Board of Studies Meeting

Department of Biotechnology

TERI School of Advanced Studies

Venue: Conference Hall **Date:** 27th November 2025

Time: 10:30 am. to 12:30 p.m.

Members

Prof. Anandita Singh (Dean academic and Chair)

Prof. Ramakrishnan Sitaraman

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. Shashi Bhushan Tripathi

Prof. Chaithanya Madhurantakam

Dr. Souren Paul

Invited

Prof. Suman Kumar Dhar (Vice Chancellor, TERI SAS)

Prof. Sanjit Dey, Department of Physiology, University College of Science Technology and Agriculture, University of Calcutta, Kolkata (Invited external member)

1. **Agenda points discussed:**

Approval of Cellular and Molecular Physiology, Essentials of Bioinformatics, and Biotechnology Laboratory 2 courses for the FYUP/FYIPP programs.

The BoS members discussed the revised course structure of "Molecular and Cellular Physiology", along with two other courses titled "Essentials of Bioinformatics" and "Biotechnology Laboratory 2", for the FYUP/FYIPP programs. All three courses were approved by the members (Annexure 1).

Number of supernumerary seats for international applicants.

The Board members also discussed the possible number of supernumerary seats for international applicants at the UG, PG, and PhD levels. The members unanimously decided to keep the number at 20% of the total seats offered for all UG, PG, and PhD programs.

Matter of information regarding the M.Sc. Biotechnology program:

The following matter of information was shared with all the members.

In accordance with suggestions received from the student members, the core course "Statistics for The Life Sciences" (BBP 112) will be offered in the second semester instead of the third, starting January 2026. The core course "Introduction to Nanobiotechnology" (BBP 115) will be offered in the third semester instead of the second, starting January 2026. This exchange results in the second semester having at total of 21 credits and the third having a total of 20 credits.

2. **Any other matter with the permission of the Chair.**

No other matter was discussed.

.....The meeting ended at 12:30 PM .....

(Annexure in the following pages)

Signatures of the members:

Prof. Anandita Singh

Prof. Ramakrishnan Sitaraman

Prof. Shashi Bhushan Tripathi

Prof. Chaithanya Madhurantakam

Dr. Souren Paul

Prof. Shailendra Goel

Prof. Ashis K Nandi

Outlook

FYI 3: Draft minutes of the BoS meeting held on Nov. 27, 2025

From Ramakrishnan Sitaraman <rkraman@terisas.ac.in>
Date Tue 12/2/2025 4:11 PM
To Vidhya Sharma <vidhya.sharma@terisas.ac.in>

From: Shailendra Goel <shailendragoel@gmail.com>
Sent: Monday, December 1, 2025 1:10 PM
To: Anandita Singh <asingh@terisas.ac.in>
Cc: Souren Paul <souren.paul@terisas.ac.in>; Ramakrishnan Sitaraman <rkraman@terisas.ac.in>; VC TERI SAS <vc@terisas.ac.in>; Shashi Bhushan Tripathi <shashi.tripathi@terisas.ac.in>; Chaithanya Madhurantakam <chaithanya.madhurantakam@terisas.ac.in>; Ashis Nandi <aknandijnu@gmail.com>
Subject: Re: Draft minutes of the BoS meeting held on Nov. 27, 2025

I approve

Regards

Shailendra Goel
Professor
Department of Botany
University of Delhi
Delhi 110007

On Mon, 1 Dec 2025 at 10:54 AM, Anandita Singh <asingh@terisas.ac.in> wrote:

Approved

From: Souren Paul <souren.paul@terisas.ac.in>
Sent: Friday, November 28, 2025 14:46
To: Ramakrishnan Sitaraman <rkraman@terisas.ac.in>; VC TERI SAS <vc@terisas.ac.in>; Anandita Singh <asingh@terisas.ac.in>; Shashi Bhushan Tripathi <shashi.tripathi@terisas.ac.in>; Chaithanya Madhurantakam <chaithanya.madhurantakam@terisas.ac.in>; shailendragoel <shailendragoel@gmail.com>; Ashis Nandi <aknandijnu@gmail.com>
Cc: Souren Paul <souren.paul@terisas.ac.in>
Subject: Draft minutes of the BoS meeting held on Nov. 27, 2025

Dear Colleagues,

Attached herewith are the minutes of the BoS meeting held on November 27, 2025.
Please provide your consent or suggestions by 5:00 PM on Monday, December 1st.

