

## Discrete Mathematics Optional Modules 2025-26

These modules have been approved by the Course Director and agreed with contributing departments for the below courses of study:

- BSc Discrete Mathematics
- MEng Discrete Mathematics
- BSc Discrete Mathematics (with Intercalated Year)
- MEng Discrete Mathematics (with Intercalated Year)

### Year 1

| Code     | Module Title                         | Term | Additional requirements/ restrictions                                    |
|----------|--------------------------------------|------|--|
| CS133-15 | Professional Skills                  | 1,2  |  |
| CS139-15 | Web Development Technologies         | 2    |  |
| CS140-15 | Computer Security                    | 1    |  |
| CS141-15 | Functional Programming               | 2    |  |
| MA133-10 | Differential Equations               | 2    | cannot be taken with MA145 or MA147                                      |
| MA145-10 | Mathematical Methods and Modelling 2 | 2    | must have taken MA147 in Term 1  |
| MA147-10 | Mathematical Methods and Modelling 1 | 1    | pre-requisite for MA145.<br>Recommended to take MA147 and MA145 together |
| ST121-10 | Statistical Laboratory               | 2    | pre-requisite for ST231-10. Introduces R                                 |

### Year 2

| Code     | Module Title                                 | Term | Additional requirements/ restrictions |
|----------|--|------|---------------------------------------|
| MA222-10 | Metric Spaces                                | 2    | Core for MEng; List A for BSc         |
| CS262-15 | Logic and Verification                       | 2    | List A                                |
| MA267-10 | Groups and Rings                             | 1    | List A                                |
| MA252-10 | Combinatorial Optimisation                   | 2    | List A                                |
| MA257-10 | Introduction to Number Theory                | 2    | List A                                |
| MA250-10 | Partial Differential Equations               | 1    | List A                                |
| MA271-10 | Mathematical Analysis 3                      | 1    | List A                                |
| ST227-10 | Stochastic Processes                         | 2    | List A                                |
| ST232-15 | Introduction to Mathematical Statistics      | 1    | List A                                |
| CS241-15 | Operating Systems and Computer Networks      | 1    |                                       |
| CS249-15 | Digital Communications and Signal Processing | 2    |                                       |
| CS255-15 | Artificial Intelligence                      | 1    |                                       |
| CS257-15 | Advanced Computer Architecture               | 2    |                                       |
| CS258-15 | Database Systems                             | 1    |                                       |
| CS261-15 | Software Engineering                         | 2    |                                       |
| CS263-15 | Cyber Security                               | 1    |                                       |
| CS266-15 | Data Analytics                               | 2    |                                       |
| MA240-10 | Modelling Nature's Nonlinearity              | 1    |                                       |
| MA243-10 | Geometry                                     | 1    |                                       |
| MA254-10 | Theory of ODEs                               | 2    |                                       |

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|----------|--------------------------------------|---|--|
| MA256-10 | Introduction to Mathematical Biology | 1 |  |
| MA259-10 | Multivariable Calculus               | 2 |  |
| MA269-10 | Asymptotics and Integral Transforms  | 2 |  |
| MA2K3-10 | Consolidation                        | 1 |  |
| MA2K4-10 | Numerical Methods and Computing      | 2 |  |
| ST231-10 | Linear Statistical Modelling with R  | 2 | must have taken ST121 in Year 1.<br>Requires R |
| ST234-10 | Games and Decisions                  | 1 |  |

