Kanya Maha Vidyalaya, Jalandhar
(An Autonomous College)

Minutes of 11th Meeting of Board of Studies
Department of Bio-Technology
Via Zoom video conferencing
Date: 11-06-2026
Time: 04:00 PM

KANYA MAHA VIDYALAYA, JALANDHAR
(UGC Autonomous College)
Agenda of the eleventh Meeting of Board of studies
Department of Bio-Technology
Meeting by Circulation

Eleventh meeting of the Board of Studies will be held online through zoom. The zoom meeting for the Department of Bio-Technology has been fixed on 11.06.26 at 4:00 PM.

Members of Board of Studies:

1.	Dr. Manju Sahni, Head and Associate Professor, PG Department of Chemistry, Kanya Maha Vidyalaya, Jalandhar	Chairperson
2.	Dr. Pratap Kumar Pati, Professor, Department of Biotechnology, Guru Nanak Dev University, Amritsar (GNDU Nominee)	Member
3.	Dr. Neena Caplash, Professor, Department of Biotechnology, Panjab University, Chandigarh (Outside GNDU Nominee)	Member
4.	Dr. Prangya Ranjan Rout, Assistant professor, Department of Biotechnology, Dr B R Ambedkar National Institute of Technology, Jalandhar (Outside GNDU Nominee)	Member
5.	Dr. Kamaljit Singh, Managing Director, Green Planet Bioproducts, GP tower, 1-Amar Garden, Near Pathankot Chowk, NH-1, Jalandhar (Industry Expert)	Member
6.	Dr. Himadri, Associate professor, A & M institute of computer and Technology, Punjab technical university, Pathankot, Punjab (Alumni)	Member
7.	Dr. Sandeep Kaur Saggu, Assistant Professor, Department of Bio-Technology, Kanya Maha Vidyalaya, Jalandhar	Member

Agenda

Item: Bio 11: 2026: 1 To discuss and approve the minutes of tenth Board of Studies meeting held on 24.05.25 and Action Taken Report **(Annexure A).**

Item: Bio 11: 2026: 2 To discuss proposed syllabus of **B.Sc. Bio-Technology semester-III, IV, V and VI** (Session 2026-27) **(Annexure B)** and Semester I-VIII (Batch 2026-30) **(Annexure C)** under Credit Based Continuous Evaluation Grading System with 30% internal assessment.

Item: Bio 11: 2026: 3 To discuss the syllabus of Introduction to Bacteriology and Virology and Basics of Microbiology-I of **B.Sc. Medical Laboratory Technology Semester- III** and Basics of Microbiology-II for **BSc Medical Laboratory Technology-IV** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27 **(Annexure D).**

Item: Bio 11: 2026: 4 To discuss the syllabus of Fundamentals of Microbiology of **Bachelor of Medical Laboratory Science Semester- II** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27 **(Annexure E).**

Item: Bio 11: 2026: 5 To discuss the list of proposed examiners for above stated courses **(Annexure F).**

Item: Bio 11: 2026: 6 To discuss teaching methodologies adopted in the department and inputs required to upgrade the same **(Annexure G)**.

Item: Bio 11: 2026: 7 To discuss research inputs and plans of department for session 2026-27 **(Annexure H).**

Item: Bio 11: 2026: 8 To discuss the outcomes of above stated courses and programs.

Item: Bio 11: 2026: 9 To discuss the result analysis for the session 2025-26 **(Annexure I)**.

(Chairperson)
Dr. (Mrs.) Manju Sahni,
Dean Life Sciences
Kanya Maha Vidyalaya, Jalandhar

Proceedings of the Meeting of Board of Studies held on 24-05-2025

The eleventh meeting of the Board of Studies of Bio-Technology was held on **11-06-2026 at 4:00 pm through Zoom.**

The following members have attended meeting and detailed minutes are listed below:

S. No.	Details of Member	Presence/Absence
1.	Dr. Manju Sahni, Head and Associate Professor, PG Department of Chemistry, Kanya Maha Vidyalaya, Jalandhar **(Chairperson)**	**Present**
2.	Dr. Pratap Kumar Pati, Professor and Head, Department of Biotechnology, Guru Nanak Dev University, Amritsar **(Parent University Nominee)**	**Present**
3.	Dr. Neena Caplash, Professor, Department of Biotechnology, Panjab University, Chandigarh **(Outside Parent University Nominee)**	**Present**
4.	Dr. Prangya Ranjan Rout, Assistant professor, Department of Biotechnology, Dr B R Ambedkar National Institute of Technology, Jalandhar **(Outside Parent University Nominee)**	**Present**
5.	Dr. Himadri, Associate professor, A & M institute of computer and Technology, Punjab technical university, Pathankot, Punjab **(Alumni)**	**Present**
6.	Dr. Kamaljit Singh, Managing Director, Green Planet Bioproducts, GP tower, 1-Amar Garden, Near Pathankot Chowk, NH-1, Jalandhar **(Industry Expert)**	**Present**
7.	Dr. Sandeep Kaur Saggu, Assistant Professor, Department of Bio-Technology **(Internal Member)**	**Present**

The Chairperson Dr. Manju Sahni welcomed and introduced the Members of Board of studies. She apprised the members about the Programme in department along with teaching and research strengths of the department. She highlighted the progress made by department in establishing sophisticated labs with high end instrumentation and glory of the department at National and International Scenario. She took up the agenda items for deliberation one by one with the permission of committee members.

