S K Somaiya College
Admission Manual

Ph.D. Programme
Mathematics

July 2021

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

About Somaiya Vidyavihar University

On 26th August 2019, Somaiya Vidyavihar University has become a reality

A new milestone in a glorious ongoing journey established in 2019, Somaiya Vidyavihar University, Mumbai recognised by the University Grants Commission (UGC). Somaiya Vidyavihar, with over six decades of rich experience in building and managing educational institutes of great repute, is the sponsoring body. With over six decades of rich experience Somaiya Vidyavihar has become a self-finance Private University. Somaiya Vidyavihar University is the first private university in Mumbai vide the Maharashtra Self- Financed Universities (Establishment and Regulation) Act 2013.With this status, we now have the academic, administrative, and financial freedom, to achieve the dreams as imagined by our founders. We have a dream to build and support a world class institution, one that is proudly Indian, and excels in education, research and service. Somaiya Vidyavihar University will be a place where knowledge is preserved, disseminated, and new knowledge is created. It will be global in the reach of its ideas and universal in its service. Operational from 26th August 2019, Somaiya Vidyavihar University is a place where you can explore new possibilities, pursue your passion and above all, find yourself.

Our History

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

In just five decades it has grown into a large educational complex with 34 institutions catering to diverse fields of education such as Humanities, Engineering, Education, Medicine, Management, Pure Sciences and Mass Communication, with more than 39000+ Candidates and 3000+ Faculties and staff on a throbbing 65 acre campus.

The Somaiya Vidyavihar Complex was founded in 1959 by late Shri K.J. Somaiya (1902-1999). Endowed with a sharp business acumen, a balanced perspective and a social bent of mind, Karamshibhai set up the Somaiya Trust in 1953 for furthering his dream of shaping young minds through quality education. For this purpose, he bought a large area of land at Ghatkopar, then considered to be distant, meagrely populated.

Our Vision

Our Founder, Padmabhushan Shri K. J. Somaiya founded Somaiya Vidyavihar on the 9th of September 1959. He later founded the Girivanvasi Pragati Mandal, The K J Somaiya Medical Trust, Girivanvasi Education Trust and sister institutions to make great citizens of India and the World. In the words of Swami Vivekananda, “We want that education by which character is formed, strength of mind is increased, and the intellect expanded, and by which one can stand on one’s own feet.” We have now grown into a multi-disciplinary and multi-campus education institution with over 1500 faculty, and 38, 000 candidates.

The Somaiya Vidyavihar University admitted 3000+ candidates in 100+ UG/PG/PhD/PG Diploma/Diploma/Certificate programmes in the very first year of establishment.

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, S K Somaiya College, Somaiya Vidyavihar University. The primary focus of the Ph.D. 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 Ph.D Research programme is starting from the academic year 2021-22.

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 member have presented several papers in reputed national and international peer reviewed conferences. Faculty member also possesses number of recognized awards from renowned organizations of the globe.

KEY FEATURES

- Department with Ph.D.-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

Ph.D. Admission Eligibility for Somaiya Vidyavihar University (SVU): Minimum Qualifications for Admission	
Subject to the conditions stipulated in the Regulations, the following candidate are eligible to seek admission to the Ph.D. Programme	
i.	Master's degree 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.	A person whose Master's dissertation has been evaluated and the viva-voce is pending may be admitted to the Ph.D. Programme but subject to completion of Master's degree before provisional admission to SVU Ph.D. Programmes.
iii.	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 Ph.D. Programme.
iv.	Candidate not having Master's degree but having research / work / professional experience or possessing post graduate diploma **may appear for Ph.D. Entrance Examination of SVU** subject to such candidates need to apply separately to SVU for obtaining equivalence for Master's degree. The SVU will have final rights reserved to give such equivalence as per the regulations. Such candidates must possess undergraduate degree with **at least 55% marks** in **aggregate** or **its equivalent as per UGC regulations**. The relaxation will be as per UGC norms from time to time.
v.	**MUST** have qualified score of **Ph.D. Entrance Examination of SVU** – mandatory eligibility criteria for all candidates.
vi.	**Candidates exempted** from appearing for Ph.D. Entrance Examination of SVU **MUST fill the application form** as per the schedule displayed on website. The exempted candidates **need not pay** the **application processing fee**.
vii.	A No Objection Certificate (NOC) in prescribed format from the employer in case of those who are applying to Ph.D. Programme as a sponsored candidate.

