18.6501x Fundamentals of Statistics - Syllabus and Schedule

Unit 1. Introduction to Statistics		
Week 1	Homework 0: Probability and Linear algebra Review Lecture 1: What is statistics Lecture 2: Probability Redux	Due on Tuesday: **May 26, 2020 UTC23:59**
Unit 2. Foundation of Inference		
Week 2	Lecture 3: Parametric Statistical Models Lecture 4: Parametric Estimation and Confidence Intervals Recitation 1. Confidence Intervals of the mean of Gaussian random variables Homework 1: Estimation, Confidence Interval, Modes of Convergence	Due on Tuesday: **June 2, 2020 UTC23:59**
Week 3	Lecture 5: Delta Method and Confidence Intervals Recitation 2 Confidence Intervals of the shift of shifted exponential random variables Homework 2. Statistical Models, Estimation, and Confidence Intervals	Due on Tuesday: **June 9, 2020 UTC23:59**
Week 4	Lecture 6: Introduction to Hypothesis Testing, and Type 1 and Type 2 Errors Lecture 7: Levels and P-values Recitation 3. Introduction to Hypothesis Testing Homework 3. Introduction to Hypothesis Testing	Due on Tuesday: **June 16, 2020 UTC23:59**
Unit 3 Methods of Estimation		
Week 5	Lecture 8: Total Variation Distance, Kullback-Leibler (KL) divergence, and the Maximum Likelihood Principle Recitation 4: Distance measures between distributions Lecture 9: Introduction to Maximum Likelihood Estimation Homework 4: TV, KL, and Introduction to MLE	Due on Tuesday: **June 23, 2020 UTC23:59**

Week 6	Recitation 5: Maximum Likelihood Estimation Lecture 10: Covariance Matrices, Multivariate Statistics, and Fisher Information Homework 5: Maximum Likelihood Estimation	Due on Tuesday: **June 30, 2020 UTC23:59**
July break + Week 7	Lecture 11: Maximum Likelihood Estimation (Continued) and the Method of Moments Lecture 12: M-Estimation Homework 6 Maximum Likelihood Estimation and Method of Moments	Due on Tuesday: **July 14, 2020 UTC23:59**
Midterm Exam 1		
Week 8	Midterm Exam 1	Due on Monday: **July 20, 2020 UTC23:59**

Unit 4 Hypothesis Testing		
Week 9	Lecture 13: Hypothesis Testing: χ^2 distribution and T-test Recitation 6: T-test Lecture 14: Hypothesis Testing: Wald's test, Likelihood Ratio Test, and Implicit Hypothesis Homework 7	Due on Tuesday: **July 28, 2020 UTC23:59**
Week 10	Lecture 15: Hypothesis Testing: χ^2-test for multinomial distribution, Goodness of fit test Lecture 16: Hypothesis Testing: Kolmogorov-Smirnov test, Kolmogorov-Lilliefors test, QQ-plot Recitation 7: Sample Kolmogorov-Smirnov test Homework 8	Due on Tuesday: **Aug 4, 2020 UTC23:59**

Unit 5 Bayesian Statistics		
Week 11	Lecture 17: Introduction to Bayesian Statistics Lecture 18: Jeffrey's Prior and Bayesian Confidence Interval Homework 9: Bayesian Statistics	Due on Tuesday: **Aug 11, 2020 UTC23:59**
Midterm Exam 2		
Week 12	Midterm Exam 2	Due on Monday: **Aug 17, 2020 UTC23:59**

Unit 6 Linear Regression		
Week 13	Lectures 19: Linear Regression 1 Lecture 20: Linear Regression 2 Recitation 8: Hypothesis Test for Linear Regression Recitation 9: Ridge Regression Homework 10 Linear regression	Due on Tuesday: **Aug 25, 2020 UTC23:59**
Unit 7 Generalized Linear Model		
Week 14	Lecture 21: Introduction to Generalized Linear Model: Exponential Families Lectures 22: The Canonical Link Function Recitation 10: Hypothesis Test for Logistic regression Homework 11	Due on Tuesday: **Sept 1 , 2020 UTC23:59**
Final Exam		
Week 15	Final Exam	Due on Monday: **Sept 7, 2020 UTC23:59**

(Optional) Unit 8 Principal Component Analysis		
(Optional) Week 16	(Optional) Preparation Exercises for Principal Component Analysis (Optional) Lecture 23: Principal Component Analysis (Optional) Recitation 10: Hypothesis Test for Logistic regression	(Optional) Due on Monday: **Sept 14, 2020 UTC23:59**