

## The Department of Mathematics

2020–21–B term

**Course Name** Discrete Mathematics for Data Engineers

**Course Number** 201.1.9111

**Course web page**

<https://www.math.bgu.ac.il/en/teaching/spring2021/courses/discrete-mathematics-for-data-engineers>

**Lecturer** Dr. Stewart Smith, <[smith@post.bgu.ac.il](mailto:smith@post.bgu.ac.il)>, Office -109

**Office Hours** <https://www.math.bgu.ac.il/en/teaching/hours>

### Abstract

### Requirements and grading<sup>1</sup>

### Course topics

Part A: Logic and set-theory. Propositional calculus, Boolean operations. Truth tables, the truth-value of a propositional formula (without induction at this stage), logical implication and logical equivalence, tautologies and contradictions, the useful tautologies, distributivity and de-Morgan's Law. Sets: the notion of a set, membership and equality, operations: union, intersection, set-difference and power-set. Ordered pairs and Cartesian products. Equivalence relations, quotient spaces and partitions. Partial orders. Functions, injective and surjective functions, invertibility of a function. The ordered set of natural numbers. The axiom of induction in different forms.

Part B: Finite and infinite sets. The notion of cardinality. Countable sets. Cantor's theorem on the power set of a set.

Part C: Combinatorics. Basic counting formulas. Binomials. Inclusion-exclusion technique. Recursive definition and formulas.

Part D: Graph Theory. Graphs, examples, basic facts, vertex degrees, representing a graph, neighborhood matrices, connected components, Euler graphs, bipartite graphs, matching in bipartite graphs, Hall's marriage theorem, graph colorings.

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<sup>1</sup>Information may change during the first two weeks of the term. Please consult the webpage for updates