# Module Descriptor 2016/17

School of Computer Science and Statistics.

<table>
<thead>
<tr>
<th>Module Code</th>
<th>CS1003</th>
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<tbody>
<tr>
<td>Module Name</td>
<td>Mathematics</td>
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<tr>
<td>Module Short Title</td>
<td>N/a</td>
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<tr>
<td>ECTS weighting</td>
<td>10</td>
</tr>
<tr>
<td>Semester/term taught</td>
<td>Michaelmas Term, Hillary Term</td>
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</table>
| Contact Hours | Lecture hours:22  
                  Tutorial hours:11  
                  Total hours:33  |
| Module Personnel | Hugh Gibbons  |

## Learning Outcomes
When students have successfully completed this module they should be able to:

- Produce coherent, convincing mathematical arguments that are precise in terms of both technical description and computation
- Assimilate complex mathematical ideas and arguments.
- Derive, formulate and apply solutions for linear systems
- Recognise and employ the main ideas and techniques of basic calculus
- Create mathematical proofs using formal symbol manipulation
- Articulate the logic behind formal proofs
- Construct rigorous proofs in discrete mathematics and logic

## Module Learning Aims
The module aims to provide students with an introduction to the mathematics, both continuous and discrete, which lies at the foundation of many real-world applications in Computer Science, Engineering and the Social Sciences.

Mathematics is of interest to computer scientists due to the fact that it is both practical and theoretical in nature. Not only does it have a myriad of applications (e.g. in wireless communications and computer graphics), it is also of intrinsic interest to theoretical computer scientists. The mathematical techniques learned as part of this module have wider applications in areas as diverse as Business (e.g. for modelling volatility and risk), Economics and Engineering (e.g. for structural monitoring).

This module aims to develop the students’ skills and abilities in the mathematical methods necessary for solving practical problems. In the first semester students will encounter some of the key mathematical structures at the heart of computer science including the representation of data using matrices. They will gain a greater appreciation of the relationships between calculus and the graphs of functions, including the representation of functions using Taylor Series. During Semester 2 students will be introduced to discrete mathematics and mathematical logic along with their applications to computer science. In particular, the module will introduce set operations, discrete maths functions in Number Theory and Logic calculation. This part of the module is influenced by the approaches of Backhouse, Dijkstra and Gries.

One of the key objectives for this module is to introduce students to the learning styles needed for university level mathematics. Students will be encouraged to develop the independent, reflective learning skills needed for success at University level. It is expected that students will
adapt their learning style to become more independent, self-motivated learners.

### Module Content

**Specific topics addressed in this module include:**

- Linear algebra
- Calculus and its applications
- Set Theory
- Logic
- Number Theory

### Recommended Reading List

The is no set module text, the following books are suggested reading material for students:

- Elementary Linear Algebra, Howard Anton, Chris Rorres, Wiley.
- Linear Algebra, J. Hefferon, Online textbook: [http://joshua.smcvt.edu/linearalgebra/](http://joshua.smcvt.edu/linearalgebra/)
- Advanced Engineering Mathematics, Erwin Kreyszig, Wiley

**Suggested General Reading Material:**

- How to Solve It, George Pólya, Penguin.
- Algorithmics David Harel, Springer.

### Module Pre Requisite

N/A

### Module Co Requisite

N/A

### Assessment Details

Assessment is by examination (80%) and continuous assessment (20%).

### Module approval date

N/a

### Approved By

N/a

### Academic Start Year

N/a

### Academic Year of Data

N/a