ECON 502
Economic Statistics
Section M1, TR 10:00-11:50 am, 317 David Kinley Hall
Section M2, TR 1:30-3:20 pm, 317 David Kinley Hall
Department of Economics • UIUC
Course Syllabus Fall 2018

Compass site login page: *https://compass2g.illinois.edu/*

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Assistant Instructors:
Office: 110 DKH
Section M1: Prakrati Thakur
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Office hours: Monday to Thursday: noon-1:00 pm
Weekly Session: Friday 8:00-9:20 am room 119 DKH

Section M2: Lucas Chagas
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Office hours: MW 10:50-11:50 am; TR 3:30-4:30 pm
Weekly Session: Friday 9:30-10:50 am room 119 DKH

*The first meeting of weekly sessions will be on **Friday August 31**.*

The Assistant Instructors will meet with you once a week on Fridays. These meetings will provide you with an opportunity to review the material covered in class and to work examples concerning the class.

This course is designed to teach you what statistics mean and how to use statistics effectively in your own work and life. The text provides very good coverage of needed material.

I will try to make effective use of the computer. The computer will serve several different purposes. It will be employed as a tool to understand and describe data sets, to compute statistical estimates and make inferences from data and finally, the computer will help understanding of theoretical concepts by allowing us to see how those concepts work.

Required Textbook: *Mathematical Statistics with Applications* (7th ed.), by Dennis Wackerly, William Mendenhall III, Richard Scheaffer. Cengage Learning.
Note that an eBook option is available which is cheaper than the textbook. Go to:
http://www.cengage.com/c/mathematical-statistics-with-applications-7e-wackerly/9780495110811

Recommended Textbook: *Probability & Statistical Inference* (9th ed.), by Hogg / Tanis / Zimmerman. Pearson https://www.pearson.com/us/higher-education/program/Hogg-Probability-and-Statistical-Inference-9th-Edition/PGM91556.html

Attendance: You are **required** to attend both the lectures during the week and the recitations on Fridays. For excused absences, the student must provide an explanation and supply supporting evidence.

Homework: There will be a required homework assignment approximately every two weeks (7-8 homeworks).
In some of the problems, you have to use APPLETS (*a short computer application especially for performing a simple specific task*). You can access the APPLETS in the following site: http://www.brookscole.com/cgi-wadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495110811&disciplinenumber=17

Exams: The class will have two *midterm exams* and *a final examination*.

Midterm 1: Tuesday, ***October 2***, 7:00 - 9:00 pm in room 66 Library
Midterm 2: Tuesday, ***November 6***, 7:00 - 9:00 pm in room 66 library
Final exam: Saturday ***December 15*** 1:30-4:30 pm room 120 Architecture

Grading: The course grade will be determined as follows:

Homework	20%
Midterm 1	25%
Midterm 2	25%
Final	30%

I will adjust the average determined above to take into consideration the trend of your performance and grades.

Emergency Response Recommendations:
Emergencies can happen anywhere and at any time, so it's important that we take a minute to prepare for a situation in which our safety could depend on our ability to react quickly. Take a moment to learn the different ways to leave this building. If there's ever a fire alarm or something like that, you'll know how to get out and you'll be able to help others get out. Next, figure out the best place to go in case of severe weather – we'll need to go to a low-level in the middle of the building, away from windows. And finally, if there's ever someone trying to hurt us, our best option is to run out of the building. If we cannot do that safely, we'll want to hide somewhere we can't be seen, and we'll have to lock or barricade the door if possible and be as quiet as we can. We will not leave that safe area until we get an Illini-Alert confirming that it's safe to do so. If we can't run or hide, we'll fight back with whatever we can get our hands on.

If you want to better prepare yourself for any of these situations, visit http://police.illinois.edu/emergency-preparedness/

Remember you can sign up for emergency text messages at *emergency.illinois.edu*.

