FP006-30 Statistics and Further Mathematics

20/21

Department
Warwick Foundation Studies
Level
Foundation
Module leader
David Tapp
Credit value
30
Module duration
25 weeks
Assessment
40% coursework, 60% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

FP006-30 Statistics and Further Mathematics

Module web page

Module aims

To develop the students' understanding of statistics and further mathematics to enable progression onto undergraduate degree programmes.

To develop an understanding of how statistics and further mathematics can be used in different areas of study and to use them as an effective means of communication.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Statistics

Part 1: Numerical measures

- Standard deviation and variance calculated on ungrouped and grouped data
- Choice of numerical measures; mean, median, mode, range and interquartile range

Part 2: Probability

- Addition law of probability, mutually exclusive events
- Multiplication law of probability and conditional probability, independent events.

Part 3: Discrete Random Variables

- Discrete random variables and their associated probability distributions
- Mean, variance and standard deviation
- Mean, variance and standard deviation of a simple function of a discrete random variable

Part 4: Binomial Distribution

- Calculation of probability using formula
- Use of tables
- Mean, variance and standard deviation of a binomial distribution

Part 5: Geometric Distribution

- Calculation of probability using formula
- Mean, variance and standard deviation of a Geometric distribution

Part 6 Poisson Distribution

- Calculation of probability using formula
- Use of tables
- Mean, variance and standard deviation of a Poisson distribution
- Use the Poisson distribution to approximate binomial distributions

Part 7: Continuous Random Variables

- Differences from discrete random variables
- Probability density functions, cumulative distribution functions and their relationship
- The probability of an observation lying in a specified interval
- Quartiles and percentiles
- Mean, variance and standard deviation
- Mean, variance and standard deviation of a simple function of continuous random variable

Part 8: Continuous Uniform (Rectangular) Distribution

- General probability density function and cumulative distribution function
- Mean, variance and standard deviation

Part 9: Normal Distribution

- Continuous random variables
- Properties of normal distributions
- Calculation of probabilities
- Mean, variance and standard deviation of a normal distribution
- Use the normal distribution to approximate binomial and Poisson distributions

Part 10: Correlation and regression

- Calculation and interpretation of the product moment correlation coefficient
- Identification of response (dependent) and explanatory (independent) variables in regression
- Calculation of least squares regression lines with one explanatory variable. Scatter diagrams and drawing a regression line theorem
- Calculation of residuals

Further Mathematics

Part 1: Matrices

- Addition, subtraction and multiplication, inverse (2x2 and 3x3).
- Solving linear systems using inverse matrix method.
- Determinants (2x2 and 3x3).
- Solutions of simultaneous equations using Cramer's rule.
- Linear transformations.
- Matrix algebra, identity matrices.
- Reversing transformations using inverse matrix method.
- Calculating area enlargement scale factors using determinants.
  Part 2: Vectors
- Vector equations of lines.
- Intersection of lines
- Distance between lines: parallel and skew
- Dot product.
- Vector product. Application to area of triangle and parallelogram in 3d.
- Scalar triple product. Application to volume of parallelepiped and tetrahedron
- Vector equation of the plane.
- Intersection of a line and a plane
- Intersection of two planes
  Part 3: Partial Differentiation:
- Functions of several variables.
- Partial derivatives of functions of several variables.
- Directional derivatives.
- Total derivatives.
- Higher partial derivatives.
- Maxima, minima and saddle points.
- Lagrange multiplier method.
- Unconstrained optimization in economics.
- Constrained optimization in economics.
  Part 4: First Order Differential Equations
- Solving homogeneous first order differential equations.
- Solving linear first order differential equations using an integrating factor.
- Solving exact and non-exact first order differential equations.
  Part 5: Second Order Differential Equations
- Solutions of homogeneous second order differential equations.
- Solution of non-homogeneous second order differential equations by particular integrals.
  Part 6: Maclaurin and Taylor Series
- Maclaurin series. Standard series expansions.
- Taylor series expansions.
- Series solution to a differential equations.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate a good understanding of the statistical and further mathematics principles and processes to enable progression onto relevant undergraduate degree programmes;

- Construct and present arguments through appropriate use of logical deduction and precise statements involving correct use of symbols and appropriate statistical and further mathematical language; and
- Use statistical and further mathematics principles in the analysis and solution of real world problems.

Indicative reading list

Statistics
Crawshaw, D.J. and Chambers, J.S. (2001) A Concise Course in Advanced Level Statistics (4th ed.) Nelson Thornes

Mathematics
Gaulter, B. and Gaulter, M. (2001) Further pure mathematics. Oxford University Press.

View reading list on Talis Aspire

Subject specific skills

Mathematical Skills

Analytical Skills

Problem-solving skills

Transferable skills

Mathematical Skills

Analytical Skills

Problem-solving skills

Communication Skills

Study

Study time

Type	Required
Seminars	25 sessions of 4 hours (33%)
Private study	150 hours (50%)
Assessment	50 hours (17%)
Total	300 hours

Private study description

Students are expected to review seminar work after the sessions and also complete the series of Independent Study Questions provided on Moodle.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D3

	Weighting	Study time
Class Test 1	20%	10 hours
Class Test 2	20%	10 hours
Online Examination	60%	30 hours

Feedback on assessment

Written feedback provided on scripts and Tabula.

Past exam papers for FP006

Availability

Courses

This module is Core for:

- FIOE Warwick International Foundation Programme
  - Year 1 of FP18 Warwick International Foundation Programme - Computer Science
  - Year 1 of FP17 Warwick International Foundation Programme - Economics
  - Year 1 of FP13 Warwick International Foundation Programme - Mathematics and Economics
  - Year 1 of FP16 Warwick International Foundation Programme - Mathematics and Statistics