Fall 2013: ST465: Experimental Research Methods

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PREREQUISITE ST210 or ST265 or EC220 or ST381 or PY292.
COREQUISITE ST365 for students majoring in statistics.

CLASS TIME  MWF  12:00 – 12:50
OFFICE HOURS MWF  10:00 – 10:50
MWF  1:00 – 1:50 or by appointment

COURSE DESCRIPTION
Concepts and techniques for experimental research including simple, logistic, and multiple regression; analysis of variance; analysis of categorical data.

GRADING  3 Midterm Exams (10% (for lowest) & 2×15%): W 10/2, W 10/30, M 11/25.
Cumulative Final Exam (20%) Wednesday December 18, 1pm
Homework due weekly on Monday at the beginning of class (25%)
Project (15%)

Final Grade Determination:
A− B+ B− C+ C− D+ D F
[92,100] [90,92) [87,90) [83,87) [80,83) [77,80) [73,77) [70,73) [67,70) [60,67) [0,60)

Catalog Description of Grades:
A: Excellent. Denotes outstanding achievement and an unusual degree of intellectual initiative. It is the highest grade awarded.
B: Good. Denotes work which surpasses the objectives for the course. It is a mark of distinction.
C: Satisfactory. Denotes work which achieves the objectives for the course. It is the lowest grade given for an acceptable performance.

Absence from an exam will require a valid written medical excuse or written evidence of some other serious occurrence.

HONOR CODE: The Honor Code states that all students of the Loyola Community have been equally entrusted by their peers to conduct themselves honestly on all academic assignments and tests. The students of this College understand that having collective and individual responsibility for the ethical welfare of their peers exemplifies a commitment to the community. Students who submit materials that are the products of their own minds demonstrate respect for themselves and the community in which they study. All outside resources or information should be clearly acknowledged. If there is any doubt or question regarding the use and documentation of outside sources for academic assignments, your instructor should be consulted. Any violations of the Honor Code will be handled by the Honor Council.

STUDENTS WITH DISABILITIES:
To request academic accommodations due to a disability, please contact Disability Support Services (DSS), Newman Towers West 107, at DSS@loyola.edu or call (410) 617-2750/2062.
If you already registered with DSS and requested an accommodations letter (and DSS has sent the letter to your professors via email), please schedule a brief meeting to discuss the accommodations you might need in this class.
CELL PHONES/TEXTING:
When you come to class, I expect you to not only be in attendance physically but also mentally. That means no cell phone usage or texting during the class period. Please switch off these devices. If you must take an important call, feel free to leave the class to do so.


SECTIONS COVERED:
Ch. 11 1 – 5, 7, 9 Simple Linear Regression and Correlation
Ch. 12 1 – 8, 11 Multiple Regression
Ch. 13 1 – 4, 6 More on Multiple Regression
Ch. 10 2 – 7, 10 Categorical Data - Chi-Square tests.
Ch. 8 1-5, 8 One Way Analysis of Variance
Ch. 9 1-6, 8, 11 Multiple Comparisons
Nonparametric Methods - as time allows - §5.9, §6.3, §6.5, §8.6, §9.9

You are responsible for the material covered in class. Some material in the book will be omitted and extra material will be included. Thus, it is very important that you attend class. After each class you should review the material covered before the next class and work on the assigned problems that relate to the material already covered. This will help you to avoid having too much homework to complete the night before the homework is due.

ASSIGNMENTS:

- All assignments must be on 8½ × 11 paper - ragged paper torn from notebooks is unacceptable.
- Assignments must be stapled. **If they are not, only the first page will be graded.**
- Not all assigned problems will be graded. Thus, it is important that you attempt all assigned problems. To do well you should work consistently throughout the semester.
- Note that homework counts 25% of the course grade.
- **Late homework is not accepted.**
- The lowest homework score is dropped.
- For the homework assignments you may work with one partner, if you wish. This partner does not have to remain the same for all assignments. For assignments that allow group work, the group will submit one assignment to be graded.
- The purpose of the teams is to interact, not divide the work and staple it together. For assignments that allow group work the group will submit one assignment to be graded.

**EACH GROUP IS TO WORK INDEPENDENTLY!**

*A violation of this rule is considered to be an honor code violation.*
LEARNING OUTCOMES OF THE COURSE:
This course will cover the three most widely used techniques in applied statistics: regression, analysis of variance (ANOVA), and chi-square tests for categorical data. The course will be very applied with most of the calculations will be performed using the Minitab statistical software package. The assumptions underlying the analyses will be stressed. Thus, it will be important to be able to check whether the assumptions are valid. Graphing calculators are also able to perform many of these analyses.

By the end of the semester you should be able to:

1. Use linear regression to model numerical data (including transformations of the variables).
2. Perform model checks to decide whether the model "fits" the data.
3. Perform various tests related to regression analysis.
4. Use dummy/indicator variables to compare a number of groups.
5. Use logistic regression to model a binary variable.
6. Perform chi-squared tests of goodness of fit, homogeneity, and independence and be able to distinguish between these situations.
7. Compare the means of a number of "treatments" (1 way ANOVA).
8. Use multiple comparisons to decide which treatments are different.
9. Know the assumptions of the various analyses and be able to check their validity.

Guidelines for Assessment and Instruction in Statistics Education (GAISE) for Undergraduates
1. Emphasize statistical literacy and develop statistical thinking.
2. Use real data.
3. Stress conceptual understanding rather than mere knowledge of procedures.
4. Foster active learning in the classroom.
5. Use technology for developing concepts and analyzing data.
6. Use assessments to improve and evaluate student learning.

THE LEARNING AIMS FOR ST465 AS THEY RELATE TO LOYOLA UNIVERSITY’S LEARNING AIDS:
Undergraduate Educational Aims of the University:
(http://www.loyola.edu/academics/academicaffairs/UgAims.html)

- Intellectual Excellence –
  - Appreciation of and passion for intellectual endeavor and the life of the mind.
  - Appreciation of and grounding in the liberal arts and sciences.
  - Excellence in a discipline, including understanding of the relationship between one's discipline and other disciplines; understanding the interconnected ness of all knowledge.
  - Habits of intellectual curiosity, honesty, humility, and persistence.

- Critical Understanding: Thinking, Reading, and Analyzing –
  - The ability to evaluate a claim based on documentation, plausibility, and logical coherence.
  - The ability to analyze and solve problems using appropriate tools.
  - The ability to make sound judgements in complex and changing environments.
  - The ability to use mathematical concepts and procedures competently, and to evaluate claims made in numeric terms.
  - The ability to use information technology in research and problem solving, with an appreciation of its advantage and limitations.

Core Learning Aims for courses in Natural and Mathematical Sciences:
(http://loc.loyola.edu/senay07/documents/natural%20sciences%20final.pdf)

- Students understand the process of science - its methodology, how questions are framed, how data are acquired, how arguments are constructed and conclusions reached.
- Students learn to reason mathematically, and to think critically and analytically through statistical or mathematical methods.