Thank you very much

Best regards

Annexure 1

Course title: Molecular and Cellular Physiology			
Course code: XXX ---	**No. of credits:** 3	**L-T-P:** 45-0-0	**Learning hours:** 45
Pre-requisite course code and title (if any): Class 12 or equivalent in Science			
Department: Department of Biotechnology			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 2	

Course description:

The course aims to provide students with fundamental concepts of cellular structure, organization, and function while introducing them to the molecular basis of physiological processes in plants, animals, and microbes. Understanding the molecular physiology of living systems is essential for comprehending how cells sense, respond, and adapt to internal and external cues.

This course will explore the organization of biological membranes and cytoskeletal systems, along with the molecular mechanisms of growth, division and metabolism. It will further emphasize the bioenergetics and regulation of key metabolic pathways that sustain cellular life. Through this integrated framework, students will gain a comprehensive understanding of how molecular and cellular processes coordinate to maintain homeostasis and physiological balance across biological systems.

Course objectives:

1. To familiarize students with the structural and functional organization of cells.
2. To introduce the molecular mechanisms governing cellular growth, division and regulation.
3. To explain the physiological and metabolic processes in plants, animals and microbes at the cellular level
4. To provide an understanding of bioenergetics and metabolic regulation, emphasizing their integration in maintaining homeostasis and in biotechnological applications

Course contents

Module	Topic	L	T	P
1	**Module 1: Plant structure, development and physiology**			
	1.1 Structural organization and function of plant cell, morphogenesis and organogenesis in plants, programmed cell death, senescence	7		
	1.2 Water movement in plant, transpiration, photosynthesis, respiration and photorespiration, nitrogen metabolism, physiological effects and mechanisms of action of plant hormones, photoreceptors, photoperiodism. Applications in research and human benefits.	8		
2	**Module 2 Animal cellular organization and function**			
	2.1 Membrane models, chemical composition of membrane, membrane proteins, movement of small and large molecules across the cell membrane, osmosis, diffusion, endocytosis, phagocytosis, artificial liposomes and its application, ion pumps. Applications in research and human benefits.	7		
	2.2 Cytoskeleton: Structure, organization and function of microtubules and microfilaments, role of myosin, kinesin and dynein, cell movements, cell-cell adhesion, cell polarity, G protein coupled receptors, receptor tyrosine kinases,	6		

	second messengers. Techniques used to study the pathways and their applications in research and industries.			
	2.3 Biotechnological and research applications by discussing examples of pathway engineering of carbon metabolic pathways to develop valuable industrial strains	**2**		
3	**Module 3: Microbial growth and solute transport**			
	3.1. Measurement of growth, physiology, cell division, growth yields, growth kinetics, steady-state growth and continuous growth. Solute Transport: Introduction, simple and facilitated diffusion, kinetics, primary and secondary transport. Membrane transport proteins: porins and aquaporins, mechanosensitive channels, ABC transporter, group translocation PEP-PTS system. Catabolite repression, inducer exclusion and expulsion. Techniques to identify and study the pathways	**15**		
	Total	**45**	**0**	**0**

Evaluation criteria:

1. Minor test: Mid-semester (40%)
2. Major exam: End-Semester (60%)

Learning outcomes:

1. Understanding of the structural and functional organization of cells and their organelles.
2. Knowledge of molecular mechanisms underlying cell growth, division, signalling, and regulation.
3. Comprehension of physiological and metabolic pathways and their bioenergetic principles in plants, animals, and microbes.
4. Ability to integrate molecular and physiological concepts toward biotechnological and research applications
5. Knowledge gained shall help students to pursue their future academics and research (both applied and basic) careers

Pedagogical Approach:

1. Online/classroom lectures and discussions
2. Case studies and examples from original research articles

Skill Set:

1. Knowledge of analysing and interpreting molecular and physiological principles and concepts, and to apply these principles in further studies.

