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MATH20701

Probability 2

Unit code:	MATH20701
Credit Rating:	10
Unit level:	Level 2
Teaching period(s):	Semester 1
Offered by	School of Mathematics
Available as a free choice unit?:	N

Requisites

Prerequisite

- [MATH10141 - Probability 1](#) (Compulsory)

Aims

The course unit aims to develop a solid foundation in the calculus of probabilities and indicate the relevance and importance of this to tackling real-life problems.

Overview

This course continues the development of probability and statistics from the first year so that all students on the single honours programme have the basic grounding in this area which would be expected of a mathematics graduate. It provides a solid basis for a wide variety of options later in the programme for students who wish to take their studies in probability and/or statistics further.

Assessment methods

- Other - 20%

- Written exam - 80%

Assessment Further Information

- Coursework (in-class test on the Friday of reading week, 4 November): weighting within unit 20%
- 2 hour end of semester examination: weighting within unit 80%

Learning outcomes

On completion of this unit successful students will:

- understand the concept of both univariate and multivariate random variables;
- be familiar with a range of parametric families to model their probability distribution;
- be able to calculate expectations and conditional expectations;
- be able to evaluate the distribution of functions of random variables;
- be familiar with the distribution of various statistics arising from sampling from a normal distribution.

Syllabus

- **Univariate random variables.** Review of random variables, cumulative distribution functions of discrete, continuous and piecewise continuous random variables, probability mass functions and probability distribution functions, expectation and variance, probability generating functions, moments and moment generating functions. [5 lectures]
- **Multivariate random variables.** Bivariate distributions, marginal distributions, expectation and conditional expectation, independence, covariance and correlation, the bivariate normal distribution, multivariate random variables. [6]
- **Distributions of functions of random variables.** The equivalent events technique, the distribution function technique, functions of several variables, the bivariate transformation technique, the distribution of sums of random variables, moment generating function techniques, the gamma distribution, sums with a random number of terms (compound distributions). [6]
- **Sampling and sampling distributions.** Expectation and variance of sums of random variables, the Central Limit Theorem, sampling from the normal distribution, the chi-square, Student t and F distributions, applications to confidence intervals. [5]

Recommended reading

- Mood, A. M., Graybill, F. A. and Boes, D. C., Introduction to the Theory of Statistics, 3rd edition, McGraw-Hill 1974

- S. Ross, A First Course in Probability, 4th edition, Macmillan.
- D. Stirzaker, Elementary Probability, Cambridge University Press. Available electronically
- Neil A. Weiss, A Course in Probability, Pearson.

Feedback methods

Tutorials will provide an opportunity for students' work to be discussed and to provide feedback on their understanding.

Study hours

- Lectures - 22 hours
- Tutorials - 11 hours
- Independent study hours - 67 hours

Teaching staff

Denis Denisov - Unit coordinator