“Vigyan Vidushi 2026 (Mathematics)”

June 22 – July 03, 2026
Tata Institute of Fundamental Research, Mumbai

LECTURE SCHEDULE (Week 1)

Lecture Timings	Monday (22 June)	Tuesday (23 June)	Wednesday (24 June)	Thursday (25 June)	Friday (26 June)
09.00 – 09.30	**Inauguration** (AG66)	–	–	–	–
09.30 – 10.30	**Kaneenika Sinha** (Algebra) (AG66)	**Kaneenika Sinha** (Algebra) (AG66)	**Kaneenika Sinha** (Algebra) (AG66)	**Kaneenika Sinha** (Algebra) (AG66)	**Kaneenika Sinha** (Algebra) (AG66)
10.30 – 11.00	**TEA BREAK**				
11.00 – 12.00	**Charanya Ravi** (Topology) (AG66)	**Charanya Ravi** (Topology) (AG66)	**Charanya Ravi** (Topology) (AG66)	**Charanya Ravi** (Topology) (AG69)	**Charanya Ravi** (Topology) (AG66)
12.15 – 01.15	**Tutorial 1** (Algebra) (AG66)	**Tutorial 2** (Analysis) (AG66)	**Tutorial 4** (Algebra) (AG66)	**Tutorial 5** (Topology) (AG69)	**Tutorial 6** (Analysis) (AG66)
1.15 – 02.30	**LUNCH**				
2.30 – 03.30	**Parthanil Roy** (Analysis) (AG69)	**Parthanil Roy** (Analysis) (AG66)	**Parthanil Roy** (Analysis) (AG66)	**Parthanil Roy** (Analysis) (AG66)	**Parthanil Roy** (Analysis) (AG66)
3.30 – 04.00	**TEA BREAK**				
4.00 – 05.00	**Mohan Swaminathan** (Colloquium) (AG66)	**Tutorial 3** (Topology) (AG77)	**Panel Discussion** (Student/Postdoc & Non-academic) (AG69)	**Moumanti Podder** (Colloquium) (AG66)	–
5.15 – 06.00	**High Tea** (East Canteen)	–	–	–	–

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LECTURE SCHEDULE (Week 2)

Lecture Timings	Monday (29 June)	Tuesday (30 June)	Wednesday (1 July)	Thursday (2 July)	Friday (3 July)
09.30 – 10.30	**Srimathy Srinivasan (Algebra) (AG77)**	**Srimathy Srinivasan (Algebra) (AG69)**	**Srimathy Srinivasan (Algebra) (AG77)**	**Srimathy Srinivasan (Algebra) (AG77)**	**Srimathy Srinivasan (Algebra) (AG77)**
10.30 – 11.00	**TEA BREAK**				
11.00 – 12.00	**Mitul Islam (Topology) (AG77)**	**Mitul Islam (Topology) (AG69)**	**Mitul Islam (Topology) (AG77)**	**Mitul Islam (Topology) (AG77)**	**Mitul Islam (Topology) (AG77)**
12.15 – 01.15	**Tutorial 7 (Algebra II) (AG77)**	**Tutorial 8 (Topology II) (AG69)**	**Tutorial 9 (Analysis II) (AG77)**	**Tutorial 10 (All Subject) (AG77)**	**Lakshmi Priya (Analysis) (AG77)**
1.15 – 2.30	**LUNCH**				
02.30 – 03.30	**Lakshmi Priya (Analysis) (AG77)**	**Lakshmi Priya (Analysis) (AG69)**	**Lakshmi Priya (Analysis) (AG77)**	**Lakshmi Priya (Analysis) (AG77)**	**Feedback & Certificates (AG77)**
3.30 – 04.00	**TEA BREAK**				
04.00 – 05.00	**Prithwijit De (Colloquium) (AG66)**	–	**Panel discussion with faculty (AG77)**	**Sujatha Ramdorai (Colloquium) (AG66)**	–
05.30 – 7.00	–	**Movie**	–	–	–

COURSE DETAILS

Week 1

Algebra 1: Number fields and factorization

Instructor. Kaneenika Sinha

Brief Overview. These lectures are aimed at introducing students to basic algebraic number theory. A number field is a field extension of the field of rational numbers of finite degree. In these lectures, we will introduce the notion of algebraic integers, and focus on the algebraic structure of the ring of integers of a number field. We will show that such a ring is a "Dedekind domain", and use this to study questions about factorization of ideals into prime ideals.

Prerequisites. A familiarity with the basic theory of rings and fields will be assumed.

Suggested references for the prerequisites: The content of the lectures corresponds to topics within the first 5 chapters of "Problems in algebraic number theory" by Jody Esmonde and M. Ram Murty.

