1 Instructor:

Instructor:	Dasa Celik Katreniak
E-mail:	dasa [dot] katreniakova [at] gmail [dot] com

2 Administrative Information:

Class Duration:	Fall semester 2016
Location:	TBA
Office hours:	TBA

3 Course Description:

The goal of this course is to broaden and systematize students' knowledge of econometrics and to practice its application. During the course we will go through the essentials of econometrics: from the statistical background through the theory and intuition behind regression analysis to practical applications. The course is elementary and presents concepts and techniques in way that benefits students of all mathematical backgrounds. Fundamental concepts and methods of statistics and econometrics are introduced with emphasis on interpretation of arguments and application to real-world problems. Every topic will be backed up with an applied exercise.

Prerequisite: Working knowledge of mathematics and Introduction to Statistics.

4 Course Objectives:

Upon successful completion of the course, the student will:

- be able to present the basic concepts and methods of statistical reasoning and data analysis in the context of decision-making
- develop computational skills in fundamental statistical analysis
- acquire a basic/working knowledge of data analysis using MS Excel and statistical software GRETL (publicly available) and STATA
- demonstrate the appropriate level of competence regarding the fundamentals of statistics and econometrics
- demonstrate the appropriate level of competence in written expression

5 Instructional Material: PRELIMINARY

Required:

UE: Using Econometrics: A practical guide, A.H.Stundemund, 6th EditionAddison-Wesley Series in Economic

SM: Statistics for Managers using Microsoft Excel, David M. Levine, David F. Stephan, Timothy C. Krehbiel & Mark L. Berenson, 5th Edition, Pearson Education, Inc.

Supplemental: TBA

Optional: TBA

6 Course Schedule: PRELIMINARY

TIME	PART	TOPICS	READING ASSIGNED
Week 1	**A. STATISTICAL BACKGROUND**	**A.1 Recapitulation: Data description and numerical measures**	**TBA**
Week 2	**A. STATISTICAL BACKGROUND**	**A.2 Recapitulation: Probabilities, probability distributions, sampling and estimation, and hypothesis testing**	**TBA**
Week 3	**B. LINEAR REGRESSION MODEL**	**B.1 OLS, the assumptions and the properties of OLS estimators**	**TBA**
Week 4	**B. LINEAR REGRESSION MODEL**	**B.2 Hypothesis Testing after OLS estimation**	**TBA**
Week 5	**B. LINEAR REGRESSION MODEL**	**B.3 Multiple linear restrictions, R-squared**	**TBA**
Week 6	**B. LINEAR REGRESSION MODEL**	**B.4 Recapitulation, practical training, GRETL and STATA training**	**Materials distributed in class**
Week 7	**EXAM 1**		
Week 8	**C. EXTENTIONS**	**C.1 Nonlinear and discrete independent variables**	**TBA**
Week 9	**C. EXTENTIONS**	**C.2 Departures from OLS assumptions**	**TBA**
Week 10	**C. EXTENTIONS**	**C.3 Misspecifications**	**TBA**
Week 11	**C. EXTENTIONS**	**C.4 Introduction to qualitative dependent variables I**	**TBA**
Week 12	**C. EXTENTIONS**	**C.5 Introduction to qualitative dependent variables II**	**TBA**
Week 13	**C. EXTENTIONS**	**C.6 Presentations of projects and recapitulation**	x
Week 14	**EXAM 2**		

The above schedule is preliminary and for reference only. The instructor may have the flexibility to control the pace of teaching.

7 Course Requirements:

Two in-class exams: first accounting for 15 points, second for 40 points; homework assignments: 15 points, class project: 15 points, in-class quizzes: 10 points, class participation (discussions & team work): 5 points. **Total: 100 points.** Detailed explanation will be given to students during the first class.

EXAMINATIONS AND QUIZZES:

- The exam retake policy is: A student can retake the exam 2 if her/his score was below 50%. Retake of the exam 1 is allowed only if the student was sick and has a confirmation from a doctor.
- No retakes are allowed for quizzes.
- Quizzes will NOT be announced in advance.
- ONLY BASIC CALCULATORS will be allowed in the exams.
- EXAM 1 is an open-book exam, i.e., you can use all your HANDWRITTEN materials (exception: printed lecture notes). EXAM 2 is a closed-book exam.

HOMEWORK ASSIGNMENTS:

- Late homework submission WILL NOT BE ACCEPTED.
- Students are allowed to work on homework assignments individually or in groups of two.
- Homework outputs will be handed in a printed version at the beginning of a predefined class (unless agreed differently). If the students work in pairs, the role of each student needs to be described and both students need to sign it (there will be 50% point deduction it is missing).

PROJECT:

- At the beginning of the course each student will be given a dataset. Student will use the dataset throughout the course. The dataset will be also used in the final project, whose main goal is to provide students with practical exercise of what will be taught during the course and to apply knowledge using statistical softwares (MS Office, and GRETL/STATA).
- Student will work on the project individually.
- Project accounts for 15 per cent of the final grade and need to be handed at the end of the semester (the date will be agreed during the class).
- Projects will be presented during the last lecture.

- During the semester, students will be given voluntary tasks (graded as bonus points), which will guide students through all required chapters of the project. Fulfilling the tasks will help students to work on their projects step by step. Additionally, student who will work on all bonus tasks sequentially will have a chance to get feedback on the task performed throughout the year.
- Maximum number of bonus points is 10.
- Students will work on the tasks individually.

