As of 1 August 2019

Lsn	Wk	Date	Lesson Name	Reading Assignment [Homework Problem Assignment]	Learning Objectives
Block 1: Hypothesis Testing and Regression Review and Extension (From MA-206)					
1	1	19-Aug	Introduction: The Science of Uncertainty and Central Limit Theorem	Ensure R and R Studio Software are loaded onto your laptop Read all posted course level administrative documents HW: Watch R videos on blackboard	• Understand the goals, objectives, organization, and administrative requirements for SE375 • Check that course level requirements are met (R installed, textbook on hand) • Review basic concepts of statistics • Review confidence intervals
2		21-Aug	MA-206 Review I: Hypothesis Testing	Review Montgomery 9.1-9.5, 10.1-10.2, 10.4-10.7, Summary Table Problem Set #1	• Review hypothesis testing material from MA-206 • Understand, define, and apply: One and two-sided hypothesis tests, p-value, error types, z-test, t-test for single and two-sample tests
3		23-Aug	MA-206 Review II: Linear Regression	Review Montgomery 11.1-11.9, 12.1-12.3 Problem Set #1	• Review linear regression topics from MA-206 • Understand and apply the Shapiro-Wilk test of normality.
4	2	27-Aug	Hypothesis Testing I: Goodness-of-Fit	Montgomery 9.7 HW Problem [9.7.2] **Problem Set # 1 due at the beginning of class**	• Conduct hypothesis testing for goodness of fit. • Be able to read a Chi-Square table.
5		30-Aug	Hypothesis Testing II: Tests of Independence and Homogeneity	Montgomery 9.8 HW Problem [9.8.6]	• Conduct hypothesis testing for homogeneity and independence using the Chi-square test statistic and two-way contingency tables
6	3	3-Sep	**Review Test**	**Hypothesis testing and linear regression**	
7		6-Sep	Advanced Regression I: Regression on Transformed Variables	Montgomery 11.9, 12.6.1 HW Problems [11.9.3, 12.6.2]	• Define "intrinsically linear" • Understand when and how to transform a non-linear variable into a linear one • Understand polynomial regression models
8	4	10-Sep	Advanced Regression II: Logistic Regression	Montgomery 11.10 HW Problem [11.10.1]	• Define "logit response function" and "logistic regression" • Understand when and how to conduct a logistic regression
9		12-Sep	Advanced Regression III: Multiple Linear Regression	Montgomery 12.1-12.4 HW Problems [12.1.7, 12.4.5]	• Understand the Multiple Linear Regression (MLR) Model • Fit a MLR Model to experimental data using R • Conduct and interpret hypothesis tests on coefficients in a multiple regression analysis
10		14-Sep	Advanced Regression IV: Model Adequacy	Montgomery 12.5 HW Problems[12.5.1, 12.1.5 (just fit a model and assess multicollinearity)]	• Understand the assumptions of MLR and how to test them • Assess problems with multi-collinearity • Evaluate a model's performance using Adjusted R^2 • Conduct a Model Utility Test in R and interpret results
11	5	16-Sep	Advanced Regression V: Regression on Categorical Variables	Montgomery 12.6.2, 12.6.3	• Understand how to use categorical variables in regression models • Understand the different approaches to model building
Block 2: Analysis of Variance (ANOVA)					
12	5	18-Sep	ANOVA I: Completely Randomized Design	Montgomery 13.1 - 13.2.2 HW Problems [13.2.1] **Problem Set # 2 due at the beginning of class**	• Understand the concept of ANOVA and Completely Randomized Designs • Understand the statistical model of ANOVA • Use the F-test and be able to read an F-table
13		20-Sep	ANOVA II: Multiple Comparisons Using the Tukey Test	Handout on Tukey's Procedure HW Problems [13.2.9 a-c, then use Tukey's method]	• Conduct a single factor ANOVA using R • Understand the purpose of a multiple comparisons procedure in ANOVA • Use Tukey's Procedure to conduct multiple comparisons of single factor ANOVA
14	6	23-Sep	ANOVA III: Model Checking	Montgomery 13.2.4, 13.3 HW Problems [13.3.1]	• Know the assumptions of single factor ANOVA and how to test them • Define the differences between fixed, random, and mixed effects models • Understand and apply the Bartlett Hypothesis Test (homoscedasticity)
15		27-Sep	ANOVA IV: Randomized Complete Block Design	Montgomery 13.4 HW Problems [13.4.5]	• Understand blocking and why it is employed • Conduct an ANOVA using a Randomized Complete Block Design • Test the assumptions of ANOVA in a blocked design
16	7	1-Oct	ANOVA V: 2-Factor Factorial Experiments	Montgomery 14.1 - 14.3.1 HW Problems [14.3.1]	• Understand Factorial Experiments, Treatment Combinations, Replicates, Main vs. Interaction Effects • Understand the calculations and entries in a 2-factor ANOVA table • Conduct a 2-factor ANOVA
17		3-Oct	ANOVA VI: Model Adequacy in 2-Factor ANOVA	Montgomery 14.3.2 - 14.3.3 HW Problems [14.3.2]	• Visualize and interpret interaction effects using R • Understand how to check model adequacy in 2-factor ANOVA • Understand the consequences of lack of replication in ANOVA
18	8	7-Oct	Problem Solving Lab	Bring Computers **Problem Set #3 due at the beginning of class**	• Apply the techniques learned in Block 2 in an actual analysis using R
