

## Liverpool John Moores University

Title: ADVANCED MATHEMATICS AND STATISTICS  
Status: Definitive but changes made  
Code: **6007MATHS** (117482)  
Version Start Date: 01-08-2016

Owning School/Faculty: Applied Mathematics  
Teaching School/Faculty: Applied Mathematics

Team	Leader
Paul Strickland	Y

**Academic Level:** FHEQ6      **Credit Value:** 24      **Total Delivered Hours:** 75

**Total Learning Hours:** 240      **Private Study:** 165

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Practical	24
Tutorial	24

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Report based on questions on Fourier series and vector calculus.	15	
Report	AS2	Minitab-based report on numerical and graphical analysis of a set of multivariate data.	15	
Exam	AS3	Examination.	70	3

### Aims

*To further develop the student's ability to understand and use a wide range of mathematical methods in the solution of problems arising in the field of applicable*

mathematics.

To help the student to explore the structure of multidimensional data sets.

To allow the student to carry out inferential procedures using multivariate data.

## Learning Outcomes

After completing the module the student should be able to:

- 1 Solve ordinary and partial differential equations, including the use of Laplace transforms and separation of variables.
- 2 Determine the gradient, divergence and curl of scalar and vector quantities as appropriate, state the theorems of Gauss, Green and Stokes and apply them in a selection of case studies from physics and engineering.
- 3 Analyze periodic phenomena into corresponding Fourier series, using both analytic and numerical techniques.
- 4 Carry out an exploratory numerical and graphical analysis of a set of multivariate data.
- 5 Recognize situations in which a multivariate approach is required and carry out the appropriate inferential procedures.
- 6 Classify future multivariate observations into one of a number of known populations.

## Learning Outcomes of Assessments

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

Fourier series	1	3	
Minitab report	4		
Examination	2	5	6

## Outline Syllabus

*Fourier series: functions of arbitrary period, Odd and even functions, half range series.*

*Vector calculus: gradient, divergence and curl.*

*Partial differential equations: solution by separation of variable with applications to the wave, Laplace and diffusion equations.*

*Laplace transforms: definition, tables, properties, inverse, theorems, convolution, application to the solution of ODEs which may include the step and impulse functions.*

*Multiple integrals in Cartesian co-ordinates only. Theorems of Gauss, Green and Stokes with physical applications.*

*Graphical display and numerical summary of multivariate data.*

*Investigation of the dependence among variables.*

*Discrimination and prediction. Error rate estimation.*

*Hypothesis construction and testing. Use of simultaneous confidence intervals.*

*Principal Components Analysis.*

*Use of Minitab for data exploration, parameter estimation and significance testing.*

## **Learning Activities**

Lectures incorporating demonstrations will be followed by tutor-led practical sessions. These will be supported by practical hands-on work in the laboratory.

## **Notes**

This module gives students the opportunity to apply mathematics to scientific problems, and to analyse multivariate statistical problems.