FUNDAMENTALS OF PROBABILITY AND STATISTICS

ASIGNATURAS CONVERGENTES
Professor: RAFIF SROUR DAHER
E-mail: rsrour@faculty.ie.edu

Academic year: 18-19
Degree course: FIRST
Semester: 1º
Category: BASIC
Number of credits: 6.0
Language: English

PREREQUISITES
Basic knowledge of Mathematics.

PREREQUISITES

SUBJECT DESCRIPTION
Statistics is the science of data. It uses mathematical tools to collect, organize, process, and summarize data; make estimates using probability rules; and draw inferences that will affect decision-making in uncertain environments. In the business world, statistics are used to predict sales of a new product, assess the attractiveness of a business opportunity, increase customer satisfaction, choose between different investment possibilities, analyze and improve production processes, etc... In the social sciences, statistics help identify interesting questions, explore data sets, and correctly interpret results to make solid, evidence-based conclusions.

Students enrolled in this course will learn how to examine, organize, and read data and how to make informed decisions. In addition, this course provides the theoretical and practical bases for other courses in the data and social science degrees, such as Fundamentals of data analysis, Simulating and modelling to understand change, Probability and statistics for data management and analysis, and others.

SUBJECT DESCRIPTION

OBJECTIVES AND SKILLS
The objective of this course is to provide students with the tools to delve into data sets and to make use of this information in business, social and behavioral applications. At the end of the course; students should be able to:
- Describe data by means of graphs or numbers, and understand in which context each of these descriptive tools is useful;
- Understand patterns of randomness that can affect business and social activities and relate them to known probability distributions;
- Understand the differences between population and sample distributions;
- Read the most common distribution tables.

Additionally, the course will focus on the acquisition or reinforcement of generic skills:
- The ability to summarize and present information in a meaningful way;
- The ability to build an abstract model to address an economic or social problem;
- The ability to quickly identify the tools that need to be used in business situations.

OBJECTIVES AND SKILLS

METHODOLOGY

The course is divided into 2 sections: theoretical (20 sessions) and practical (5 sessions).

The theoretical section comprises both conceptual and review sessions. Conceptual sessions are delivered using Power Point presentations and focus on discussing the basic concepts underlying statistical theories along with various examples (test your understanding, worked examples, and challenging problems). In the review sessions (3 sessions); the theoretical part will be revised. In addition, key problems from problem-sets (uploaded to Campus Online/Additional Documentation/Problem-sets) will be assigned to groups of 2 to 3 students and will be solved in class.

During the practical sessions; Spreadsheet Statistical Packages namely Microsoft Excel and SPSS will be used to solve specific questions presented in the context of case-studies. Bringing your laptop is mandatory to all sessions, although its use (or not) will be decided by the professor.

Prior to all sessions, you should read assigned textbook sections. Reading the textbook in advance will allow you to get the most out of each lecture. When reading the textbook sections prior to each lecture, you must look at the examples but you do not need to solve them.

Throughout the course, various case studies (2 to 3) will be presented. These will reflect current and emerging problems/situations/phenomena. The students will be asked to work in group to address and solve these cases. Five to 10 mins will be given for them to present their findings.

On weekly basis, a brief quiz covering previously taught material will be given. These quizzes are meant to test your overall understanding of the material and will help the professor assess the overall performance and evolution of the class.

<table>
<thead>
<tr>
<th>Teaching methodology</th>
<th>Weighting</th>
<th>Estimated time a student should dedicate to prepare for and participate in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>20.0 %</td>
<td>30 hours</td>
</tr>
<tr>
<td>Discussions</td>
<td>10.0 %</td>
<td>15 hours</td>
</tr>
<tr>
<td>Exercises</td>
<td>20.0 %</td>
<td>30 hours</td>
</tr>
<tr>
<td>Group work</td>
<td>30.01 %</td>
<td>45 hours</td>
</tr>
<tr>
<td>Other individual studying</td>
<td>20.0 %</td>
<td>30 hours</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0 %</td>
<td>150 hours</td>
</tr>
</tbody>
</table>
Content
The theoretical content of this course consists of two parts and each part is divided into several units. The first part covers descriptive statistics and focuses on the graphical and numerical procedures that are used to summarize, organize, and process data. The second part discusses probability axioms and basic discrete and continuous probability distributions.

All the required readings are from the compulsory textbook “Statistics for Business and Economics”, Macclave, Benson & Sincich, 13th global edition. Reading a section means reading the text AND doing the examples.

Note: The following description of the material covered is tentative. An attempt will be made to cover all listed topics. However, the pace in the classes will depend on the group performance.

