Syllabus for
MAT 332H--Introduction to Biostatistics Honors
3 Credit Hours
Fall 2010

I. COURSE DESCRIPTION

This course is an intermediate-level statistics course for students of the health sciences, which includes both descriptive and inferential statistics. Topics include sampling techniques, various standard distributions, hypothesis testing, and computer-related statistical packages. (Does not count toward major or minor in mathematics.)

Honors Distinctive: The student is expected to complete one Service-Learning project approved by the Professor by the end of the semester. Progress reports for the project and short discussion papers will also be submitted throughout the semester.
Prerequisite: MAT 113 or Special permission of Professor.

II. COURSE GOALS

Introduction to Biostatistics contributes to the concept of the whole person—an integrated person who is intellectually alert and spiritually alive. The intent is not only to assist the student in a quest for knowledge of his or her relationship to God, other people, and the universe, but also to enable the student to intelligently assume some of the roles encountered in everyday life such as decision maker in health matters.

The student will become statistically literate. As the professional literature in biology and the health fields continues to be statistically oriented, it is essential for the student of science to understand statistics in order to apply research findings to his or her own practice, thus enabling students to go into everyone's world with healing for the totality of human need.

This course provides the groundwork and basic tools, including proficiency with hand-held calculators and computer software, for those who plan to pursue the study of statistics for research purpose or for more concentrated study. The student will also apply statistics to a Service-Learning project.

III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

Unit Objectives
Unit 1: Approaches to statistics, scales of measurement, random sampling, mode, median, mean, variance, standard deviation, percentiles, discrete and continuous variables, box plots, stem-and-leaf displays, histograms, frequency polygons, binomial distribution, the normal distribution, and sampling distributions of means, mean differences, and proportions. As a result of successfully completing Unit 1, the student will be able to do the following:

A. Give examples of descriptive and inferential statistical methods.

B. Given a data set, represent it using appropriate graphical tools.

C. Name and define the measures of central tendency and dispersion.

D. Given a data set, compute the mode, median, mean, variance, standard deviation, and percentiles.

E. Calculate the probabilities of simple and compound events.

F. State properties of the binomial and normal distributions.

G. Calculate probabilities using the binomial and normal distributions.

H. Find percentiles in normal distributions and sampling distributions of means, mean differences, and proportions.

I. Calculate probabilities of events occurring in sampling distributions.

J. Perform tests of hypotheses involving statistical inference and estimation.

Unit 2: Two sample tests, the F distribution, analysis of variance, regression analyses, correlation analysis, and the chi-square test for independence. Special emphasis is placed on non-parametric testing and statistical analysis. As a result of successfully completing Unit 2, the student will be able to do the following:

A. Find confidence intervals for population means, the difference between two population means, and population proportions.

B. Perform tests of hypotheses involving population proportions.

C. Perform tests of hypotheses involving the difference between two population means (independent samples).

D. Perform tests of hypotheses involving the difference between two population means when samples are naturally paired (dependent samples).

E. Translate real-world theories into hypotheses and test them using appropriate procedures.

F. State properties of the F distribution and curve.

G. Perform Chi-square analysis for "goodness-of-fit" and test for independence.

H. Perform tests of hypotheses involving the ratio between two population variances.

I. Perform tests of hypotheses involving the differences among a group of population means (ANOVA).

J. Determine the equation of the least-squares line for a scatter-gram (prediction line) and use it to make predictions.

K. Compute the correlation and linear regression analysis and tests for significance.

Unit 3: Publishable Project.
The student is expected to complete one project approved by the Professor by the end of the semester. Progress reports for the project and short discussion papers will also be submitted throughout the semester. The project will extend the concepts covered in the lecture and/or textbook. All projects require use of a computer and statistical software. Throughout the semester the student will submit a paper describing the progress made on the project. These papers will be reflection papers and papers that indicate each of the following: the goal of the study, population description, methods used in the study (data collection techniques, statistical methodology, etc.), and ethical concerns in the study. The project **MUST** be done on an individual basis for the honors section.