Item: Bio 11: 2026: 1

To discuss and approve the minutes of tenth Board of Studies meeting held on 24.05.2025 and Action Taken Report.

The minutes and Action Taken Report of the previous Board of Studies meeting held on 24.05.2025 were sent through email to all the members and were approved by all the members. The Chairperson however again put up the summary of the minutes and Action Taken Report for approval of the house and they approved it through Zoom meeting. **(attached herewith as Annexure A)**

The house approved the Bio 11: 2026: 1

Action Taken Report

S. No.	Agenda Item	Decision taken in Meeting	Action Taken
Item: Bio 10: 2025: 2	To discuss proposed syllabus of **B.Sc. Bio-Technology semester-I, II, III and IV** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2025-26.	The proposed syllabus and course outcomes of **B.Sc. Bio-Technology semester-I-IV under credit Based Continuous Evaluation Grading System for the session 2025-26** was discussed by board members and they approved the	The syllabus approved in the minutes by the BOS members has been executed.

		syllabus with 30% internal assessment with following changes.	
	BSc Bio-Technology Sem -I Biochemistry-I Course Code: BBTM-1083	Course outcomes have been modified.	The changes were approved and executed.
	BSc Bio-Technology Sem -I General Microbiology-I Course Code: BBTM-1345	It was decided to add the topic "Physiology of micro-organisms" in Unit 3.	The changes were approved and executed
	BSc Bio-Technology Sem -II Biochemistry-II	It was decided to add: • Effect of temperature and pH on enzyme activity and Estimation of enzymes such as α amylase, acid phosphatase, and catalase to demonstrate enzyme function and their response to temperature and pH in Unit 3. • Competitive and non-competitive inhibition in Unit 4.	The changes were approved and executed
	BSc Bio-Technology	It has been	The changes were

	Sem -IV Status report of Industrial/ Institutional Visit BBTF-2063	discontinued	approved and executed
Item: Bio 10: 2025: 3	To discuss proposed syllabus of B.Sc. Bio-Technology semester-V and VI under Credit Based Continuous Evaluation Grading System with 20% internal assessment for the session 2025-26.	The Board of Studies members discussed the proposed syllabus of B.Sc. Bio-Technology semester-V and VI under Credit Based Continuous Evaluation Grading system with 20% internal assessment for the session 2024-25.	The syllabus approved in the minutes by the BOS members has been executed.
Item: Bio 10: 2025: 4	To discuss the syllabus of Introduction to Bacteriology and Virology and Basics of Microbiology-I of B.Sc. Medical Laboratory Technology Semester- III and Basics of Microbiology-II for BSc Medical Laboratory	The Board of Studies members discussed the proposed syllabus of Introduction to Bacteriology and Virology and Basics of Microbiology-I of B.Sc. Medical Laboratory Technology Semester- III and Basics of Microbiology-II for BSc Medical	It was approved by all the members with few changes in syllabus.

	Technology-IV under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2025 26 (Annexure D).	Laboratory Technology-IV Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2025-26.	
Item: Bio 10: 2025: 5	To discuss the list of proposed examiners for above stated courses.	The Chairperson discussed and approved the list of proposed examiners for above stated courses with Board of Studies members for the session 2025-26.	The list of examiners was approved and sent to COE office.
Item: Bio 10: 2025: 6	To discuss teaching methodologies adopted in the department and inputs required to upgrade the same	The Chairperson discussed the teaching methodologies adopted in the department. The members appreciated the teaching methodologies adopted in the department.	Various activities were organized in department in session 2025-26: • 06 August 2025: The Department of Bio-technology, in association with IIC, organized poster making competition on "Biotech innovations and skills." • 26 August 2025: The Department of Bio-Technology, in

			collaboration with IIC, organized a "Session on innovation/prototype validation-converting innovation into startup-up". • 16 September 2025: The Department of Bio-technology organized a career counselling session on Unlocking Careers in Biotechnology: Opportunities and growth. • 23 September 2025: The Department organized an Alumni talk on "Cracking Competitive Exams for higher students in Biotechnology." • 1 October 2025: The Department of Bio-technology, in association with IIC, organized Quiz competition on Entrepreneurship, skills, and patents in Biotechnology. • 8 October 2025:

			The Department of Bio-technology organized a Storytelling Competition on "Success Stories of Women Entrepreneurs". • 9 October 2025: The Department of Bio-technology organized an Extension Lecture on Navigating the Path to Mental Health and Wellness" as a part of the Mental Health Celebration. • 11 November 2025: The Department of Bio-technology organized a Slogan Writing Competition to celebrate National Education Day. • 12 November 2025: Department of Bio-technology organized a Student-Student mentoring session titled "Bio-Bridge: Connecting Minds, Cultivating Innovation."

