**Liverpool** John Moores University

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| Title: | ADVANCED CALCULUS AND RIGID 3D MOTION |
| Status: | Definitive |
| Code: | **6009MATHS** (120291) |
| Version Start Date: | 01-08-2018 |
| Owning School/Faculty: | Applied Mathematics |
| Teaching School/Faculty: | Applied Mathematics |

| Team | Leader |
|---|---|
| Ivan Olier-Caparroso | Y |
| Paul Strickland | |

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| **Academic Level:** | FHEQ6 | **Credit Value:** | 24 | **Total Delivered Hours:** | 40.5 |
| **Total Learning Hours:** | 240 | **Private Study:** | 199.5 | | |

**Delivery Options**
Course typically offered: Standard Year Long

| Component | Contact Hours |
|---|---|
| Lecture | 13 |
| Tutorial | 26 |

**Grading Basis:** 40 %

**Assessment Details**

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|---|---|---|---|---|
| Report | AS1 | Report on rigid body motion in 3D. | 50 | |
| Report | AS2 | Report based on questions on Fourier series and complex analysis. | 20 | |
| Exam | AS3 | Examination | 30 | 1.5 |

**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 develop the skills necessary for independent learning in higher mathematics, using rigid 3D motion as an exemplar.*

## Learning Outcomes

After completing the module the student should be able to:

1 Use complex analysis to solve problems in calculus.
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 Derive information by reading mathematical papers.
5 Perform calculations relating to different representations of rigid body transformations.

## Learning Outcomes of Assessments

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

| | | | |
|---|---|---|---|
| Rigid body motion | 4 | 5 | |
| Fourier series | 1 | 3 | |
| Examination | 1 | 2 | 3 |

## Outline Syllabus

*Fourier series: functions of arbitrary period, Odd and even functions,*
*Vector calculus: gradient, divergence and curl.*
*Partial differential equations: solution by separation of variable with applications to the wave, Laplace and diffusion equations.*
*Complex function theory, including concepts of continuity, analyticity, integration, residues and poles.*
*Multiple integrals in Cartesian co-ordinates only. Theorems of Gauss, Green and Stokes with physical applications.*

## Learning Activities

Lectures, tutorials and substantial self-study.

## Notes

This module gives students the opportunity to apply mathematics to scientific problems, and to learn how to read a relatively recent piece of mathematics.