



BIOSTAT – Statistics for Biologists
Prerequisite: MATH111

Prerequisite to:

Instructor: _____
Consultation Hours: _____

Contact details: _____
Class Schedule and Room: _____

Course Description

BIOSTAT (Statistics for Biologists) is an introductory course on the basic concepts of descriptive and inferential statistics designed for Biology students. Topics include descriptive and inferential statistics, probability distributions, estimation of parameters, tests of hypotheses, regression and correlation analyses, analysis of variance, and chi-square tests.

Learning Outcomes

On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA)

ELGA	Learning Outcome
Critical and Creative Thinker Effective Communicator Lifelong Learner Service-Driven Citizen	At the end of the course, the students will be able to apply appropriate statistical concepts, methodologies and technologies in organizing, analyzing and interpreting various real-world situations and in coming up with relevant decisions.

Final Course Output

As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated dates of the term.

Learning Outcome	Required Output	Due Date
At the end of the course, the students will be able to apply appropriate statistical concepts, methodologies and technologies in organizing, analyzing and interpreting various real-world situations and in coming up with relevant decisions.	Statistical analysis of real-life data in biology / health sciences	Week 13

Rubric for assessment

CRITERIA	EXEMPLARY 4	SATISFACTORY 3	DEVELOPING 2	BEGINNING 1
Formulation of the Research Problem and Objectives (10%)	Research problem and objectives are clearly defined and significant; Demonstrates evidence that the research problem was researched and designed well.	Research problem and objectives are clearly defined and significant.	Research problem is clearly defined but some objectives are insignificant.	Research problem and objectives are vague and insignificant.
Appropriateness and Extensiveness of Descriptive Statistics (20%)	Data are presented accurately using all appropriate tables/graphs/numerical measures with proper labels/titles and correct interpretations.	Data are presented using appropriate tables/graphs/numerical measures.	Some data are presented using inappropriate tables/graphs/numerical measures.	Data are presented using inappropriate tables/graphs/numerical measures.
Applications of Inferential Statistics (30%)	Statistical analyses are appropriate, necessary, and sufficient which completely lead to the solution of the research problem.	Statistical analyses are appropriate and necessary which partially lead to the solution of the research problem.	Some statistical analyses are inappropriate and do not lead to the solution of the research problem.	Statistical analyses are inappropriate and do not lead to the solution of the research problem.
Depth of Analysis (25%)	Interpretations and conclusions are correct and relevant with meaningful implications.	Interpretations and conclusions are correct and relevant	Some interpretations and conclusions are incorrect and irrelevant	Interpretations and conclusions are incorrect and irrelevant

Clarity and Organization of Report (15%)	Report is organized logically and presented clearly with effective transitions.	Report is organized logically and presented clearly.	Report is organized and some discussions are not clear.	Report is not organized.

Additional Requirements				
<div> <div></div> Inquiry Plans \ Activities <div></div> Skills Check <div></div> Computer Output <div></div> Portfolio <div></div> Reflection \ Reaction Paper <div></div> Mid Term Exam <div></div> Final Exam </div>				

Grading System				
				Scale: 95-100% 4.0 89-94% 3.5 83-88% 3.0 78-82% 2.5 72-77% 2.0 66-71% 1.5 60-65% 1.0 <60% 0.0
	FOR EXEMPTED STUDENTS (w/out Final Exam)	FOR STUDENTS with FINAL EXAM		
		<i>with no missed quiz</i>	<i>with one missed quiz</i>	
Average of quizzes (at least 4)	85%	55%	45%	
Class Activities and Computer Outputs	5%	5%	5%	
Learning Output	10%	10%	10%	
Final Examination	--	30%	40%	

Learning Plan			
	Culminating Topics	Time Frame	Learning Activities
At the end of the course, the students will be able to apply appropriate statistical concepts, methodologies and technologies in organizing, analyzing and interpreting various real-world situations and in coming up with relevant decisions.	I. INTRODUCTION 1.1 The Meaning of Statistics 1.2 The Uses of Statistics 1.3 Descriptive and Inferential Statistics 1.4 Sources of Data 1.4.1 Surveys and Experiments 1.4.2 Retrospective and Prospective Studies 1.4.3 Clinical Trials 1.5 Population and Sample 1.6 Qualitative and Quantitative Data 1.7 Scales of Measurement	Weeks 1-2	Eliciting Prior Knowledge Inquiry Approach: Variations in Real Life Newspaper /Journal Clippings on Applications of Statistics Critiques on Use and Misuse of Statistics Data Collection Sampling from Actual Data On-line Activity: Search on Government/Non-government Surveys and their Results Computer Laboratory Activity: Working on Microsoft Excel and PhStat2 in Generating Tables and Graphs. Project on Data Presentation of Real-life Data
	II. VITAL STATISTICS AND DEMOGRAPHIC METHOD 2.1 Sources of Vital Statistics and Demographic Data 2.2 Vital Statistics Rates, Ratios, and Proportions 2.3 Measures of Mortality, Fertility, and Morbidity		

