KOLKATA · ESTABLISHED 2010

Advanced University Mathematics (Research and Applications) Program

A four-year, full-time programme in mathematical sciences

This four-year programme is designed to prepare young mathematicians for fundamental or industry-focused research, with a strong inclination to expose them to both tracks. Graduates are positioned for academic and industrial research opportunities, including leading PhD programmes in the United States, Europe, China, India, and the world's other leading seats of mathematical research.

The programme has a special focus on **rural talent** — students from outside metropolitan centres who are motivated to learn mathematical sciences and contribute to solving new problems. Identifying and supporting such students is a core institutional commitment.

Programme Components

I. Pure Mathematics

Group Theory, Rings and Fields, Analysis, Linear Algebra, Vector Calculus, Complex Analysis, Manifolds, Topology, and Functional Analysis, with electives in Differential Geometry, Probability Theory, and Measure Theory. The pure mathematics track prioritises depth and problem-solving over breadth.

II. Specialization with Research Projects

Machine Learning and Computational Mathematics are taken by every student in Year 1. From Year 2 onwards, students declare a specialization from: Machine Learning, Computer Vision, Computational Mathematics, Statistics, Geometric Group Theory, LEAN 4 (Formalization and Auto Formalization), and Neural Networks and Gravitational Physics. Each student completes original research aimed at **two undergraduate publications**: the first by the end of Year 2, and the second as the senior thesis in Year 4.

III. Contest Mentoring

Three hours per week of mentoring for TIFR, ISI M.Math, IIT-JAM, Subject GRE, General GRE, and college-level olympiads including the Madhava Mathematics Competition, the International Mathematics Competition for University Students (IMC), and the Simon Marais Mathematics Competition (SMMC).

IV. Teaching Assistantship and Research Internship

Six hours per week of Teaching Assistantship at Cheenta Academy and six hours per week of Research Internship with collaborating businesses, research groups, or non-profits, running concurrently from Semester 2 onwards. Semester 1 has twelve hours of Teaching Assistantship only. All engagements are stipended.

V. Graduate School Mentoring

Mentoring for graduate school applications, statement of purpose, recommendations, and conference participation, intensifying in Year 4.

Weekly Engagement — 33 Hours

Pure Mathematics Paper I	6 h
Pure Mathematics Paper II	6 h
Research Specialization and Project	6 h
Contest Mentoring	3 h
Teaching Assistantship	6 h
Research Internship	6 h

CURRICULUM

Eight Semesters

Pure mathematics papers, research specialization, and engagement components

YEAR / SEMESTER	PURE MATHEMATICS — PAPER I	PURE MATHEMATICS — PAPER II	RESEARCH SPECIALIZATION	ENGAGEMENT
YEAR ONE Semester 1	Group Theory I	Vector Calculus	Machine Learning *(mandatory)*	Teaching Assistantship — 12 hours
YEAR ONE Semester 2	Linear Algebra I	Real Analysis I	Computational Mathematics *(mandatory)*	TA 6h + Research Internship 6h
YEAR TWO Semester 3	Group Theory II	Topology of Metric Spaces	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h
YEAR TWO Semester 4	Manifolds	Rings, Fields and Modules I	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h
YEAR THREE Semester 5	Real Analysis II	Rings, Fields and Modules II	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h
YEAR THREE Semester 6	Point Set Topology	Complex Analysis	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h
YEAR FOUR Semester 7	Algebraic Topology	Elective — Differential Geometry / Probability Theory / Measure Theory	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h
YEAR FOUR Semester 8	Functional Analysis	Elective — Differential Geometry / Probability Theory / Measure Theory	Machine Learning · Computer Vision · Computational Mathematics · Statistics · Geometric Group Theory · LEAN 4 (Formalization and Auto Formalization) · Neural Networks and Gravitational Physics	TA 6h + Research Internship 6h

Notes

- In Year 1, all students take **Machine Learning** in Semester 1 and **Computational Mathematics** in Semester 2 as mandatory foundational papers. From Semester 3 onwards, students declare a research specialization (informally at end of Year 1) from the full list of seven tracks. Research projects are coupled to the declared specialization; the first publication is targeted by the end of Year 2, the second as the senior thesis in Year 4.
- Applications for the **September 2026 cohort** are reviewed on a rolling basis. Applicants may send a CV and cover letter to **talent@cheenta.org**.

FACULTY AND ADVISORS

The Team

Researchers and scholars across mathematics, statistics, and physics

Faculty

Dr. Ashani Dasgupta
PhD in Mathematics, University of Wisconsin–Milwaukee

Dr. Nitesh Bhardwaj
PhD in Physics, Bielefeld University

Dr. Sankhadip Chakraborty
PhD in Mathematics, IMPA

Srijit Mukherjee
Doctoral Scholar, Pennsylvania State University

Raghunath J.V.
Doctoral Scholar, University of Tennessee

Shayeef Murshid
Doctoral Scholar, Indian Statistical Institute

Visiting Faculty

Dr. Arka Banerjee
Assistant Professor, Vivekananda University; PhD in Mathematics, University of Wisconsin–Milwaukee

Dr. Debajyoti Biswas
Assistant Professor, Shiv Nadar University Chennai; PhD and M.S. from IIT Madras

Apply for Admission

We invite expressions of interest from faculty colleagues, research collaborators, and prospective students. The first cohort of the Advanced University Mathematics (Research and Applications) Program is being assembled for **September 2026**.

Apply or learn more at **cheenta.com/advanced-university-mathematics-program**.