Pre-Requisite Modules code(s)	*Co-Requisite Modules code(s)*	*ECTS Credits*	*Module Code*	*Module Title*
None	*None*	*5*	*CMPU1018*	*Mathematics 1*

8.1.5. Mathematics 1

Module author: Shane Mulligan.

Module Description:

This is an introductory module, to give the student a range of basic mathematical skills, and knowledge of how they are applied in various areas of computing and computer science. A number of common mathematical structures and methods will be presented, and their application to represent and solve simple problems. Their application to various areas in computing will be demonstrated.

Module aim

The aim of this module is to give the student the basic knowledge and competence to deal with mathematical concepts and problems that arise in computer science. It will give the student an understanding of discrete mathematics, and demonstrate the wide applicability of discrete mathematics to computing. It will present mathematics as an exact science, and train the student to think logically, and express themselves clearly.

Learning Outcomes:

On completion of this module, the student will be able to:

- Describe number theory concepts and how they can be used in computing.
- Perform the operations associated with sets, relations and functions, and relate practical examples to the appropriate set, function, or relation model.
- Describe symbolic logic and how it can be used to model real-life situations, e.g. represent sentences.
- Define sequences and series, and their definition using iteration.
- Explain and apply the rules for indices, and logs using base 2 and base 10.
- Describe matrices, and their operations, and apply simple matrix algebra.
- Describe and compute basic statistics and their application to data presentation and analysis.

Learning and Teaching Methods:

The learning and teaching methods will consist of lectures and tutorials. Exercises and continuous assessments will be given to ensure that the student understands and masters the material, and to give them practice at representing and solving simple problems. Computer based or online methods may also be used for assessment.

Pre-Requisite Modules code(s)	*Co-Requisite Modules code(s)*	*ECTS Credits*	*Module Code*	*Module Title*
None	*None*	*5*	*CMPU1018*	*Mathematics 1*

Module content:

Number Theory. Division Algorithm, Euclidean algorithm, Prime numbers, Fundamental Theorem of Arithmetic, Modular arithmetic, relevance to computing.

Number Systems and Boolean logic. Logic gates, diagrams, Introduction to Boolean algebra. Binary, decimal and hexadecimal numbers. Operations and conversion. Representing negative numbers, one's/two's complement.

Indices and logs. Arithmetic of, application and manipulation rules.

Set Theory: Definition. Algebra of sets, set operations, subsets, power set, Venn diagrams. Cartesian product, Computer representation of sets.

Relations: Definition, Binary relations. Equivalence relation properties, and application to databases.

Sequences and series. Definitions, sum of integers 1 to N, sum of squares.

Functions: Onto and one-to-one functions. Composition of functions, inverse functions. The floor function and the ceiling function. Linear and quadratic functions. Arithmetic operators and operator precedence. Application of the concept of a function to computer programming and to the computational complexity of algorithms.

Propositional Logic. Propositions, operators, representing English sentences with propositions.

Matrices: Definition, Matrix algebra (addition, multiplication, inverse). Application to representing systems of equations. Storing large data sets. Applications in computing, e.g. computer graphics, and computer representation of relations.

Statistics: Data collection and presentation in tables, stem-plots and histograms. Summarizing and describing numerical data. Measures of central tendency and spread of data, mean, mode, variance, standard deviation. Frequency distribution.

Module Assessment

The Module assessment will be by written Examination (70%), and Continuous Assessment (30%).

Essential Reading: (author, date, title, publisher)

Kenneth H. Rosen, 2003, Discrete Mathematics and its Applications, 5th Edition, McGraw-Hill.

Supplemental Reading:

Seymour Lipschutz, Marc Lipson, 1997, Schaum's outlines Discrete Mathematics 2nd Edition, McGraw-Hill.

Web references:

http://webcourses.dit.ie

Further Details:

3 contact hours per week. To be delivered in one semester; 2 hours lecture. 1 hour tutorial.

Date of Academic Council approval ……