spread across (transferred to) the other quizzes.

Mid-Term Examination

The mid-term examination will be 1 1/4 hours (75 minutes) in length. It will be written during regular lecture/lab time *per the Detailed Course Schedule* and can cover all materials included in the course up to the date of the exam.

A grade of 0% will be awarded for a mid-term examination missed *without a legitimate reason*. If the mid-term examination is missed *with a legitimate reason*, a make-up mid-term examination will be arranged within one week. If the instructor determines that this arrangement is not practical, half of the 20% will be added to the weight of the final examination and the other half will be spread across (transferred to) the quizzes.

Final Examination

The final examination can include questions on any course materials covered during the semester, but emphasis will be on materials covered since the mid-term exam. Allowed writing time for the final examination will be three hours (180 minutes). Use of a lab computer may be required, and students are advised to bring a hand-held electronic calculator *with statistical functions*.

The exact time and date for writing will be posted by the Registrar. The final examination will be written during the final examination period – April 13th to 19th, 2010 – following the last day of classes. It is the student's responsibility to ensure that he/she does not have any conflicting commitments during the final examination period.

Graded final examinations will be available for supervised review at the request of the student.

Available Letters for Course Grades

<u>% Grade</u>		<u>Letter Grade</u>	<u>4.0 Point Scale</u>
95% to 100%		A+	4.0
90% to 94%	Excellent	A	4.0
85% to 89%		A-	3.7
80% to 84%		B+	3.3
76% to 79%	Good	B	3.0
72% to 75%		B-	2.7
68% to 71%		C+	2.3
64% to 67%	Satisfactory	C	2.0
60% to 63%		C-	1.7
55% to 59%		D+	1.3
50% to 54%	Minimal Pass	D	1.0
0% to 49%	Failure	F	0.0

Important Notes

A student's final course grade is not based upon the student's attendance record; however, the general expectation is that students will attend all classes in which they are registered. A combination of low academic performance and notable absences from lecture and lab sessions may be brought to the attention of program administrators.

January 15th, 2010, is the last day to enter a course without permission or to withdraw from a course and receive tuition refund (less any applicable deposits or penalties).

March 12th, 2010 is the last day to withdraw from a course or change to audit without academic penalty.

Course withdrawal forms are available from the Registrar. Students who do not follow the proper withdrawal procedures will be recorded as having failed the course.

It is the responsibility of all students to become familiar with and adhere to the academic policies contained in the Student Handbook and Academic Calendar. Students are particularly referred to policies and regulations that pertain to plagiarism and requests for deferred examinations. These will be strictly followed.

Students are reminded that examinations will be actively invigilated. Students may only bring to an examination room items stipulated by the instructor to be required for the completion of the examination. All non-essential items (including, but not limited to, hats, coats, gloves, knapsacks, purses, and electronic devices other than approved calculators) must be left in an area of the examination room designated by the instructor. All cell phones and other unauthorized electrical devices **MUST** be turned off during examinations. Failure to comply may result in a failing grade for the examination.

Students are advised to retain this course outline for future reference.