			• 13 November 2026: Department of Bio-technology organized Mentoring Session at KV3, Jalandhar Cantt. Under Viksit Bharat Buildathon Program • 15 November 2026: Department of Bio-Technology organized Mentoring Session at KV1 and 2, Jalandhar Cantt. Under Viksit Bharat Buildathon Program. • 15 November 2025: Department of Bio-technology organized a social awareness activity: "Together we rise: Building a responsible society". • 28 January 2026: Department of Bio-technology organized Drug Abuse Awareness: Pledge-taking activity • 13 February 2026: Department of Bio-Technology organized Exhibition

			on From Plantation to Profit: Promoting green Startups” • 28 February 2026: Department of Bio-Technology celebrated National Science Day,2026. • 6 March 2026: Department of Bio-Technology organized Biotech Innovation: Picture Perfect Challenge • 13 March 2026: Department of Bio-Technology organized Slogan Writing Competition on Women in Biotech Startups and Innovation. • 19 March 2026: Department of Bio-Technology organized Microbes to Market: Fermentation Innovation Fest • 24 March 2026: Department of Bio-Technology organized

			Educational Visit to Verka Milk Plant, Jalandhar • 21 April 2026: Department of Bio-Technology organized Exhibition on Innovative Prototypes for Future Startups to celebrate World Creativity and Innovation Day. • 25 April, 2026: Department of Bio-Technology organized Mentoring Session at KV2, Jalandhar Cantt. On Biotechnology: Bridging Innovation and Industry.
Item: Bio 10: 2025: 7	To discuss research inputs and plans of department for session 2025-26.	The house highly appreciated that the faculty members are actively involved in research and said their input reflects from their publications. They have also encouraged the faculty members to indulge themselves more in research and writing papers.	Faculty members keep students engaged in number of extension practical and small research projects. **Review paper** Dr. Sandeep Kaur Saggu published review paper entitled "Metagenomics and its impact on environmental and therapeutic

			microbiology" in journal named "Archives of Microbiology" in November, 2025. **Book chapters** Dr. Sandeep Kaur Saggu published book chapter entitled "Bioreactor Designs for Algal and Microbial Cultivation" in book entitled "Algal Bioengineering and Microbial Synergy to Green Remediation" in August, 2025. Dr. Jaspreet Kaur published book chapter entitled "Herbal Approaches to Hormonal Balance The Synergistic Effects of Herbs on the Endocrine System" in book entitled "Exploring Herbal Synergies for optimal Human Health" in February, 2026. Dr. Jaspreet Kaur published book chapter entitled "Integrating

			Herbal Synergies in to Pediatric Care: A Multifaceted Framework" in book entitled "Exploring Herbal Synergies for optimal Human Health" in February, 2026. Dr. Jaspreet Kaur published book chapter entitled "Synergistic Effects of Multi-Herbal and Herb-Drug Combinations and their molecular mechanisms of action and clinical relevance" in book entitled "Exploring Herbal Synergies for optimal Human Health" in February, 2026. Dr. Jaspreet Kaur published book chapter entitled "Sustainable Developments Towards 3D Printing Replacing Agricultural Wastes" in book entitled **"**Smart Sustainable Materials Advancing Re-manufacturing and Technology" in April,

			2026. Dr. Jaspreet Kaur published book chapter entitled “Recovery of energy and nutrients from natural resources, Biomass, and Solid Wastes” in book entitled “Smart Sustainable Materials Advancing Re-manufacturing and Technology” in April, 2026. Dr. Jaspreet Kaur published book chapter entitled “Wood and Harvested Crops Straws for 3D Printing and Greener Solutions” in book entitled “Smart Sustainable Materials Advancing Re-manufacturing and Technology” in April, 2026. Dr. Jaspreet Kaur published book chapter entitled “Aquatic Agriculture: Technology-Led Shifts from Terrestrial Farming to Ocean-Based Food Systems” in book entitled **“**Smart

			Sustainable Materials Advancing Re-manufacturing and Technology" in April, 2026.
Item: Bio 10: 2025: 8	To discuss the outcomes of above stated courses and programs.	The Chairperson discussed the outcomes of above stated courses and programs with the Board of Studies members.	The house approved the Bio 10: 2025: 8
Item: Bio 10: 2025:9	To discuss the result analysis for the session 2024-25.	The Chairperson discussed the result analysis for the session 2024-25 with the members of Board of Studies.	Remedial classes and mentoring sessions were conducted to support low-performing students and improve overall academic outcomes.

The house approved the Bio 11: 2025: 1

Item: Bio 11: 2026: 2 To discuss proposed syllabus of **B.Sc. Bio-Technology semester-III, IV, V and VI** (Session 2026-27) **(Annexure B)** and Semester I-VIII (Batch 2026-30) **(Annexure C)** under Credit Based Continuous Evaluation Grading System with 30% internal assessment.

