



Shanghai Jiao Tong University

MA315 Statistics

<b>Instructor Information:</b>	TBD		
<b>Term:</b>	December 16, 2019 - January 7, 2020	<b>Credits:</b>	4 units
<b>Class Hours:</b>	Monday through Friday, 160 mins per teaching day		
<b>Discussion Sessions:</b>	2 hours each week, conducted by teaching assistant(s)		
<b>Total Contact Hours:</b>	64 contact hours (1 contact hour = 45 mins, 2880 mins in total)		
<b>Required Texts (with ISBN):</b>	R. Hogg, E. Tanis, and D. Zimmerman, Probability and Statistical Inference. 9th Edition, Pearson 2015		
<b>Prerequisite:</b>	Students are expected to pass either “Probability” or “Probability for Statistics”		



## Course Overview

This subject introduces the theory underlying modern statistical inference and statistical computation. In particular, it demonstrates that many commonly used statistical procedures arise as applications of a common theory. Both classical and Bayesian statistical methods are developed. Basic statistical concepts including maximum likelihood, sufficiency, unbiased estimation, confidence intervals, hypothesis testing and significance levels are discussed.

Applications include distribution free methods, goodness of fit tests, correlation and regression; the analysis of one-way and two-way classifications.

## Learning Outcomes

On completion of this subject students should

1. Be familiar with the basic ideas of estimation and hypothesis testing;
2. Be able to carry out many standard statistical procedures using a statistical computing package;
3. Develop the ability to fit probability models to data by both estimating and testing hypotheses about model parameters;
4. Problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies;
5. Analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis;
6. Collaborative skills: the ability to work in a team;
7. Time management skills: the ability to meet regular deadlines while balancing competing commitments;
8. Computer skills: the ability to use statistical computing packages.



### Grading Policy

Assignments	20%
Computer Laboratory Test	10%
Midterm Test	35%
Final Examination	35%

### Grading Scale

Number grade	Letter grade	GPA
90-100	A	4.0
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3.0
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2.0
62-64	C-	1.7
60-61	D	1.0
≤59	F (Failure)	0



### Class Schedule

Day 1	Subject Information, Review of Probability, Descriptive Statistics, Basic Data Visualizations
Day 2	Estimation & Sampling Distributions, Estimators, Method of Moments, Maximum Likelihood Estimation
Day 3	The Need to Quantify Uncertainty, Standard Error, Confidence Intervals
Day 4	Confidence & Prediction Intervals
Day 5	Simple Linear regression and Further Regression Models; Assignment 1 Due
Day 6	Classical & Modern Hypothesis Testing, Common Scenarios, Usage & (Mis)interpretation
Day 7	<b>Midterm Exam</b>
Day 8	Testing for a Difference in Location, Goodness-of-fit Tests 1
Day 9	Goodness-of-fit Tests 2, Tests of Independence
Day 10	Analysis of Variance, Hypothesis Testing in Regression, Likelihood Ratio Tests
Day 11	Order Statistics, Quantiles, Resampling Methods
Day 12	Interpretations of Probability, Bayesian Inference: Introduction and Further Examples; Assignment 2 Due
Day 13	Prior Distributions, Comparing Bayesian & Classical Inference
Day 14	Likelihood Theory, Sufficient Statistics, Optimal Tests
Day 15	<b>Final Exam (Computer Test and Written Examination)</b>