Eligibility at UG/PG Degree	
Branch of study at UG	Mathematics Statistics Physics
Branch of study at PG	Mathematics Statistics

Exemption Criteria for SVU Ph.D. Entrance Examination
Candidates who qualified in UGC - CSIR -NET-JRF/ ICMR-JRF / DBT-JRF (BET)/ INSPIRE/ Prime Minister's Fellowships and those qualified in any of the UGC recognized national or state level eligibility tests with a valid fellowship in the Mathematical Sciences and related field. **However, the candidates who fulfill the above criteria MUST fill the application form as per the schedule displayed on the website.**

Pattern and syllabus of SVU Ph.D. Entrance Examination Subject of Entrance Examination: Mathematics
The SVU Ph.D. Entrance examination will be proctored/supervised close book examination
Paper-1 General Aptitude Test – MCQs Online test of 30 marks with 30 questions - duration of the test 30 min.- no negative marking and options a) Logical Reasoning b) Numerical Ability c) Reasoning and Language Aptitude
Paper - 2: Subject Specific Test – Online of 70 marks - duration 1 and half hours a) Multiple Choice Questions – Maximum marks – 10 - MCQs online or offline test of 10 marks with 10 questions - no negative marking and option b) Theoretical / Descriptive Questions – Maximum marks 60 – online or offline descriptive type six questions each of 15 marks - any four to be solved

Syllabus for Entrance Examination

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.

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.

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.

Algebra: Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements, Fundamental theorem of arithmetic, divisibility in Z, congruence, Chinese Remainder Theorem, Euler's Ø- 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.

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 non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

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.

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.

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.

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.

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 – at the time of provisional admission

Sr. No.	Steps adapted for Ph.D. Programme
1.	Advertisement in the newspaper
2.	Acceptance of the applications for Ph.D. entrance examination along with applications processing fee
3.	Execution of Ph.D. entrance examination for all PhD programmes
4.	Results of Ph.D. entrance examination
5.	Selection process - Display of list of eligible shortlisted candidates for interview
6.	Selection process – Interviews of shortlisted candidates
7.	Display of shortlisted candidates for provisional admission
8.	Provisional admission and payment of fees in accounts/admin office of the colleges.
9.	Orientation and beginning of the yearlong two semester course work
10.	Allotment of the guide at individual college level / department (within the first six months of provisional admission)
11.	In the first year, first semester is course work, which includes teaching learning, continuous evaluation and ESE examination (Comprehensive examination). The second semester will have dedicated research activities, lab rotation and research proposal drafting & presentation and its evaluation.
12.	Research proposal presentation (Qualifying examination)
13.	KT examination for the semester I and II for unsuccessful candidates or for grade improvement
14.	Issue of mark sheets for course work of semester I and II
15.	Topic approval of the thesis work (after Qualifying course work examination)
16.	Registration for Ph. D programme

17.	Appointment of Examiners and chairman from Research Committee
18.	Annual Progress Seminars (APS) every June/July and Intermediate Progress Seminar (IPS) every January/February of the academic year
19.	Approval of examiners to present pre-synopsis in one of the APS and IPS
20.	Presentation of pre-synopsis and its approval by the examiners
21.	Submission of thesis
22.	Sending the thesis to reviewers
23.	Receipt of reviews about thesis from the reviewers
24.	Final defence of the thesis
25.	Submission of final corrected thesis after defence
26.	Issue of provisional degree certificate
27.	Issue of degree certificate
	The steps and the progress evaluation of Ph.D. students by the committee/examiners/experts will be as per the provisions of Ph.D. regulations