Proceedings:

The proposed syllabus of **B.Sc. Bio-Technology semester-III, IV, V and VI** (Session 2026-27) and **Semester I-VIII** (Batch 2026-30) under **credit Based Continuous Evaluation Grading System** was discussed by board members and they approved the syllabus with 30% internal assessment with following changes.

Semester	**Name of the Course and course code**	**Section in which changes were made**	**2025-26**	**2026-27**

Sem I	Biochemistry-I and BBTM-1083	Course Outcomes	Course Outcomes have been modified.	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1**: Gain basic knowledge about the role of pH and the physiological properties of water in biological systems. **CO2**: Acquire the knowledge of carbohydrates, classification, and their biological functions **CO3**: Understand the definition, structure and biological functions of lipids and their subclasses. **CO4**: Understand the definition, structure, biological functions, and classification of proteins. **New Course outcomes (Theory):** Upon successful completion of this course, the students will be able to: **CO1:** Explain the structure, physicochemical properties, and biological significance of water, pH, buffers, and their role in maintaining biological systems. **CO2:** Classify and interpret the structure, properties, and biological functions of carbohydrates and lipids, and relate them to cellular metabolism and physiological processes. **CO3:** Analyze the structural organization, classification, and functional significance of proteins, amino acids, and the forces governing protein

				stability. **CO4:** Evaluate the relationship between the structure and function of major biomolecules and their importance in maintaining normal biological functions and metabolic activities. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1**: Perform Beer Lamberts Law **CO2**: Determine pKa value while performing practical **CO3**: Estimate carbohydrates in the given sample **CO4**: Estimate proteins and fats in the sample by different methods **New Course Outcomes (Practical):** Upon successful completion of this course, the students will be able to: **CO1:** Explain the principles of spectrophotometric analysis and biochemical assays used for the qualitative and quantitative estimation of biomolecules. **CO2:** Perform biochemical experiments to estimate carbohydrates, proteins, and lipid parameters using standard laboratory techniques. **CO3:** Analyze experimental data to determine pKa values, verify Beer-Lambert's law, and differentiate reducing and non-reducing sugars. **CO4:** Evaluate the accuracy and reliability of biochemical experimental results using appropriate calculations and laboratory practices.

		Books recommended	No changes	1. The reference "Voet, D., Voet, J. G. and Prait, C. W. (2018). Principles of Biochemistry, 5th Edition, Wiley." was replaced with "Heilman, D., Woski, S., Voet, D., Voet, J. G., & Pratt, C. W. (2024). *Fundamentals of Biochemistry*. John Wiley & Sons." 2. The reference "Ferrier (2017) Lipincott's Illustrated Reviews. 7 th Edition, Wolters Kluwer India Pvt. Ltd." was replaced with "Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins." 3. The reference "Berg, J. M., Tymoczko, J. L. And Stryer, L. (2019). Biochemistry, 9th Edition, Freeman." was replaced with "Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education." 4. The reference "Jain J. L., Jain S., Jain N. (2016) Fundamentals of Biochemistry. 7 th Edition. S Chand." was replaced with "Jain, J. L., Jain, S. & Jain, N. (2023). *Fundamentals of Biochemistry*. 9th Edition. S. Chand Publishing." 5. The reference "Satyanarayana (2020) Biochemistry. 5th Edition, Elsevier." was deleted. 6. The reference "Lehninger, A. L., Nelson, D. L. and Lox,

				M. M. (2017). Principles of Biochemistry, 7th Edition, CBS Publishers and Distributors, New Delhi." was replaced with "Nelson, D. L. & Cox, M. M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman." 7. The reference "David L. Nelson and Michael Cox (2017) Lehninger Principles of Biochemistry. 7th Edition. WH Freeman" was deleted. 8. The reference "Jeremy M. Berg, Lubert Stryer, John Tymoczko, Gregory Gatto (2019). Biochemistry. 9th Edition, WH Freeman" was deleted.
Sem I	Genetics and BBTM-1064	Course Code Course outcomes	No changes No changes	The course "Genetics" (BBTM-2063) was shifted to Semester I, and its course code was changed to BBTM-1064. All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand Mendelian and Neo-mendelian genetics along with the study of phenomenon of dominance, laws of segregation, independent assortment of genes. **CO2:** Develop an understanding of the principles and mechanisms of linkage and crossing over.

