

ST218-12 Mathematical Statistics Part A

21/22

Department

Statistics

Level

Undergraduate Level 2

Module leader

Horatio Boedihardjo

Credit value

12

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 core for students with their home department in Statistics and not available for students from other departments.

Pre-requisite: ST115 Introduction to Probability.

[Module web page](#)

Module aims

To develop more advanced probabilistic methods that are used in Statistics.

The module builds the necessary probability background for mathematical statistics. It covers topics such as multivariate probability distributions, conditional probability distributions and conditional expectation, multivariate normal distribution, convergence of sequences of random variables.

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.

Discrete and continuous multivariate distributions. Marginal distributions.

Jacobian transformation formula.

Conditional distributions, conditional expectation and properties.

Moment generating functions for multivariate random variables.

Multivariate Gaussian distribution and properties.

Distributions related to Gaussian distribution: the Chi-squared, Student's and Fisher distributions.

Convergence in distribution, convergence in probability and almost sure convergence. Examples.

Laws of large numbers.

Central limit theorem.

Learning outcomes

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

- Understand more advanced notions of probability needed in mathematical statistics including properties of multivariate Gaussian distributions, the law of large numbers, and the central limit theorem.
- Be able to calculate probabilities and expected values in more complex and sometimes multidimensional contexts.
- To be able to manipulate mathematical statements regarding the limiting behaviour of random sequences.

Indicative reading list

[View reading list on Talis Aspire](#)

Subject specific skills

Mathematical, analytical, problem solving

Transferable skills

Analytical, problem solving, investigative skills, communication, good working habits

Study

Study time

| Type | Required |
|----------|-----------------------------|
| Lectures | 30 sessions of 1 hour (25%) |
| Total | 120 hours |

| Type | Required |
|---------------|---------------------------|
| Tutorials | 5 sessions of 1 hour (4%) |
| Private study | 61 hours (51%) |
| Assessment | 24 hours (20%) |
| Total | 120 hours |

Private study description

Weekly revision of lecture notes and materials, wider reading and practice exercises, working on problem sets and preparing for 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 | Eligible for self-certification |
|--|------------------|-------------------|--|
| Multiple Choice Quiz 1 | 3% | 4 hours | Yes (waive) |
| A multiple choice quiz which will take place during the term that the module is delivered. | | | |
| Multiple Choice Quiz 2 | 3% | 4 hours | Yes (waive) |
| A multiple choice quiz which will take place during the term that the module is delivered. | | | |
| Multiple Choice Quiz 3 | 4% | 4 hours | Yes (waive) |
| A multiple choice quiz which will take place during the term that the module is delivered. | | | |
| Written assignment | 10% | 12 hours | Yes (extension) |
| The assignment will contain a number of questions for which solutions and / or written responses will be required. 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. You will write your answers on paper and submit it as instructed. | | | |
| In-person Examination | 80% | | No |
| Full marks may be obtained by correctly answering Question 1 from Part I and two complete questions from Part II. | | | |
| Candidates may attempt all questions. Marks will be awarded for the answer to Question 1 from | | | |

| | Weighting | Study time | Eligible for self-certification |
|---|------------------|-------------------|--|
| Part I and the best two answers to questions from Part II only. | | | |

- Answerbook Pink (12 page)
- Students may use a calculator
- Cambridge Statistical Tables (blue)

Assessment group R1

| | Weighting | Study time | Eligible for self-certification |
|---|------------------|-------------------|--|
| In-person Examination - Resit | 100% | | No |
| Full marks may be obtained by correctly answering Question 1 from Part I and two complete questions from Part II. | | | |
| Candidates may attempt all questions. Marks will be awarded for the answer to Question 1 from Part I and the best two answers to questions from Part II only. | | | |

~Platforms - Moodle

- Answerbook Pink (12 page)
- Cambridge Statistical Tables (blue)

Feedback on assessment

Answers to problems sets will be marked and returned to you in a tutorial or seminar taking place the following week when you will have the opportunity to discuss it.

Solutions and cohort level feedback will be provided. The results of the January examination and cohort level examination feedback will be available in week 10 of term 2.

[Past exam papers for ST218](#)

Availability

Post-requisite modules

If you pass this module, you can take:

- EC338-15 Econometrics 2: Microeconometrics

- EC306-15 Econometrics 2: Time Series
- ST409-15 Medical Statistics with Advanced Topics
- ST332-15 Medical Statistics

Anti-requisite modules

If you take this module, you cannot also take:

- ST220-12 Introduction to Mathematical Statistics

Courses

This module is Core for:

- Year 2 of USTA-G302 Undergraduate Data Science
- Year 2 of USTA-G304 Undergraduate Data Science (MSci)
- Year 2 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
- Year 2 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 2 of USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
- Year 2 of USTA-Y602 Undergraduate Mathematics, Operational Research, Statistics and Economics

This module is Optional for:

- Year 3 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 4 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)

This module is Option list B for:

- Year 2 of UCSA-G4G1 Undergraduate Discrete Mathematics
- Year 2 of UCSA-G4G3 Undergraduate Discrete Mathematics