Board of Studies Meeting
Department of Biotechnology
TERI School of Advanced Studies

Venue: Conference Hall **Date:** 19th November 2025
Time: 2:00 p.m. to 4:00 p.m.

Members

Prof. Ramakrishnan Sitaraman (HoD and Chair, BoS)
Prof. Shailendra Goel, Department of Botany, University of Delhi, New Delhi (External member)
Prof. Ashis K Nandi, Department of Life Sciences, Jawaharlal Nehru University, New Delhi (External member)
Prof. Anandita Singh
Prof. Shashi Bhushan Tripathi
Prof. Chaithanya Madhurantakam
Dr. Souren Paul
Ms. Jahnavi Varma, alumna, M.Sc. Biotechnology (2023-25, Reg. No. 2300182MSB)
Mr. Aniket Walia, doctoral student, Bioresources & Biotechnology (Reg. No. 1900506RSP)
Mr. Naman Dosi, second year student, M.Sc. Biotechnology (Reg. No. 2400135MSB)
Mr. Harsh Ghosalkar, first year student, M.Sc. Biotechnology (Reg. No. 2500323MSB)
Ms. Aanya Tyagi, first year student, FYUP/FYIPP Biotechnology (Reg. No. 2500039BSB)

1. Matters of information:

a) Dr. Ramakrishnan Sitaraman has been appointed as HoD, Department of Biotechnology, with effect from September 11, 2025, vide NOT/R35 dated September 10, 2025. The department recognizes and appreciates the contributions of the outgoing HoD, Dr. Chaithanya Madhurantakam.

(b) In-principle approval by circulation was obtained for launching 1-year MSc and 1-year Post-graduate Diploma in Biotechnology from AY 2026-2027 (October 29, 2025).

(c) Received BoS ratification by circulation on November 13, 2025 for the 1-year extension granted to Ph.D. student Ms. Swetannita Chattopadhyay by the DRC, Department of Biotechnology on June 12, 2025.

2. Acceptance of the 3-year validity of NEET/JEE mains/CUET-UG scores for UG and NEET-PG/CUET-PG scores for PG.

All members agreed that the 3-year window will be calculated with respect to the first day on which the admission portal opens on the TERI SAS website.

3. Acceptance of international test scores at appropriate levels for entry into UG & PG programs offered by the Department of Biotechnology.

Members agreed that:

(a) Individual applications will be scrutinized by the corresponding program executive committees. (b) Three-year validity will apply, with the 3-year window being calculated with respect to the first day on which the admission portal opens on the TERI SAS website.

Members suggested that supernumerary seats be allocated to international applicants, in keeping with UGC guidelines.

4. Finalization of the nomenclature of degrees/diplomas/certificates in programs offered by the Department of Biotechnology:

Members agreed on the following nomenclature:

(a) "Certificate in Biotechnology" (For students availing of the exit option after Year 1 in FYUP/FYIPP).

(b) "Diploma in Biotechnology" (For students availing of the exit option after Year 1 in FYUP/FYIPP).

(c) "B.Sc. in Biotechnology with a minor in business administration / data science / environmental studies" (For students availing of the exit option after Year 3 in FYUP/FYIPP).

(d) "B.Sc. (Hons.) in Biotechnology with a minor in business administration / data science / environmental studies" (For students completing 4 years in the FYUP **OR** exiting after 4 years in FYIPP).

(e) "B.Sc. (Hons.) by Research in Biotechnology with a minor in business administration / data science / environmental studies" ({For students completing 4 years in the FYUP **OR** exiting after 4 years in FYIPP} **AND** have also undertaken a 12-credit research project in semester 8 in lieu of an equivelent amount of coursework).

(f) "M.Sc. in Biotechnology with a specialization in plant biotechnology / microbial biotechnology" (For students completing the FYIPP or enrolled in the ongoing 2-year M.Sc. program in Biotechnology).

(g) "Post-graduate diploma in Biotechnology" (For students exiting after Year 1 of the ongoing 2-year M.Sc. program in Biotechnology **OR** completing the standalone 1-year post-graduate diploma program in Biotechnology to be offered from AY 2026-27).

(h) "One-year M.Sc. in Biotechnology" (For students enrolling in the standalone 1-year M.Sc. program in Biotechnology to be offered from AY 2026-27).

5. Change in attendance requirements.

Section 8.0 of the UGC (Minimum Standards of Instruction for the Grant of Undergraduate Degree and Postgraduate Degree) Regulations, 2025 of March 26, 2025 reads as follows:

"**Attendance Requirement.** Considering the diverse learning modes and holistic and multidisciplinary learning opportunities suggested by NEP 2020, HEIs shall decide on the minimum attendance requirement of students in different programs with the approval of their statutory bodies."

Members arrived at the following consensus:

(a) The minimum attendance requirement in theory courses offered by the Department of Biotechnology to be reduced to 65% from the earlier 75%.

(b) The above provision will not apply to Biotechnology Laboratory – Parts 1, 2 & 3 and project- / lab- / research-based courses, both present and future.