				CO3: To learn various types of mutations their significance and practical applications along with basic microbial genetics. **CO4**: Understand the organization of chromosomes and concept of human genetics **New Course Outcomes (Theory):** After successful completion of this course, the students will be able to: **CO1:** Explain the principles of Mendelian inheritance, gene interactions, linkage, crossing over, mutation, and chromosome organization. **CO2:** Apply the principles of classical, microbial, and cytoplasmic genetics to solve problems related to inheritance, recombination, and chromosomal abnormalities. **CO3:** Analyze the genetic basis of mutations, chromosomal aberrations, population genetics, and human genetic disorders using appropriate genetic principles. **CO4:** Evaluate genetic data using pedigree analysis, karyotyping, and Hardy–Weinberg equilibrium to interpret patterns of inheritance and assess genetic disorders. **Old Course Outcomes (Practical):** After passing this course the student will be able to:

				CO1: Understand Mendelian laws. **CO2**: Solve paternity disputes. **CO3**: Demonstrate segregation in preserved material. **CO4**: Study polytene chromosomes and dermatoglyphics. **New Course Outcomes (Practical):** After successful completion of this practical course, the students will be able to: CO1: Apply the principles of Mendelian genetics and probability to solve numerical problems and demonstrate patterns of inheritance. CO2: Analyze genetic traits and inheritance patterns using blood group data, dermatoglyphics, and preserved genetic materials. CO3: Examine chromosomal structures and stages of cell division through microscopic observation of polytene chromosomes and mitotic chromosomes. CO4: Evaluate genetic observations and experimental data to interpret inheritance patterns and chromosomal behavior using appropriate laboratory techniques.
		Books recommended	No changes	THEORY 1. The reference “Brooker, R. J. (2017). Genetics: Analysis

				and Principles, McGraw-Hill Education." was replaced with "Brooker, R. J. (2021). Genetics: Analysis and Principles. 7th Edition. McGraw-Hill Education." 2. The reference "Pierce, B. (2016). Genetics: A conceptual approach, 6th Edition, WH Freeman" was deleted. 5.The reference "Singh B. D. (2019). Genetics, Kalyani Publications" was replaced with "Singh, B. D. (2022). Genetics. 6th Revised Edition. Kalyani Publishers." 7.The reference "Benjamin P (2016) Genetics: A Conceptual Approach, 6th Ed., WH Freeman" was deleted. PRACTICAL 1.The reference "Pierce, B (2016). Genetics: A Conceptual Approach, 6th Edition, WH Freeman" was replaced with "Pierce, B.A. (2020). *Genetics: A Conceptual Approach*. 7th Edition. W.H. Freeman/Macmillan Learning" 2.The reference "Singh, B. D. (2019) Genetics, Kalyani Publishers." was replaced with "Singh, B. D. (2022). *Genetics*. 6th Revised Edition. Kalyani Publishers"
Sem I	General Microbiology I and BBTM-1345	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course outcomes (Theory):** After passing this course the

				student will be able to: **CO1**: Know the contribution of microbiologists and general features of various microbes. **CO2**: Study the structure of bacteria cell and bacterial classification **CO3**: Study the microbial culture collection centers, microbial preservation and sterilization methods and understand the basic concepts of bacterial nutrition. **CO4:** To learn different types of microscopy techniques. **New Course Outcomes (Theory):** Upon successful completion of this course, the students will be able to: CO1: Explain the evolution, scope, diversity, structure, and significance of microorganisms, including their role in biotechnology and various industrial, agricultural, healthcare, and environmental applications. CO2: Apply the principles of bacterial classification, staining techniques, microbial cultivation, preservation, nutrition, and sterilization in microbiological studies. CO3: Analyze the structural, physiological, and nutritional characteristics of microorganisms and the mechanisms involved in microbial growth and nutrient transport. CO4: Evaluate the principles, applications, and limitations of different microscopic techniques used for the observation and

				characterization of microorganisms. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1**: Understand sterilization techniques of different types of materials. **CO2**: Learn methods of isolation and identification of bacteria **CO3**: Learn methods of detection of microbes. **CO4**: Understand preservation methods of microbes. **New Course Outcomes (Practical):** Upon successful completion of this course, the students will be able to: **CO1:** Explain microbiology laboratory safety practices, aseptic techniques, sterilization methods, and the functions of common microbiological equipment. **CO2:** Perform the preparation, sterilization, isolation, cultivation, purification, and preservation of microorganisms using standard microbiological techniques. **CO3:** Analyze the morphological characteristics of bacteria, fungi, yeast, and algae using staining methods and microscopic examination. **CO4:** Evaluate microbial cultures based on colony characteristics, staining reactions, and motility tests for their identification and characterization.
		Course Content	It was decided to add the topic "Physiology of micro-organisms" in Unit 3	Following changes were suggested: 1. The practical titled "Introduction to Microbiology Laboratory and its Equipment" was revised as "Introduction to Microbiology

				Laboratory, Laboratory Safety and Common Microbiological Equipment. 2. The practical titled "Cleaning of Glassware and Aseptic Techniques of Sterilization" was revised to "Cleaning of Glassware and Aseptic Techniques of Sterilization by Physical and Chemical Methods." 3. The practical titled "Preparation of media, cotton plugging and its sterilization" was revised to "Preparation of culture media, cotton plugging and its sterilization by autoclaving." 4. The practical titled "Isolation of micro-organism from air, water and soil samples. Dilution, spread plating and pour plating, Colony purification" was revised to "Isolation of Microorganisms from Air, Water, and Soil Samples by Serial Dilution, Spread Plate, and Pour Plate Techniques; Observation of Colony Characteristics and Purification of bacterial cultures." 5. Study of the Morphology of Fungi, Yeast, and Algae" by Staining Techniques – A new practical was introduced. 6. The practical titled "Detection of specific bacteria by Wet mount preparation method and Hanging drop mount method" was revised to "Observation of Bacterial motility by wet mount and hanging drop 7. The practical titled "To preserve bacteria by short term preservation methods like direct transfer to subculture, Immersion in oil,

