

## MSc (Plant Biotechnology)

undertake projects in collaboration with industrial, research, governmental, or non-governmental organizations. This project is guided by a TERI SAS faculty member(s) as well as external researcher(s) from TERI or other organizations. Study tours are undertaken to demonstrate the link between biotechnology and sustainable development.

### Placement

A placement cell has been formed for exploring placement opportunities for students. The University facilitates placement of students in industry and suitable organizations, both for major project and final placements.

### Previous Employers, Biotech Companies, and Organizations for Internship

CIMMYT, Mexico; John Innes Centre, Norwich, UK; University of Tennessee, USA; CIMAP, Lucknow; NBRI, Lucknow; IITs (Delhi, Mumbai, Kharagpur, Kanpur, and Roorkee); Central Bureau of Investigation, Government of India, Delhi; National Institute of Plant and Genetic Resources, Government of India, Delhi; International Centre for Genetic Engineering and Biotechnology, Delhi; International Rice Research Institute, Manila, Philippines; ICRISAT, Patancheru; National Institute for Research in Reproductive Health, Mumbai; National Institute for Immunology, Delhi; Centre for Cellular and Molecular Biology, Hyderabad; Institute of Genomics and Integrative Biology, Delhi; Defence Research & Development Organisation, Delhi; Jawaharlal Nehru University, Delhi; University of Delhi, Delhi; Delhi Technological University, Delhi; Lakshmikumaran and Sridharan Attorneys, Delhi; Lal, Lahiri and Malhotra, Delhi; Uttam Group of Institutions, Uttar Pradesh; Ingenious E-Brain Solutions, Gurgaon; TERI, Delhi; Department of Forest and Wildlife, Government of NCT of Delhi, Delhi; All India Institute of Medical Sciences, Delhi; Innodata India Pvt. Ltd.; Translation Health Science & Technical Institute, Faridabad; YJ Trivedi & Co, Ahmedabad; Department of Biotechnology Effectual Services; University of Hawaii; Texas Tech University, USA.

### Department of Biotechnology

The Department of Biotechnology at TERI SAS offers both master's and doctoral programmes. The Department is committed to the furtherance of scientific enterprise through establishment of a vigorous research programme and to contribute to postgraduate-level academic programmes to cater to national requirements in basic science as well as agricultural and environmental applications. The MSc programme in Plant Biotechnology was initiated with funding from the Department of Biotechnology, Government of India. Students opting for master's or doctoral programme can expect an academically rigorous and interdisciplinary environment and significant emphasis on laboratory work, emphasizing original, creative thinking, and research. Doctoral students may choose to carry out their research in the Department of Biotechnology within the following research areas namely; bioinformatics, microbial pathogenesis, nanosciences, plant developmental biology, plant molecular breeding and structural & molecular biology.

### About TERI School of Advanced Studies

Academic programmes at the TERI SAS are focused around the challenges of providing the rising global population with a limited and degraded natural resource base. In moving towards sustainability, the implicit understanding is that there is no panacea or straight road, with recognized and established methodologies, tools or specializations leading to such development. The solutions therefore do not lie in a specific subject discipline, but must be appropriate and relevant to the context or the practical problem being addressed. Developing such an understanding among its students is best achieved through exposure to a variety of subjects, tools, and methodologies offered in interdisciplinary mode. This has been the guiding philosophy behind the programmes offered by the TERI SAS and is practised by building a theoretical understanding in courses covering a variety of traditional disciplines, such as ecology, natural and social sciences, governance, policy, law, and engineering.

Over a period of two years, students converge upon a few areas of focus based upon their interest, having been exposed to a new way of thinking that looks at problems not from the lens of a subject specialist, but from the perspective of one who recognizes the complex linkages between man and his environment.

Apart from doctoral research, the TERI SAS offers MSc degree programmes in Environmental Studies and Resource Management, Environmental and Resource Economics, Geoinformatics, Water Science and Governance, Climate Science and Policy, and Plant Biotechnology; MBA programmes in Infrastructure and in Business Sustainability; MTech programmes in Renewable Energy Engineering and Management, Water Science and Governance and Urban Development and Management; and LL.M. programmes in Environment & Natural Resources Law and in Infrastructure & Business Law.

The University offers two MA programmes, one in Public Policy and Sustainable Development, and the other in Sustainable Development Practice. The TERI SAS is one of a select group of 22 institutions chosen worldwide by the MacArthur Foundation, USA, to run the Sustainable Development Practice programme. The University uses modern pedagogical tools, richly supplemented by field visits, live industry projects, and hands-on applications. It provides the very best in equipment and instruments, which includes state-of-the-art computer facilities, well-equipped laboratories, video-conferencing facilities, and access to South Asia's most comprehensive library on energy and environment.

TERI SAS has established excellent partnerships and collaborative arrangements with a number of institutions overseas, including Yale University, USA; The Freie University of Germany; Utrecht University, The Netherlands; North Carolina State University, USA; and University of Technology, Australia.