	III. DESCRIBING POPULATION AND SAMPLE DATA 3.1 Tabular and Graphical Descriptions 3.2 Numerical Measures 3.2.1 Parameter and Statistics 3.2.2 Measures of Central Tendency 3.2.3 Measures of Variability (including Coefficient of Variation) 3.2.4 Measures of Relative Standing 3.3 Box and Whiskers Plot	Weeks 2-3	Worksheets on Numerical Measures Exploratory Comparison of Two Actual Data Sets Computer Laboratory Activity: Generating and Interpreting Summary Measures
	IV. PROBABILITY AND PROBABILITY DISTRIBUTIONS 4.1 Basic Probability Concepts 4.2 Discrete Probability Distributions: Binomial and Poisson 4.3 Normal Probability Distribution	Week 4	Cooperative Learning: Statistical Experiments Using Coins, Dice, Cards, and/or Balls Monty Hall Problem/Dice Problems/Birthday Problem/Recreational Probability Problems Newspaper /Journal Clippings on Applications of Probability Distributions Computer Laboratory Activity: probability distributions to real-life prob On-line active learning: Simulating normal distribution Computer Laboratory Activity: Applications of normal distribution to real-life problems
	V. ESTIMATION OF PARAMETERS 5.1 Sampling and Sampling Distribution 5.2 Estimation of mean, variance and proportion for a single population 5.3 Error of estimation and sample size determination 5.4 Estimation of the difference between 2 means, ratio of 2 variances and difference of 2 proportions for two populations	Week 5	On-line active learning: Simulating sampling distribution of the mean Inquiry Approach: Which is a better estimate? Computer Laboratory Activity: Estimation of proportion and mean

	VI. TEST OF HYPOTHESIS 6.1 Tests of mean, variance and proportion for a single population 6.2 Tests of the difference between 2 means, ratio of 2 variances and difference of 2 proportions for two populations 6.3 Interpretation of p - value	Weeks 6-8	Eliciting Prior Knowledge: Formulating Hypotheses Inquiry Approach: 'Guilty' or 'Not Guilty'? Computer Laboratory data analysis involving z-test and t-test
	VII. REGRESSION AND CORRELATION 7.1 Correlation Analysis 7.2 Simple Linear Regression Analysis	Weeks 9-11	Computer Laboratory Activity: Actual data analysis involving simple linear regression and correlation analysis; ANOVA
	VIII. ANALYSIS OF VARIANCE 8.1 One - way ANOVA 8.2 Two - way ANOVA 8.3 Post-Hoc Test (Tukey-Kramer Test)		
	XI. CHI – SQUARE TESTS 9.1 Test for goodness of fit 9.2 Test for Equality of more than two proportions 9.3 Test for independence	Weeks 12	Computer Laboratory Activity: Actual data analysis involving chi-square tests
	LEARNING OUTCOME	Week 13	Statistical analysis of real-life data in biology / health sciences
	FINAL EXAMINATION	Week 14	

References
<p>Albert (2007). <i>Basics Statistics for the Tertiary level</i>. Manila: Rex Publishing Company.</p> <p>Arcilla, R., Co, F., Ocampo, S. & Trevalles, R. (2011). <i>Statistical Literacy for Lifelong Learning</i>. Manila: ABIVA Publishing House, Inc</p> <p>Downie and Heath (1984). <i>Basic Statistical Methods (5th Edition)</i>. Manila: National Bookstore.</p> <p>Glover, T. and Mitchell, K. (2008). <i>An Introduction to Biostatistics</i>. NY: McGraw Hill (Asia).</p> <p>Kuzma, J.W. and Bohnenblust, S.E. (2005). <i>Basic Statistics for the Health Sciences (5th edition)</i>. McGraw Hill International.</p> <p>Levine, Berenson & Stephan (2002). <i>Statistics for Managers Using Microsoft Excel (3rd edition)</i>. Upper Saddle River, NJ: Prentice Hall</p> <p>Mann. (2011). <i>Introductory Statistics (7th edition)</i>. Hoboken, NJ: Wiley.</p> <p>Mendenhall, Beaver & Beaver (2009). <i>Introduction to Probability and Statistics (13th edition)</i>. Belmont, CA: Thomson/Brooke/Cole.</p> <p>Rao, P.V. (1997). <i>Statistical Research Methods in the Life Sciences</i>. CA: Duxbury Press.</p> <p>Walpole, Myers, Myers & Ye (2005). <i>Probability and Statistics for Engineers and Scientists (7th edition)</i>. Singapore: Pearson Education (Asia).</p>

Online Resources
<p>National Statistics Office Accessed October 22, 2012 from: http://census.gov.ph</p> <p>Math Goodies. Accessed October 15, 2012 from: http://www.mathgoodies.com</p> <p>http://www.ruf.rice.edu/~lane/statsim/samplingdist/</p> <p>Big Data Analytics, Enterprise Analytics, Data Mining Software, Statistical Analysis, Predictive Analytics. Accessed October 15, 2012 from: http://www.statsoft.com</p> <p>Chung, B.C. (2012) <i>Betty C. Chung's Web Site</i>. Accessed October 22, 2012 from http://www.bettychung.net/Statsites.htm</p>

Class Policies

1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
 - A. approved absences (where the student concerned officially represented the University at some function or activity).
 - B. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
4. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
5. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
6. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other prefinal course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
7. Learning outputs are required and not optional to pass the course.
8. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.
9. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
10. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
11. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
12. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
13. Only students who are officially enrolled in the course are allowed to attend the class meetings.

Approved by:

DR. ARTURO Y. PACIFICADOR, JR.

Chair, Department of Mathematics