Somaiya School of Basic and Applied Sciences

Faculty of Science

Somaiya Vidyavihar University, Mumbai
Admission Manual

Ph.D. Programme- Life Sciences

AY 2026-27

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

About Somaiya Vidyavihar University

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

We made this milestone after eight decades of creating holistic teaching learning experience educational institutes of great repute. Somaiya Vidyavihar University has become a self-finance – the first private University in Mumbai vide the Maharashtra Self-Financed Universities (Establishment and Regulation) Act 2013.

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. Somaiya Vidyavihar University is a place where students and faculty can explore "Freedom of Possibilities", pursue your passion and above all, find yourself.

Our History and Vision

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

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.

In six 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, Dharma Studies ,Pure Sciences and Commerce & Business Studies, with more than 39000+ Candidates and 3000+ Faculties and staff on a throbbing 50 acre campus.

Our Founder, Shri K. J. Somaiya founded Somaiya Vidyavihar on 9th 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.

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

About Research Center

Doctoral programme in Life Sciences at Somaiya Institute for Research and Consultancy, Somaiya Vidyavihar University is committed towards advancing research excellence, fostering interdisciplinary collaboration, and addressing key societal challenges through innovation and knowledge creation. At SIRAC, we aim to carry out and progress in the area of Interdisciplinary & Applied research across various domains-

- **Drug Design & Discovery**: This group aims to advance research in drug design and discovery, with a focus on areas such as marine biotechnology, cancer biology, and neurodegenerative diseases. It is currently equipped with a fully functional cell culture laboratory and has secured extramural research grants, including the SERB POWER grant.

- **Microbial Ecology and Microbiome Engineering Studies**: This research group aims to develop a mechanistic and predictive understanding of microbiome-driven processes across natural and managed ecosystems, including regenerative agricultural systems. Integrating ecology, molecular profiling, bioinformatics, and systems biology, the research spans soil, water, and forest ecosystems, regenerative farms, indigenous dyeing vats, ethnoveterinary systems, anaerobic digesters, and other managed ecosystems within the Somaiya ecosystem. The group is anchored by an established core laboratory and operates as an inter-campus, cross-cultural research team in research partnership with Michigan State University. Students contribute to peer-reviewed research as well as science education and community outreach, making knowledge dissemination an integral component of the programme.

- **Medicinal Chemistry and Nanomedicine:** This research group focuses on developing new therapeutic molecules using medicinal chemistry, organic synthesis, computational simulation, and nanotechnology. The team works on designing safer and more effective drugs, applying green chemistry approaches, and developing advanced drug-delivery systems to improve treatment outcomes. By integrating molecular design, docking studies, and nanomedicine, the group addresses key challenges in modern drug development.

- **Shimadzu-Somaiya Center of Excellence in Analytical & Measurement Sciences**: Established through a memorandum of understanding (MOU) with Shimadzu Japan, this center specializes in spectroscopy, chromatography, and thermal analysis, providing research, training, and testing services to academia and industry. It conducts workshops, seminars, and short-term courses on the latest advances in analytical sciences.

Eligibility criteria for PhD Admission	
Subject to the conditions stipulated in the SVU Ph.D. Regulations, the following candidate are eligible to seek admission to the Ph.D. 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) or Pharma.D / Pharma.D. (Post Baccalaureate) 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 Ph.D. Programme but subject to completion of Master's degree before provisional admission to SVU Ph.D. 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 Ph.D. Programme
v.	**MUST** have qualified the **Ph.D. Entrance Examination and interview 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 to pay** the **application processing fee**.
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 **need to pay** the **application processing fee** per subject.

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

Eligibility at UG/PG Degree	
Branch of study at UG (4 Year degree with 75% or 7.5 CGPA)	Life Sciences B.Tech in Biotechnology, Bioinformatics Bachelor of Pharmacy Bachelor of Dental Surgery Bachelor of Physiotherapy & allied courses BSc Nursing MBBS and allied sciences
Branch of study at PG	M.Tech in Biotechnology, Bioinformatics MSc in Biotechnology, Bioinformatics M.Pharmacy Environmental Sciences and any allied sciences

Syllabus for Entrance Examination

UNIT 1. MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY

a) Structure of atoms, molecules, and chemical bonds.
b) Composition, structure, and function of biomolecules - carbohydrates, lipids, proteins, nucleic acids, and vitamins.
c) Stabilizing interactions -Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.
d) Principles of biophysical chemistry -pH, buffer, reaction kinetics, thermodynamics, colligative properties.
e) Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
f) Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes
g) Conformation of proteins - Ramachandran plot, secondary structure, domains, motif, and folds.
h) Conformation of nucleic acids -helix (A, B, Z), t-RNA, micro-RNA.
i) Stability of proteins and nucleic acids.
j) Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

UNIT 2. CELLULAR ORGANIZATION

a) Membrane structure and function - Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.
b) Structural organization and function of intracellular organelles - Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.
c) Organization of genes and chromosomes - Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons.
d) Cell division and cell cycle - Mitosis and meiosis, their regulation, steps in cell cycle, regulation, and control of cell cycle.
e) Microbial Physiology - Growth yield and characteristics, strategies of cell division, stress response.