Analysis 1: Approximating functions I

Instructor. Parthanil Roy

Brief Overview. General continuous or differentiable functions on an interval $[a, b] \subset \mathbb{R}$ can be highly erratic and difficult to analyze. However, it is often possible to approximate them arbitrarily well using much simpler objects, such as algebraic or trigonometric polynomials. This two-week course will introduce the rigorous analysis behind function approximation. We will conclude by applying these ideas to solve the classical wave equation and understand the mathematics of a vibrating guitar string.

Prerequisites. Sequence and series of real numbers, continuity and differentiability of functions on the real line, Riemann integration.

Suggested references for the prerequisites: Calculus (Vol 1) by Tom M. Apostol.

Topology 1: Introduction to point-set topology

Instructor. Charanya Ravi

Brief Overview. In familiar settings such as euclidean space or metric spaces, we have intuitive notions of closeness, convergence, continuity, and shape. This course aims to develop a more general language in which these ideas still make sense, even for spaces that do not come with an obvious notion of distance. We will introduce topological spaces, continuous maps and homeomorphisms, and discuss basic ways of distinguishing spaces. We will also study important properties such as compactness and connectedness, and see how new spaces can be constructed from old ones using quotient constructions. The emphasis will be on building the basic vocabulary needed to formulate geometric ideas in a precise way.

Prerequisites. Basics of metric spaces, including open and closed sets, convergence, continuity, and examples such as euclidean spaces and subspaces of euclidean spaces.

Suggested references for the prerequisites:

(1) Basic Topology, M. A. Armstrong.
(2) Topology: A First Course, J. R. Munkres
(3) Introduction to Topology and Modern Analysis, G. F. Simmons.

Week 2

Algebra 2: Local fields and valuation theory

Instructor. Srimathy Srinivasan

Brief Overview. Utilizing the material from the first week of lectures, we will study discrete valuation rings, specifically covering residue fields and ramification indices, with a primer on local fields.

Prerequisites. Basic algebra, rings, fields.

Suggested references for the prerequisites: "Algebraic number theory" by Jurgen Neukirch.

Analysis 2: Approximating functions II

Instructor. Lakshmi Priya M E

Brief Overview. General continuous or differentiable functions on an interval $[a, b] \subset \mathbb{R}$ can be highly erratic and difficult to analyze. However, it is often possible to approximate them arbitrarily well using much simpler objects, such as algebraic or trigonometric polynomials. This two-week course will introduce the rigorous analysis behind function approximation. We will conclude by applying these ideas to solve the classical wave equation and understand the mathematics of a vibrating guitar string.

Prerequisites. Sequence and series of real numbers, continuity and differentiability of functions on the real line, Riemann integration.

Suggested references for the prerequisites: Calculus (Vol 1) by Tom M. Apostol.

Topology 2: Fundamental groups, covering spaces, and classification of surfaces

Instructor. Mitul Islam

Brief Overview. This course will focus on how one can extract more subtle information from a space than what we learnt in the first week. We will study paths, loops, and homotopies that ultimately lead to the notion of fundamental group — the first algebraic invariant of a space. We will then discuss covering spaces and universal covers — objects that provide a universal way of building new spaces via quotient constructions. We will finally see applications of these ideas to the classification of compact surfaces.

Prerequisites. Basics of group theory, presentations of groups, continuity, quotient topology.

Suggested references for the prerequisites:

(1) Basic Topology, M. A. Armstrong.
(2) Algebraic Topology, Allen Hatcher
(3) A Guide to the Classification Theorem for Compact Surfaces, J. Gallier and D. Xu

SPECIAL LECTURES

Colloquium 1: Mohan Swaminathan, TIFR Mumbai

Date, Time, Venue. 22nd June, Monday, 4 PM, AG 66

Title. Intersection points and how to count them

Abstract. Given two curves in the plane described by polynomial equations, at how many points do they meet? On our way to answering this question, we will naturally be led to notions like "algebraic closure", "projective space" and "intersection multiplicity".

Colloquium 2: Moumanti Podder, IISER Pune

Date, Time, Venue. 25th June, Thursday, 4 PM, AG 66

Title. TBA

Abstract. TBA

Colloquium 3: Prithwijit De, HBCSE Mumbai

Date, Time, Venue. 29th June, Monday, 4 PM, AG 66

Title. TBA

Abstract. TBA

Colloquium 4: Sujatha Ramdorai, The University of British Columbia, Canada

Date, Time, Venue. 2nd July, Thursday, 4 PM, AG 66

Title. Rational Points of elliptic curves along infinite towers

Abstract. Let E be an elliptic curve over a number field F. A classical result of Mordell-Weil asserts that $E(F)$ is a finitely generated abelian group, and the celebrated Birch and Swinnerton-Dyer Conjecture postulates the rank of $E(F)$. We explain how Iwasawa theory provides growth asymptotics for $E(F_n)$ where F_n are finite layers of certain infinite extensions of the field of rational numbers.