



LOMA LINDA UNIVERSITY
INTEGRATED BIOMEDICAL GRADUATE STUDIES

COURSE: IBGS 502 Biomedical Information and Statistics (2 units)

COURSE DESCRIPTION: Introduces students to the basics of statistical analysis in a relevant biomedical setting. Additionally, provides practical information on the use of data base systems and software tools for data management and analysis.

QUARTER: Winter 2006

INSTRUCTOR: Grenith Zimmerman, Ph.D. 909-558-4300 ext. 47667 (o)
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OFFICE HOURS: See posted office hours at room A520 in Nichol Hall. Additional hours can be arranged by appointment.

LECTURE HOURS: Tuesday, 9:10 – 11:00 Shryock Hall

REQUIRED TEXT: Introductory Biological Statistics, 2nd ed. RE Hampton, JE Havel; Waveland Press, 2006

GRADING: Letter grade based on the following distribution of points.
Assignments 25%
Quizzes 25%
Final Exam 50%

ASSESSMENT OF STUDENT LEARNING:

Homework: Homework will be based on the reading and lectures and will be distributed in class or assigned from the text. All written assignments are due one week after they are assigned. Late homework will receive a 20% penalty unless lateness is due to documented illness. If you are absent for medical reasons, the assignment will be due on the first day you are back in class.

Quizzes and Exams: Quizzes and Exams may be a combination of interpretation of computer output, multiple choice, True/False, calculations, and/or short answers.

Lecture Schedule

Lecture	Title	Faculty
January 3	Introduction to Research and Statistics/Descriptive Statistics	Zimmerman
January 10	Probability/Random Variables and Probability Distributions	Zimmerman
January 17	Sampling Distributions/Statistical Inference	Zimmerman
January 24	Two Sample Inference for Means/Inference for Proportions	Zimmerman
January 31	Looking at Relationships/Correlations and Regression	Zimmerman
February 7	Inferences for Multiple Population Means/ANOVA Choosing Statistical Tests	Zimmerman
February 14	Introduction to Bioinformatics and Biological databases - Pubmed, GenBank, PDB, etc	Gonzales
February 21	Alignment of Pairs of Sequences - Scoring matrices, algorithms, significance of alignments	Gonzales
February 28	Database searches using sequences - BLAST and FASTA e-value, sequence formats	Gonzales
March 7	TBA	TBA
March 14	Final Exam	

COURSE

OBJECTIVES: Upon completion of this course the student will have learned the concepts and will be able to do data analysis in the areas of descriptive and inferential statistics. The student will be able to define a data file, enter data, and do simple data analysis using the SPSS statistical package.

STUDENT

OBJECTIVES: Student objectives for each module will appear as part of the module.

COURSE OUTLINE

1. Module 1 Introduction to Research and Statistics/Descriptive Statistics

Objectives: Upon completion of this module, the student will be able to:

1. Describe the relationship between populations and parameters; and between samples and statistics.
2. Recognize the difference between and give examples of nominal, ordinal, interval and ratio scales of measurement.
3. Determine what types of tables and graphs are appropriate for data with different levels of measurement.
4. Define and compute measures of central tendency: mean, median, mode.
5. Define and compute measures of variability: range, variance, standard deviation.
6. Define and compute the coefficient of variation.
7. Identify shapes of distributions and choose appropriate statistics to describe central tendency and location for distributions having different shapes.
8. Discuss appropriate use of measures of central tendency with respect to levels of measurement.

Tuesday, January 3 READ: Chapters 1-4
HW: 2.1; 2.3; 2.4; 2.7; 2.8; 2.9; 3.2 (begin by making a Stem & Leaf plot); 4.2

2. Module 2 Probability/Random Variables/Probability Distributions

Objectives: Upon completion of this module, the student will be able to:

1. Calculate probabilities from frequency tables and contingency tables.
2. Understand and use the axioms and rules of probability.
3. Discuss and apply the concepts of dependence and independence in statistics.
4. List the properties of the Binomial Distribution.
5. Use a Binomial table to determine Binomial probabilities.
6. List the properties of the Normal Distribution.
7. Use a standard Normal table to calculate Normal probabilities.
8. Differentiate between discrete and continuous random variables.

Tuesday, January 10 READ: Chapters 5-6
HW: 5:13 – 16; Handout Exercises

3. Module 3 Sampling Distributions/Statistical Inference

Objectives: Upon completion of this module, the student will be able to:

1. Describe what a sampling distribution is and its use.
2. State and Central Limit Theorem and discuss its importance in statistics.
3. Define the terms standard deviation and standard error and identify the difference between the two concepts.
4. Use the standard Normal table to calculate probabilities for sample means and sample proportions.
5. Compute and interpret confidence intervals for means and proportions.
6. List factors which affect the length of a confidence interval and describe the effect each has on the length of the interval.
7. Describe the t-distribution and use the t-table to calculate probabilities and find critical values.
8. Explain the difference between null and alternative hypotheses; Type I and Type II errors; statistical significance and clinical importance.
9. Use either a p-value or a critical value in determining statistical significance.
10. Illustrate the process of statistical decision making.
11. Carry out and interpret one-sample t-tests

Tuesday, January 17 READ: Chapters 7, 8 (14)
HW: 8.3; 8.6; Also make 95% and 99% confidence intervals for each of the means for these two exercises.

4. Give ways of completing the analysis if the assumptions for ANOVA are not satisfied.
5. Explain the repeated measures and randomized block designs.
6. Define and illustrate what the word interaction means, in the context of factorial ANOVA designs.
7. List the hypotheses for a factorial ANOVA design.
8. Give example of factorial designs which have both factors independent; that have both factors repeated measures; and that have one factor of each.
9. Interpret computer output for the various ANOVA analyses.
10. Choose appropriate tests for data analysis.

Tuesday, February 7

READ: Chapters 10, 11

HW: