ST120-10 Introduction to Probability

24/25

Department
Statistics
Level
Undergraduate Level 1
Module leader
Martyn Parker
Credit value
10
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module runs in Term 1 and is a core or listed optional module for some degree courses (primarily in Mathematics and Computer Science) and is also available as an unusual option to students on non-listed degrees. You may be interested in this module if you wish to take further statistics modules.

Co-requisites: MA132 Foundations and MA141 Analysis 1 (or equivalents)

Post-requisites: ST121 Statistical Laboratory, ST220 Introduction to Mathematical Statistics.

This module is not available to students who have their home department in Statistics, who take equivalent modules. Students who are considering transferring to a course in Data Science, Mathematics & Statistics or MORSE at the end of their first year should take this module.

Module web page

Module aims

To lay the foundation for all subsequent modules in probability and statistics, by introducing the key notions of mathematical probability and developing the techniques for calculating with probabilities and expectations.

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.

This module provides interdisciplinary coverage of mathematical techniques applying them to probabilistic methods. The module covers:

1. Experiments with random outcomes, including the notions of events and their probability, operations with sets and their interpretations.
2. Probability spaces, including the addition law and axiomatic definition of a probability space.
3. Discrete probability spaces, including combinatorial probability methods such as the inclusion-exclusion formula and multinomial coefficients.
4. Continuous probability spaces, for example, points chosen uniformly at random in space.
5. Conditioning and independence, including independence of events, conditional probabilities, the law of total probability and Bayes' theorem.
6. Theory of Random variables, including discrete and continuous random variables, joint distributions, common families of distributions, expectation, variance and covariance.
7. Moment generating functions, inequality theorems, central limit theorem.

Learning outcomes

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

- know and apply appropriate techniques to solve probabilistic problems;
- describe and interpret experiments with random outcomes using mathematical probability;
- know and interpret the concepts of conditional probability and independence;
- know and apply the theory of probability distributions, expectation, variance, and covariance associated with random variables;
- interpret problems and select appropriate distributions to create probability models.

Indicative reading list

Richard Durrett, (2009), Elementary Probability for Applications, Cambridge University Press, New York

Geoffrey Grimmett; D. J. A. Welsh, (2014), Probability - An Introduction, Oxford University, Oxford.

Geoffrey Grimmett, (2020) One Thousand Exercises in Probability. Third Edition, Oxford University Press.

View reading list on Talis Aspire

Subject specific skills

Demonstrate facility with advanced mathematical and probabilistic methods.

Select and apply appropriate mathematical and/or statistical techniques.

Demonstrate knowledge of key mathematical and statistical concepts, both explicitly and by applying them to the solution of mathematical problems.

Create structured and coherent arguments communicating them in written form.

Reason critically, carefully, and logically and derive (prove) mathematical results.

Transferable skills

Problem solving skills: The module requires students to solve problems presenting their conclusions as logical and coherent arguments.

Written communication: Written work requires precise and unambiguous communication in the manner and style expected in mathematical sciences.

Verbal communication: Dialogue with class tutors around problems prepared for each class.

Teaming working and working effectively with others: Students are encouraged to discuss and debate formative assessment and lecture material within small-group tutorials sessions.

Professionalism: Students work autonomously by developing and sustain effective approaches to learning, including time management, organisation, flexibility, creativity, collaboratively and intellectual integrity.

Study

Study time

Type	Required	Optional
Lectures	30 sessions of 1 hour (31%)	2 sessions of 1 hour
Seminars	4 sessions of 1 hour (4%)	
Private study	54 hours (55%)	
Assessment	10 hours (10%)	
Total	98 hours	

Private study description

Weekly revision of lecture notes and materials, wider reading and practice exercises working on problem sets and preparing for the examination.

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 D2

	Weighting	Study time
Term time assessments	10%	8 hours

There will be approximately four problem sets. Theproblem sheets will contain a number of questions for which solutions and / or written responses will be required. Problem sheets are supported by seminars, including both analytical and computational tasks.

The preparation and completion time noted below refers to the amount of time in hours that a well-prepared student who has attended lectures and carried out an appropriate amount of independent study on the material could expect to spend on this assignment.

In-person Examination	90%	2 hours

You will be required to answer all questions on this examination paper.

- Answerbook Pink (12 page)

Assessment group R2

	Weighting	Study time
In-person Examination - Resit	100%	

You will be required to answer all questions on this examination paper.

- Answerbook Pink (12 page)

Feedback on assessment

Individual feedback will be provided on problem sheets by class tutors. A cohort-level feedback will be available for the examination. Students are actively encouraged to make use of office hours to build up their understanding, and to view all their interactions with lecturers and class tutors as feedback.

Past exam papers for ST120

Availability

Courses

This module is Core for:

- UCSA-G4G1 Undergraduate Discrete Mathematics
  - Year 1 of G4G1 Discrete Mathematics
  - Year 1 of G4G1 Discrete Mathematics
- Year 1 of UCSA-G4G3 Undergraduate Discrete Mathematics
- Year 1 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- UMAA-G100 Undergraduate Mathematics (BSc)
  - Year 1 of G100 Mathematics
  - Year 1 of G100 Mathematics
  - Year 1 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 1 of G100 Mathematics
  - Year 1 of G103 Mathematics (MMath)
  - Year 1 of G103 Mathematics (MMath)
- Year 1 of UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
- Year 1 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 1 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 1 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 1 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- UMAA-GV17 Undergraduate Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
- Year 1 of UMAA-G101 Undergraduate Mathematics with Intercalated Year