

MA4M8-15 Theory of Random Graphs

22/23

Department

Warwick Mathematics Institute

Level

Undergraduate Level 4

Module leader

Richard Montgomery

Credit value

15

Module duration

10 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

The study of random graphs is a highly active area of Probabilistic Combinatorics with connections and applications to other areas of Combinatorics and other fields. In this module, we will cover results and techniques from the theory of random graphs.

Module aims

To introduce students to the study of random graphs, giving a basic grounding in the subject and subsequently covering more advanced topics in the area.

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.

In this module we will cover the fundamentals of the study of random graphs, including the following topics.

- Different random graph models and their relation to each other
- Thresholds for increasing properties
- Probability coupling techniques

We will then cover selected important topics in more detail, including the following topics.

- The appearance of the giant component in the binomial random graph
- The chromatic number of a typical random graph
- The appearance of different subgraphs in the random graph
- The application of random graphs via the probabilistic method

Learning outcomes

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

- To state basic results and definitions which are covered by the module.
- To understand the main ideas of the underlying mathematics.
- To prove some key results in the course, as highlighted in the material.
- To manipulate with basic graph decomposition techniques.

Indicative reading list

Janson, Łuczak and Rucinski (2011), Random Graphs, John Wiley & Sons, ISBN: 9780471175414

Frieze and Karoński (2016), Introduction to Random Graphs, Cambridge University Press, ISBN: 9781107118508

[View reading list on Talis Aspire](#)

Subject specific skills

See learning outcomes

Transferable skills

Students will acquire key reasoning and problem solving skills which will empower them to address new problems with confidence.

Study

Study time

| Type | Required |
|---------------|------------------------------|
| Lectures | 10 sessions of 3 hours (20%) |
| Tutorials | 9 sessions of 1 hour (6%) |
| Private study | 68 hours (45%) |
| Assessment | 43 hours (29%) |
| Total | 150 hours |

Private study description

Review lectured material and work on set exercises.

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 B

| | Weighting | Study time |
|---|-----------|------------|
| In-person Examination | 100% | 43 hours |
| <ul style="list-style-type: none">• Answerbook Pink (12 page) | | |

Assessment group R

| | Weighting | Study time |
|---|-----------|------------|
| In-person Examination - Resit | 100% | |
| <ul style="list-style-type: none">• Answerbook Gold (24 page) | | |

Feedback on assessment

Exam feedback.

[Past exam papers for MA4M8](#)

Availability

Pre-requisites

Useful background:
MA3J2 Combinatorics II

Courses

This module is Optional for:

- Year 1 of TMAA-G1PE Master of Advanced Study in Mathematical Sciences
- Year 1 of TMAA-G1PD Postgraduate Taught Interdisciplinary Mathematics (Diploma plus MSc)
- Year 1 of TMAA-G1P0 Postgraduate Taught Mathematics
- Year 1 of TMAA-G1PC Postgraduate Taught Mathematics (Diploma plus MSc)

This module is Option list A for:

- Year 2 of TMAA-G1PC Postgraduate Taught Mathematics (Diploma plus MSc)
- Year 4 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 5 of USTA-G1G4 Undergraduate Mathematics and Statistics (BSc MMathStat) (with Intercalated Year)

This module is Option list B for:

- Year 2 of TMAA-G1PD Postgraduate Taught Interdisciplinary Mathematics (Diploma plus MSc)
- Year 4 of UCSA-G4G3 Undergraduate Discrete Mathematics
- Year 3 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 4 of USTA-G1G4 Undergraduate Mathematics and Statistics (BSc MMathStat) (with Intercalated Year)

This module is Option list C for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
 - Year 4 of G105 Mathematics (MMath) with Intercalated Year
 - Year 5 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G103 Undergraduate Mathematics (MMath)
 - Year 3 of G103 Mathematics (MMath)
 - Year 3 of G103 Mathematics (MMath)
 - Year 4 of G103 Mathematics (MMath)
 - Year 4 of G103 Mathematics (MMath)
- Year 4 of UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe