

**Somaiya School of Basic and Applied Sciences**

Faculty of Science

**Somaiya Vidyavihar University, Mumbai**

Admission Manual

PhD Programme – Mathematics

AY 2026-27

Visit for Further Details: <https://www.somaiya.edu/en/phd/>

## About Somaiya Vidyavihar University, Mumbai

On 26th August 2019, Somaiya Vidyavihar University, Mumbai became a reality !

After six decades of fostering a holistic teaching and learning experience and establishing reputed educational institutions, Somaiya Vidyavihar University, Mumbai, has achieved a significant milestone. It has become the first self-financed private university in Mumbai under the Maharashtra Self-Financed Universities (Establishment and Regulation) Act, 2013.

We aspire to build and support a world-class institution—one that is proudly Indian and excels in education, research, and service. Somaiya Vidyavihar University, Mumbai, will be a hub for preserving, disseminating, and creating knowledge. It will have a global impact through its ideas and a universal commitment to service. Here, students and faculty can embrace the "Freedom of Possibilities," pursue their passions, and, most importantly, discover themselves.

### *Our History and Vision*

**An all-round education must integrate Indian culture, values & morality into the curriculum.**

Somaiya Vidyavihar was founded on September 9, 1959, by Shri K.J. Somaiya (1902–1999), a visionary leader with sharp business acumen, a balanced perspective, and a deep commitment to social progress. His dream of shaping young minds through quality education led him to establish the Somaiya Trust in 1953, acquiring a vast expanse of land in Ghatkopar—then a sparsely populated area.

Driven by his passion for education and inclusivity, he later founded the Girivanvasi Pragati Mandal, the K.J. Somaiya Medical Trust, and the Girivanvasi Education Trust, along with several sister institutions, to provide greater access to learning and opportunity. Inspired by Swami Vivekananda's words, *“We want that education by which character is formed, strength of mind is increased, the intellect expanded, and by which one can stand on one’s own feet,”* he dedicated his life to fostering knowledge and empowerment.

Over the past six decades, Somaiya Vidyavihar has grown into a thriving educational ecosystem with 34 institutions across diverse fields, including Humanities & Social Sciences, Engineering, Medicine, Management, Education, Dharma Studies, Pure Sciences, and Commerce & Business Studies. Today, with a vibrant 50-acre campus, it is home to over 39,000 students and 3,000 faculty and staff, continuing its legacy of excellence in education and innovation.

With PhD programmes in various faculties, we provide an innovative platform for research aspirants to make a niche of their own to impact society and life.

### **About Somaiya School of Basic and Applied Sciences, SVU**

The Somaiya School of Basic and Applied Sciences (SSBAS) is a newly established institution under the Faculty of Sciences at Somaiya Vidyavihar University, Mumbai. Initially it was a part of S.K. Somaiya College, SSBAS has grown into a center of academic and research excellence. With six departments, the school offers six undergraduate and eight postgraduate programs, along with a Doctor of Philosophy (Ph.D.) program in six disciplines. SSBAS is equipped with state-of-the-art research laboratories, advanced instrumentation, and cutting-edge software, fostering a seamless integration of science and technology research. The school has successfully secured ₹1 crore+ in research funding from various governmental agencies, reinforcing its commitment to advancing fundamental research for societal development.

<b>1. Eligibility criteria for PhD Admission</b>	
Subject to the conditions stipulated in the SVU PhD Regulations, the following candidates are eligible to seek admission to the PhD Programme	
1. Education Qualification	
i.	Master's degree (2 year or 1 year) or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent as per UGC regulations.
ii.	Candidate seeking admission after a 4-year/8-semester bachelor's degree programme ( B.Tech / B.E, B.Pharma, MBBS or BDS or BAMS or BHMS or B.Sc (Honors) should have a minimum of 75% marks in aggregate or its equivalent as per UGC regulations
iii.	A person whose Master's dissertation has been evaluated and the viva-voce is pending may be admitted to the PhD Programme but subject to completion of Master's degree before provisional admission to SVU PhD Programmes.
iv.	Candidates possessing a Degree considered equivalent to Master's Degree of an Indian Institution, from a Foreign Educational Institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions, shall be eligible for admission to PhD Programme
v.	<b>MUST</b> have qualified the <b>Ph.D. Entrance Examination and interview of SVU</b> – mandatory eligibility criteria for all candidates.
vi	<b>Candidates exempted</b> from appearing for Ph.D. Entrance Examination of SVU <b>MUST fill the application form</b> as per the schedule displayed on website. The exempted candidates <b>need to pay the application processing fee.</b>
vii	A No Objection Certificate (NOC) from the employer in case of those who are working / employed for applying to Ph.D. Programme
viii	If candidate wants to apply more than one subject then should submit separate / another application and <b>need to pay the application processing fee</b> per subject.