UNIT 3. FUNDAMENTAL PROCESSES

a) DNA replication, repair, and recombination - Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination.
b) RNA synthesis and processing - transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping elongation, and termination,RNA processing, RNA editing, splicing, and polyadenylation, structure, and function of different types of RNA, RNA transport.
c) Protein synthesis and processing - Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, post-translational modification of proteins.
d) Control of gene expression at transcription and translation level - regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing.

UNIT 4. CELL COMMUNICATION AND CELL SIGNALING

a) Host parasite interaction - Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behaviour by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.
b) Cell signalling - Hormones and their receptors, cell surface receptor, signalling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signalling pathways, bacterial and plant two- component systems, light signalling in plants, bacterial chemotaxis, and quorum sensing
c) Cellular communication - Regulation of haematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
d) Cancer - Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.
e) Innate and adaptive immune system - Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity, and immunogenicity. B and T cell epitopes, structure, and function of antibody molecules. generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell- mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies, vaccines.
f) Programmed cell death, aging, and senescence

UNIT 5. SYSTEM PHYSIOLOGY - PLANT

a) Photosynthesis - Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms.

b) Respiration and photorespiration – Citric acid cycle; plant mitochondrial electron transport and ATP synthesis.
c) Nitrogen metabolism - Nitrate and ammonium assimilation; amino acid biosynthesis.
d) Plant hormones – Biosynthesis, storage, breakdown, and transport.
e) Solute transport and photo assimilate translocation – uptake, transport and translocation of water, ions, solutes, and macromolecules from soil, through cells, across membranes, through xylem and phloem, transpiration.
f) Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
g) Stress physiology - Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature, and salt) stresses.

UNIT 6. SYSTEM PHYSIOLOGY - ANIMAL

a) Blood and circulation - Blood corpuscles, hemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.
b) Cardiovascular System - Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.
c) Respiratory system - Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
d) Nervous system - Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.
e) Sense organs - Vision, hearing, and tactile response.
f) Excretory system - Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.
g) Thermoregulation - Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.
h) Stress and adaptation.
i) Digestive system - Digestion, absorption, energy balance, BMR.
j) Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones, and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation

UNIT 7. INHERITANCE BIOLOGY

a) Mendelian principles : Dominance, segregation, independent assortment.
b) Concept of gene : Allele, multiple alleles, pseudo allele, complementation tests
c) Extensions of Mendelian principles : Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
d) Gene mapping methods : Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.
e) Extra chromosomal inheritance : Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.
f) Microbial genetics : Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure

analysis of genes.

g) Human genetics : Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.
h) Quantitative genetics : Polygenic inheritance, heritability and its measurements, QTL mapping.
i) Mutation : Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function
j) Structural and numerical alterations of chromosomes : Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

UNIT 8. ECOLOGICAL PRINCIPLES

a) The Environment: Physical environment; biotic environment; biotic and abiotic interactions.
b) Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
c) Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection);
d) Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.
e) Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.
f) Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.
g) Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).
h) Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
i) Applied Ecology: Environmental pollution; global environmental change; biodiversity status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.
j) Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).
k) Organisms of conservation concern: Rare, endangered species. Conservation strategies

UNIT 9. APPLIED BIOLOGY:

a) Microbial fermentation and production of small and macro molecules.
b) Application of immunological principles, vaccines, diagnostics. Tissue and cell culture methods for plants and animals.
c) Transgenic animals and plants, molecular approaches to diagnosis and strain identification.
d) Genomics and its application to health and agriculture, including gene therapy.
e) Bioresource and uses of biodiversity.
f) Breeding in plants and animals, including marker – assisted selection.
g) Bioremediation and phytoremediation
h) Biosensors

UNIT 10. METHODS IN BIOLOGY

a) Molecular Biology and Recombinant DNA methods:
   i. Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods.
   ii. Analysis of RNA, DNA and proteins by one- and two-dimensional gel electrophoresis, Isoelectric focusing gels.
   iii. Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Expression of recombinant proteins using bacterial, animal and plant vectors.
   iv. Isolation of specific nucleic acid sequences
   v. Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors.
   vi. In vitro mutagenesis and deletion techniques, genes knock out bacterial and eukaryotic organisms.
   vii. Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods and strategies for genome sequencing.
   viii. Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array-based techniques
   ix. Isolation, separation and analysis of carbohydrate and lipid molecules RFLP, RAPD and AFLP techniques

b) Histochemical and Immunotechniques - Antibody generation, Detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.

c) Biophysical Method - Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy Molecular structure determination using X-ray diffraction and NMR, Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

d) Radiolabelling techniques - Detection and measurement of different types of radioisotopes normally used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.

e) Microscopic techniques - Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze- fracture methods for EM, image processing methods in microscopy.

f) Electrophysiological methods - Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.

g) Methods in field biology - Methods of estimating population density of animals and plants, ranging patterns through direct, indirect, and remote observations, sampling methods in the study of behaviour, habitat characterization: ground and remote sensing method.

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.

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