6. Change in the number of evaluation components in courses offered by the Department of Biotechnology with effect from January 1, 2026.

Course coordinators of all theory courses offered by the Department of Biotechnology for the M.Sc. program can choose to conduct a total of two tests – one before the mid-semester break followed by an end-semester examination – unless the course coordinator decides to follow a different evaluation pattern. All members agreed that the theory courses offered by the department (starting with the code 'BBP') would have a total of two tests, the first receiving 40% weightage and second receiving 60% weightage. These changes would be effective from January 2026.

The list of courses in which the above change has been made are listed in Annexure 1.

7. Approval of the program outline for the proposed 1-year Post-graduate Program in Biotechnology.

The program outline was approved (Annexure 2).

8. Approval of the program outline for the proposed 1-year Post-graduate Diploma in Biotechnology.

The program outline was approved (Annexure 3).

9. Approval of two vocational courses in the FYUP/FYIPP programs for students availing of the exit option.

The courses were not approved as external members suggested that the upskilling courses should allow students to explore internships with multiple organizations rather than restricting their options to DIVACC Research Laboratories Pvt. Ltd. Accordingly, a suitable course outline will be developed and tabled before the BoS later.

8. Approval of courses for the FYUP/FYIPP programs.

Of the four courses tabled, one titled "Gene Expression and Regulation" was approved (Annexure 4).

Members advised that the course titled "Cellular and Molecular Physiology" be substantially revised and resubmitted for approval.

Two other courses titled "Essentials of Bioinformatics" and "Biotechnology Laboratory – 2" could not be discussed due to lack of time.

9. Any other matter with the permission of the Chair.

No other matter was discussed.

.....The meeting ended at 4:00 PM .....

(Annexures in the following pages)

Prof. Shailendra Goel

Prof. Ashis K Nandi

Prof. Ramakrishnan Sitaraman

Prof. Anandita Singh

Prof. Shashi Bhushan Tripathi

Prof. Chaithanya Madhurantakam

Dr. Souren Paul

Outlook

FYI 1: Draft minutes of the Board of Studies meeting held on Nov. 19, 2025

From Ramakrishnan Sitaraman <rkraman@terisas.ac.in>
Date Tue 12/2/2025 12:01 PM
To Vidhya Sharma <vidhya.sharma@terisas.ac.in>

From: Shailendra Goel <shailendragoel@gmail.com>
Sent: Monday, December 1, 2025 8:30 PM
To: Ramakrishnan Sitaraman <rkraman@terisas.ac.in>
Cc: CoreFacultyDBT <CoreFacultyDBT@terisas.ac.in>; Jahnavi Varma <jahnavi.varma@terisas.ac.in>; Aniket Walia <aniket.walia2@terisas.ac.in>; Naman Dosi <naman.dosi@terisas.ac.in>; Harsh Ghosalkar <harsh.ghosalkar@terisas.ac.in>; Aanya Tyagi <aanya.tyagi@terisas.ac.in>; Ashis Nandi <aknandijnu@gmail.com>
Subject: Re: Draft minutes of the Board of Studies meeting held on Nov. 19, 2025

I approve

Regards

Shailendra Goel
Professor
Department of Botany
University of Delhi
Delhi 110007

On Fri, 28 Nov 2025 at 8:54 AM, Ramakrishnan Sitaraman <rkraman@terisas.ac.in> wrote:

> Dear all,
>
> Attached herewith are the minutes of the BoS meeting held on Nov. 19, 2025.

Please provide your approval/comments/suggestions by or before December 1, 2025 (1500 hrs).

Thank you.

Sincerely,
Dr. Ramakrishnan Sitaraman
Head, Department of Biotechnology
TERI School of Advanced Studies
10 Institutional Area, Vasant Kunj
New Delhi - 110070, India
Ph: 011-71800222 ext. 4766; 9971005164

Outlook

FYI 2: Draft minutes of the Board of Studies meeting held on Nov. 19, 2025

From Ramakrishnan Sitaraman <rkraman@terisas.ac.in>
Date Tue 12/2/2025 12:12 PM
To Vidhya Sharma <vidhya.sharma@terisas.ac.in>

From: Ashis Nandi <aknandijnu@gmail.com>
Sent: Friday, November 28, 2025 3:52 PM
To: Ramakrishnan Sitaraman <rkraman@terisas.ac.in>
Cc: CoreFacultyDBT <CoreFacultyDBT@terisas.ac.in>; Jahnavi Varma <jahnavi.varma@terisas.ac.in>; Aniket Walia <aniket.walia2@terisas.ac.in>; Naman Dosi <naman.dosi@terisas.ac.in>; Harsh Ghosalkar <harsh.ghosalkar@terisas.ac.in>; Aanya Tyagi <aanya.tyagi@terisas.ac.in>; shailendragoel <shailendragoel@gmail.com>
Subject: Re: Draft minutes of the Board of Studies meeting held on Nov. 19, 2025