## About Research Center

Mathematics is a broad discipline in which calculus, algebra, analysis, number theory etc. are studied to derive new functions, properties and results. These results are used in different fields of science, technologies, economics etc. The research centre in Mathematics has been established in the Department of Mathematics and Statistics, S K Somaiya College, Somaiya Vidyavihar University. The primary focus of the PhD centre for Mathematics is to provide world class education, training and conduct innovative research at the interface of multiple disciplines to create high quality human resource in disciplinary and interdisciplinary areas of Mathematics in a globally competitive research milieu. Both basic and applied research topics will be addressed in this research centre. The PhD Research programme has started from the academic year 2022-23. Faculty members also collaborate with experts from National Institutes of India and abroad. Their research component further strengthens & enriches the teaching programme. Faculty members of the research centre have an excellent track record of research in various areas of Mathematics. The Faculty members have excellent records of publication in journals with high impact factors like Springer, Elsevier etc. Faculty members have presented several papers in reputed national and international peer reviewed conferences. Faculty members also possess a number of recognized awards from renowned organizations of the globe.

### KEY FEATURES

- Department with PhD-qualified faculty
- Dynamic curriculum
- Aim for Research-driven opportunities in Institutions in India and abroad
- Wide range of program and open electives
- Opportunity for students to carry out inter-disciplinary research projects
- Workshops and Guest Lectures on a regular basis

<b>Eligibility at UG/PG Degree</b>	
Branch of study at UG	Mathematics Statistics Related Science Field
Branch of study at PG	Mathematics Statistics. Related Science Field

**Exemption Criteria for SVU Ph.D. Entrance Examination**

Candidates who hold a JRF Fellowship with CSIR/UGC/ICAR/ ICMR and DBT examinations are **exempted** from appearing for Ph.D. entrance examination of SVU.

For further details about exemption and category of students refer PhD regulation - [Link](#)  
**However, the candidates who fulfil the above criteria MUST fill the application form as per the schedule displayed on the website along with necessary fees.**

**Pattern and syllabus of SVU Ph.D. Entrance Examination**

**The Ph.D and JRF Entrance examination will be common and will be at Somaiya Vidyavihar Campus, SVU, Vidyavihar, Mumbai -77**

**Pattern of entrance examination will be notified separately in due course of time**

**Unit-I: Analysis**

Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem, Limits, Continuity, uniform continuity, differentiability, mean value theorem, Sequences and series of functions, convergence, uniform convergence, Weierstrass approximation theorem, Riemann sums and Riemann integral, Improper Integrals, Monotonic functions, types of discontinuity, functions of bounded variation, contraction mapping principle, Inverse and Implicit function theorems, Lebesgue measure, measurable functions Lebesgue integral, Functions of several variables, directional derivative, partial derivative, total Derivative, maxima and minima, saddle point, method of Lagrange's multipliers; derivative as a linear transformation, Metric spaces, compactness, connectedness, Normed Linear Spaces, Spaces of Continuous functions, Fatou's lemma, monotone convergence theorem, dominated convergence theorem, Double and Triple integrals and their applications; Line integrals and Surface integrals, Green's theorem, Stokes' theorem, and Gauss divergence theorem.

**Unit-II: Complex Analysis:**

Algebra of complex numbers, Analytic functions, Harmonic Functions, Cauchy-Riemann equations, Contour integral, line integrals, Cauchy's Theorem and integral formula, Morera's theorem, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem, Power series, Taylor's and Laurent's series, Classification of zeros & singularities, Radius of Convergence, Residues, Contour integration, Riemann Sphere and Stereographic projection, Conformal mapping, Mobius transformations.

**Unit-III: Linear Algebra:**

Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations & their matrix representations, Algebra of matrices, rank and determinant of matrices, rank & nullity, systems of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, minimal polynomial, diagonalization, Jordan canonical form, symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal and unitary matrices; Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms, Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, definite forms, Inner product spaces, orthonormal basis, Quadratic forms, reduction and classification of quadratic forms.