				cryopreservation" was revised to "Preservation of bacterial cultures by short term preservation methods: Periodic transfer to subculture, Mineral oil overlay, and cryopreservation techniques."
		Books recommended	No changes	THEORY 1. The reference “Stanier, R. Y. (1999). General microbiology, MacMillan Press, London” was deleted. 2. The reference “Tortora, G. J., Funke, B. R. and Case, C. L. (2015). Microbiology: An introduction, 12th Edition, Pearson College Div.” was replaced with “Tortora, G., Tortora, G. J., Funke, B. R., Case, C. L., Weber, D., & Bair, W. B. (2024). *Microbiology: an introduction*.” 3. The reference “Willey, J., Sherwood, L. And Wooverton, C. J. (2017). Prescott’s Microbiology, 10th Edition, McGraw-Hill Education/ Asia” was deleted. 4. The reference “Pelczar, M. J., Chan, E.C.S. and Krieg, N. R. (2010). Microbiology: An application-based approach, Tata McGraw Hill.” was replaced with “Pelczar, M. J., Chan, E.C.S. & Krieg, N. R. *Microbiology*. 7th Edition. McGraw-Hill” 5. The reference “Presscott and Dunn (1999). Industrial Microbiology. 4th edition, By S.K. Jain for CBS Publishers and Distributors was replaced with “Sherwood, L., Prescott, L. M., Sherwood, L. M., & Woolverton, C. J. (2017). *Prescott's*

				microbiology. McGraw-Hill Education" PRACTICAL 1. The reference "Dubey R. C. and Maheshwari (2012). Practical Microbiology 5th edition: S. Chand and company ltd. New Delhi" was replaced with "Dubey, R. C., & Maheshwari, D. K. (2023). *A textbook of microbiology*. S. Chand Publishing" 2. The reference "Sastry, A. S. and Bhat, S. (2018). Essentials of Practical microbiology. Jaypee Brothers Medical Publishers" was replaced with "Sastry, A. S. (2021). *Essentials of Practical Microbiology*. JP Medical Ltd"
Sem I	Entrepreneurship Mindset-I and USEP0001	Content	-	A new course, "Entrepreneurship Mindset-I" (Course Code: USEP0001), was introduced.
Sem II	Biochemistry II and BBTM 2084	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand basic metabolic pathways and energy flow in biological systems. **CO2:** Explain the role of ATP and biological oxidation in metabolism. **CO3:** Describe enzyme structure, function, and catalytic mechanisms. **CO4:** Interpret enzyme kinetics and types of enzyme

				inhibition. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the fundamental principles of metabolism, bioenergetics, thermodynamics, ATP-mediated energy transfer, and electron transport mechanisms underlying cellular metabolic processes. CO2: Analyze the structural organization and biochemical properties of nucleic acids and biologically important nucleotides, and examine their functional significance in cellular metabolism. CO3: Evaluate the structure, classification, catalytic mechanisms, and regulation of enzymes, and assess the biochemical significance of vitamins as enzyme cofactors in maintaining normal physiological functions. CO4: Assess the principles of enzyme kinetics, enzyme inhibition, and hormonal regulation, and appraise their roles in metabolic regulation and human health. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Estimate the activity of enzymes like alpha-amylase and acid phosphatase from biological samples.

				CO2: Study the effect of temperature and pH on enzyme activity. **CO3:** Perform quantitative estimation of catalase activity in plant tissues. **CO4:** Develop practical skills in enzyme assay techniques and data interpretation. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Explain the principles underlying enzyme assays, enzyme kinetics, and biochemical estimation techniques employed in experimental biochemistry. CO2: Perform biochemical assays for the estimation of enzyme activities, creatinine, DNA, and RNA using standard laboratory protocols and Good Laboratory Practices (GLP). CO3: Analyze the effects of pH, temperature, substrate concentration, and inhibitors on enzyme activity by interpreting experimental observations and enzyme kinetic parameters. CO4: Evaluate experimental data to determine enzyme kinetic parameters and biochemical estimations, and draw scientifically valid conclusions based on the experimental findings.
			No changes	The course “Biochemistry-II”

		Couse Code		with Course Code: BBTM-2084 was shifted to Semester II under the revised curriculum. Earlier, this course was offered in Semester IV with Course Code: BBTM-4083.
		Course Content	It was decided to add: • Effect of temperature and pH on enzyme activity and Estimation of enzymes such as α-amylase, acid phosphatase, and catalase to demonstrate enzyme function and their response to temperature and pH in Unit 3. Competitive and non-competitive inhibition in Unit	No Changes
		Books recommended	No changes	THEORY AND PRACTICAL 1. The reference "David L. Nelson and Michael Cox (2017) Lehninger Principles of Biochemistry, 7th ed, WH Freeman" was replaced with "Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry*. Macmillan." 2. The reference "Jeremy M. Berg, Lubert Stryer, John