The minutes are fine with me.
Regards
Ashis

Ashis Kumar Nandi, Ph.D.
Professor
415, School of Life Sciences
Jawaharlal Nehru University
New Delhi 110067, India
Website: https://sites.google.com/view/plant-immunity-lab/home
E-mail: aknandijnu@gmail.com; ashis_nandi@mail.jnu.ac.in
Phone: +91-11-2670-4152 (office)

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10 Institutional Area, Vasant Kunj
New Delhi - 110070, India
Ph: 011-71800222 ext. 4766; 9971005164

Annexure 1

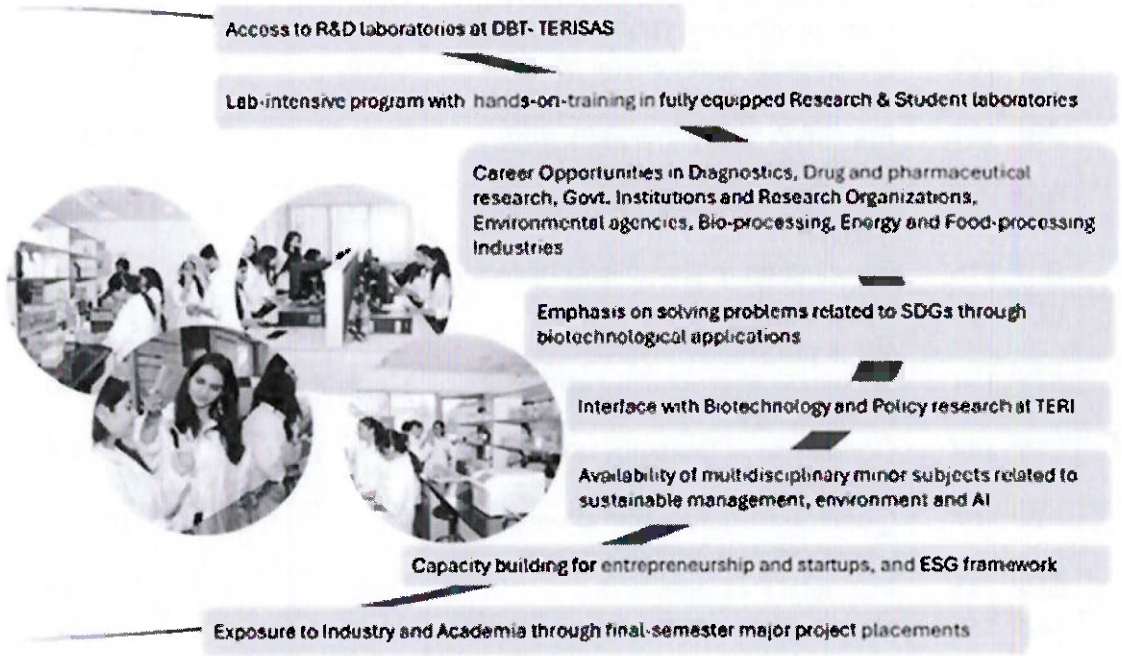
List of theory courses offered in the M.Sc. Biotechnology program with two evaluation components (Test 1 & Test 2)

S. No.	Course code	Course title	Course type	Credits	Semester
1	BBP 111	Bioanalytical techniques	Core	3	First
2	BBP 123	Plant and Animal Biotechnology	Core	2	First
3	BBP 155	Principles of genetic engineering and recombinant DNA technology	Core	3	First
4	BBP 158	Conceptual foundations of molecular biology	Core	2	First
5	BBP 161	Principles of Biochemistry and Biophysics	Core	2	First
6	BBP 174	Bioinformatics and computational biology	Core	2	First
7	BBP 115	Introduction to Nanobiotechnology	Core	2	Second
8	BBP 114	Molecular Cell Biology - From Genes to Communities	Core	2	Second
9	BBP 131	Molecular Microbiology and Immunology	Core	2	Second
10	BBP 144	Conservation Genetics and Genomics	Core	2	Second
11	BBP 167	Genome Structure and Diversity: Concepts and Methodologies	Core	3	Second
12	BBP 145	Microbial Pathogenesis	DSE*	2	Second
13	BBP 116	Molecular Plant Physiology and Metabolism	DSE	2	Second
14	BBP 112	Statistics for The Life Sciences	Core	3	Third
15	BBP 149	Bioethics, IPR and Regulations in Biotechnology	Core	3	Third
16	BBP 163	Gene Expression Analysis and Transcriptomics	Core	2	Third
17	BBP 166	Proteomics and Protein Engineering	Core	3	Third
18	BBP 165	Bioprocess Engineering and Environmental Biotechnology	DSE	3	Third
19	BBP 148	Molecular Genetics for Plant Functional Genomics: Principles and Practice	DSE	3	Third

Annexure 2

Overview and outline of the proposed One-year Post-Graduate Program (M.Sc.) in Biotechnology

Department of Biotechnology, TERI SAS



To be submitted for consideration to the Academic Council, TERI School of Advanced Studies

December 2025

Requirement for a 1-year M.Sc. in biotechnology at TERI SAS

This 1-year post graduate programme in Biotechnology is aimed at

1. Development of skilled human resources in a field of economic and strategic importance, nationally as well as globally.
2. Leveraging existing capacities at TERI SAS and TERI to align with national policy decisions and national missions promoting biotechnology-related research and industries.
3. To provide diverse academic options and more opportunities to add to the workforce skilled in biotechnology.
4. Organization-wide directive to adapt to the impending nation-wide re-structuring of tertiary educational programs.

