CO1103 Mathematics Fundamentals

Credits: *15* **Convenor:** *Dr. M. Hoffmann* **Semester:** *1st*

Prerequisites: *none*

Lectures: *24 hours*
Tutorials: *22 hours*

Independent Study: *104 hours*

Assessment: *Coursework: 100%*

Formative Coursework
None

Summative Coursework
Class Tests: *1 in total*
Assignments: *10 in total*

Learning Outcomes **Students should be able to:**

- translate basic logical propositions to and from English;
- understand basic set notation and solve simple problems concerning sets;
- build and use regular expressions
- define relations, specify the matrix representation of a graph or a relation, and perform basic operations on matrices;
- solve simple problems on functions, including problems concerning partiality and composition;
- solve simple problems involving exponentials and logarithms, factorials, combinatorics, probability and order notation.

Explanation of Prerequisites

We do not assume any prior knowledge of mathematics other than some basic concepts from GCSE Mathematics (or equivalent).

Module Description

The main purpose of this course is to teach the basic concepts from discrete mathematics that are needed in the study of computer science. While the main purpose is to learn the necessary mathematics, the course is taught from a computer science viewpoint throughout.

There will be each week a tutorial class (for going through the assessed work) and a tutorial session (to enable to students to attempt questions and overcome any difficulties they are having with the material).

Syllabus

1. Elementary logic. Notation for logical connectives. Translating statements into formal notation. Methods of proof.
2. Sets. Basic operations on sets (union, intersection, difference, powerset). Properties of these operations. Cardinality of a set.
3. Strings, Languages and Regular Expressions
4. Cartesian products. Relations between sets. Examples of relations. Types of relation. Composition of relations.
5. Partial and total functions. Composition of functions. Recursive definitions of functions from the set of natural numbers. Exponentials and logarithms. Factorials.

6. Graphs. Trees. Subtrees. Simple searching problems on trees.
7. Matrices. Adjacency matrix of a graph. Operations on matrices. Matrix representation of a relation. Composition of relations via matrices.
8. Permutations and combinations. Basic concepts of algorithm analysis applied to simple algorithms.
9. Elementary probability. Independent Events. Statistics
10. Big O notation: concept and basic properties.

Reading List

[B] Kenneth H. Rosen, *Discrete Mathematics and Its Applications,*; McGraw-Hill.

Convenor's Notes

Module Learning This module covers a variety of connected topics, as listed in the syllabus section above. It builds a solid foundation for the further modules that you encounter during the degree. We do not follow any particular text book. Any introductory text books for those topics will be suitable.

Assessment The module splits roughly into ten topics. There is a short online assignment for each topic. The participation mark for each online assignments is 1.5% of the module mark. The class test accounts for the remaining 85% of the module mark.