Statement on Accommodations:
To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak Street, Champaign, call 333-4603 (V/TTY), or email a message to *disability@uiuc.edu*.

Academic Integrity:

Violations of academic integrity as given in the Code of Policies and Regulations will be taken extremely seriously, and students found cheating in the course (or helping others to cheat) will be penalized according to the Code's guidelines.

"The University has the responsibility for maintaining academic integrity so as to protect the quality of education and research on our campus and to protect those who depend upon our integrity.
Expectations of Students. It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions. Students have been given notice of this Part by virtue of its publication. Regardless of whether a student has actually read this Part, a student is charged with knowledge of it. Ignorance is not a defense."

The University's full academic integrity policy is available at:
http://studentcode.illinois.edu/article1_part4_1-401.html

The course outline lists the dates each topic will be covered.
The dates are approximate & could change.

Lecture	Date	Topics Covered
1	August 28	**Chapter 1: What is statistics?** Descriptive & Inferential Statistics Population or Process, Sample Strategies for collecting data Types of studies: experimental/Observational Types of Data: Cross section, Time series, Panel
2	August 30	**Chapter 1: What is statistics?** (*Continued*) Types of Data: Quantitative vs Qualitative **Descriptive statistics:** Quantiles, **Descriptive statistics:** Mean, Median, mode, trimmed mean, Variance, CV , Interquartile range, range, MAD, Empirical Rules, Skewness, Kurtosis, JB test for normality
3	September 4	**Chapter 2: Probability** Set theory, random experiments, sample space (Discrete , Continuous); event (simple, compound)

		Def. of probability=> 3 approaches: 1-probability as proportion of desired to possible outcomes, 2- probability as relative frequency, 3- axiomatic approach,
4	September 6	**Chapter 2: Probability** (*Continued*) Using axiomatic approach to derive some results Assigning probability of event: Sample point method Tools for counting : multiplication rule, permutation, combination examples on counting
Tuesday	**September 11**	**First Homework Due**
5	September 11	**Chapter 2: Probability** (*Continued*) Conditional probability Independence of events Multiplicative law of probability additive law of probability Calculating probability of event: event composition method
6	September 13	**Chapter 2: Probability** (*Continued*) event composition method: More examples The law of total probability & Bayes' rule random sampling **Chapter 3: Discrete random variables** Random variable and its realization P(Y=y)
7	September 18	**Chapter 3: Discrete random variables (continued)** Discrete probability distribution expected value: mean, variance mean & variance of a function of a random variable Examples on expected value and variance Bernoulli experiment & related distributions Bernoulli Distribution Binomial Distribution: as sum of Bernoulli random variables, formula, Mean, variance
8	September 20	**Chapter 3: Discrete random variables (continued)** Examples on Binomial Distribution

		Hyper Geometric *Geometric*
Thursday	**September 20**	**Second Homework Due**
9	September 25	**Chapter 3: Discrete random variables (continued)** *Negative Binomial*; *Poisson*
10	September 27	**Chapter 3: Discrete random variables (continued)** Moments around origin and about the mean Moment generating functions Tchebysheff's Theorem
Monday	**October 1- By 4 pm in mailbox**	**Third Homework Due**
12	October 2	**Review for Midterm** **Chapter4: Continuous random variables** Cumulative Distribution function (CDF)
Midterm 1	**Tuesday Oct. 2**	**7:00-9:00 pm in room 66 Library**
12	October 4	**Chapter4: Continuous random variables (continued)** Discrete Y: CDF ➔STEP function (right Continuous) Continuous Y: CDF ➔Continuous function Continuous Y: Probability Density Function Example on PDF & CDF Expected value & Variance of Continuous RV The uniform PD
13	October 9	**Chapter4: (continued)** Normal PD The Gamma PD Relationship between Gamma & Poisson Gamma Special cases: Chi-square, Exponential Relationship between Exponential & Poisson
14	October 11	**Chapter4: (continued)** Memoryless property of Exponential Examples on exponential Hazard function Beta Distribution MGF for continuous RV Tchebysheff's theorem for continuous RV **Chapter 5: Multivariate PD (discrete)** Joint and cumulative probability

