UNIVERSITY OF LONDON

BSc Computer Science

Module Specification

Key Information			
Module title	Computational Mathematics		
Level	4	Credit value	15
Member Institution	Goldsmiths	Notional study hours and duration of course	150
Module lead author/ Subject matter expert			
Module co-author			

Rationale for the module

Understanding the manner in which computational systems represent and process numbers is critical to working effectively in the computational domain. Applied areas of computing which you will study in this programme such as graphics, data programming and signal processing depend upon a solid understanding of linear algebra and geometry.

Aims of the module

This module helps you hone your skills in thinking abstractly. It also introduces you to many of the standard continuous models used to help understand and design computational systems. Through this module, you will develop the fundamental numerical mathematical tools that will support you throughout the BSc programme. Particular attention is paid to notions of experimentation, reasoning, and generalisation. By taking this module, you will learn a wide range of the numerical mathematical concepts and techniques that underpin Computer Science. In particular, you will study number systems, special functions, graphing and linear algebra.

Topics covered in this module:

The topics listed here are an approximation of what will be covered. The topics presented may be slightly revised to ensure currency and relevance. Students will be advised of any changes in advance of their study.

1. Number bases
2. Sequences and Series
3. Modular arithmetic
4. Angles, Triangles and Trigonometry
5. Graph Sketching and Kinematics
6. Trigonometric functions
7. Exponential and logarithmic functions
8. Calculus: limits and differentiation
9. Algebra: Vectors, Matrices and Linear Transformations
10. Combinatorics and Probability

Approximately 10-12 hours of study will be required per topic. The remaining study time is intended for coursework and examination preparation.

Learning outcomes for the module

Students who successfully complete this module will be able to:

1. Transform numbers between number bases and perform arithmetic in number bases
2. Use trigonometric definitions and identities to solve triangles and trigonometric equations, and to compute with vectors
3. Describe, represent, analyse and discover relationships between quantities by using functions, graphs, limits and differentiation, with functions including trigonometric, exponential and logarithmic
4. Translate between geometric and algebraic representations of shapes and spaces, including points, lines, vectors, matrices and linear transformations
5. Use combinatorial techniques to describe, represent and count sample spaces and events, and calculate probabilities

Assessment strategy, assessment methods

Summative and Formative Assessments
The module will contain a range of summative and formative assessments. Summative assessments are assessments which contribute directly towards your final grade. Formative assessments do not count directly towards your final grade. Instead, they provide you with opportunities for low stakes practice, and will often provide some sort of feedback about your progress. For example, a practice quiz might provide you with feedback about why a particular answer was wrong.

Assessment Activities
The table below lists the assessment activity types you might encounter taking the module. It also states if that type of assessment can be automatically graded. For example, multiple choice quizzes can be automatically graded, and so can some programming assignments. It also states if that type of assessment will be found in the summative coursework and the summative examination. More details about the summative assessments are provided below.

Assessment activity type	Can it be automatically graded with feedback in some cases?	CW	Examination
Quiz	X	X	X
Writing task		X	X

Pass Mark

In order to pass this module, you must achieve at least 35% in each element of summative assessment and an overall weighted average of 40%, subject to the application of rules for compensation. Please refer to the programme regulations for more information.

Summative Assessment Elements

As this is a module that has a significant amount of theory it is assessed as a theory-based module. This means that the summative assessment is composed of two elements, whose weightings are listed in the table below.

Summative Assessment Component	Percentage of final credit	Deadline
Coursework	50%	Mid session
Examination	50%	End of session

The coursework comprises a variety of practical exercises and quizzes which in total will take up to 25 hours of study time to complete. The examination will be two hours long, and consist of written answer and multiple choice questions.

Learning resources

The module will draw on a number of different, largely web-based, public resources as well as the resources produced as bespoke material for this module. Textbooks with useful material include:

Bone, G., Chadha, G., Saunders, N. - A Level physics A for OCR Year 1 and AS Student Book (OUP) – PDF available via Coursera

Croft, A. and Davison, R. - Foundation maths (Pearson) – PDF available in Coursera

Kuldeep Singh, Linear Algebra: Step by Step , Oxford University Press, 2013

Larson, R. - Precalculus with limits (Cengage) - https://www.dawsonera.com/abstract/9781337516853

Song Y. Yan - Number theory for computing (Springer) https://www.dawsonera.com/abstract/9781292095196

Vince - Mathematics for computer graphics (Springer) - https://www.dawsonera.com/abstract/9781846282836