TERI SAS aims to create a skilled cadre of biotechnology professionals, while maintaining quality parameters at par with current requirements in academia, industry and allied professions. The proposed program aims to provide students with an understanding of advanced concepts and techniques in biotechnology, while promoting inter-disciplinary and holistic skill development and learning that contributes to the attainment of SDGs.

Overall guiding principles of the proposed program based on NEP 2020:

Removal of disciplinary barriers to entry, while maintaining the rigor of disciplinary requirements.

Provision of multidisciplinary and interdisciplinary learning opportunities for students in various fields of study available at TERI SAS.

Emphasis on inclusive, barrier-free entry options at all levels to provide credit- and/or degree-earning opportunities not only for regular students but also for members of the general public who aspire to be lifelong learners.

Programme Outcomes

• A research-oriented learning that develops analytical and integrative problem-solving approaches.

• Specialized knowledge and practical training to address contemporary problems in academia and industry.

• Awareness of ethical issues and regulatory considerations while addressing societal needs for sustainability.

• To advance education and research in biotechnology and explore sustainable solutions for agriculture, environment and energy sectors.

• Promote an understanding of interdisciplinary approaches and technologies used in the analysis of complex biological information.

• Impart rigorous hands-on training in both laboratory-based methods and bio-informatics tools for biological research.

• Sensitize students about multifaceted regulatory issues and ethical concerns related to biotechnology.

Programme-Specific Outcomes

• Molecular biology tools and experimental strategies, theoretical understanding of OMICS approaches.

• DNA profiling and barcoding techniques, generation of transgenics, marker assisted breeding and selection, testing of hybrid purity.

• Computational skills such as modelling, simulation analysis of data.

• Structural and functional characterization of biological macromolecules.

• IPRs, ethics and regulations in the field of biotechnology

Operational guidelines for implementation

The proposed program structure is based on the recommendations of the following UGC guidelines:

1. Curriculum and Credit Framework for Postgraduate Programs, 2024.

Features of the proposed 1-year PG program

1. Open to all students who have completed a four-year Bachelor's degree in Sciences/ Engineering/ Technology/ Vocational studies
2. Semester 2 involves full time research towards the Major Project culminating in the submission of a dissertation

Eligibility and selection criteria (Entry options)

Program	Eligibility criteria	Selection criteria
One-year PG Program in biotechnology	Four-year B.Sc. (Honours/ Honours with research) Degree or equivalent in Sciences/ Engineering/ Technology/ Vocational studies from a recognized University	Aggregate marks /CGPA of qualifying B.Sc. Degree, followed by interaction/counselling or CUET-PG /NEET-PG score/ equivalent international examination

Detailed semester-wise list of courses of study

1. Minimum credit requirement for one-year PG Program is 40 (Semester 1- 20 credits; Semester 2- 20 credits)

Overall program structure

Semester	Course No.	Course Title	Type	Number of Credits
Sem 1	BBP 174	Advanced Bioinformatics and computational biology	Major	2
Sem 1	BBP 162	Statistics for The Life Sciences	Major	3
Sem 1	BBP 163	Gene Expression Analysis and Transcriptomics	Major	2
Sem 1	NRE 165	Proteomics and Protein Engineering	Major	3
Sem 1	BBP 147	Biotechnology Laboratory (1 – year M.Sc.)	Practical	7
Sem 1	BBP 103	Bioethics, IPR and Regulations in Biotechnology	Major	3

Semester	Course No.	Course Title	Type	Number of Credits
Sem 2	BBP 108	Major Project	Major Project	20

