STAT 313 APPLIED EXPERIMENTAL DESIGN AND REGRESSION MODELS
SUMMER 2020

INSTRUCTORS: DR. BETH CHANCE DR. KAREN MCGAUGHEY

COURSE PREREQUISITE: Successful completion of STAT 217, 218, 312 or equivalent.

REQUIRED MATERIALS:

- *We will use the software packages JMP and/or R for all data analysis. See the technology instructions page in Canvas. Let us know if you have any problems.*
  - *We recommend that you choose one of the software packages and use that one for the entire course. Instructions for both will be posted.*
- *Textbook (pdf files posted in Canvas):* ***Intermediate Statistical Investigations*** *by Tintle, Chance, McGaughey, Roy, Swanson, VanderStoep*
  - Under the Creative Commons license, please do not share these materials on any webpages etc.

LEARNING OBJECTIVES: The student should be able to:

- Identify, describe, and contrast different study designs such as observational studies, one-factor completely randomized designs, randomized complete block designs and factorial designs
- Analyze and interpret the results of analysis of variance (ANOVA) from different study designs, including multiple comparisons of means
- Analyze and interpret the results of a multiple regression using both quantitative and categorical predictors
- Describe the assumptions of the ANOVA and regression models and evaluate whether they are satisfied for a particular analysis.
- Describe Type I error, Type II error and statistical power in context and discuss how different aspects of study design will affect them.

This is an inclusive class that welcomes and values participation from individuals of all identities, which includes but is not limited to: race, ethnicity, culture, religion, gender, sexual orientation, language, national origin, age, immigration status, physical/emotional/developmental ability, and socio-economic status.

Please familiarize yourself with the video conferencing tool Zoom. You can get started here (https://calpoly.zoom.us/) where you'll find links to download the various clients, as well as links for help.

CANVAS: We will use Canvas to manage the course. Content will be posted daily.

CANVAS DISCUSSION BOARDS: We will use the Discussion Boards in Canvas to manage questions and responses regarding course content. **Please do NOT send an email about homework questions or questions about the course material.** It will be very helpful to others in the course to see the questions you have and the responses to those questions. We will try to answer any questions within 12 hours. If you think you can answer another student's question, please respond. We will correct any inaccurate responses. If you have a question about something, the Discussion Boards are the first place you should go. Personal matters may be sent via email.

GRADING:

Assignments: Homework, Other	20%
Quizzes	20%
Midterm Exam	30%
Final Exam	30%

ASSIGNMENTS - HOMEWORK, OTHER: All of the non-quiz assignments in the course will together be worth 20% of your course grade.

- **Homework:** Traditional, free-response type homework problems assigned daily and due weekly. Typically, there will be one problem per section in the textbook. These assignments may be done with up to 2 other people (no more than 3 people working together). We will provide a sign-up sheet to indicate interest if you would like our help getting into a group. If you decide to work with a group, please turn in only one copy of the homework assignment. All names should be clearly visible at the top of the homework file when it is opened. Only neat, legible, well organized, and on-time assignments will be graded. *Late homework assignments will NOT be accepted.*
- **Other:** Occasionally, you may be asked to turn in one of the guided explorations or some other assignment.

QUIZZES: There will be two types of quizzes. The quizzes will be worth 20% of your course grade.

- **Reading Quizzes:** Short auto-graded quizzes consisting of multiple choice, true/false, and fill-in-the-blank numeric responses for each section covered in the textbook reading. These are formative assessments, designed to let you check your understanding of the readings. You will be given 3 attempts on each quiz and your grade will be the average of the three attempts. After each submission, you will be able to see your score.
- **End-of-Week Quizzes:** Longer auto-graded quizzes consisting of multiple choice, true/false, and fill-in-the-blank numeric responses which cover multiple sections of the reading and review learning from the week. These assessments are more summative in nature, designed to assess your understanding of the material covered each week in contexts that you have not seen before.

EXAMS: There will be 1 midterm exam worth 30% of your course grade and 1 final exam worth 30% of your course grade. More detail on the exams will be forthcoming.

GENERAL FORMAT OF THE COURSE: This course will be asynchronous. There will be no live, in-person lectures for you to attend. Students will be able to engage with the course and the material on their own schedule. However, in order to keep you moving through the course on a pace that matches that of your classmates, and a pace that allows us to take exams at the same time, and complete the course in 5-weeks, you will have deadlines for completion of specific tasks, e.g., Reading Quizzes, End-of-Week Quizzes and Homework.

The primary resource for course content is the textbook (freely available and posted by chapter in Canvas). There are also short (3-6 minute) Learning Goal videos that go hand-in-hand with the text. At the end of each section in the textbook is a written, guided Exploration designed to walk you through the learning goals in the context of a new study. It is within the Guided Explorations that you will learn the statistical software package JMP or R. Occasionally, there will be additional video content to clarify or expand on content provided in the reading.

The course will be organized by week in Canvas. Each day we will provide a set of resources that cover 1-3 sections in the textbook. Some items are "optional." However, students who have been successful in the course tend to work through these optional resources. A typical day is shown below.

Tuesday, June 23

- Read the Preliminaries Chapter focusing on Example P.A and P.B
- Optional: Exploration P.A
- Optional: Exploration P.A
- Optional: Preliminaries Learning Goal Videos
- Optional: Week 1 Practice Problems Questions 1-2
- Reading Quiz Preliminaries (due 5pm Wednesday)
- Week 1 Homework: Questions 1, 2

EXPECTATIONS: In a face-to-face lecture course like STAT 313, each unit of credit represents one hour of in-class instruction and approximately 2 hours of work outside of class per week. This equals approximately 12 hours of student work for a 4-unit class: 4 hours in-class and approximately 8 hours outside of class each week. For a 4-unit asynchronous, online course taught in 5 weeks, we expect you to work approximately 2-3 hours per day (Mon-Thurs), plus another 3-6 hours over the weekend (Fri-Sun). We will attempt to follow this guideline as we develop and post materials for the course.

ACADEMIC INTEGRITY: *It is assumed that all work turned in for this course is the work of the student whose name appears on that work. Cheating on a quiz or exam will result in an F in the course and will be reported to the Office of Student Rights and Responsibilities (http://www.osrr.calpoly.edu/). Penalties for other forms of cheating will be at the instructor's discretion. Go to http://www.osrr.calpoly.edu/plagiarism for information on the CPSU academic honesty policy.*

Tentative Course Schedule: STAT 313 Summer 2020 (subject to change)

Week	Topics	M	T	W	R	F
Week 1 6/22 – 6/26	Preliminaries & Chpt. 1 Sources of Variation	Course Surveys	P.A, P.B	1.1, 1.2	1.3, 1.4	
Week 2 6/29 – 7/3	Chpt 1 cont'd & Chpt 2 Controlling Additional Sources of Variation	1.5, 1.6	2.1, 2.2	2.2, 2.3	3.1, 3.2	
Week 3 7/6 – 7/10	Chpt 3: Multi-factor Studies and Interaction	3.3, 3.4	3.3, 3.4	**Exam 1**	4.1	
Week 4 7/13 – 7/17	Chpt 4: Including a Quantitative Explanatory Variable	4.2	4.3	4.4	5.1	
Week 5 7/20 – 7/24	Chpt 5: Multiple Quantitative Explanatory Variables & Chpt 6: Categorical Response Variable	5.2	6.1	Review	**Final Exam**	