Module Code | CSU11001
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Module Name | Mathematics I
ECTS Weighting | 5 ECTS
Semester taught | Semester 1
Module Coordinator/s | Dr. Meriel Huggard

Module Learning Outcomes
On successful completion of this module, students will be able to:

- **LO1.** Produce coherent, convincing mathematical arguments that are precise in terms of both technical description and computation.
- **LO2.** Derive, formulate and apply solutions for linear systems.
- **LO3.** Manipulate matrices algebraically and use concepts related to matrices such as invertibility, symmetry, triangularity.
- **LO4.** Use Gaussian elimination techniques to solve systems of linear equations, find inverses of matrices and solve problems which can be reduced to such systems of linear equations.
- **LO5.** Recognise and employ the main ideas and techniques of basic calculus.
- **LO6.** Discriminate between, and calculate, a variety of integrals.

Module Content
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).

These learning aims are achieved by providing students with an introduction to the mathematical techniques which lies at the foundation of many real-world applications in Computer Science, Engineering and the Social Sciences.

This module aims to develop the students' skills and abilities in the mathematical methods necessary for solving practical problems. 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.

Specific topics addressed in this module include:

- Matrices and the solution of linear systems
- Eigenvalue, Eigenvectors and their applications
- Differentiation of functions and the use of derivatives to graph functions, solve extremal problems and related rates problems.
- Integration of functions using substitution, integration by parts, partial fractions and reduction formulae.
- Using calculus to find areas, volumes, length of curves and averages.
Teaching and Learning Methods

The module will employ a variety of teaching and learning methods including formal lectures, large group problem solving classes and small group tutorials.

Assessment Details

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Brief Description</th>
<th>Learning Outcomes Addressed</th>
<th>% of total</th>
<th>Week set</th>
<th>Week due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>1 1/2 hour written examination</td>
<td>LO1, LO2, LO3, LO4, LO5, LO6</td>
<td>80%</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>In-class test</td>
<td>Mid-Term In-class test</td>
<td>LO1, LO2, LO3, LO4</td>
<td>12%</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>Assignment</td>
<td>Four separate assignments, each worth 2% of the total</td>
<td>LO2, LO3, LO4, LO5, LO6</td>
<td>8%</td>
<td>1, 3, 8, 10</td>
<td>2,4,9,11</td>
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Reassessment Details

Examination (1 1/2 hours, 100%)#

Contact Hours and Indicative Student Workload

<table>
<thead>
<tr>
<th>Contact Hours (scheduled hours per student over full module), broken down by:</th>
<th>44 hours</th>
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</thead>
<tbody>
<tr>
<td>lecture</td>
<td>33 hours</td>
</tr>
<tr>
<td>tutorial or seminar</td>
<td>11 hours</td>
</tr>
<tr>
<td>other</td>
<td>0 hours</td>
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Independent study (outside scheduled contact hours), broken down by:

| preparation for classes and review of material (including preparation for examination, if applicable) | 72 hours |
| completion of assessments (including examination, if applicable)                                                        | 36 hours |

Total Hours 116 hours

Recommended Reading List

1. Elementary Linear Algebra, Howard Anton, Chris Rorres, Wiley.
2. Calculus: Early Transcendentals, Single Variable Howard Anton, Irl Bivens, Stephen Davis, Wiley

Module Pre-requisites

Prerequisite modules: None

Other/alternative non-module prerequisites: None

Module Co-requisites

Module Website

Mymodule.tcd.ie

Last Update

01/08/2019 Meriel Huggard