



Course Code & Title	LISS005 Introduction to Quantitative Research				
Convenor(s)	Dr Yang Ye, School of Human Sciences, the University of Greenwich				
Institution	LISS DTP	Department		LISS DTP	
Academic Year	2021-22	Term		Summer	
Number of sessions	10	Research Platform	Quantitative Research	Length of Session(s)	3 hrs (2 hr lecture + 1 hr seminar)
Day, Date		Start : End		Room Location	
Lecture 1: 16 May 2022 (Mon) Lecture 2: 19 May 2022 (Thu) Lecture 3: 23 May 2022 (Mon) Lecture 4: 26 May 2022 (Thu) Lecture 5: 30 May 2022 (Mon) Lecture 6: 6 June 2022 (Mon) Lecture 7: 9 June 2022 (Thu) Lecture 8: 13 June 2022 (Mon) Lecture 9: 16 June 2022 (Thu) Lecture 10: 20 June 2022 (Mon)		13:00 to 16:00		Online (Zoom or Teams)– URL available upon enrolment. Meeting links e-mailed 2 days before first session	
Enrolment Links:	https://bit.ly/LISS005 You may be prompted to log into SkillsForge				

Course Description:

The main purpose of this course is to introduce students to quantitative data, basic concepts in statistics, the basic logic of statistical reasoning and null-hypothesis significance testing, and the fundamentals of quantitative research design. The course will provide students introductory-level practical ability to choose, generate, and properly interpret descriptive and inferential statistics, and to design quantitative surveys and experimental studies.

The course does not assume any prior knowledge in statistics. The only prerequisite is basic algebra.

The course will use Microsoft Excel for 1) depicting data with graphs and 2) demonstrating the mathematical procedures behind various types of statistical testing. It will also use SPSS (<https://www.ibm.com/uk-en/products/spss-statistics>) for demonstrating the procedures of data analysis in SPSS.

The course uses some materials from the open course “Statistical Reasoning” by Carnegie Mellon University under the Creative Commons Attribution: Non-commercial Share Alike 4.0 License, Copyright 2020 Open Learning Initiative.



Course Schedule:

Session	Lecture topic	Practical seminar topic	Unit
1	Distribution	Depicting a variable	Unit 1: Depicting quantitative data
2	Covariation	Depicting relationship	
3	Probability	Using normal distribution	Unit 2: Probability and sampling
4	Sampling	Sampling distribution	
5	Statistical estimation	Confidence interval	Unit 3: Statistical inference
6	Hypothesis testing: Part 1	Chi-square test	
7	Hypothesis testing: Part 2	T-test and analysis of variance (ANOVA)	
8	Hypothesis testing: Part 3	Correlation and regression	
9	Research design	Power analysis	Unit 4: Research design
10	Measurement	Open science and research practice	



Course Outline:

Unit 1: Depicting quantitative data

In this unit we will learn about the basics of quantitative data. We will start with the concept of quantification: turning observations of real-life phenomena into numbers. We will then learn a few key data-related concepts: variable, distribution, and co-variation. We will study how to depict a simple variable using statistics or graphics, and how to depict the relationship between two variables.

Lecture 1: Distribution

- Overview of the course
- Variable
 - Categorical variable
 - Quantitative variable
- Distribution
 - Graphic depictions
 - Numerical descriptions

Keywords: variable, distribution, mean, standard deviation, median, mode, range

Lecture 2: Covariation

- Depicting relationships
 - Categorical and categorical variables
 - Categorical and quantitative variables
 - Quantitative and quantitative variables

Keywords: two-way table, boxplot, scatterplot

Unit 2: Probability and sampling

In this unit we will learn about the probability. We will have a brief overview about the basics about probability. We will then learn about how we could make highly precise conclusions about a large population while only having access to small samples - where the power of statistics lies.

Lecture 3: Probability

- Relative frequency
- Probability distribution
 - Random variables
 - Normal distribution

Keywords: probability, random variable, normal distribution

Lecture 4: Sampling

- Sampling methods



- Sampling distribution
 - The behaviour of sample mean
 - Sample size
 - The central limit theorem

Keywords: sampling bias, standard error, central limit theorem

Unit 3: Statistical inference

In this unit we will learn about how to make statistical estimations and to conduct statistical analysis that test hypotheses about the relationship between IV(s) and DVs.

Lecture 5: Statistical estimation

- Point estimation
- Interval estimation

Keywords: sample statistics, population parameters, confidence intervals

Lecture 6: Hypothesis testing: Part 1

- The NHST paradigm
 - Null and alternative hypotheses
 - The four steps of hypothesis testing
 - P-value
 - Type 1 and Type 2 Error
 - Statistical power
- Testing C-C relationship
 - Chi-square test

Keywords: null hypothesis, alternative hypothesis, p-value, testing statistics, statistical power

Lecture 7: Hypothesis Testing: Part 2

- Testing C-Q relationship
 - Independent t-test
 - Paired t-test
 - Complete randomised analysis of variance (ANOVA)
 - Two factor complete randomised ANOVA
 - Test of simple effects and interaction effects

Keywords: t-test, ANOVA, post-hoc comparison

Lecture 8: Hypothesis Testing: Part 3

- Testing Q-Q relationship
 - Bi-variate correlation
 - Bi-variate regression



- Multiple regression
- Multiple regression with interaction

Keywords: interaction, simple effects, Pearson's correlation, bivariate regression

Unit 4: Research Design

In the final unit we will learn about the fundamentals of research design and quantitative measurement.

Lecture 9: Research design

- Internal validity and confounding variable
- External validity
- Experimental design
- Keywords: internal and external validity, confounding variable

Lecture 10: Measurement

- Levels of measurement
- Measurement reliability
- Measurement validity
- Open science and research practice

Keywords: measurement validity and reliability

Useful link

- The Open Course "Statistical Reasoning" at Open Learning Initiative:
<https://oli.cmu.edu/courses/statistical-reasoning-copy/>
- My statistics teacher Dr. Bob Gardner's (Professor Emeritus, Western University, Canada) webpage of data analysis and materials from his Psychology 9540 course:
<http://publish.uwo.ca/~gardner/DataAnalysisDotCalm/>

About the course instructor:

Dr. Yang Ye is a Lecturer in Psychology at the School of Human Sciences, University of Greenwich, where he teaches introductory research methods in psychology and social psychology. Yang received his PhD in Social Psychology at Western University, Canada. Before joining the University of Greenwich, he did post-doctoral research in experimental psychology at Ghent University, Belgium and in sociolinguistics at Queen Mary University of London. His research focuses on explicit and implicit forms of attitudes, stereotypes and bias in judgment and decision making.