SESSIONS 1 - 2 (FACE TO FACE)
Topics: Introduction and presentation of the course syllabus and objectives. Basic statistical concepts. Variables and levels of measurement. Data cleaning and preparation.
Required Reading
- Chapter 1: Sections 1.1 – 1.7.
Statistics in Action: Case Study 1.

SESSION 3 (FACE TO FACE)
Topics: Organizing data into tables and charts. Frequency distribution tables. Using graphs to summarize data (histograms, time-series plots, etc.). Data presentation errors.
Required Reading
- Chapter 2: Sections 2.1 – 2.2

SESSIONS 4 - 6 (FACE TO FACE)
Required Reading
- Chapter 2: Sections 2.3 – 2.5; 2.7 – 2.8; & 2.10

Requirements: Submit Section 1 of your group project (Title, objectives, population of interest, type of sampling and sample size, proposed information gathering strategy, and survey questions; if applicable).

SESSIONS 7 - 9
Using Technology: Excel and SPSS

SESSION 10
REVIEW OF UNITS 1 & 2.

SESSION 11 (FACE TO FACE)


Required Reading
- Chapter 3: Sections 3.1 – 3.4

SESSION 12

Topics: Bivariate probability (probabilities of joint and marginal events). Conditional probability: Bayes’ theorem. Independent events.

Required Reading
- Chapter 3: Sections 3.5 – 3.7

Requirements: Submit Section 2 of your group work (Data cleaning and preparation).

SESSION 13

REVIEW OF UNIT 3.

SESSION 14

MIDTERM

SESSIONS 15 - 16


Required Reading
- Chapter 4: Sections 4.1 – 4.2

Statistics in Action: Case Study 2

SESSIONS 17 - 19


Required Reading
- Chapter 4: Sections 4.3 – 4.4

Requirements: Submit Section 3 of your group work (Descriptive statistics).

SESSIONS 20 - 21

Topics: Continuous random variables: Definition and properties. The normal distribution. Others continuous distributions.

Required Reading
- Chapter 4: Sections 4.5 – 4.8
SESSIONS 22 - 24 (FACE TO FACE)


Required Reading
- Chapter 5: Sections 5.1 – 5.4

SESSIONS 25 - 27

Using Technology: Excel and SPSS


SESSION 28

Presentation of group projects.

SESSION 29

GENERAL REVIEW.

SESSION 30

FINAL EXAM.
BIBLIOGRAPHY

COMPULSORY
Title: Statistics for Business and Economics
Authors: Mcclave, J.T, Benson, P.G., & Sincich, T.
Publisher / Edition / Year: Pearson Prentice Hall / 13th edition/ 2018
ISBN / ISSN: 978-1-29-222713-9
Medium: PRINT ELECTRONIC

REQUIRED
Title: OpenIntro Statistics, 2nd Edition
Authors: Diez, David; Barr Christopher; Cetinkaya-Rundel, Mine
This textbook is supplementary and can be used to review some of the topics presented in class, to find extra exercises, etc. The textbook is offered under a Creative Commons license at https://www.openintro.org/.
Additional documents, including lecture slides, problem sets, extra readings, etc... will be posted on Campus Online throughout the semester.

EVALUATION CRITERIA
Your final grade in the course will be based on both individual and group work of different characteristics that will be weighted in the following way:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Percentage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>40 %</td>
<td></td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>25 %</td>
<td></td>
</tr>
<tr>
<td>Workgroups</td>
<td>20 %</td>
<td></td>
</tr>
<tr>
<td>Quizzes</td>
<td>5 %</td>
<td></td>
</tr>
<tr>
<td>Class Participation</td>
<td>10 %</td>
<td></td>
</tr>
</tbody>
</table>

A. Class participation and discussion
Class participation will be evaluated based on the following criteria:
- Quality (not quantity) of your participation in class discussion: The most important dimension of participation concerns what it is that you are saying. A high quality comment reveals depth of insight, rigorous use of case evidence, consistency of argument, and realism. Frequency refers to the attainment of a threshold quantity of contributions that is sufficient for making a reliable assessment of comment quality. The logic is simple: if contributions are too few, one cannot reliably assess the quality of your remarks. However, once threshold quantity has been achieved, simply increasing the number of times you talk does not automatically improve your evaluation. Beyond the threshold, it is the quality of your comments that must improve. In particular, one must be especially careful that in claiming more than a fair share of “airtime”, quality is not sacrificed for quantity. Finally, your attempts at participation should not be such that the instructor has to “go looking for you”. You should be attempting to get into the debate on a regular basis.
You might want to avoid being classified as one of the following types of students:
- Repeaters, i.e., students that, consciously or unconsciously, make comments that are really just repeats/rephrasing of what has already been said (by other students, or you). This wastes time and adds nothing to learning.
- Ramblers, i.e., students that take a lot of time to say simple things or they may tell long personal/professional stories, or they roam into topics that are not relevant, or simply make low-quality comments just to participate. They waste valuable time and prevent other students from being able to participate.
- Students that have been distracted (by Facebook, etc.) or who have stopped paying attention and then, later on, when they realized they have missed a term or concept, they ask you about it.