Qualifying CUET-PG Examination List

Test paper code	Details
SCQP01	SCQP01 Agricultural Science- Agricultural Economics; Agronomy; Entomology; Agricultural Extension & Communication; Genetics & Plant Breeding; Horticulture, Plant Pathology, Plant Physiology; Soil Science & Agricultural Chemistry,Agriculture Technology (Informatics)
SCQP02	SCQP02 Agro-forestry
SCQP03	SCQP03 Microbiology/Applied Microbiology
SCQP05	SCQP05 Biochemistry,Anatomy,Pharmacology,Bio Science
SCQP06	SCQP06 Bioinformatics,Food Science and Nutrition,Bio Science - Bioinformatics
SCQP07	SCQP07 Botany,Bio Science
SCQP08	SCQP08 Chemistry,Chemical Sciences,Industrial Chemistry etc.
SCQP09	SCQP09 Computer Science, Information Technology, Computer Application, Big Data Analytics, Cyber Security, Artificial Intelligence and Machine Learning, etc.
SCQP11	SCQP11 Environmental Sciences/Studies,Ecology etc.
SCQP12	SCQP12 Food Science and Technology, Nutrition,Food Processing and Management,Food Safety and Quality Control etc.
SCQP13	SCQP13 Forensic Science.
SCQP16	SCQP16 Horticulture,Forestry & Biodiversity,Seed Science & Technology,Plant Breeding,Agronomy,Genetics,Fruit Science, Floriculture, Vegetable Science etc.
SCQP17	SCQP17 Life Science-Molecular Biology,Biotechnology, Microbiology,Biochemistry,Botany,Bioinformatics,Molecular Medicine,Zoology,Biomedical Engineering & Science,Virology and Immunology, Optometry,Bio-Physics,Genetics,Health Science
SCQP18	SCQP18 Material Science
SCQP19	SCQP19 Mathematics, Applied Mathematics,Electronics
SCQP20	SCQP20 Medical Laboratory Technology, Medical Physics etc.
SCQP22	SCQP22 Nanoscience/Integrative Biosciences
SCQP23	SCQP23 Pharmacy-Pharmacology,Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutics, Pharmaceutical Science, Pharmaceutical Analysis etc.
SCQP24	SCQP24 Physics, Computational and Integrative Sciences, Electronics, Applied Physics, Applied Physics + Electronics Engineering
SCQP25	SCQP25 Plant Biotechnology
SCQP27	SCQP27 Statistics , Applied Mathematics, Statistics & Computing, Data Science and Applied Statistics etc
SCQP28	Zoology, Sericulture, Human Genetics
SCQP30	Animal Science (Poultry)
COQP12	3 (a) 100 MCQ Questions Hindi/English Language

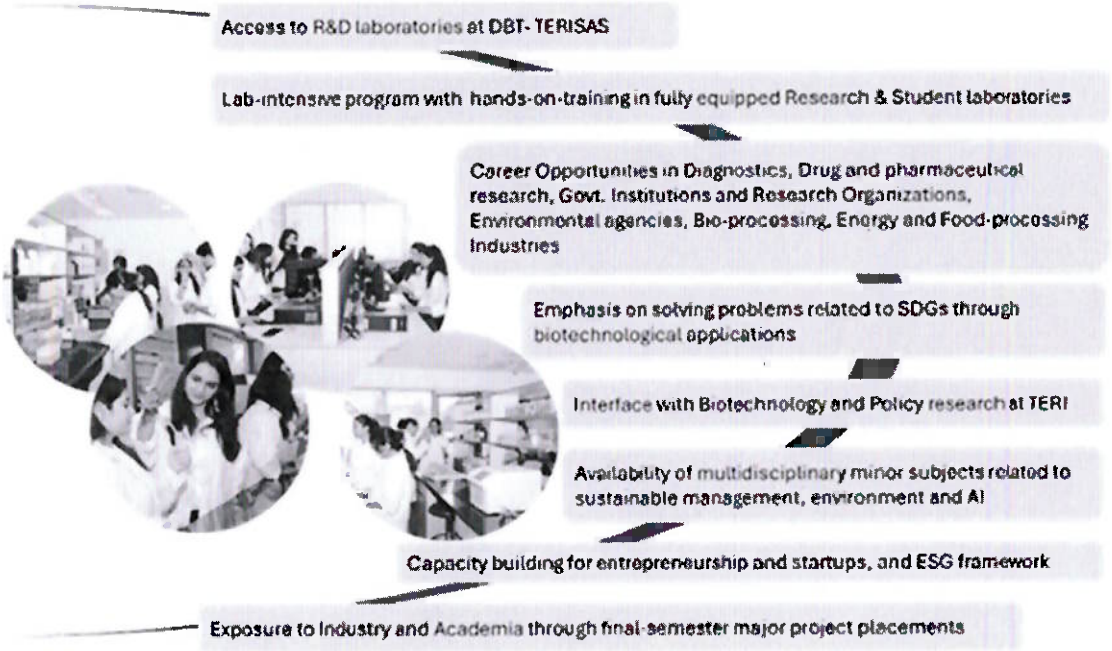
	Comprehension/ Verbal Ability, Mathematical/ Quantitative ability, Data Interpretation and Logical Reasoning (Bilingual English/Hindi)
COQP11	3 (b) 100 MCQ Questions Hindi/English Language Comprehension/ Verbal Ability, General Knowledge/ Awareness, Computer Basics and Logical Reasoning (Bilingual English/Hindi)

Note: Any subject(s) may be chosen from the above. The highest percentage score among the chosen subjects will be considered for admission purposes.