Employability:

1. The course provides foundational knowledge and practical skills in molecular, and physiological processes, enabling employment in academia, R&D labs, biotech and agro-industries at entry-level positions.

Materials:

Suggested Readings

1. Alberts, B. et al. (2022). Molecular Biology of the Cell. 7th Edition, Garland Science.
2. Nelson, D. L., & Cox, M. M. (2023). Lehninger Principles of Biochemistry. 9th Edition, W. H. Freeman.
3. Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2023). Plant Physiology and Development. 7th Edition, Sinauer Associates.
4. Karp, G. (2021). Cell and Molecular Biology: Concepts and Experiments. 9th Edition, Wiley.

Additional information (if any):

Student responsibilities:

1. Class attendance.
2. Study of reading materials as specified by course instructor
3. Self-study

Course title: Molecular and Cellular Physiology			
Course code: XXX ---	**No. of credits:** 3	**L-T-P:** 45-0-0	**Learning hours:** 45
Pre-requisite course code and title (if any): Class 12 or equivalent in Science			
Department: Department of Biotechnology			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 2	

Course description:

The course aims to provide students with fundamental concepts of cellular structure, organization, and function while introducing them to the molecular basis of physiological processes in plants, animals, and microbes. Understanding the molecular physiology of living systems is essential for comprehending how cells sense, respond, and adapt to internal and external cues.

This course will explore the organization of biological membranes and cytoskeletal systems, along with the molecular mechanisms of growth, division and metabolism. It will further emphasize the bioenergetics and regulation of key metabolic pathways that sustain cellular life. Through this integrated framework, students will gain a comprehensive understanding of how molecular and cellular processes coordinate to maintain homeostasis and physiological balance across biological systems.

Course objectives:

5. To familiarize students with the structural and functional organization of cells.
6. To introduce the molecular mechanisms governing cellular growth, division and regulation.
7. To explain the physiological and metabolic processes in plants, animals and microbes at the cellular level
8. To provide an understanding of bioenergetics and metabolic regulation, emphasizing their integration in maintaining homeostasis and in biotechnological applications

Course contents

Module	Topic	L	T	P
1	**Module 1: Plant structure, development and physiology**			
	1.1 Structural organization and function of plant cell, morphogenesis and organogenesis in plants, programmed cell death, senescence	7		
	1.2 Water movement in plant, transpiration, photosynthesis, respiration and photorespiration, nitrogen metabolism, physiological effects and mechanisms of action of plant hormones, photoreceptors, photoperiodism. Applications in research and human benefits.	8		
2	**Module 2 Animal cellular organization and function**			
	2.1 Membrane models, chemical composition of membrane, membrane proteins, movement of small and large molecules across the cell membrane, osmosis, diffusion, endocytosis, phagocytosis, artificial liposomes and its application, ion pumps. Applications in research and human benefits.	7		
	2.2 Cytoskeleton: Structure, organization and function of microtubules and microfilaments, role of myosin, kinesin and dynein, cell movements, cell-cell adhesion, cell polarity, G protein coupled receptors, receptor tyrosine kinases, second messengers. Techniques used to study the pathways and their applications in research and industries.	6		

	2.3 Biotechnological and research applications by discussing examples of pathway engineering of carbon metabolic pathways to develop valuable industrial strains	**2**		
3	**Module 3: Microbial growth and solute transport**			
	3.1. Measurement of growth, physiology, cell division, growth yields, growth kinetics, steady-state growth and continuous growth. Solute Transport: Introduction, simple and facilitated diffusion, kinetics, primary and secondary transport. Membrane transport proteins: porins and aquaporins, mechanosensitive channels, ABC transporter, group translocation PEP-PTS system. Catabolite repression, inducer exclusion and expulsion. Techniques to identify and study the pathways	**15**		
	Total	**45**	**0**	**0**