IV. TEXTBOOKS AND OTHER LEARNING RESOURCES

A. Required Materials
1. Textbook
Marcello Pagano and Kimberlee Gauvreau, Thomson *Principles of Biostatistics,* Brooks/Cole Publishers, 2000 Second Edition, ISBN: 0 534229026 with CD
2. Graphing Calculator such as Texas Instruments TI-83 (or TI-83 Plus) with statistical functions and tests. The Instructor will be using a TI-84 Plus Silver Edition.

B. Recommended
Marcello Pagano and Kimberlee Gauvreau, *Student Solutions Manual for Principles of Biostatistics,* Thomson Brooks/Cole Publishers, 2001 Second Edition, ISBN: 0534373894

V. POLICIES AND PROCEDURES

A. University Policies and Procedures
1. Attendance at each class or laboratory is mandatory at Oral Roberts University. Excessive absences can reduce a student's grade or deny credit for the course.
2. Students taking a late exam because of an unauthorized absence are charged a late exam fee.
3. Students and faculty at Oral Roberts University must adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, electronic, video, multimedia, or computer software. Plagiarism and other forms of cheating involve both lying and stealing and are violations of ORU's Honor Code: "I will not cheat or plagiarize; I will do my own academic work and will not inappropriately collaborate with other students on assignments." Plagiarism is usually defined as copying someone else's ideas, words, or sentence structure and submitting them as one's own. Other forms of academic dishonesty include (but are not limited to) the following:
    a. Submitting another's work as one's own or colluding with someone else and submitting that work as though it were his or hers;

b. Failing to meet group assignment or project requirements while claiming to have done so;
c. Failing to cite sources used in a paper;
d. Creating results for experiments, observations, interviews, or projects that were not done;
e. Receiving or giving unauthorized help on assignments.

By submitting an assignment in any form, the student gives permission for the assignment to be checked for plagiarism, either by submitting the work for electronic verification or by other means. Penalties for any of the above infractions may result in disciplinary action including failing the assignment or failing the course or expulsion from the University, as determined by department and University guidelines.

4. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
5. Students are to be in compliance with university, school, and departmental policies regarding Whole Person Assessment (WPA) requirements. Students should consult the WPA handbooks for requirements regarding general education and the students' majors.
   a. The penalty for not submitting electronically or for incorrectly submitting an ePortfolio artifact is a zero for that assignment.
   b. By submitting an assignment, the student gives permission for the assignment to be assessed electronically.

B. Department Policies and Procedures

1. Each student who uses the computer is given access to the appropriate computer resources. These limited resources and privileges are given to allow students to perform course assignments. Abuse of these privileges will result in their curtailment. Students should note that the contents of computer directories are subject to review by instructors and the computer administrative staff.
2. A fee of $15.00 will be assessed for all late exams. This policy applies to all exams taken without notifying the professor prior to the regularly scheduled exam time, and to all exams taken late without an administrative excuse.
3. Any student whose unexcused absences total 33% or more of the total number of class sessions will receive an F for the course grade.

C. Course Policies and Procedures

1. Evaluation Procedures

   The standard grading scale will be used, A (90% - 100%), B (80% - 89%), C (70% - 79%), D (60% - 69%), F (0% - 59%). The composite score is determined by the following distribution:

Three fifty-minute exams	(40%)
Homework and quizzes	(30%)
One written projects	(15%)
One comprehensive final exam	(15%)

   This course does not require a Whole Person Assessment artifact.

2. Whole Person Assessment Requirements

This course does not require a Whole Person Assessment artifact.

3. Other Policies and/or Procedure

   a. Most of the student's previous mathematics class time has probably been spent listening to an instructor lecture about the material while taking notes. This is a very passive approach, one which will be changed in this course. Rather than lecturing all of the time, some class time will be spent discussing the material with the student. The student will be surprised how much clearer things become once they are said out loud. In order for this to work, the student must prepare for each class by reading the book prior to class. Remember, **mathematics is not a spectator sport!!!**

   b. There are four types of learning activities—reading, workbook exercises, Service-Learning, and computer laboratory. A daily assignment schedule will be supplied at the beginning of the class. Each section of the text is to be read prior to the class discussion of that section. Assignments will be reviewed on the day on which they are due. Exercises and problems must be turned in at the end of the class period on the date they are due in order to receive credit (see Grading Scale above). The student may be asked to put some problems or exercises on the board in class.

