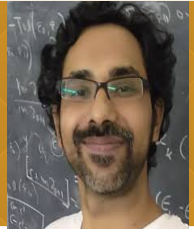

AN INVITATION TO TOPOLOGY

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COURSE OUTLINE :
Topology is the study of abstract shapes and their properties which do not change under stretching or squeezing an object without tearing. In this course, we shall investigate and formalize the abstract notion of a "space" under a bare minimum set-theoretic structure, called a topology. This basic structure gives rise to a beautiful and rich source of ideas which at the same time greatly simplify and extend familiar objects in mathematics, such as limits and continuous functions. Arguably, topology (along with the theory of numbers) lies at the heart of mathematics. I invite you to explore this abstract yet foundational theory which plays a significant role in modern mathematics, and by extension, other mathematical sciences.

ABOUT INSTRUCTOR :
Indrava Roy is an Assistant Professor of Mathematics at the Institute of Mathematical Sciences, Chennai

COURSE PLAN :

Week 1**:** Set theory and Logic: Sets and functions, Finite and Infinite sets, Well-ordered sets, Zorn's lemma and the Axiom of Choice

Week 2**:** Topological spaces: the basic axioms of topology with examples, Bases and Subbases, Various kinds of topologies on the real line

Week 3**:** Limit points and closed sets, continuous functions

Week 4**:** Product topology, Quotient topology and Metric topology

Week 5**:** Connectedness: connected spaces and subspaces, Connectedness of the real line, Intermediate value theorem

Week 6**:** Connected components, Path connected, locally connected, and locally path-connected spaces

Week 7**:** Compact spaces: open cover characterization, Finite intersection property, various notions of compactness

Week 8**:** Compact subspaces of the real line, Heine-Borel theorem, extreme value theorem

Week 9**:** Urysohn's Lemma and Tietze extension theorem on metric spaces

Week 10**:** Complete metric spaces, Totally bounded metric spaces and compactness, Lebesgue number lemma

Week 11**:** Function spaces and the Arzela-Ascoli theorem

Week 12**:** Baire spaces and the Baire category theorem