Evaluation criteria:

3. Minor test: Mid-semester (40%)
4. Major exam: End-Semester (60%)

Learning outcomes:

6. Understanding of the structural and functional organization of cells and their organelles.
7. Knowledge of molecular mechanisms underlying cell growth, division, signalling, and regulation.
8. Comprehension of physiological and metabolic pathways and their bioenergetic principles in plants, animals, and microbes.
9. Ability to integrate molecular and physiological concepts toward biotechnological and research applications
10. Knowledge gained shall help students to pursue their future academics and research (both applied and basic) careers

Pedagogical Approach:

3. Online/classroom lectures and discussions
4. Case studies and examples from original research articles

Skill Set:

2. Knowledge of analysing and interpreting molecular and physiological principles and concepts, and to apply these principles in further studies.

Employability:

2. The course provides foundational knowledge and practical skills in molecular, and physiological processes, enabling employment in academia, R&D labs, biotech and agro-industries at entry-level positions.

Materials:

Suggested Readings

5. Alberts, B. et al. (2022). Molecular Biology of the Cell. 7th Edition, Garland Science.
6. Nelson, D. L., & Cox, M. M. (2023). Lehninger Principles of Biochemistry. 9th Edition, W. H. Freeman.
7. Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2023). Plant Physiology and Development. 7th Edition, Sinauer Associates.
8. Karp, G. (2021). Cell and Molecular Biology: Concepts and Experiments. 9th Edition, Wiley.

Additional information (if any):

Student responsibilities:

4. Class attendance.
5. Study of reading materials as specified by course instructor
6. Self-study

Course reviewers:

1. Prof. Sanjit Dey
   Department of Physiology,
   University College of Science Technology and Agriculture,
   University of Calcutta, Kolkata

2. Dr. Vijay Kumar Prajapati
   Associate Professor,
   Department of Biochemistry
   University of Delhi, South Campus
   New Delhi

Course title: Essentials of Bioinformatics

Course code: XXX	**No. of credits:** 2	**L-T-P:** 30-0-0	**Learning hours:** 30

Pre-requisite course code and title (if any): Class 12 or equivalent in Science

Department: Department of Biotechnology

Course coordinator: Prof. Shashi Bhushan Tripathi	**Course instructor:**

Contact details:

Course type: Major	**Course offered in:** Semester II

Course description: This course provides an introduction to the fundamental principles and applications of bioinformatics. It covers the use of computational tools and biological databases for analyzing molecular data such as DNA, RNA, and proteins. The course aims to develop basic understanding of data retrieval, sequence analysis, and structural visualization, thereby equipping students with essential analytical skills in modern biology.

Course objectives:

1. To introduce students to the basic concepts and scope of bioinformatics.
2. To familiarize students with biological databases and sequence data formats.
3. To develop skills in sequence alignment and molecular data interpretation

Course contents

Module	**Topic**	**L**	**T**	**P**
1	Introduction to Bioinformatics – definition, scope, and applications; types of biological data; overview of major biological databases (NCBI, EMBL, UniProt, PDB).	**10**		
2	Sequence Analysis – nucleotide and protein sequence formats; sequence similarity, identity, and homology; pairwise and multiple sequence alignment; BLAST and Clustal Omega tools.	**12**		
3	Structural Bioinformatics and Applications – protein structure visualization (PyMOL, Jmol); molecular modeling concepts; role of bioinformatics in genomics, proteomics, and biotechnology.	**8**		
	Total	**30**	**0**	**0**

Evaluation criteria:

5. Minor test: Mid-semester (40%)
6. Major exam: End-Semester (60%)

Learning outcomes:

1. Understand the basic principles and importance of bioinformatics.
2. Retrieve biological data from online databases and perform basic analyses.
3. Conduct sequence alignments and interpret similarity results.
4. Visualize biomolecular structures and understand their significance in biological functions.

Pedagogical Approach:

1. Online/classroom lectures and demonstrations.
2. Hands-on sessions using open-access bioinformatics tools.
3. Case studies using real biological data examples.