Fee Structure and payment for regular/confirm admission – as per schedule specified in notification from time to time	
Particulars	**@Total Fees per annum (₹)**
Tuition Fee	103600
Development Fee	15000
Examination Fee	4400
Laboratory Fees	25000
Library Fee	2000
Total (₹)	**1,50,000/-**
@ If paid provisional admission fee then should be debuted from total fee	
Link for fees payment (Fees will be accepted via online payment gateway only and in no case, it can be paid using any other type of mode of payment and to any office/person)	https://myaccount.somaiya.edu/#/login

Payment of fees schedule for Provisional admission and subsequent years of Ph.D. programme			
Program Academic Year	**Particulars**	**Amount in Rupees (₹)**	**Payment Schedule**
First Year	Provisional admission fee/ First Instalment	75,000/-	Within eight days from the date of receiving the offer letter
	Second Instalment	75,000/-	Within six weeks from the commencement of the Academic Year
Second Year and Onwards	First Instalment	75,000/-	Within first week from the commencement of the new Academic Year
	Second Instalment	75,000/-	Within six weeks from the commencement of the new Academic Year
Link for fees payment (Fees will be accepted via online payment only and in no case it can be paid using any other mode of payment and to any office/person)		https://myaccount.somaiya.edu/#/login	
Note: Students have to pay the full fees of the program per year till the submission of the thesis			

Guidelines to do fee payment in Online Mode

There is a provision of ONLINE PAYMENT of college fees for student's convenience 24x7 on or before scheduled due date. Student will get notification from institute in three ways.

1) SMS
2) Email
3) Notification on myaccount.somaiya.edu portal

In notification there will be a link to make the payment. You just need to click on the link and follow below simple steps to make the payment.

STEP 1: Link will take you to myaccount.somaiya.edu portal. Use Somaiya SVV Net ID and password to login. Want to know more about myaccount.somaiya.edu click on https://somaiya.edu/media/pdf/SVVNetID_and_Email%20id.pdf

STEP 2: Login, select instalments and click on "**Pay Now**".

STEP 3: System will redirect to Online Payment Gateway. Fill the required information and follow payment options to complete the payment cycle.

STEP 4: After the successful payment, the payment receipt will be available at student's MyAccount portal

Admission Cancellation policy of Ph.D. programme

If the candidate has accepted the allotted seat by paying the fees and later chooses/decides to withdraw from the programme of study, then cancellation option is available at his/her MyAccount login.

The college shall follow the below system for deduction of fees against the cancellation request for the candidate.

Sr. No.	Point of time when application for admission cancellation is received by college	Applicable Deduction
1	15 days or more before the date of commencement of academic term	Rs 5,000/-
2	Less than 15 days before the date of commencement of academic term	10% of total fees
3	Less than 15 days from the date of commencement of academic term	20% of total fees
4	On or beyond 15th day but within six weeks from the date of commencement of academic term	50% of total fees
5	More than six weeks from the date of commencement of academic term	100% of total fees

Note:

- Total Fees for the program per year is Rs. 1,50,000/-
- Tentative date of commencement of every academic term will be announced on website.

Typical Sample example for further illustration to know about cancellation charges with reference to the date of commencement of term

Refer the below example for clarification of Ph.D. admission cancellation policy

Assume that the academic term commences from 15th July of a particular academic year. Based on this assumption, following table illustrates important dates of cancellation policy:

Illustration:

Sr. No.	Point of time when application for admission cancellation is received by college	Applicable Deduction
1	Cancellation on or before 30th June (up to 11.59pm)	Rs 5,000/-
2	Any time from 1st July to 14th July (up to 11.59pm)	10% of total fees

3	Any time from 15th July to 28th July (up to 11.59pm)	20% of total fees
4	Any time from 29th July to 25th August (up to 11.59pm)	50% of total fees
5	After 25th August	100% of total fees

Process of getting documents submitted return
After verifications of documents, within 7 days, documents will be returned to students.

Contact

Dr. Seema Sambrani
Ph.D. Coordinator, SKSC
E-mail - seema.sambrani@somaiya.edu / svu.phdcoordinators@somaiya.edu