MA124-10 Mathematics by Computer

24/25

Department
Warwick Mathematics Institute
Level
Undergraduate Level 1
Module leader
Richard Lissaman
Credit value
10
Module duration
22 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module provides an overview of using the computer as a tool to provide intuition, guide and test hypotheses, enhance understanding and make predictions on mathematical questions. It particularly aims at learning how to use computer-based mathematical tools (chiefly Python) through individual and group work.

Module aims

The first aim is to learn Python. The second aim is to get experience work in a group on computer based mathematical project.

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.

Term 1:

- Fundamentals of programming in Python: input/output, conditional statements, functions, loops, lists, arrays and plotting.
- Mathematics using Python: solving equations, properties of functions, visualisation of

functions and data; elementary number theory and abstract algebra, sequences and series, vectors and matrices, symbolic algebra, differential equations, probability, statistics and data analysis.

Term 2:
Group project and presentation

Learning outcomes

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

- Learn foundations of programming in Python
- Use Python for: plotting data, curves and surfaces; vectors and matrices; symbolic algebra and solving equations, solving differential equations; statistics and data analysis.
- Learn how to manage a group project
- Develop research skills and practice presentation skills

Indicative reading list

- M Lutz, Learning Python, O'Reilly Media Inc., 3rd edition, 2007.
- JV Guttag, Introduction to Computation and Programming Using Python, MIT Press, 2nd edition, 2016.

View reading list on Talis Aspire

Subject specific skills

At the end of the module, students will be able to use software (currently Python but it may change in future, depending on the industry trends) to create simple programs and perform interactive analysis. They will understand rudimentary computer programming control structures and graph functions. They will use the computer to study various topics in mathematics including algebra, number theory, sequences and series, vectors and matrices, differential equations, probability, statistics and data analysis.

Transferable skills

The module will teach students basic computer skills and their relationship with mathematics. It will encourage them to use the computer as an exploratory tool research and equip them with foundational programming knowledge. They will also learn to work in a group.

Study

Study time

Type	Required
Lectures	4 sessions of 1 hour (4%)
Online learning (scheduled sessions)	7 sessions of 1 hour (7%)
Private study	89 hours (89%)
Total	100 hours

Private study description

Work on quizzes, work on assignments and independent work on the group project with some guidance.

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 A2

	Weighting	Study time
Quizzes	20%	
3 moodle quizzes		
Individual Assignment	30%	
3 individual assignments submitted as Jupyter files		
Group Project	50%	
Assessment contains three subcomponents: group presentation (10%), group report (30%) and individual report (10%)		

Assessment group R2

	Weighting	Study time
Reassessment tasks - assignment	100%	
Instead of a group project the students will need to submit an extended individual assignment related to both the Jupyter and project tasks		

Feedback on assessment

Formative feedback available from the personal tutor throughout year. Assessment of earlier

components is available during the year.

Availability

Courses

This module is Core for:

- 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)
- Year 1 of UMAA-G101 Undergraduate Mathematics with Intercalated Year

This module is Option list C for:

- 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