### Year 3

| Code     | Module Title                                   | Term | Additional requirements/ restrictions |
|----------|--|------|---------------------------------------|
| MA3J2-15 | Combinatorics II                               | 2    | Core for MEng                         |
| CS313-15 | Mobile Robotics                                | 2    |                                       |
| CS324-15 | Computer Graphics                              | 1    |                                       |
| CS325-15 | Compiler Design                                | 1    |                                       |
| CS331-15 | Neural Computing                               | 2    |                                       |
| CS342-15 | Machine Learning                               | 1    |                                       |
| CS345-15 | Sensor Networks and Mobile Data Communications | 1    |                                       |
| CS346-15 | Advanced Databases                             | 2    |                                       |
| CS349-15 | Principles of Programming Languages            | 1    |                                       |
| CS352-15 | Project Management for Computer Scientists     | 1    |                                       |
| CS355-15 | Digital Forensics                              | 2    |                                       |
| CS357-15 | Responsible Computing                          | 1    |                                       |
| CS359-15 | Computational Social Choice                    | 1    |                                       |
| MA300-15 | Mathematics of Cryptography                    | 1    |                                       |
| MA301-15 | Waves and Metamaterials                        | 2    |                                       |
| MA302-15 | Electromagnetism                               | 2    |                                       |
| MA359-15 | Measure Theory                                 | 1    |                                       |
| MA372-15 | Reading Module                                 | 1    |                                       |
| MA377-15 | Rings and Modules                              | 2    |                                       |
| MA390-15 | Topics in Mathematical Biology                 | 1    |                                       |
| MA395-15 | Essay  | 1    |                                       |
| MA397-15 | Consolidation                                  | 1    |                                       |
| MA398-15 | Matrix Analysis & Algorithms                   | 1    |                                       |
| MA3A6-15 | Algebraic Number Theory                        | 2    |                                       |
| MA3B8-15 | Complex Analysis                               | 1    |                                       |
| MA3D1-15 | Fluid Dynamics                                 | 2    |                                       |
| MA3D4-15 | Fractal Geometry                               | 2    |                                       |
| MA3D5-15 | Galois Theory                                  | 1    |                                       |
| MA3D9-15 | Geometry of Curves & Surfaces                  | 2    |                                       |
| MA3E1-15 | Groups & Representations                       | 2    |                                       |
| MA3F1-15 | Introduction to Topology                       | 1    |                                       |

|          |   |   |  |
|----------|---|---|--|
| MA3F2-15 | Knot Theory   | 1 |  |
| MA3G1-15 | Theory of Partial Differential Equations                    | 2 |  |
| MA3G6-15 | Commutative Algebra   | 1 |  |
| MA3G7-15 | Functional Analysis I                                       | 1 |  |
| MA3G8-15 | Functional Analysis II                                      | 2 |  |
| MA3H0-15 | Numerical Analysis & PDE's                                  | 2 |  |
| MA3H2-15 | Markov Processes and Percolation Theory                     | 2 |  |
| MA3H3-15 | Set Theory  | 1 |  |
| MA3H5-15 | Manifolds   | 1 |  |
| MA3H6-15 | Algebraic Topology  | 1 |  |
| MA3H7-15 | Control Theory  | 2 |  |
| MA3J3-15 | Bifurcations, Catastrophes and Symmetry                     | 2 |  |
| MA3J4-15 | Mathematical Modelling with PDE                             | 1 |  |
| MA3J8-15 | Approximation Theory and Applications                       | 1 |  |
| MA3K0-15 | High-Dimensional Probability                                | 2 |  |
| MA3K1-15 | Mathematics of Machine Learning                             | 2 |  |
| MA3K4-15 | Introduction to Group Theory                                | 1 |  |
| MA3K6-15 | Boolean Functions   | 1 |  |
| MA3K7-15 | Problem Solving with Python                                 | 2 |  |
| MA3K9-15 | Mathematics of Digital Signal Processing                    | 1 |  |
| MA3L2-15 | Optimisation  | 1 |  |
| MA3L3-15 | Communicating Mathematics                                   | 1 |  |
| ST301-15 | Bayesian Statistics and Decision Theory                     | 1 |  |
| ST305-15 | Designed Experiments  | 1 |  |
| ST318-15 | Probability Theory  | 2 |  |
| ST323-15 | Multivariate Statistics                                     | 1 |  |
| ST332-15 | Medical Statistics  | 2 |  |
| ST333-15 | Applied Stochastic Processes                                | 1 |  |
| ST337-15 | Bayesian Forecasting and Intervention                       | 2 |  |
| ST341-15 | Statistical Genetics  | 2 |  |
| ST343-15 | Topics in Data Science                                      | 2 |  |
| ST346-15 | Generalised Linear Models for Regression and Classification | 1 |  |
| ST350-15 | Measure Theory for Probability                              | 1 |  |