#### For further information, please contact

TERI School of Advanced Studies  
10, Institutional Area  
Vasant Kunj, New Delhi – 110 070, India

Tel. +91 11 71800222  
Fax +91 11 2612 2874  
E-mail registrar@terisas.ac.in  
Web www.terisas.ac.in



www.terisas.ac.in

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Established under Section 3  
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www.terisas.ac.in



*Of late there has been a growing realization that India should emerge as an economy driven by knowledge. Given the rapid progress that intellectual enterprises are making worldwide, higher education must benefit from a continuous accretion of knowledge through research. This is what TERI SAS is attempting to do through all its programmes, for the benefit of not only Indian citizens but people from other countries as well who would pass through the portals of this institution. This University offers education supported by rigorous research.*

## Background

Biotechnology is arguably the most revolutionary and promising field of modern science. The term 'Biotechnology' encompasses practices ranging from selective breeding to advanced techniques, such as recombinant DNA technology. Our society is immensely impacted by various applications of biotechnology in contexts as varied as health care, crop improvement, conservation of biological diversity, and abatement of environmental problems. Moreover, the socio-economic implication of this science needs to be analysed in a spirit of objectivity informed by a sound knowledge base, and relevant information should be disseminated in a free and transparent manner.

The MSc. programme in Plant Biotechnology seeks to provide education and training, empower students with technical skill-set, create capacities and build career opportunities in three key domains of biotechnology namely: research and development, science education policy, regulations and management. With its rigorous hands-on training in both laboratory-based methods, bio-informatics tools for biological research and constantly updated interdisciplinary curricula; the programme is expected to build rewarding careers in both public and private organizations for the graduate students.



## Highlights

- Students have qualified NET and won highly competitive national-level fellowships from DBT, CSIR, ICAR, UGC for pursuing research.
- Former MSc students are pursuing doctoral programmes in acclaimed international universities and research organizations (ICRISAT, Mexico; The John Innes Centre, Norwich, UK).
- Students have won awards for summer research fellowships by the Indian National Science Academies (INSA).
- Some of the former MSc students are placed as research scholars in prestigious institutions, such as Indian Institutes of Technology (IITs); International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi; Institute of Genomics and Integrative Biology (IGIB), New Delhi; Translational Health Science and Technology Institute (THSTI), Gurgaon; National Centre for Biological Sciences (NCBS), Bangalore; Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore; and University of Tennessee, Knoxville, USA.

## Programme Overview

The MSc programme in Plant Biotechnology was initiated in 2008. It was formulated with the objective of advancing education and research in the area of plant biotechnology with adequate attention to regulatory frameworks. The programme offers conceptual understanding by imparting cutting-edge disciplines of science along with a preliminary exposure to regulatory issues and ethical concerns related to plant biotechnology. Emphasis is laid on training in applied mathematics, statistics, and computational skills in view of the projected demand for a trained cadre adept at approaching biological problems in truly interdisciplinary and integrative manner. Courses have been specifically structured to impart concepts pertaining to advanced areas of research in plant genomics and contemporary approaches employed by molecular biologists. Therefore, a graduate of this programme can be expected to have both specialized knowledge and practical experience required to address contemporary problems in both academic and industrial settings.

## Eligibility Criteria

A Bachelor's degree in Sciences/Engineering/Technology.

## Selection Procedure

Admission to the MSc programme is made on the basis of a combined entrance examination followed by an interview conducted by the TERI SAS. Applications are invited from candidates on the basis of advertisements printed in leading newspapers. Details may also be gathered at the TERI SAS's website <[www.terisas.ac.in](http://www.terisas.ac.in)>.

## Pedagogical Tools

The classroom lectures are complemented with extensive laboratory practicals, case studies, classroom discussions, and guest lectures by experts. During the fourth semester, students are involved in full-time research for their major project.

## Programme Outline

Semester 1	
Course title	Course title
Technical Writing (Communication skills and technical writing)	Plant biotechnology and crop improvement
Conceptual foundations of molecular biology	Bioanalytical techniques
Applied mathematics	Principles of genetic engineering and recombinant DNA technology
Concepts in biochemistry	Plant biotechnology laboratory—Part 1

Semester 2	
Course title	Course title
Immunochemistry	Molecular plant physiology and metabolism
Molecular cell biology- From genes to communities	Statistics for the life sciences
Molecular markers and breeding	Plant biotechnology laboratory—Part 2
Bioinformatics and computational biology-Part 1	

Semester 3	
Course title	Course title
Genomics and molecular genetics	Bioinformatics and computational biology - Part 2
Plant biotechnology management and regulatory issues	Multivariate data analysis
Bioethics and public awareness	Plant biotechnology laboratory - Part 3

Semester 4	
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### Major Project :

During fourth semester, students work on a research problem/innovative concept broadly related to the programme using an appropriate methodology that may involve interdisciplinary approaches. This is to allow students the greatest scope to explore a wide range of career options. Students may