

Course Title: Maths for Computer Science

Course Description:

An introduction to discrete maths for computer science. The course will cover

1. fundamental concepts of mathematics - definitions, proofs, sets, functions, relations;
2. discrete structures - graphs, state machines, modular arithmetic, counting.

These methods will be used in the design and analysis of algorithms.

Pre-bootcamp study requirements:

All the content below will need to be covered in the pre-bootcamp stage.

Main Course Textbook:

The main textbook for this course is 'Mathematics for Computer Science' by E. Lehman et al. You can [download the free PDF here](#). It is also available in your module folder.

Essential Reading

The following chapters of the main text are essential reading:

1. Chapter 1 - What is a Proof?
2. Chapter 2 - The Well Ordering Principle
3. Chapter 3 - Logical Formulas
4. Chapter 4 - Mathematical Data Types
5. Chapter 5 - Induction
6. Chapter 6 - Recursive Data Types
7. Chapter 8 - Number Theory
8. Chapter 9 - Directed Graphs and Partial Orders
9. Chapter 10 - Simple Graphs
10. Chapter 13 - Sums and Asymptotics

Course Lecture Videos:

The lecture videos for [this course are available here](#). **Most of what you need to know, can be learnt by reading the recommended topics in the main course textbook.** But if you would like to watch the accompanying lecture videos, we recommend you watch the following:

Unit 1: Proofs

- 1.1 Intro To Proofs
- 1.2 Proof Methods
- 1.3 Well Ordering Principle
- 1.4 Logic & Propositions
- 1.5 Quantifiers & Predicate Logic
- 1.6 Sets
- 1.7 Binary Relations
- 1.8 Induction
- 1.9 State Machines - Invariants
- 1.10 Recursive Definition

Unit 2: Structures

- 2.1 Gcds
- 2.2 Congruences
- 2.3 Euler's Theorem
- 2.5 Digraphs: Walks & Paths
- 2.6 Directed Acyclic Graphs (Dags) & Scheduling
- 2.7 Partial Orders And Equivalence
- 2.10 Trees

Unit 3: Counting

- 3.1 Sums & Products
- 3.2 Asymptotics
- 3.4 Repetitions & Binomial Theorem

Further Reading:

1. [The Stamford Mathematical Foundations for computing](#) . You can download it following the link. It is also available in your module folder.
2. Many of the topics in the essential reading section are also covered there.

Assessment:

As you study, you are required to attempt the following practice problems after reading the specified chapters. They are for your practice only, and you will not be evaluated on this. Aim to completed them before the stipulated dates. We may provide sample answers to a select set of these.

Assessment	Chapters covered	Assignment	Deadline date
1	Chapter 1, 2	Problem Set 1 - Problems 1, 2 and 3(a, b, c, d)	2nd February 2018
2	Chapters 2, 4	Problem Set 2 - Problem 2	9th February 2018
3	Chapter 5, 6	Problem Set 3 - Problem 1 Problem Set 4 - Problem 1 and 2	16th February 2018
4	Chapters 8, 9	Problem Set 6 - Problem 2	23rd February 208
5	Chapters 10, 13, 14	Problem Set 9 - Problem 1	Extra practice

Module Exam

The exam for the is module comes up on Saturday 24th February 2018.

The exam will be an online exam based on the the material you have covered in this course.