				Tymoczko, Gregory Gatto (2019) Biochemistry, 9th Ed., WH Freeman" was replaced with "Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education" 3. The reference "Ferrier (2017) Lippincott's Illustrated Reviews Biochemistry, 7th Ed, Wolters Kluwer India Pvt. Ltd." was replaced with "Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins"
Sem II	General Microbiology-II	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Know the concept of microbial growth in batch and continuous system. **CO2:** Know the basics of viruses and its types. **CO3:** Have the basic mechanism of action, diagnosis, and treatment for different viral, bacterial, and fungal diseases. **CO4:** Acquire the knowledge of industrial microbiology and to understand the role of microbes in environment. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to:

				CO1: Explain the principles of microbial growth, growth kinetics, factors influencing microbial growth, and bacterial sporulation in batch and continuous culture systems. CO2: Analyze the structure, classification, cultivation, and life cycles of plant, animal, and bacterial viruses, including their replication strategies and biological significance. CO3: Evaluate the interactions between microorganisms and the human host by examining normal microbiota, mechanisms of microbial pathogenicity, host defense systems, and the diagnosis and management of major viral, bacterial, and fungal diseases. CO4: Assess the role of microorganisms in environmental sustainability through their applications in biomining, bioconversion, bioremediation, and municipal solid waste management. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Count microorganisms by different methods using microbiological practices **CO2:** Know the importance of personal hygiene. **CO3:** Identify different fungus by staining **CO4:** Study the growth curve of different microorganisms **New Course Outcomes (Practical):** Upon successful completion

				of this practical course, the learners will be able to: CO1: Perform microbial enumeration, isolation, and cultivation techniques using standard microbiological methods while adhering to Good Laboratory Practices (GLP) and aseptic techniques. CO2: Determine microbial growth characteristics by constructing growth curves, calculating generation time, and demonstrating bacterial sporulation using appropriate staining techniques. CO3: Identify clinically and agriculturally important microorganisms and viral infections through standard diagnostic procedures, including the Germ Tube Test for *Candida albicans* and symptom-based identification of Tobacco Mosaic Virus (TMV). CO4: Analyze the microbiological quality of environmental samples by performing Standard Plate Count (SPC) and interpreting experimental results for microbial assessment.
		Course Content	No changes	Following changes were suggested: 1. The practical titled "Enumeration of microorganism. Total vs viable counts" was revised as "Enumeration of microorganism by Total count and viable count methods." 2. The Practical titled "Personal Hygiene-Microbes from hands, tooth-scum and other body parts" was revised as "Isolation and Study of Normal Microflora from

				Hands, Oral Cavity (Tooth-Scum), and Other Body Surfaces". 3. The Practical titled "Growth curve of micro-organisms" was revised as "Determination of Growth curve of micro-organisms and Calculation of Generation Time". 4. The previous experiment titled "Identification of fungus by lactophenol staining" was replaced with the Practical titled "Study of Sporulation in Bacteria by Endospore Staining". 5. The Practical titled "Identification of formation of germ tube by *Candida albicans*" was replaced as "Identification of *Candida albicans* by Germ Tube Test". 6. The Practical titled "Visualization of *Streptococcus*" experiment was replaced with the practical titled "Study of Symptoms of Tobacco Mosaic Virus (TMV) Using Infected Plant Specimens/Charts". 7. The Practical titled "Waste water management test" was revised as Microbiological Analysis of Water by Standard Plate Count (SPC) Method." 8. The Practical titled "To stain a smear by Ziehl-Neelsen technique for diagnosis of acid-fast bacilli" was deleted.
		Books recommended	No changes	THEORY 1. The reference "Tortora, G. J., Funke, B.R. and Case, C. L. (1994). Microbiology: An Introduction: 5th Edition, The Benjamin / Cummings Publishing Company, Inc." was replaced with "Tortora, G., Tortora, G. J., Funke, B.

				R., Case, C. L., Weber, D., & Bair, W. B. (2024). *Microbiology: an introduction*." 2. The reference "Stanier, R. Y. (1995). General microbiology, MacMillan Press, London" was deleted. 3. The reference "Pelczar, M. T. (1995). Microbiology, Tata McGraw Hill Publication, New Delhi." was replaced with "Pelczar, M.J., Chan, E.C.S. & Krieg, N. R. *Microbiology*. 7th Edition. McGraw-Hill. 4. The reference "Schlegel, H. G., (1995). General Microbiology 7th Edition, Cambridge Univ. Press" was deleted. 5. The reference "Jain, S. K. (1999). Prescott and Dunn's Industrial Microbiology 4th Edition, CBS Publishers & Distributors" was replaced with "Sherwood, L., Prescott, L. M., Sherwood, L. M., & Woolverton, C. J. (2017). *Prescott's microbiology*. McGraw-Hill Education." 6. The reference "Chander, M. and Puri, P (2008). A Concise Course in Microbiology, Krishna Brothers Publishers, Old Railway Road, Jalandhar" was replaced with "Purohit, S. S. (2006). Microbiology: Fundamentals and Applications, 7th Edition, Agrobios (India)" 7. The reference "Postgate. J. (2000). Microbes & Man, 4th Edition, Cambridge Univ. Press." was replaced with "Postgate, J. R. (2000). *Microbes and man*. Cambridge university press." 8. The reference "Tortora.