8 Course Schedule and Learning Outcomes:

PART	TOPICS	READING ASSIGNED
A. STATISTICAL BACKGROUND	**A.1 Recapitulation: Data description and numerical measures**	

Things to recap:

- know the difference between a population and a sample
- understand how to categorize data, construct frequency distributions and a histogram
- construct and interpret various types of charts and diagrams
- create a line chart and interpret the trend in the data
- distinguish between descriptive statistics and inferential statistics, between a population and a sample, and among the types of measurement scales
- describe the properties of a data set presented as a histogram or a frequency polygon
- calculate and interpret relative frequencies and cumulative relative frequencies, given a frequency distribution
- calculate and interpret measures of central tendency, including the population mean, sample mean, arithmetic mean, weighted average or mean (including a portfolio return viewed as a weighted mean), geometric mean, harmonic mean, median, and mode, construct and interpret a box and whisker graph
- compute and interpret the range, interquartile range, variance, and standard deviation and know what these values mean, coefficient of variation, explain measures of sample skewness and kurtosis
- compute a z-score and the coefficient of variation and understand how they are applied in decision-making situations
- calculate and interpret quartiles, quintiles, deciles, and percentiles
- calculate and interpret the proportion of observations falling within a specified number of standard deviations of the mean using Chebyshev's inequality

A. STATISTICAL BACKGROUND	**A.2 Recapitulation: Probabilities, probability distributions, sampling and estimation, and hypothesis testing**	

Things to recap:

- understand the three approaches to assessing probabilities
- be able to apply the Addition Rule and the Multiplication Rule
- know how to use Bayes' Theorem for applications involving conditional probabilities

- define an event, mutually exclusive events, and exhaustive events
- distinguish between unconditional and conditional probabilities
- random variable, the expected value of a discrete random variable
- Bernoulli random variable
- binomial, Poisson and hypergeometric distributions and their application to decision-making situations
- interpret a cumulative distribution function
- convert a normal distribution to a standard normal distribution
- determine the probability that a normally distributed random variable lies inside a given interval
- explain the key properties of the normal distribution
- distinguish between a univariate and a multivariate distribution, and explain the role of correlation in the multivariate normal distribution
- calculate and interpret the expected value, variance, standard deviation of a random variable
- understand the concept of sampling error
- determine the mean and standard deviation for the sampling distribution of the sample mean x
- understand the importance of the Central Limit Theorem
- determine the mean and standard deviation for the sampling distribution of the sample proportion, p
- distinguish between simple random and stratified random sampling
- distinguish between a point estimate and a confidence interval estimate
- construct and interpret a confidence interval estimate for a single population mean using both the standard normal and t distributions
- determine the required sample size for estimating a single population mean
- formulate null and alternative hypotheses for applications involving a single population mean or proportion
- explain a test statistic, Type I and Type II errors
- correctly formulate a decision rule for testing a hypothesis
- know how to use the test statistic, critical value, and p-value approaches to test a hypothesis
- compute the probability of a Type II error
- discuss the logic behind, and demonstrate the techniques for, using independent samples to test hypotheses and develop interval estimates for the difference between two population means
- develop confidence interval estimates and conduct hypothesis tests for the difference between two population means for paired samples
- carry out hypothesis tests and establish interval estimates, using sample data, for the difference between two population proportions
- identify the appropriate test statistic and interpret the results for a hypothesis test concerning the

mean difference of two normally distributed populations ▪ understand the basic logic of analysis of variance ▪ perform a hypothesis test for a single-factor design using analysis of variance ▪ odd and risk ratios		
B. LINEAR REGRESSION MODEL	**B.1 OLS, the assumptions and the properties of OLS estimators**	
Learning outcomes: ▪ Derivation and interpretation of Ordinary Least Squares ▪ Assumptions in OLS regression models ▪ Properties of OLS estimators ▪ Marginal effect and its interpretation		
B. LINEAR REGRESSION MODEL	**B.2 Hypothesis Testing after OLS estimation**	
Learning outcomes: ▪ Single population parameter ▪ Linear combination of parameters		
B. LINEAR REGRESSION MODEL	**B.3 Multiple linear restrictions, R-squared**	
Learning outcomes: ▪ Multiple linear restrictions ▪ Goodness of fit (R-squared) ▪ Marginal effects and their interpretation		
B. LINEAR REGRESSION MODEL	**B.4 Recapitulation, practical training, GRETL and STATA training**	
Learning outcomes: ▪ Solving practical examples ▪ GRETL and STATA training: working with project dataset and getting used to commands		
C. EXTENTIONS	**C.1 Nonlinear and discrete independent variables**	
▪ Nonlinear specifications ▪ Dummy variables		
C. EXTENTIONS	**C.2 Departures from OLS assumptions**	

▪ Heteroskedasticity (consequences and tests) ▪ Autocorrelation (consequences and tests) ▪ Generalized Least Squares		
C. EXTENTIONS	**C.3 Misspecifications**	
▪ Omitted variable bias ▪ Irrelevant variables ▪ Testing for endogeneity ▪ Instrumental variables ▪ 2-stage least squares		
C. EXTENTIONS	**C.4 Introduction to qualitative dependent variables I**	
▪ Logit model and practical examples ▪ Marginal effects after logit models and their interpretation		
C. EXTENTIONS	**C.5 Introduction to qualitative dependent variables II**	
▪ Probit model and practical examples ▪ Marginal effects after probit models and their interpretation		

9 Academic Integrity:

Academic honesty is non-negotiable. All quizzes and exams must be student's own work. All assignments submitted in fulfillment of course requirements must be the student's own work (if submitting assignment individually). If submitting the assignment in a pair, the role of each student of the group must be clearly specified and the assignment must be signed by both authors. Plagiarism and/or any other form of academic dishonesty will not be tolerated and will result in a grade of zero on the assignment or exam.