B. Group report and presentation
The group project is an integral part of this course. It consists of the identification of a real-world problem, the formulation of appropriate hypotheses, the collection and statistical analysis of data, and the presentation and interpretation of obtained results.

Throughout the semester, each group (randomly composed of 5-6 students) will be asked to submit 5 sections (hard copy) as briefly described in Section 4 of this syllabus. These sections will be corrected by the professor and returned to the group. A final report and presentation are due at the end of the course (Refer to Section 4 for dates and deadlines).

At the end of the semester, you must submit the full report including all sections. The final version should include edited versions of the previously submitted sections following the recommendations of your professor. In addition, each group will be asked to prepare a short video (3-4 min) that will be uploaded on youtube.

Information (description, specifics, etc.) related to each section as well as the final report (format, content, etc.), presentation (time, format, content, etc.) and video are detailed in “Statistics Project: Description & Instructions” file, which is already available on Campus Online/Documents.

C. Quizzes
Throughout the semester and on weekly basis (unless otherwise specified by your instructor), you will be given a short announced online-quiz based on previously covered material. These quizzes will help you assess your overall understanding of the subject being studied and identify any caveat in your learning. NO MAKE UP FOR QUIZZES WILL BE PERMITTED. The dates of these quizzes will be set by the professor the first week of classes.

D. Exams
There will be one midterm and one final exam. For these exams, you must bring your own simple calculator (phones, tablets, laptops and other electronic devices are not allowed). You are also allowed to bring up one-sided A4 SHEET paper for the midterm (two sides in the final exam) with any formulae that you think could be helpful. NO QUESTIONS ARE ALLOWED DURING THE EXAMS. THE CHEAT-SHEET ALONG WITH ANY SCRAP PAPER WILL BE COLLECTED AND STAPLED TO YOUR EXAMS.

In order to pass the course, you need a minimum grade of 3.5 in the final exam. If your grade in the final exam does not reach the threshold value of 3.5, you will fail the course, even in the case in which your weighted average (computed using the table above) exceeds 5.0.

Notice that the date of the midterm could change and need to be considered with flexibility. The precise date will be communicated to students two weeks ahead of time.

PROFESSOR BIO

Professor: RAFIF SROUR DAHER
E-mail: rsrour@faculty.ie.edu

? B.S./B.E. Agricultural Engineer, American University of Beirut.
BIBLIOGRAPHY

CODE OF CONDUCT IN CLASS

1. **Be on time:** Students arriving more than 5 minutes late will be marked as “Absent”.
   Only students that notify in advance in writing that they will be late for a specific session may be granted an exception (at the discretion of the professor).

2. **If applicable, bring your name card and strictly follow the seating chart.** It helps faculty members and fellow students learn your names.

3. **Do not leave the room during the lecture:** Students are not allowed to leave the room during lectures. If a student leaves the room during lectures, he/she will not be allowed to re-enter and, therefore, will be marked as “Absent”.
   Only students that notify that they have a special reason to leave the session early will be granted an exception (at the discretion of the professor).

4. **Do not engage in side conversation.** As a sign of respect toward the person presenting the lecture (the teacher as well as fellow students), side conversations are not allowed. If you have a question, raise your hand and ask it. If you do not want to ask it during the lecture, feel free to approach your teacher after class.
   If a student is disrupting the flow of the lecture, he/she will be asked to leave the classroom and, consequently, will be marked as “Absent”.

5. **Use your laptop for course-related purposes only.** The use of laptops during lectures must be authorized by the professor. The use of Social Media or accessing any type of content not related to the lecture is penalized. The student will be asked to leave the room and, consequently, will be marked as “Absent”.

6. **No cellular phones:** IE University implements a “Phone-free Classroom” policy and, therefore, the use of phones, tablets, etc. is forbidden inside the classroom. Failing to abide by this rule entails expulsion from the room and will be counted as one absence.

7. **Escalation policy: 1/3/5.** Items 4, 5, and 6 above entail expulsion from the classroom and the consequent marking of the student as “Absent.” IE University implements an “escalation policy”: The first time a student is asked to leave the room for disciplinary reasons (as per items 4, 5, and 6 above), the student will incur one absence, the second time it will count as three absences, and from the third time onward, any expulsion from the classroom due to disciplinary issues will entail 5 absences.