Annexure 3

Overview and outline of the proposed One-year Post-Graduate Diploma in Biotechnology

Department of Biotechnology, TERI SAS



To be submitted for consideration to the Academic Council, TERI School of Advanced Studies

December 2025

Requirement for a one-year PG Diploma in biotechnology at TERI SAS

This 1-year post graduate diploma in Biotechnology is aimed at

1. Development of skilled human resources in a field of economic and strategic importance, nationally as well as globally.
2. Leveraging existing capacities at TERI SAS and TERI to align with national policy decisions and national missions promoting biotechnology-related research and industries.
3. To provide diverse academic options and more opportunities to add to the workforce skilled in biotechnology.
4. Organization-wide directive to adapt to the impending nation-wide re-structuring of tertiary educational programs.

TERI SAS aims to create a skilled cadre of biotechnology professionals, while maintaining quality parameters at par with current requirements in academia, industry and allied professions. The proposed program aims to provide students with an understanding of advanced concepts and techniques in biotechnology, while promoting inter-disciplinary and holistic skill development and learning that contributes to the attainment of SDGs.

Overall guiding principles of the proposed program based on NEP 2020:

Removal of disciplinary barriers to entry, while maintaining the rigor of disciplinary requirements.

Provision of multidisciplinary and interdisciplinary learning opportunities for students in various fields of study available at TERI SAS.

Emphasis on inclusive, barrier-free entry options at all levels to provide credit- and/or degree-earning opportunities not only for regular students but also for members of the general public who aspire to be lifelong learners.

Programme Outcomes

• A research-oriented learning that develops analytical and integrative problem-solving approaches.

• Specialized knowledge and practical training to address contemporary problems in academia and industry.

• Awareness of ethical issues and regulatory considerations while addressing societal needs for sustainability.

• To advance education and research in biotechnology and explore sustainable solutions for agriculture, environment and energy sectors.

• Promote an understanding of interdisciplinary approaches and technologies used in the analysis of complex biological information.

• Impart rigorous hands-on training in both laboratory-based methods and bio-informatics tools for biological research.

• Sensitize students about multifaceted regulatory issues and ethical concerns related to biotechnology.

Programme-specific Outcomes

• Molecular biology tools and experimental strategies, theoretical understanding of OMICS approaches.

• DNA profiling and barcoding techniques, generation of transgenics, marker assisted breeding and selection, testing of hybrid purity.

• Computational skills such as modelling, simulation analysis of data.

• Structural and functional characterization of biological macromolecules.

• IPRs, ethics and regulations in the field of biotechnology

Operational guidelines for implementation

The proposed program structure is based on the recommendations of the following UGC guidelines:

1. Curriculum and Credit Framework for Postgraduate Programs, 2024[3]

Features of the proposed 1-year PG Diploma program

1. Open to all students who have completed a three-year Bachelor's degree in Sciences/ Engineering/ Technology/ Vocational studies
2. Students can opt for a Research Project of 20 credits or equivalent credits of courses in semester 2 of the program

Eligibility and selection criteria (Entry options)

Program	Eligibility criteria	Selection criteria
One-year PG Diploma in biotechnology	Three-year B.Sc. (Honours/ Honours with research) Degree or equivalent in Sciences/ Engineering/ Technology/ Vocational studies from a recognized University	Aggregate marks /CGPA of qualifying B.Sc. Degree, followed by interaction/counselling or CUET-PG /NEET-PG score/ equivalent international examination

Detailed semester-wise list of courses of study

1. Minimum credit requirement for one-year PG Program is 41 (Semester 1- 21 credits; Semester 2- 20 credits)

2. In semester 1, students can choose any one of the available DSEs

Overall program structure

Semester	Course No.	Course Title	Type	Number of Credits
Semester 1	BBP 103	Bioethics, IPR and Regulations in Biotechnology	Elective	3
Semester 1	BBP 111	Bioanalytical techniques	Core	3
Semester 1	BBP 174	Bioinformatics and computational biology - Part I	Core	2
Semester 1	BBP 105	Biotechnology laboratory - Part 1	Core	7
Semester 1	BBP 158	Conceptual foundations of molecular biology	Core	2
Semester 1	BBP 123	Plant and Animal Biotechnology	Core	2
Semester 1	BBP 161	Principles of Biochemistry and Biophysics	Core	2
Semester 1	BBP 155	Principles of genetic engineering and recombinant DNA technology	Core	3
Semester 2	BBP 106	Biotechnology Laboratory - Part 2	Core	7
Semester 2	BBP 144	Conservation Genetics and Genomics	Core	2
Semester 2	BBP 146	Genome Structure and Diversity: Concepts and Methodologies	Core	3
Semester 2	BBP 115	Introduction to Nanobiotechnology	Core	2
Semester 2	BBP 145	Microbial Pathogenesis	DSE	2
Semester 2	BBP 114	Molecular Cell Biology - From Genes to Communities	Core	2
Semester 2	BBP 131	Molecular Microbiology and Immunology	Core	2
Semester 2	BBP 116	Molecular Plant Physiology and Metabolism	DSE	2
Semester 2	New	Research Project	Research Project	20

