JOLIET JUNIOR COLLEGE
1901
DEPARTMENT OF MATHEMATICS

STAT 228
Advanced Statistics

Course Description
A second course in statistics, focusing on advanced topics including: data manipulation, variable creation, and transformations; multiple regression; nonlinear regression; ANOVA; and non-parametric statistics. This course uses a statistical software package such as R or other equivalent programs.

Illinois Articulation Initiative (IAI) number:

Credit and Contact Hours:

Lecture	**3**
Lab	**0**
Credit Hours	**3**

Prerequisites: Grade of "C" in Math 128 or equivalent.

Books, Supplies, and Supplementary Materials

A. Textbooks

Statistics: Informed Decisions (Set: Text/CD/*MyStatLab*), 6th Ed., 2020, Sullivan, ISBN: 9780134135366, Pearson Education

Wickham, H. and Grolemund, G., *R for Data Science*. Riley. https://r4ds.had.co.nz/

B. Other Required Materials

R or *R-Studio* free downloads

Methods of Instruction:

Hybrid
Online

General Education Student Learning Outcome

Applied Knowledge: Students draw from learning experiences/concepts to solve a variety of problems or challenges.

Course Learning Outcomes (CLOs)

1. Students should apply data science techniques to prepare data sets for analysis.

2. Students should analyze multiple regression problems.
3. Students should analyze ANOVA problems.
4. Students should analyze problems using non-parametric statistics.

Lesson Learning Outcomes (LLOs)

1. Students build probability models using simulation.
2. Students use transformations to create a normal random variable.
3. Students create new variables within a data set.
4. Students learn how to access existing data sets and clean them.
5. Students perform a One-Way ANOVA.
6. Students perform post hoc tests on one-way ANOVA.
7. Students analyze the randomized complete block design.
8. Students examine a two-way ANOVA.
9. Students review least-squares regression.
10. Students use randomization techniques on the slope of the least-squares regression line.
11. Students perform a test of significance of the least-squares regression model.
12. Students construct a correlation matrix.
13. Students perform a residual analysis on multiple regression.
14. Students perform polynomial regression.
15. Students build a regression model with forward selection and backward elimination.
16. Students build a regression model using stepwise regression.
17. Students analyze data using the runs test for randomness.
18. Students analyze data using the one-sample sign test.
19. Students analyze data using the Mann-Whitney test.
20. Students analyze data using the Wilcoxon matched-pairs signed-ranks test.
21. Students analyze data using the Spearman's Rank-Correlation test.
22. Students analyze data using the Kruskal-Wallis test.

TOPICAL OUTLINE/TIMELINE

Week	LLOs Learned	CLOs Learned
Week One	1,2	1
Week Two	3	1
Week Three	4	1
Week Four	9,10	2
Week Five	11,12	2
Week Six	13	2
Week Seven	14	2
Week Eight	15,16	2
Week Nine	5	3
Week Ten	6	3
Week Eleven	7	3
Week Twelve	8	3
Week Thirteen	17,18	4
Week Fourteen	19,20	4
Week Fifteen	21	4
Week Sixteen	22	4

Graded Assignments
The individual instructor will determine which items he or she considers essential for the student to memorize without error and test accordingly. The individual instructor will determine the types of projects that the student will complete during the class

Final Course Grading Scale

Grade	Percentage
A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	lower than 60%

Faculty Commitment
Faculty members are committed to providing a quality learning experience through thoughtful planning, implementation, and assessment of course activities. They are also committed to being readily available to students throughout the semester by returning e-mails and phone calls within 48 hours and to returning graded course work within a week. Furthermore, they are committed to selecting appropriate course materials and making them available in an organized and timely manner.

Student Commitment
For every credit hour a student is enrolled in, they should expect to spend at least 2 hours outside of class studying, working on assignments, and preparing for class each week of the fifteen-week semester. For example, for this four credit-hour class, students can expect to spend four hours per week in class actively engaged in learning the material by participating in face-to-face classes or viewing lectures and instructional material online. In addition, students should expect to spend another eight hours per week outside of class completing homework and assignments, posting to discussion boards online, or studying for quizzes and tests. This means students should spend a minimum of 12 hours per week engaged in achieving the learning outcomes for this course. If you are not achieving your desired results in this class, you should consider increasing your prep time outside of class, in addition to using available resources such as instructor office hours and tutoring services.

By registering for this course, you commit yourself to active participation in course activities as well as the submission of all assignments and exams on time. Furthermore, you commit to accessing the course site and checking your JJC e-mail several times a week.

TOPICAL OUTLINE	**Lesson Outcomes**	**Assignments**
Week One	1,2	Homework: Data transformation
Week Two	3	Homework: Data manipulation
Week Three	4	Project 1: Data Cleaning
Week Four	9,10	Homework: 4.1-4.3, 14.1A
Week Five	11,12	Homework: MyLab 14.1,14.3.1
Week Six	13	Homework: MyLab 14.3.2, 14.4
Week Seven	14	Homework: MyLab 14.5, 14.6
Week Eight	15,16	Project 2: Multiple Regression
Week Nine	5	Homework: MyLab 13.1,13.2
Week Ten	6	Homework: MyLab 13.3
Week Eleven	7	Homework: MyLab 13.4
Week Twelve	8	Project 3: ANOVA
Week Thirteen	17,18	Homework: MyLab 15.2,15.3
Week Fourteen	19,20	Homework: MyLab 15.4,15.5
Week Fifteen	21	Homework: MyLab 15.6,15.7
Week Sixteen	22	Project 4: Non-parametric Statistics