



Course Code & Title	LISS005 Introduction to Quantitative Research				
Convenor(s)	Dr Yang Ye, School of Human Sciences, the University of Greenwich Email: y.ye@gre.ac.uk				
Institution	Combined	Department		LISS DTP	
Academic Year	2023	Term		Summer	
Number of sessions	10	Research Platform	Quantitative Research	Length of Session(s)	2 hr lect 1 hr sem
Day, Date		Start : End		Room Location	
Lecture 1: May 24 Lecture 2: May 26 Lecture 3: May 31 Lecture 4: June 2 Lecture 5: June 7 Lecture 6: June 9 Lecture 7: June 14 Lecture 8: June 16 Lecture 9: June 21 Lecture 10: June 23 Additional session: June 28		13:00 to 16:00		Online (Zoom) – URL available upon request	
Enrolment Links:	Available to book on SkillsForge from Tuesday 11th April 2023 . Click to log in and register: https://training.kcl.ac.uk/kcl/#/he/dev/eventDetails;em,providerCode=LISS,providerOrgAlias=kcl Questions? Visit our Training FAQ here: Frequently Asked Questions - LISS DTP (liss-dtp.ac.uk)				

Course Description:

The main purpose of this course is to introduce students to the fundamentals of statistical reasoning, data analysis and research design, as well as to provide students with introductory-level practical abilities of descriptive and inferential statistics.

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

The course uses Excel for demonstrating the mathematical algorithms and procedures behind various statistical procedures and IBM SPSS version 28 (<https://www.ibm.com/uk-en/products/spss-statistics>) for data analysis (in seminar).

The course adopts some materials from the open course “Statistical Reasoning” from 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 Senior Lecturer in Psychology at the School of Human Sciences, University of Greenwich, where he teaches statistics, research methods 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 topics include attitudes, stereotype and bias in judgments and perceptions.