19		9-Oct	WPR #1 Review	Bring Questions on Lessons 1-18	• Review Lessons 1 - 18
20		11-Oct	**WPR #1**	**In Class, Covers Blocks 1 & 2**	• Assess learning

			Block 3: Design of Experiments (DOE)		
21	9	16-Oct	DOE I: Introduction to Factorial Experiments	Excerpt from Montgomery's DOE, Chapter 1	• Understand Design of Experiments and the 7 Step Experimental Design Process • Understand basic principles of experimental design: randomization, replication, and blocking • Develop a cause-and-effect diagram for experimental designs
22		18-Oct	DOE II: 3-Factor Factorial Experiments	Montgomery 14.4 HW Problem [14.4.1]	• Understand the underlying statistical model in 3-factor ANOVA • Understand the calculations and entries in a 3-factor ANOVA table • Conduct a 3-factor-factorial ANOVA using R, interpret results, and check model adequacy
23	10	22-Oct	DOE III: 2^k Factorial Experimental Design	Montgomery 14.5 - 14.5.3 HW Problems [14.5.2]	• Understand geometric notation for a 2^2 factorial experiment • Understand the use of signs to indicate factor levels in 2^2 design table • Understand the limitations of an unreplicated 2^k design
24		24-Oct	DOE IV: Center Point Designs	Montgomery 14.7 HW Problem [14.7.1]	• Understand how to add center points to a 2^k factor experiment to check for curvature • Conduct a 2^k factor experiment with center points using R and interpret the results
25	11	28-Oct	DOE V: Blocking and Confounding	Montgomery 14.8 HW Problems [14.8.1]	• Understand the terms Blocking and Confounding • Demonstrate the ability to block given a 2^k design
26		30-Oct	DOE VI: 2^(k-1) Fractional Factorial Designs	Montgomery 14.9 HW Problem [14.9.1]	• Understand and apply: half-fractional designs, effect contrasts, and aliased effects • Determine the resolution of a design • Identify a design's alias structure
27		1-Nov	DOE VII: 2^(k-p) Fractional Factorial Designs	Montgomery 14.10 HW Problems [14.10.2]	• Use a design generator to determine which test conditions should be run • Use design generators to find the defining relations and alias structure of a 2^(k-p) design • Conduct analysis of a 2^(k-p) experiment in R, interpret results, and check model adequacy
28	12	4-Nov	DOE Integration Lab	HW Problem [14.59]	• Apply the techniques learned in Block 3 in an actual analysis in R
29		8-Nov	DOE Project Workshop - Experiment Planning	Problem Set #4 due at the beginning of class	• Become familiar with the Statapult Project • Apply DoE techniques in designing an actual experiment
30	13	14-Nov	DOE Project Workshop - IPRs	**IPR EMAILED to your instructor by beginning of class**	• Apply DoE techniques in designing an actual experiment • Develop technical presentation skills
31	14	18-Nov	DOE Project Workshop - Data Collection	**Begin Data Collection only after notification that IPR is approved** Perform experiments	• Apply DoE techniques in an actual analysis
32		20-Nov	DOE Project Workshop - Presentation Preparation (and backup data collection)	Team collaboration workshop	• Apply DoE techniques in an actual analysis • Develop technical writing skills
33		22-Nov	DOE Project Presentations	Project Presentations **(Slides emailed to instructor prior to class)**	• Apply DoE techniques in an actual analysis • Develop technical presentation skills
34	15	25-Nov	DOE Project Workshop - Tech Report Writing	Team collaboration workshop (tech report writing)	• Apply DoE techniques in an actual analysis • Develop technical writing skills
			Block 4: Statistical Quality Control (SQC)		
35	15	27-Nov	Statistical Quality Control I: Introduction	**Project Technical Report Due at the Beginning of Class** Read: Montgomery 15.1	• Understand when and why data order (time) matters in analysis.
36	16	3-Dec	Statistical Quality Control II: Design X Control Charts	Read: Montgomery 15.2 – 15.2.3; 15.3 HW Problem [15.3.5 (X chart only)]	• Understand the purpose and key elements of a control chart • Understand the relationship between the central limit theorem and an X control chart • Understand how to design an X control chart
37		5-Dec	Statistical Quality Control III: Analyze X Control Charts	Read: Montgomery 15.2.4 HW Problem [15.3.5b (X chart only)]	• Define in control and out of control • Use Western Electric Rules to analyze a control chart • Understand why Western Electric rules are useful for detecting anomalies
38	17	9-Dec	Statistical Quality Control IV: S Control Charts	Read: Montgomery 15.3 HW Problem [15.3.5 a and b (S Chart)]	• Design an S control chart • Use Western Electric Rules to analyze an S control chart
39		11-Dec	Statistical Quality Control V: Time Series Visualization	**Problem Set #5 due at the beginning of class**	• Employ R packages to visualize time series data
40		13-Dec	TEE Review	Bring QuestionsComplete Course Survey	• Prepare for the TEE
TEE	**18**	**17 Dec - 21 Dec**	**TEE**	**TEE**	• Assess learning