Qualifying CUET-PG Examination List

Test paper code	Details
SCQP01	SCQP01 Agricultural Science- Agricultural Economics; Agronomy; Entomology; Agricultural Extension & Communication; Genetics & Plant Breeding; Horticulture, Plant Pathology, Plant Physiology; Soil Science & Agricultural Chemistry,Agriculture Technology (Informatics)
SCQP02	SCQP02 Agro-forestry
SCQP03	SCQP03 Microbiology/Applied Microbiology
SCQP05	SCQP05 Biochemistry,Anatomy,Pharmacology,Bio Science
SCQP06	SCQP06 Bioinformatics,Food Science and Nutrition,Bio Science - Bioinformatics
SCQP07	SCQP07 Botany,Bio Science
SCQP08	SCQP08 Chemistry,Chemical Sciences,Industrial Chemistry etc.
SCQP09	SCQP09 Computer Science, Information Technology, Computer Application, Big Data Analytics, Cyber Security, Artificial Intelligence and Machine Learning, etc.
SCQP11	SCQP11 Environmental Sciences/Studies,Ecology etc.
SCQP12	SCQP12 Food Science and Technology, Nutrition,Food Processing and Management,Food Safety and Quality Control etc.
SCQP13	SCQP13 Forensic Science.
SCQP16	SCQP16 Horticulture,Forestry & Biodiversity,Seed Science & Technology,Plant Breeding,Agronomy,Genetics,Fruit Science, Floriculture, Vegetable Science etc.
SCQP17	SCQP17 Life Science-Molecular Biology,Biotechnology, Microbiology,Biochemistry,Botany,Bioinformatics,Molecular Medicine,Zoology,Biomedical Engineering & Science,Virology and Immunology, Optometry,Bio-Physics,Genetics,Health Science
SCQP18	SCQP18 Material Science
SCQP19	SCQP19 Mathematics, Applied Mathematics,Electronics
SCQP20	SCQP20 Medical Laboratory Technology, Medical Physics etc.
SCQP22	SCQP22 Nanoscience/Integrative Biosciences
SCQP23	SCQP23 Pharmacy-Pharmacology,Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutics, Pharmaceutical Science, Pharmaceutical Analysis etc.
SCQP24	SCQP24 Physics, Computational and Integrative Sciences, Electronics, Applied Physics, Applied Physics + Electronics Engineering
SCQP25	SCQP25 Plant Biotechnology
SCQP27	SCQP27 Statistics , Applied Mathematics, Statistics & Computing, Data Science and Applied Statistics etc
SCQP28	Zoology, Sericulture, Human Genetics
SCQP30	Animal Science (Poultry)
COQP12	3 (a) 100 MCQ Questions Hindi/English Language

	Comprehension/ Verbal Ability, Mathematical/ Quantitative ability, Data Interpretation and Logical Reasoning (Bilingual English/Hindi)
COQP11	3 (b) 100 MCQ Questions Hindi/English Language Comprehension/ Verbal Ability, General Knowledge/ Awareness, Computer Basics and Logical Reasoning (Bilingual English/Hindi)

Note: Any subject(s) may be chosen from the above. The highest percentage score among the chosen subjects will be considered for admission purposes.

Annexure 4

Course title: Gene Expression and Regulation			
Course code: XXX	**No. of credits:** 3	**L-T-P: 30-15-0**	**Learning hours:** 45
Pre-requisite course code and title (if any): Class 12 or equivalent			
Faculty: Anandita Singh	**Department:** Department of Biotechnology		
Course coordinator(s): XXX	**Course instructor(s):** XXX		
Course type: Major	**Course offered in:** Semester 2 of FYUP/FYIPP		

Course description:

This course has been designed to provide an in-depth understanding of molecular mechanisms underlying the regulation of gene expression in both prokaryotic and eukaryotic systems. The course will help students explore how genes are switched "on" or "off", and, how complex regulatory processes control where, when and how much a gene must express in response to environmental or endogenous cues or to maintain cellular homeostasis. The students will also be introduced to the role of cis and trans regulatory elements. Current advances in epigenetics including the roles of chromatin structure, histone modifications, and non-coding RNAs in control of gene expression will be covered. The course will cover essential molecular biology techniques and methods for analysis of gene expression. Invited lectures will promote a comprehensive understanding of gene regulation in the context of developmental biology, stress and immunity and cancer biology as case studies.