   c. Reading mathematics is very different from reading a novel. Every word and equation is important, and the student should consider each one carefully before going on. The student should keep a pencil and paper handy while reading so that details that may not be written down explicitly can be added. The student should try the exercises in the book. The answers are in the back of the book. The student should be ready to ask questions in class about the problems in class, and not be afraid to ask; surely, there are others with the same question. Some exercises are routine and mechanical, much like the homework the student is accustomed to having in mathematics courses. Other exercises require more thought, and one may find them frustrating at the beginning. Some problem-solving strategies will be explored, but the best way to learn to solve problems is to persevere. The student will eventually learn what questions to ask, how to try simple cases, and how to generalize. The student should be patient—the effort is worth it. Problem solving is what mathematics is all about.

   d. The students are encouraged to ask for help whenever they do not understand something or cannot solve a problem. The instructor will try to be available as much as possible. If the instructor's office hours are inconvenient, the student may call for help or make an appointment.

VI. COURSE CALENDAR

Lesson	Chapter	Topic	Homework
1	1 Introduction		none
2	2 Data Presentation	Identifying different type of data.	Review Exercises Problems to be assigned.
3		Describing and comparing data with tables and graphs	
4	3 Numerical Measures	Measurement of central tendency and dispersion	
5		Exploring Data Analysis techniques	
6	4 Standardization	Rates, Standardization and Application	
7	6 Probability	Probability	
8		Probability	
9	7 Advanced Probability	Probability Distribution and Binomial	
10		Poisson Distribution and Normal	
11		Examination #1 chapters 1-7	
12	8 Sampling	Sampling and Central Limit Theorem	
13		Application of sampling	
14	9 Confidence Intervals	One and two sided intervals with Student t distributions	
15	10 Hypothesis testing	General Concepts – construction of	
16		Types of errors and power definitions	
17		Application	
18	11 Comparison of two means	Paired and Independent samples	
19		Application	
20	12Analysis of Variance	ANOVA	
21		Application	
22		Examination #2 Chapters 8 – 12	
23	13 Nonparametric Methods	Definition and different tests	
24		Advantages/disadvantages of nonparametric tests	
25		Application	
26	Handout		
27			
28			
29	14 Proportions and Inference	Normal to Binomial Distributions	
30		Hypothesis testing	
31	15Contingency Tables	Chi-Square Test	
32	16 Multiple 2x2 Tables	Simpson's Paradox and other tests	
33	17 Correlation	Two-way, Pearson's and Spearman's Correlation	
34		Application	
35	18 Simple	Model	

	Linear Regression		
36		Evaluation of model	
37		Examination #3	
38	21 Sampling theory	Sampling Schemes	
39		Make-up as needed	
40		Project	
41		Project	
42		Project	
43		Project	
44		Review for Final	

Course Inventory for ORU's Student Learning Outcomes

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This course contributes to the ORU student learning outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.
No Contribution – Does not address the outcome.

The Student Learning Glossary at http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

OUTCOMES & Proficiencies/Capacities	Significant Contribution	Moderate Contribution	Minimal Contribution	No Contribution
1	**Outcome #1 – Spiritually Alive** Proficiencies/Capacities				
1A	Biblical knowledge				x
1B	Sensitivity to the Holy Spirit				x
1C	Evangelistic capability				x
1D	Ethical behavior		x		
2	**Outcome #2 – Intellectually Alert** Proficiencies/Capacities				
2A	Critical thinking	x			
2B	Information literacy		x		
2C	Global & historical perspectives			x	
2D	Aesthetic appreciation				x
2E	Intellectual creativity	x			
3	**Outcome #3 – Physically Disciplined** Proficiencies/Capacities				
3A	Healthy lifestyle				x
3B	Physically disciplined lifestyle				x
4	**Outcome #4 – Socially Adept** Proficiencies/Capacities				
4A	Communication skills		x		
4B	Interpersonal skills		x		
4C	Appreciation of cultural & linguistic differences				x
4D	Responsible citizenship		x		
4E	Leadership capacity			x	