

## Liverpool John Moores University

Title: MATHEMATICAL METHODS  
Status: Definitive  
Code: **4101MATHS** (124194)  
Version Start Date: 01-08-2021

Owning School/Faculty: Computer Science and Mathematics  
Teaching School/Faculty: Computer Science and Mathematics

| Team             | Leader |
|------------------|--------|
| Vincent Kwasnica | Y      |

**Academic Level:** FHEQ4      **Credit Value:** 20      **Total Delivered Hours:** 57  
**Total Learning Hours:** 200      **Private Study:** 143

### Delivery Options

Course typically offered: Semester 2

| Component | Contact Hours |
|-----------|---------------|
| Lecture   | 33            |
| Practical | 2             |
| Tutorial  | 20            |

**Grading Basis:** 40 %

### Assessment Details

| Category | Short Description | Description  | Weighting (%) | Exam Duration |
|----------|-------------------|--|---------------|---------------|
| Report   | AS1               | A series of online problems using randomised questions | 30            |               |
| Exam     | AS2               | Examination  | 70            | 2             |

### Aims

*To provide a thorough grounding in the basic mathematical concepts and methods needed to solve a range of problems with scientific, business and statistical applications.*

*To develop a firm foundation for single variable calculus.*

*To provide a basic grounding in vector algebra.*

*To introduce the concepts of complex numbers and their application.*  
*To introduce multivariable calculus.*  
*To introduce methods for solving ordinary first and second order differential equations.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Apply the theory of differentiation, integration, complex numbers, partial differentiation, differential equations and elementary vector algebra to solving problems.
- 2 Formulate and solve problems using fundamental mathematical methods.

## **Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

|                 |   |   |
|-----------------|---|---|
| Problem solving | 1 |   |
| Examination     | 1 | 2 |

## **Outline Syllabus**

*Differentiation: Limits, continuity, derivatives from first principles, differentiability.*  
*Rules of Differentiation: Product, Quotient, Chain, Implicit, Parametric, Logarithmic.*  
*Applications of Differentiation: maxima and minima, curve sketching, finding normals and tangents.*  
*Series: Maclaurin series, Taylor series and regions of convergence.*  
*L'Hopital's rule: derivation and application.*  
*Integration: The Riemann Sum, the fundamental theorem of calculus, rules of integration, applications of integration.*  
*Complex Numbers: Arithmetic of, conjugates, modulus and arguments, Argand diagram, Cartesian and polar form, Euler's formula.*  
*Multivariable calculus: Introduction to Partial differentiation;*  
*Ordinary differential equations: First order; variables separable, integrating factor.*  
*Second order; constant coefficients, complementary function, particular integral.*  
*Vectors: Vector algebra, equation of a line, scalar product, vector product, equation of a plane, volume of parallelepiped using determinants.*

## **Learning Activities**

Lectures, tutorials and laboratory-based activities

## **Notes**

The foundations of mathematics (concentrating particularly on calculus, complex

numbers and vectors) are covered here using an online text and assessment software support as appropriate. The module provides an introduction to some of the mathematical methods required for the solution of problems in Applicable Mathematics.