< >	Introductory Statistics-E2 Introductory Statistics-E2					VANDENBON Alexis
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Statistics is arguably the most important science in the world, because every other field of science depends upon it. Nowadays, science is becoming increasingly driven by large amounts of data. The key problem is how to extract knowledge from this data. Statistical analysis is a necessary step in solving this problem. This course will introduce the theory behind basic statistics and practical applications.

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Students will learn about basic concepts in statistics, and learn to apply them on real datasets. Students will develop a feeling for critical thinking when faced with data, be able to make hypotheses, and suggest relevant ways to test them.

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In principle, the course will be offered according to the following plan. However, depending on the progress of the course the order or the number of lectures for each topic may change.
1. Introduction to statistics and data analysis (part 1). Statistics in the context of the general process of investigation, including a brief introduction to data collection, sampling, and experimental design.
2. Introduction to statistics and data analysis (part 2). Introduction to numerical and categorical data. Simple ways of visual inspection (scatter plots, histograms, etc) and summary statistics.
3. Probability (part 1). Formal introduction to probability, probability distributions, independent and dependent variables, and conditional, marginal, and joint probability.
4. Probability (part 2). Introduction to random variables. How to calculate the expected value and variability of a random variable?
5. Distributions of random variables. Introduction to the normal distribution and its properties. Other common probability distributions will also be discussed, including the geometric and binomial distributions.
6. Foundations for inference (part 1). We will discuss the principles of parameter inference, and the reliability of parameter estimates, including standard errors and confidence intervals. We will also introduce hypothesis testing and p-values based on these principles.
7. Foundations for inference (part 2). The Central Limit Theorem and its consequences for parameter estimation.
8. Inference for numerical data (part 1). Practical applications of parameter inference on numerical data. The t-test and illustrations of its use for hypothesis testing.
9. Inference for numerical data (part 2). Power calculations and determining proper sample sizes. Introduction to analysis of variance (ANOVA).
10. Inference for categorical data (part 1). In this lesson, we introduce parameter inference for categorical (non-numerical) variables. For example, we examine proportions, their confidence intervals, hypothesis testing, and comparison.
11. Inference for categorical data (part 2). Discussion of the widely used Chi-square test for goodness of fit, and randomization tests.
12. Introduction to linear regression. We will cover line fitting, residuals, correlation, and least squares regression. The assumptions, interpretation, and weaknesses of linear regression will be introduced.

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13. Multiple and logistic regression. We expand the principles of simple linear regression to cases were there are many variables (multiple regression), and cases where the outcomes are binary categorical (logistic regression).
14. Review of course material.
15. Final examination
16. Feedback

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Grading: attendance and active participation (20%), mid-term exam (20%), quizzes/assignment (20%), and final exam (40%)

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Diez, Barr,and Cetinkaya-Rundel,   OpenIntro Statistics (Third Edition)   OpenIntro, Inc.   ISBN:978-1943450039   The course lectures will follow the content of this textbook. Please note that this textbook is also freely (legally) available for download at https://www.openintro.org/stat/textbook.php?stat_book=os

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The course will follow a textbook. At the end of each lecture I will specify the sections to read before the next lecture.

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No fixed office hours. Students are requested to make appointments directly or by email.

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