Course objectives:

To provide an understanding of:

1. Molecular mechanisms governing gene expression in prokaryotic and eukaryotic biological systems
2. Gene regulation at the level of transcription, translation, and post-transcriptional and translational modifications
3. Gene regulation by epigenetic mechanisms and regulatory RNAs
4. Applicability of *in-silico* and experimental approaches for analyzing gene expression and regulation

Course contents

		L	T	P
Module 1: Introduction to Gene Expression	Central dogma and overview of transcriptional and translational machinery and mechanisms Structural features of genes in prokaryotes and eukaryotes, Cis-regulatory elements: promoters, enhancers, silencers, insulators. Trans-acting factors: transcription factors, co-activators, repressors, non-coding RNAs	4	4	

Module 2: Gene expression and regulation in Prokaryotes	Operon models (*lac, trp, ara*) and their regulatory mechanisms, Catabolite repression and inducer exclusion, Sigma factors and their regulatory roles, Attenuation and anti-termination-based mechanisms, Translational control and feedback inhibition	4	2	
Module 3: Transcriptional C Co-transcriptional mechanisms in eukaryotes	Types of RNA polymerases and their promoters, Processes and mechanisms of transcription: Assembly of transcriptional machinery and initiation of transcription; RNA processing: capping, splicing, and polyadenylation, alternative splicing, mRNA stability and degradation mechanisms (mRNA decay pathways)	6	2	
Module 4: Translational Regulation in Eukaryotes	Regulation of translation initiation and elongation, Post translational modification and degradation pathways	4	1	
Module 5: Regulatory RNAs and Epigenetics in regulation of eukaryotic gene expression	Small RNAs: siRNA, miRNA, and piRNA – biogenesis and function, Long non-coding RNAs and their regulatory roles, Antisense RNAs, RNA interference (RNAi) mechanisms, Epigenetic modifications: Chromatin remodeling, histone modifications and histone code, DNA methylation and gene expression, Epigenetic inheritance and its biological implications	6	2	
Module 6: Experimental Approaches to Study Gene Regulation	Traditional and modern techniques of gene expression analysis (Reporter gene assays, Electrophoretic mobility shift assay, Chromatin Immunoprecipitation (ChIP) and ChIP-Seq, DNA microarrays and RNA-Seq for transcriptome analysis, Northern blotting, RT-PCR, and quantitative PCR	6		
Module 7: Invited Lectures from experts: Case Studies and Applications)	iv) Lecture 1: Gene regulation in development, differentiation and morphogenesis iv) Lecture 2: Regulatory networks underlying stress response, immunity and cancer iv) Lecture 3: Synthetic Biology Strategies for Precision Control of Molecular Processes iv) Lecture 4: Gene regulatory networks and interactomes governing life processes		4	

	Total	**30**	**15**	
		45		

Evaluation criteria:

Minor test: Mid-semester (40%)

Major exam: End-Semester (60%)

Learning outcomes:

Upon completion, students will be able to:

iii) Elucidate and describe mechanisms of transcription and translation in both prokaryotes and eukaryotes
iii) Undertake investigations to unravel molecular pathways governing biological phenomena and biological functions
iii) Apply experimental and bioinformatics tools to study gene regulation

Pedagogical Approach:

Classroom lectures and tutorials. Detailed discussion and critical appraisal of classical and important research articles. Tutorial will also involve exposure to basic databases and bioinformatics tools such as:

1. Gene Predictions
2. Analyzing gene structure: finding exons and introns
3. Promoter analysis and prediction of transcription factor binding sites
4. miRbase, pMIREN databases
5. RNA structure analysis

Suggested readings

Foundation Level Textbooks (Including but not restricted to following)

v) Lewin, B. (2018) Genes XII. Burlington, MA: Jones C Bartlett Publishers.
v) Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. (2014) Essential Cell Biology. 4th ed. New York: Garland Science.
v) Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2018) Molecular Biology of the Gene. 7th ed. Boston: Pearson Education.
v) Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Martin, K.C. (2021) Molecular Cell Biology. 9th ed. New York: W.H. Freeman and Company.
v) Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K. and Walter, P. (2015) Molecular Biology of the Cell. 6th ed. New York: Garland Science

Reference Books

ii) Latchman, D.S. C Cheriyath, V. (2025) Gene Control. 3rd ed. London: Routledge (Garland Science). ISBN 978-1-032-46546-3.
ii) Latchman, D.S. (2010) Eukaryotic Transcription Factors. 5th ed. London: Academic Press. ISBN 978-0-12-373983-4.
v) Bina, M. (ed.) (2013) Gene Regulation: Methods and Protocols. Methods in Molecular Biology, vol. 977. New York: Humana Press / Springer.
v) Carey, M.F. C Smale, S.T. (eds.) (2007) Transcriptional Regulation in Eukaryotes: Concepts, Strategies, and Techniques. 2nd ed. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
v) Kornberg, R.D. (2019) Mechanisms of RNA Polymerase II Transcription. Annual Review of Biochemistry. Palo Alto, CA: Annual Reviews.
Alberts, B. et al. (2014) Essential Cell Biology. 4th ed. New York: Garland Science.

Additional information (if any): Keeping pace with topics, reading material as prescribed is the responsibility of students
Student responsibilities: 1. Class attendance. 2. Study of course materials as specified by the instructor.

Course reviewers:

The course has been reviewed and commented on by the following experts"

1. Prof. Yashwanti Mudgil (Department of Botany, Delhi University)
2. Prof. Rohini Muthuswami (School of Life Sciences, Jawahar Lal Nehru University)
3. Dr. Debashish Chakrabarti, Chief Scientist (National Botanical Research Institute, Lucknow)