

# The Department of Mathematics

2024–25–A term

**Course Name** Discrete Mathematics

**Course Number** 201.1.2201

**Course web page**

<https://www.math.bgu.ac.il/en/teaching/fall2025/courses/discrete-mathematics>

**Lecturer** Dr. Gili Golan, <golangi@bgu.ac.il>, Office 302

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

## Abstract

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

### Course topics

- .1 Introduction: Sets, subsets, permutations, functions, partitions. Indistinguishable elements, multisets, binary algebra of subsets. Rules of sum and product, convolutions, counting pairs. Binomial and multinomial coefficients. Stirling numbers of second kind, definition and a recurrent formula.
- .2 Graphs: General notions and examples. Isomorphism. Connectivity. Euler graphs. Trees. Cayley's theorem. Bipartite graphs. Konig's theorem, P. Hall's theorem.
- .3 The inclusion-exclusion method: The complete inclusion-exclusion theorem. An explicit formula for the Stirling numbers. Counting permutations under constraints, rook polynomials.
- .4 Generating functions: General notion, combinatorial meaning of operations on generating functions. Theory of recurrence equations with constant coefficients: the general solution of the homogeneous equation, general and special cases of nonhomogeneity. Catalan numbers. Partitions of numbers, Ferrers diagrams. Exponential generating functions, counting words, set partitions, etc.

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