MA241-10 Combinatorics

23/24

Department
Warwick Mathematics Institute
Level
Undergraduate Level 2
Module leader
Rob Silversmith
Credit value
10
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

N/A

Module web page

Module aims

N/A

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.

I Enumerative combinatorics
-Basic counting (Lists with and without repetitions, Binomial coefficients and the Binomial Theorem)
-Applications of the Binomial Theorem (Multinomial Theorem, Multiset formula, Principle of inclusion/exclusion)
-Linear recurrence relations and the Fibonacci numbers

-Generating functions and the Catalan numbers
-Permutations, Partitions and the Stirling and Bell numbers

II Graph Theory
-Basic concepts (isomorphism, connectivity, Euler circuits)
-Trees (basic properties of trees, spanning trees, counting trees)
-Planarity (Euler's formula, Kuratowski’s theorem, the Four Colour Problem)
-Matching Theory (Hall's Theorem and Systems of Distinct Representatives)
-Elements of Ramsey Theory
III Boolean Functions

Learning outcomes

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

- N/A

Indicative reading list

Edward E. Bender and S. Gill Williamson, Foundations of Combinatorics with Applications, Dover Publications, 2006. Available online at the author's website:
http://www.math.ucsd.edu/~ebender/CombText/
John M. Harris, Jeffry L. Hirst and Michael J. Mossinghoff, Combinatorics and graph theory, Springer-Verlag, 2000.

Subject specific skills

N/A

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	20 sessions of 1 hour (20%)
Tutorials	9 sessions of 1 hour (9%)
Private study	71 hours (71%)
Total	100 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 D

	Weighting	Study time	Eligible for self-certification
Assignments	10%		No
4 fortnightly assignments during the term.			
Examination	90%		No

- Answerbook Pink (12 page)

Assessment group R

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit	100%		No

- Answerbook Pink (12 page)

Feedback on assessment

Marked assignments and exam feedback.

Past exam papers for MA241

Availability

Courses

This module is Core for:

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

This module is Optional for:

- Year 2 of UCSA-I1N1 Undergraduate Computer Science with Business Studies

This module is Core option list A for:

- Year 2 of UMAA-GV17 Undergraduate Mathematics and Philosophy
- Year 2 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations

This module is Core option list B for:

- Year 3 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations

This module is Core option list D for:

- Year 4 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations

This module is Option list A for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
    - Year 2 of G105 Mathematics (MMath) with Intercalated Year
    - Year 4 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G100 Undergraduate Mathematics (BSc)
    - Year 2 of G100 Mathematics
    - Year 3 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 2 of G100 Mathematics
    - Year 2 of G103 Mathematics (MMath)
    - Year 3 of G100 Mathematics
    - Year 3 of G103 Mathematics (MMath)
- Year 2 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 2 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 2 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 2 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- Year 2 of USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
- UMAA-G101 Undergraduate Mathematics with Intercalated Year
    - Year 2 of G101 Mathematics with Intercalated Year
    - Year 4 of G101 Mathematics with Intercalated Year

This module is Option list B for:

- Year 2 of UCSA-G500 Undergraduate Computer Science

- UCSA-G503 Undergraduate Computer Science MEng
    - Year 2 of G500 Computer Science
    - Year 2 of G503 Computer Science MEng
- Year 2 of USTA-Y602 Undergraduate Mathematics,Operational Research,Statistics and Economics