Boston University Study Abroad
London

Boston University Study Abroad London
Introduction to Elementary Statistics
CAS MA 113 *(Elective A)*
Spring 2016

<u>**Instructor Information**</u>

A.	Name	Caroline Gautier
B.	Day and Time	Mondays and Tuesdays, 9.00am-1.00pm (plus Wednesday 14th January 9.00am-1.00pm and Tuesday 19th January, 1:30pm-5:30pm)
C.	Location	Alexander Room, 43 Harrington Gardens, SW7 4JU
D.	BU Telephone	020 7244 6255
E.	Email	cgautier@bu.edu
F.	Office hours	By appointment

<u>**Course Objectives**</u>

Topics include methods of summarizing data, probability, statistical inference and regression. After completion of this course, the student will be able to demonstrate statistical literacy and statistical thinking by being able to:

1. describe techniques used to collect data to represent a given population
2. classify data by type, organize data into tables, and summarize data graphically
3. identify the common shapes associated with data distributions
4. compute and apply descriptive measures to characterize data
5. quantify the variability that occurs naturally in data sets
6. explore relationships between two variables with scatter diagrams, the correlation coefficient, and, when justified, linear regression analysis
7. use simulation to create a sampling distribution and characterize the shape of the sampling distribution
8. determine probabilities of events associated with a normal distribution
9. construct confidence intervals to estimate means and proportions
10. conduct and interpret a test of hypothesis for means and proportions
11. use Excel confidently

<u>**Course Overview**</u>

Every day we are inundated with information. Information comes from newspaper, magazines, books, television newscasts and the Internet. Statistics may be the most important branch of mathematics for the citizens in today's society and it is important that all of us be confident consumers of statistics in both our professional and personal lives. Our goal in this course is to develop the ability to think critically about numerical information and to use it as a consumer to come to useful decisions and conclusions.
While good algebra skills are helpful, there is no prerequisite for this course.

Course Methodology
The course incorporates collaborative learning, oral and written reports and technology. You will need a scientific calculator, please bring one to each class. Some basic skills on Excel would be useful.
Field trips and speakers will give you an idea of how statistics are used or has been used and influence decision-making.

Course Assessment

There will be two midterms exams and one final exam for the course. The quizzes will be held during lecture. The final will be cumulative. By pair or individually, students will have to use the new statistical abilities on a project and will have to present their results to the class.

Grading Criteria	
Quizzes	20%
Project and Presentation	20%
Final Exam	50%
Attendance & Participation	10%

Grading

Please refer to the Academic Handbook for detailed grading criteria and policies on plagiarism:
http://www.bu.edu/london/current-semester
Final Grades are subject to deductions by the Academic Affairs Office due to unauthorised absences.

Attendance

Classes
All Boston University London Programme students are expected to attend each and every class session, seminar, and field trip in order to fulfil the required course contact hours and receive course credit. Any student that has been absent from two class sessions (whether authorised or unauthorised) will need to meet with the Directors to discuss their continued participation on the programme. This may result in the student having to take a medical leave of absence from the programme or withdraw from the programme.

Authorised Absence:
Students who expect to be absent from any class should notify a member of Academic Affairs and complete an Authorized Absence Approval Form 10 working days in advance of the class date (except in the case of absence due to illness for more than one day. In this situation students should submit the Authorised Absence Approval Form with the required doctor's note as soon as possible). **Please note: Submitting an Authorised Absence Approval Form does not guarantee an authorised absence**

Students may apply for an authorised absence only under the following circumstances:
- Illness (first day of sickness): If a student is too ill to attend class, the student must phone the BU London Student Affairs Office (who will in turn contact the student's lecturer).
- Illness (multiple days): If a student is missing more than one class day due to illness, the student must call into to the BU London Student Affairs Office each day the student is ill. Students must also provide the Student Affairs office with a completed

Authorised Absence Approval Form and sick note from a local doctor excusing their absence from class.
- Important placement event that clashes with a class (verified by internship supervisor)
- Special circumstances which have been approved by the Directors (see note below).

The Directors will only in the most extreme cases allow students to leave the programme early or for a significant break.

Unauthorised Absence:
Any student to miss a class due to an unauthorised absence will receive **a 4% grade penalty** to their final grade for the course whose class was missed. This grade penalty will be applied by the Academic Affairs office to the final grade at the end of the course. As stated above, any student that has missed two classes will need to meet with the Directors to discuss their participation on the programme as excessive absences may result in a 'Fail' in the class and therefore expulsion from the programme.

Lateness
Students arriving more than 15 minutes after the posted class start time will be marked as late. Any student with irregular class attendance (more than two late arrivals to class) will be required to meet with the Assistant Director of Academic Affairs and if the lateness continues, may have his/her final grade penalised.

Course Chronology

Session 1 - Wednesday 13th January
> *Module 1*: **Descriptive Statistics**
> - Population parameters (mean, weighted mean, median, mode, standard deviation, variance)
> - Graphical methods (histogram, pie chart, scatter points, bar chart, stem and leaf plot)
> - Case study London demography

Reading: Read chapter 1, chapter 2: 2.1, 2.2.3, 2.2.4
Reading: Read chapter 8, *How to tell the liars from the Statisticians*, by R. Hooke
HW: chapter 2: 2, 4e, 7, 16, 21ac, 22, 25

Session 2 – Monday 18th January:
> *Module 2:* **Location and Quartiles**
> - Definition of quartile, percentile
> - Outliers
> - Box-whisker plot
> - How to draw a box-whisker on Excel
> - Case study London Income versus Boston income

Reading: Read chapter 2: 2.2, 2.3
Reading: Read Introduction "the Roseto Mystery" from *Outliers, the story of success* by Malcolm Gladwell
HW: chapter 2: 1, 3, 5, 6, 8, 9, 13, 15, 18, 24

Session 3 – Tuesday 19th January:
    Quiz 1: Module 1 and 2
    Module 3: **Probability, Binomial distribution**
        - Basic probabilities, addition rule, independent events, conditional probabilities, mutually exclusive events
        - Tree diagram, two-way table
        - Probability distribution, mean, variance
        - Binomial distribution
Reading: Read chapter 3: 3.1, 3.2, 3.3, 3.4
HW: chapter 3: 1, 2, 3, 4, 5, 6, 7, 10

Session 4 – Tuesday 19th January: Field trip – Museum of Transportation of London

Session 5 – Monday 25th January:
    Module 4: **Normal distribution and central limit theorem**
        - Standard Normal distribution
        - Normal probabilities
        - Normal/binomial distribution
        - Z-score
        - Central limit theorem
Reading: Read chapter 3: 3.5, 3.6, chapter 4: 4.1, 4.2
HW: chapter 3: 24, 26, 29, 32, chapter 4: 1, 2

Session 6 – Tuesday 26th January:
    Module 5: **Confidence intervals**
        - Confidence interval for the mean
        - Confidence interval for the proportion
        - Simulation on Excel
Reading: Chapter 5: 5.1.1, 5.1.2, chapter 7: 7.1 (up to page 296 included)
HW: Finish worksheet 8 on Confidence Intervals

Session 7 – Monday 1st February:
    Quiz 2: Module 3, 4 and 5
    Module 6: **Hypothesis tests**
        - What is a hypothesis test?
        - Hypothesis test for the mean
        - Hypothesis test for the proportion
        - Introduction to SPSS (If time allowed)
Reading: Chapter 5: 5.2, 5.3, chapter 7: 7.1, chapter 10: 10.1.2
HW: Finish worksheet 9 on Hypothesis tests

Session 8 – Tuesday 2nd February: Correlation and Regression
        - Correlation analysis, correlation coefficient and coefficient of determination
        - Simple linear regression – least square method
        - How to use Excel and SPSS for linear regression
        - Case study: smoking and cancers
Reading: Read chapter 10: 10.1.1, 10.2 (skip SAS examples)
Reading: Read chapter 55, *How to tell liars from Statistician* by R. Hooke
HW: chapter 10: 2, Finish worksheet 10 on Correlation and Regression

*Contingency Class Date: Friday 5th February. Students are obligated to keep this date free to attend class should any class dates need to be rescheduled.

Session 9 – Monday 8ᵗʰ February: Forecasting
- Linear regression and moving average
- Case Study: Use of Excel in moving average method
- Review (Past Paper practice)

HW: Past Exams

Session 10 – Tuesday 9ᵗʰ February
- Student presentations of their project
- Review

FINAL EXAM: Tuesday 16ᵗʰ February. Exam times and locations will be posted on the BU London website and in Student Newsletter two weeks before exam dates.

Please Note: Schedules and topics are subject to change, in which case announcements will be made in class as appropriate.

Readings

Required reading is noted above in the Course Chronology. It is essential that all students read and reflect upon the relevant reading *before* each class. Students will be able to purchase the required textbooks at the start of term book sale. All books listed below are available through the BU Study Abroad London Library.

Introductory Applied Biostatistics by Raplh B. D'Agostino, Sr., Lisa M. Sullivan, Alexa S. Beiser

Supplementary and Secondary Reading:
How to tell liars from statisticians by Robert Hook
Outliers, the story of success by Malcolm Gladwell
Introductory Statistics by Jay Devore and Roxy Peck
A basic course in statistics by G.M. Clarke and D. Cooke
Presenting data: how to communicate your message effectively by Ed Swires-Hennessy

Additional readings and resources are posted on Blackboard: http://learn.bu.edu
Current news articles will be given out in class.

Terms & Conditions: I expect students to be active and engaged participants. Students have to take all exams, and complete all coursework on time.