DE LA SALLE UNIVERSITY
College of Science
Department of Mathematics

STATSCI – Statistics for Chemistry and Physics students
Prerequisite: MATH112   *Prerequisite to:*

Instructor: _____   **Contact details:** _____
Consultation Hours: _____   **Class Schedule and Room:** _____

Course Description

STATSCI is an introductory course on the basic concepts of descriptive and inferential statistics designed for Chemistry and Physics students. Topics include descriptive and inferential statistics, probability distributions, estimation of parameters, tests of hypotheses, linear regression and correlation analyses, and analysis of variance (ANOVA).

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 Reflective 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 chemistry / physics	Week 13

Rubric for assessment

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (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

- 3 Quizzes
- Final Exam
- Computer Output
- Skills Check
- Inquiry Plan / Activities
- Portfolio

Grading System

	FOR EXEMPTED STUDENTS (w/out Final Exam)	FOR STUDENTS with FINAL EXAM	
		with no missed quizzes	*with one missed quiz*
Average of quizzes (at least 3)	85%	55%	45%
Class Activities and Computer Outputs	5%	5%	5%
Learning Output	10%	10%	10%
Final Examination	--	30%	40%

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

Learning Plan

LEARNING OUTCOME	TOPIC	WEEK NO.	LEARNING ACTIVITIES
I. 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. **OVERVIEW OF STATISTICS** 1.1 Definition of Statistics 1.2 Application of Statistics 1.3 Descriptive and Inferential Statistics 1.4 Population and Sample 1.5 Sources of Data 1.6 Qualitative and Quantitative Data 1.7 Scales of Measurement	Week 1	Eliciting Prior Knowledge: Concept/Spider Mapping Critiques on Use and Misuse of Statistics Data Collection Sampling from Actual Data On-line active learning: Uses of Descriptive Statistics in Chemistry/Physics journal papers

	II. **DESCRIBING POPULATION AND SAMPLE DATA**
	
	2.1 Tabular and Graphical Descriptions
	2.2 Numerical Measures
	    2.2.1 Parameter and Statistics
	    2.2.2 Measures of Central Tendency
		Weeks 2-3	Worksheets on Numerical Measures
			
			Exploratory Comparison of Two Actual Data Sets in Chemistry/Physics
			
			Computer Laboratory Activity: Generating Tables and Graphs
			
			Computer Laboratory Activity:

		2.2.3 Measures of Variability (including Coefficient of Variation) 2.2.4 Measures of Relative Standing 2.2.5 Measure of Skewness 2.3 Box and Whiskers Plot		Generating and Interpreting Summary Measures
		III. PROBABILITY AND PROBABILITY DISTRIBUTIONS 3.1 Basic Probability Concepts 3.2 Discrete Probability Distributions: Binomial and Poisson 3.3 Normal Probability Distribution	Weeks 4-5	Cooperative Learning: Statistical Experiments Using Coins, Dice, Cards, and/or Balls Dice Puzzles/Monty Hall Problem/Birthday Problem/Recreational Probability Problems Journal Clippings on Applications of Probability Distributions On-line active learning: Simulating normal distribution
		IV. ESTIMATION OF PARAMETERS 4.1 Sampling and Sampling Distribution 4.2 Estimation of mean, variance and proportion for a single population 4.3 Error of estimation and sample size determination 4.4 Estimation of the difference between 2 means, ratio of 2 variances and difference of 2 proportions for two populations	Weeks 6-7	On-line active learning: Simulating sampling distribution of the mean Computer Laboratory Activity: Estimation of mean, proportion and variance in real-life problems
		V. TEST OF HYPOTHESIS 5.1 Tests of mean, variance and proportion for a single population 5.2 Tests of the difference between 2 means, ratio of 2 variances and difference of 2 proportions for two populations 5.3 Interpretation of p - value	Weeks 8-9	Eliciting Prior Knowledge: Formulating Hypotheses Inquiry Approach: 'Guilty' or 'Not Guilty'? Computer Laboratory Activity: Actual data analysis involving z-test, t-test and F-test
		VI. ANALYSIS OF VARIANCE 6.1 One - way ANOVA 6.2 Two - way ANOVA 6.3 Post-Hoc Test (Tukey-Kramer Test)	Weeks 10-12	Journal paper review on the use of statistical analysis in Chemistry/Physics Computer Laboratory Activity: Actual data analysis involving ANOVA
		VII. REGRESSION AND CORRELATION 7.1 Correlation Analysis 7.2 Simple Linear Regression Analysis		Exploring the relationship of two variables Computer Laboratory Activity: Actual data analysis involving simple linear regression and correlation analysis and ANOVA
		LEARNING OUTPUT	Week 13	Statistical analysis of real-life data in Chemistry / Physics
		FINAL EXAMINATION	Week 14	

References

Arcilla, Co, Ocampo and Trevalles (2013) *Statistical Literacy for Lifelong Learning*. Manila: ABIVA Publishing House, Inc.

Walpole, Myers, Myers and Ye (2011). *Probability and Statistics for Engineers and Scientists (9th edition).* Singapore: Pearson Education (Asia).

Mann (2011). *Introductory Statistics* (7th edition). Hoboken, N.J.; Wiley

Mendenhall/Beaver/Beaver (2009) *Introduction to Probability and Statistics* (13th edition). Belmont CA: Thomson/Brooke/Cole.

Albert *(2007). Basics Statistics for the Tertiary level.* Manila: Rex Publishing Company.

Online Resources

http://www.census.gov.ph/
http://www/mathgoodies.com
http://www/statsoft.com
http://www.ruf.rice.edu~lane/statsim/samplingdist/
http://www.shodor.org

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

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February 2013 / SROcampo/MGTan/