Skill Set:

3. Basic computational data handling and sequence analysis.
4. Use of biological databases (NCBI, UniProt, PDB).
5. Sequence alignment and molecular visualization

Employability:

3. Research institutions working in genomics and proteomics.
4. Pharmaceutical and biotechnology industries.
5. Bioinformatics data analysis and computational biology roles.

Materials:

Suggested Readings

1. Lesk, A. M. (2019). Introduction to Bioinformatics, 5th Ed. Oxford University Press.
2. Mount, D. W. (2004). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press.
3. Attwood, T. K., & Parry-Smith, D. J. (2021). Introduction to Bioinformatics. Pearson Education.
4. Baxevanis, A. D., & Ouellette, B. F. F. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. Wiley.

Additional information (if any):

Students will be encouraged to explore biological databases and web-based bioinformatics tools for independent analysis projects.

Student responsibilities:

9. Class attendance.
10. Study of reading materials as specified by course instructor
11. Self-study

Course reviewers:

1. Dr Santosh Kumar Magadum, Scientist-C, Regional Sericultural Research Station, Jammu
2. Dr Sangeeta Singh, Senior Scientist, ICAR-IGFRI, Jhansi

Course title: Biotechnology Laboratory 2

Course code: XXX	**No. of credits:** 2	**L-T-P:** 0-0-60	**Learning hours:** 60

Pre-requisite course code and title (if any): Class 12 or equivalent in Science

Department: Department of Biotechnology

Course coordinator:	**Course instructor:**

Contact details:

Course type: Major	**Course offered in:** Semester 2

Course description: The objective of this laboratory course is to introduce students to experiments related to biotechnology. This is a basic laboratory course which intends to introduce the students to basic laboratory activities required for biotechnology research. The experiments will be related to the theory courses taught in the second semester. The list of experiments is representative and not exhaustive.

Course objectives:

1. To provide a basic level training of preparing solutions used in biotechnology research
2. Use of compound microscopes to study different plant and animal tissue and study of microbes

Course contents

Module	Topic	L	T	P
1	• Cell counting with haemocytometer (pollen, fungal spores) • Preparation of LB medium and monitoring of bacterial growth (agar plates and liquid medium) • β-galactosidase induction using IPTG • GUS assay • DNA isolation from diverse tissue sources • Gel electrophoresis of DNA, quantification and quality assessment • Restriction digestion of DNA • Search and analysis of biological databases (NCBI and IBDC)	**0**		**60**
	Total	**0**	**0**	**60**

Evaluation criteria:

1. Attendance: 5%

2. Preparation of lab record(s) throughout the semester: 25%

3. End semester evaluation: 70% (Following components would be included)

    7. Spotting: 15 %
    8. Viva-voce: 15 %
    9. Experiment(s) assigned on the day of the exam: 40%

Learning outcomes:

1. Ability to conduct experiments with adequate safety precautions.
2. Capacity to compare and evaluate various approaches in solving a given experimental problem.

Pedagogical Approach:

5. Laboratory experiments, demonstration, writing and experiments result analysis.
6. Visit to Aravali Biodiversity Park

Skill Set:

6. Able to work in biotechnology lab and perform experiments
7. Able to analyses experimental data and critical thinking.

Employability:

6. Forestry and wildlife research institutions involved in conservation

7. Academic and industrial research
8. Industries based on biotechnology, pharmacy, and agriculture.

Materials:

Suggested Readings

5. Campbell Biology: Australian and New Zealand edition, Reece J.B. and others, Pearson 12th ed. 2021
6. National Academy of Sciences. 1999. Science and Creationism: A View from the National Academy of Sciences, Second Edition. Washington, DC: The National Academies Press. https://doi.org/10.17226/6024.

Additional information (if any):

Student responsibilities:

12. Class attendance.
13. Conducting experiments as instructed during the class
14. Self-study

Reviewers:

1. **Prof. Bijoy Neog**
   Department of Life Sciences
   Dibrugarh University, Dibrugarh, Assam