#### Year 4

| Code     | Module Title               | Term | Additional requirements/ restrictions |
|----------|----------------------------|------|---------------------------------------|
| CS402-15 | High Performance Computing | 2    |                                       |
| CS412-15 | Formal Systems Development | 1    |                                       |
| CS413-15 | Image and Video Analysis   | 1    |                                       |

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|----------|--|---|---|
| CS416-15 | Optimisation Methods                           | 2 |   |
| CS424-15 | Computational Biology                          | 2 |   |
| CS429-15 | Data Mining                                    | 2 |   |
| CS430-15 | Foundations of Data Analytics                  | 1 |   |
| CS435-15 | Advanced Computer Security                     | 1 |   |
| MA424-15 | Dynamical Systems                              | 1 |   |
| MA426-15 | Elliptic Curves                                | 2 |   |
| MA427-15 | Ergodic Theory                                 | 2 |   |
| MA433-15 | Fourier Analysis                               | 1 |   |
| MA442-15 | Group Theory                                   | 2 |   |
| MA448-15 | Hyperbolic Geometry                            | 1 |   |
| MA453-15 | Lie Algebras                                   | 2 |   |
| MA473-15 | Reflection Groups                              | 1 |   |
| MA482-15 | Stochastic Analysis                            | 2 |   |
| MA4A2-15 | Advanced PDEs                                  | 1 |   |
| MA4A5-15 | Algebraic Geometry                             | 1 |   |
| MA4C0-15 | Differential Geometry                          | 1 |   |
| MA4E0-15 | Lie Groups                                     | 2 |   |
| MA4E7-15 | Population Dynamics: Ecology & Epidemiology    | 2 |   |
| MA4F7-15 | Brownian Motion                                | 1 | If you take this module, you cannot also take: ST403-15 Brownian Motion |
| MA4H0-15 | Applied Dynamical Systems                      | 1 |   |
| MA4H4-15 | Geometric Group Theory                         | 1 |   |
| MA4J0-15 | Advanced Real Analysis                         | 2 |   |
| MA4J1-15 | Continuum Mechanics                            | 2 |   |
| MA4J3-15 | Graph Theory                                   | 1 |   |
| MA4J7-15 | Cohomology and Poincare Duality                | 2 |   |
| MA4J8-15 | Commutative Algebra II                         | 2 |   |
| MA4L0-15 | Advanced Topics in Fluids                      | 1 |   |
| MA4L2-15 | Statistical Mechanics                          | 1 |   |
| MA4L5-15 | Mathematics of Cancer                          | 2 |   |
| MA4L6-15 | Analytic Number Theory                         | 2 |   |
| MA4L7-15 | Algebraic Curves                               | 2 |   |
| MA4M1-15 | Epidemiology by Example                        | 2 |   |
| MA4M2-15 | Mathematics of inverse problems                | 1 |   |
| MA4M6-15 | Category Theory                                | 2 |   |
| MA4M8-15 | Theory of Random Graphs                        | 2 |   |
| MA4M9-15 | Mathematics of Neuronal Networks               | 2 |   |
| MA4N1-15 | Theorem Proving with Lean                      | 1 |   |
| MA4N4-15 | Transport Processes in Mathematical Biology    | 1 |   |
| MA4N5-15 | Symmetric Functions and Integrable Probability | 2 |   |
| MA4N6-15 | Finite-Element methods for PDEs                | 2 |   |

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|----------|--|---|---|
| ST403-15 | Brownian Motion  | 1 | If you take this module, you cannot also take: MA4F7-15 Brownian Motion |
| ST405-15 | Bayesian Forecasting and Intervention with Advanced Topics   | 2 | not allowed if ST337 already taken                                      |
| ST406-15 | Applied Stochastic Processes with Advanced Topics            | 1 | not allowed if ST333 already taken                                      |
| ST407-15 | Monte Carlo Methods  | 1 |   |
| ST412-15 | Multivariate Statistics with Advanced Topics                 | 1 | not allowed if ST323 already taken                                      |
| ST413-15 | Bayesian Statistics and Decision Theory with Advanced Topics | 1 | not allowed if ST301 already taken                                      |
| ST418-15 | Statistical Genetics and Advanced Topics                     | 2 | not allowed if ST341 already taken                                      |
| ST420-15 | Statistical Learning and Big Data                            | 2 |   |