

GRSC6035 Introduction to Quantitative Research Methods (The Sciences & Related Disciplines)

Aim:

The aim of the course is to introduce the basics of quantitative research and enable students to critically review simple statistical analysis.

Content:

Introduction to quantitative research methods including sufficient statistical concepts to allow students to make good sense of the statistical figures and numbers they are exposed to in daily life. The following topics will be covered in the courses:

- Research and the scientific method, theory, model and hypothesis
- Occam's law, proof and verification
- Random variables: explanatory, independent, dependent and extraneous variables
- Types of control
- Probability, association and causation
- Necessary and sufficient conditions
- Experiment versus observation
- Population and sample, units of analysis
- Representativeness, probability sample: simple random, cluster, stratified, network
- Telephone versus face-to-face interviews
- Primary versus secondary data, observation versus participation
- Qualitative versus quantitative research
- Basics of qualitative research: biography or narrative research, phenomenology, grounded theory, ethnography, case study
- Qualitative sampling: saturation, theoretical or purposeful sampling, convenience sampling, snowball sampling
- Observation, interviewing and other means of collecting qualitative data, recording and analyzing qualitative data
- Sampling versus non-sampling errors
- Reliability, validity & precision
- Nominal, ordinal scale, interval, ratio scale
- Making operational choices, index versus scale measures, scale construction: Likert scale, semantic, Guttman scales
- Basics of probability: adding, multiplying, conditional probability, Bayes Law, binomial distribution
- Computer packages for statistical analysis
- Graphical data summary: histograms, box plots, stem and leaf plots
- Numerical summaries for the centre of a distribution: mean, median, mode
- Numerical summaries for the spread/deviation of a distribution: variance, standard deviation, interquartile range
- Estimating and testing hypotheses for proportions

- Sample theory, making mistakes/errors, power, one-tailed or two-tailed tests, effect size
- Extension of hypothesis testing and confidence intervals to other situations
- Pearson's Chi-squared Goodness of Fit statistic, categorical data with more than 2 categories, testing for independence of categorical variables

This course is designed for students who are conducting research in lab-based disciplines, including Sciences & related disciplines. Students from non-lab-based disciplines are recommended to take the parallel course designed for them.

Organization:

The course comprises a total of twelve hours over four weekly sessions.

Enrollment:

This course or GRSC6034/6036/6037/6007 is compulsory for MPhil and 4-year PhD students registered in or after September 2013. Students are expected to have no, or a very limited background in statistics. Enrollment of the course is limited to 100 students.

Assessment:

Pass/Fail: Continuous assessment of weekly assignments.

Learning Outcomes:

On completion of the course, students will be able to understand:

- theory, model, Occam's law and types of random variable
- association & causation
- representativeness, probability sampling & non-sampling error
- three key criteria for a measuring instrument: reliability, validity & precision, and scales of measurement
- three laws of probability
- use of computers for statistical analysis
- how best to summarise data
- how to test hypotheses and estimate population characteristics using statistics
- statistical tools for relationships