# The Department of Mathematics 

2023-24-B term

Course Name Introduction to Set Theory
Course Number 201.1.0171
Course web page
https://www.math.bgu.ac.il//en/teaching/spring2024/courses/ intro-to-logic-and-sets

Lecturer Dr. Moshe Kamensky, [kamenskm@bgu.ac.il](mailto:kamenskm@bgu.ac.il), Office 104
Office Hours https://www.math.bgu.ac.il/en/teaching/hours

## Abstract <br> Requirements and grading <br> Course topics

.1 Partially ordered sets. Chains and antichains. Examples. Erdos-Szekeres' theorem or a similar theorem. The construction of a poset over the quotient space of a quasi-ordered set.
. 2 Comparison of sets. The definition of cardinality as as an equivalence class over equinumerousity. The Cantor-Bernstein theorem. Cantor's theorem on the cardinality of the power-set.
. 3 Countable sets. The square of the natural numbers. Finite sequences over a countable set. Construction of the ordered set of rational numbers. Uniqueness of the rational ordering.
. 4 Ramsey's theorem. Applications.
. 5 The construction of the ordered real line as a quotient over Cauchy sequences of rationals.
.6 Konig's lemma on countably infinite trees with finite levels. Applications. A countable graph is k-colorable ffi every finite subgraph of it is k -colorable.

[^0]. 7 Well ordering. Isomorphisms between well-ordered sets. The axiom of choice formulated as the well-ordering principle. Example. Applications. An arbitrary graph is k -colorable ffi every finite subgraph is k -colorable.
. 8 Zorn's lemma. Applications. Existence of a basis in a vector space. Existence of a spanning tree in an arbitrary graph.
. 9 Discussion of the axioms of set theory and the need for them. Russel's paradox. Ordinals.
. 10 Transfinite induction and recursion. Applications. Construction of a subset of the plane with exactly 2 point in every line.
. 11 Infinite cardinals as initial ordinals. Basic cardinal arithmetic. Cardinalities of well known sets. Continuous real functions, all real runctions, the automorphisms of the real field (with and without order).


[^0]:    ${ }^{1}$ Information may change during the first two weeks of the term. Please consult the webpage for updates