		distribution
15	October 16	**Chapter 5: Multivariate PD (discrete)** Marginal & conditional probability distributions Independent random variables, Expected value of a function of random variables conditional expectations Example on bivariate discrete distributions Covariance & Correlation
Tuesday	**October 16**	**4th Homework Due**
16	October 18	**Chapter 5: Multivariate PD (discrete)** Regression and correlation expected value and variance of a linear function Expected value & variance of sample mean Law of large numbers for sample mean Expected value & variance of sample proportion **Chapter 5: Bivariate PD (continuous)** Introduction to double integration Example on double integration
17	October 23 (Moved to Wed Oct 24)	**Chapter 5: Bivariate PD (continuous)** Joint Distribution function & density function Marginal & conditional probability distributions Independent random variables Expected value of a function of random variables Conditional expectations Example on conditional expectation
18	October 25	**Chapter 5: Bivariate probability distributions (continuous)** Bivariate normal **Chapter 6: Functions of random variables (sections 6.1-6.5)** Functions of random variables: 3 methods Distribution function Method Method of Transformations examples on distribution & transformation method
19	October 30	**Chapter 6: Functions of random variables (sections 6.1-6.5)** Method of MGFs Examples on Method of MGFs **Chapter 7: Sampling distribution & the**

		CLT Definition of statistic Definition of sampling distribution Sampling distribution of: sample mean (when population variance is known)
20	November 1	**Chapter 7: Sampling distribution & the CLT** sampling distribution of sample variance t-student distribution sampling distribution of sample mean (when population variance is unknown) F distribution Sampling distribution of ratio of two sample variances (from two populations) Examples on Sampling Distributions Normal approximation to the binomial Examples on approximation of binomial by standard Normal Central limit theorem
Friday	**November 2**	**Fifth Homework Due**
21	November 6	**Chapter 7: Sampling distribution & the CLT** Examples on CLT
Midterm 2	**Tuesday November 6**	**7:00-9:00 pm in room 66 Library**
22	November 8	**Chapter 8: Estimation (sections 8.1 to 8.4)** Point estimation, Estimators Properties: Bias, mean square error Relative efficiency Cramer-Rao theorem (page 448) consistency sufficiency
23	November 13	**Chapter 9: More on point estimates** More on sufficiency Distributions of Exponential Forms (DEF) DEF & sufficient statistics DEF & Minimum Variance Unbiased Estimators (MVUE) Estimation method: moments Examples on Method of moments, Estimation method: maximum likelihood
24	November 15	**Chapter 9: methods of estimation** More Examples on Method of maximum likelihood **Chapter 8 revisited** Confidence intervals

		large sample cl for the mean and proportion
Friday	**November 16**	**Sixth Homework Due**
November 17-25		**Fall Break**
25	November 27	**Chapter 8 revisited** Small sample confidence interval for: the mean & difference of means Confidence interval for the variance **Chapter 10: Hypothesis Testing** Introduction to Hypothesis Testing *How to construct RR* Type I and Type II errors Alpha, beta and Power of tests Power function *Neyman Pearson Lemma*
26	November 29	**Chapter 10: Hypothesis Testing** *Examples on N-P Lemma* Uniformly Most Powerful Tests *Likelihood ratio tests* large sample tests
Friday	**November 30**	**7th Homework Due**
27	December 4	**Chapter 10: Hypothesis Testing** Examples on large sample tests p-values Relationships between HT & CI Small sample tests HT concerning variances
28	December 6	**REVIEW**
29	December 11	**REVIEW**
Wednesday	**December 12**	**8th Homework Due**
Final Exam:	***Regular***	**Saturday December 15, 1:30-4:30 pm** **Room: 120 Architecture**