Course Description
A study of the various linear statistical models that arise in practice. Topics include multivariate normal distribution, distribution of quadratic forms, general linear models, estimation and tests of hypotheses about linear hypotheses and design matrices giving rise to analysis of variance models.

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)

<table>
<thead>
<tr>
<th>ELGA</th>
<th>Learning Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical and Creative Thinker</td>
<td>At the end of the course, the student will perform regression analysis; apply appropriate statistical concepts, processes, tools, and technologies in solving various conceptual and real-world problems.</td>
</tr>
<tr>
<td>Effective Communicator</td>
<td></td>
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<tr>
<td>Lifelong Learner</td>
<td></td>
</tr>
<tr>
<td>Service-Driven Citizen</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Required Output</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the end of the course, the student will perform regression analysis; apply appropriate statistical concepts, processes, tools, and technologies in solving various conceptual and real-world problems.</td>
<td>An inquiry-based group project highlighting the use of regression analysis in different problem situations encountered in the real world.</td>
<td>Week 13</td>
</tr>
</tbody>
</table>

Rubric for assessment
The following rubric will be used for grading students’ rewritten solutions. The new quiz score will be obtained by adding ORIGINAL QUIZ SCORE and 20% of the REWRITTEN SCORE. Note that students will only rewrite items that they did not get perfectly.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Excellent (4)</th>
<th>Good (3)</th>
<th>Satisfactory (2)</th>
<th>Needs Improvement (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulation of the Research Problem and Objectives (10%)</td>
<td>Research problem and objectives are clearly defined and significant; demonstrates evidence that the research problem was researched and designed well.</td>
<td>Research problem and objectives are clearly defined and significant.</td>
<td>Research problem is clearly defined but some objectives are insignificant.</td>
<td>Research problem and objectives are vague and insignificant.</td>
</tr>
<tr>
<td>Correct Application of the Statistical Concepts (35%)</td>
<td>Statistical analyses are appropriate with correct interpretations and relevant conclusions.</td>
<td>Statistical analyses are appropriate with correct interpretations.</td>
<td>Some statistical analyses are inappropriate.</td>
<td>Statistical analyses are inappropriate.</td>
</tr>
<tr>
<td>Depth of Analysis (30%)</td>
<td>The analysis convinces the reader about the wisdom of conclusions, implications and</td>
<td>The analysis engages the reader to appreciate the wisdom of conclusions, implications and</td>
<td>The analysis has limited ideas that do not explain the wisdom of conclusions, implications and</td>
<td>The analysis has incorrect ideas and conclusions.</td>
</tr>
</tbody>
</table>
### Clarity and Organization of Written Report (10%)
- **Clarity and Organization of Written Report (10%)**
  - Written report is organized logically and presented clearly with effective transitions.
  - Written report is organized logically and presented clearly.
  - Written report is organized and some discussions are not clear.
  - Written report is not organized.

### Oral Presentation (15%)
- **Oral Presentation (15%)**
  - Overall presentation is creative and well organized with innovative ideas.
  - Overall presentation is creative and well organized.
  - Overall presentation is organized.
  - Overall presentation is not organized.

### Additional Requirements
- Quizzes
- Class Participation (seatwork and group exercises, homework, recitation)
- Computer hands-on exercises using SAS
- Final Examination

### Grading System

<table>
<thead>
<tr>
<th></th>
<th>FOR EXEMPTED STUDENTS (w/out Final Exam)</th>
<th>FOR STUDENTS with FINAL EXAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average of quizzes &amp; Project</td>
<td>With no missed quiz</td>
</tr>
<tr>
<td></td>
<td>86%</td>
<td>With one missed quiz</td>
</tr>
<tr>
<td>Class participation &amp; Lab exercises</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>Final exam</td>
<td>-</td>
<td>30%</td>
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<tr>
<td></td>
<td></td>
<td>40%</td>
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</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>LEARNING OUTCOME</th>
<th>TOPIC</th>
<th>WEEK NO.</th>
<th>LEARNING ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the end of the course, the student will perform regression analysis, apply appropriate statistical concepts, processes, tools, and technologies in solving various conceptual and real-world problems.</td>
<td>1. Simple Linear Regression 1.1 The Problem and Motivation Behind Curve Fitting 1.2 Model Assumptions 1.3 Overview of Method of Estimation 1.4 Hypothesis Testing and Confidence Intervals for $\beta_0$ and $\beta_1$ 1.5 Correlation: Inference and Relationship to Simple Linear Regression Model</td>
<td>12 hours / Weeks 1-4</td>
<td>Prior knowledge and beliefs survey Concept mapping Library work Group discussion and presentations Computer laboratory activity (SAS) Skills exercises Student self-assessment and reflection</td>
</tr>
<tr>
<td>Quiz No. 1</td>
<td>1.5 hours / Week 5</td>
<td>4.5 hours /</td>
<td></td>
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<tr>
<td>2. Measures of Model</td>
<td></td>
<td></td>
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<tr>
<td>Adequacy</td>
<td>Weeks 5-6</td>
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<tr>
<td>2.1 Tests for Linearity</td>
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<tr>
<td>2.2 Tests for Normality</td>
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<tr>
<td>2.3 Tests for Homoscedasticity</td>
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<tr>
<td>2.4 Tests for Independence</td>
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<tr>
<td>2.5 Outliers Deletion</td>
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<tr>
<td>2.6 Transformations</td>
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</tr>
</tbody>
</table>

**Quiz No. 2**

1.5 hours / Week 7

3. Multiple Linear Regression
   3.1 Motivation: Real-world examples
   3.2 The Multiple Regression Model and its Assumptions
   3.3 Estimation of Parameters
   3.4 Using the Model to Make Predictions
   3.5 Hypothesis Testing and Confidence Intervals for \( \beta \)
   3.6 Full versus Reduced Model: The F Test

12 hours / Weeks 7-11

<table>
<thead>
<tr>
<th>4. Variable Selection and Model Building</th>
<th>3 hours / Weeks 11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Criteria for Selecting Appropriate Models: MSE, ( C_p ), and adjusted ( R^2 )</td>
<td></td>
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<tr>
<td>4.2 Forward Selection, Backward Elimination and Stepwise Selection Procedures</td>
<td></td>
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</tbody>
</table>

**Quiz No. 3**

1.5 hours / Week 12

5. Issues in Regression Modeling (Optional)

1.5 hours / Week 13

Inquiry-based Group Project

1.5 hours / Week 13

**Final Examination**

2 hours / Week 14

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**References**


Online Resources


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