**Unit-IV: Algebra:**

Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements, Fundamental theorem of arithmetic, divisibility in  $\mathbb{Z}$ , congruence, Chinese Remainder Theorem, Euler's  $\phi$ -function, primitive roots, Groups, subgroups, normal subgroups, quotient groups, homomorphisms, automorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems and their applications, Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, Polynomial rings and irreducibility criteria, Fields, finite fields, field extensions.

**Unit-V: Ordinary Differential Equations (ODEs):**

First order ordinary differential equations, existence and uniqueness theorems for initial value problems, singular solutions of first order ODEs, system of first order ODEs, linear ordinary differential equations of higher order with constant coefficients; Second order linear ordinary differential equations with variable coefficients; Cauchy-Euler equation, method of Laplace transforms for solving ordinary differential equations, series solutions (power series, Frobenius method); Legendre and Bessel functions and their orthogonal properties; Systems of linear first order ordinary differential equations, General theory of homogenous and nonhomogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's

function.

#### **Unit-VI: Partial Differential Equations (PDEs):**

Linear and quasi-linear first order partial differential equations, Lagrange and Charpit methods for solving first order PDEs, method of characteristics; Second order linear equations in two variables and their classification; General solution of higher order PDEs with constant coefficients, Cauchy, Dirichlet and Neumann problems; Solutions of Laplace and wave equations in two dimensional Cartesian coordinates, interior and exterior Dirichlet problems in polar coordinates; Separation of variables method for Laplace, heat & wave and diffusion equations; Fourier series and Fourier transform and Laplace transform methods of solutions for the equations mentioned above.

#### **Unit-VII: Numerical Analysis:**

Numerical solutions of algebraic equations and transcendental equations: bisection, secant method, Newton-Raphson method, fixed point iteration, Method of iteration, Rate of convergence, Numerical solution of a system of linear equations: direct methods (Gauss elimination, LU decomposition), iterative methods (Jacobi and Gauss-Seidel); Numerical solution of initial value problems of ODEs: Euler's method, Runge-Kutta methods of order 2, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods, Finite differences, Interpolation: error of polynomial interpolation, Lagrange, Newton, Hermite and spline interpolation, Numerical differentiation and Numerical integration: Trapezoidal and Simpson's rules.

#### **Unit-VIII: Linear Programming:**

Linear programming problem and its formulation, convex sets and their properties, graphical method, basic feasible solution, simplex method, two phase methods; infeasible and unbounded LPP's, alternate optima; Dual problem and duality theorems; Balanced and unbalanced transportation problems, Vogel's approximation method for solving transportation problems; Hungarian method for solving assignment problems.

#### **Unit-IX: Integral Transform:**

Laplace transform; Transform of elementary functions, Transform of Derivatives, Inverse Transform, Convolution Theorem, Applications, Ordinary and Partial differential equations; Fourier transform; sine and cosine transform, Inverse Fourier Transform, Application to ordinary and partial differential equations.

#### **Unit-X: Discrete Mathematics:**

Partially ordered sets, Lattices, Complete Lattices, Distributive lattices, Complements, Boolean Algebra, Boolean Expressions, Application to switching circuits, Elements of Graph Theory, Eulerian and Hamiltonian graphs, planar Graphs, Directed Graphs, Trees, Permutations and Combinations, Pigeonhole principle, principle of Inclusion and Exclusion, Derangements.

**Documents Required**

1. UG Degree or equivalent Mark List
2. UG Degree certificate
3. PG Degree or equivalent Mark List
4. PG Degree or equivalent certificate
5. AADHAR card
6. Degree equivalence / eligibility certificate – wherever is applicable
7. Migration certificate
8. Two colour passport size Photograph
9. If appearing the PG degree examination – bonafide certificate
10. If employed, then No Objection from the employer

**Important Links**

Tentative Timeline / Steps adapted for Ph.D. Programme - [Link](#)  
Fee Structure of Ph.D. Programme - [Link](#)  
Guidelines for Payment of Fees a Refund – [Link](#)  
About course work - [Link](#)

**Process of getting the documents submitted return**

After verifications of documents, within 7 days, documents will be returned back to students.

Contact

**Ph.D Coordinator**

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