				G.J., Funke. B. R. (2001). Microbiology: An Introduction, Benjamin Cummings" was replaced with "Tortora, G. J., Case, C. L., Weber D., & Funke, B. R. (2024). *Microbiology: an introduction*. 14th edition. San Francisco, CA: Pearson Benjamin Cummings." PRACTICAL 1. The reference "Dubey, R. C. and Maheshwari (2012) Practical Microbiology 5th Edition, S. Chand and company Ltd, New Delhi" was replaced with "Dubey, R. C., & Maheshwari, D. K. (2023). *A textbook of microbiology*. S. Chand Publishing."
Sem II	Entrepreneurship Mindset-II and USEP0001	-	-	A new course, "Entrepreneurship Mindset-II" (Course Code: USEP0001), was introduced.
Sem III	Fundamentals of Biotechnology Course Code: BBTM-3063	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Know the basic concept of biotechnology and recombinant technology. **CO2**: Understand applications of biotechnology in health care and agriculture. **CO3**: Know the bio business and intellectual property rights in biotechnology. **CO4:** Know different ethical issues pertaining to biotechnology.

				New Course Outcomes (Theory): After successful completion of this course, the students will be able to: CO1: Describe the historical evolution, scope, fundamental concepts, model organisms, and the role of biotechnology research, institutions, and career opportunities in India. CO2: Analyze the principles and applications of biotechnology in healthcare, agriculture, food production, environmental sustainability, molecular diagnostics, forensic sciences, and evolutionary biology. CO3: Evaluate the concepts of bio-business, intellectual property rights, patents, bioethics, biosafety, and regulatory frameworks governing biotechnology for responsible research, innovation, and commercialization. CO4: Assess the scope and potential of emerging areas of biotechnology, including marine biotechnology, nanobiotechnology, pharmacogenomics, regenerative medicine, nutraceutical biotechnology, therapeutic proteins, biosensors, bio-robotics, and bioinformatics, in addressing contemporary societal and industrial challenges. **Old Course Outcomes (Practical):** After passing this course the

				student will be able to: **CO1:** Learn good lab practices in biotechnology laboratory. **CO2:** Learn principle, working and applications of instruments. **CO3:** Know the handling and disposal procedure regarding hazardous reagents. **CO4:** Know different steps in patent writing. **New Course Outcomes (Practical):** Upon successful completion of this course, the learners will be able to: CO1: Demonstrate Good Laboratory Practices (GLP), laboratory safety measures, and standard operating procedures in a biotechnology laboratory. CO2: Operate and maintain basic biotechnology laboratory instruments by following standard operating procedures and laboratory protocols. CO3: Apply appropriate procedures for the safe handling, decontamination, and disposal of hazardous chemicals and laboratory waste in accordance with biosafety guidelines. CO4: Illustrate the process of patent drafting and filing through a biotechnology-related case study, highlighting the essential steps involved in securing intellectual property rights.
		Course Code	No changes	The course "Fundamentals of

				Biotechnology" (BBTM-2063) was shifted to Semester III for batch (2026-30), and its course code was changed to BBTM-3063.
Sem III	Gene Structure and Function BBTM-3061	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand the structure of DNA, RNA, gene organization, genome complexity, and repetitive DNA elements. **CO2:** Understand the types, characteristics, and applications of transposable elements. **CO3:** Understand the regulation of gene expression in prokaryotes through operon models. **CO4:** Understand the genetic basis of cancer and the key outcomes of the Human Genome Project. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Describe the molecular organization of DNA and RNA, gene architecture, regulatory elements, mechanisms of DNA replication, and the concepts of genome size and genome complexity in prokaryotic and

				eukaryotic organisms. CO2: Analyze the molecular mechanisms of transcription and the structure–function relationship of different RNA molecules, and examine the classification, characteristics, and applications of transposable elements in prokaryotic and eukaryotic genomes CO3: Evaluate the regulatory mechanisms governing gene expression in prokaryotic and eukaryotic systems, with special emphasis on operon models and molecular control of transcription. CO4: Assess the molecular basis of oncogenesis, tumour suppressor genes, DNA repair mechanisms, and the scientific significance of the Human Genome Project in advancing genomics, precision medicine, and biotechnology research. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Perform isolation of DNA and proteins. **CO2:** Analyze DNA through different methods. **CO3:** Study proteins through PAGE. **CO4:** Determine ORF and intron exon boundaries using bioinformatics. **New Course Outcomes (Practical):**

				Upon successful completion of this practical course, the learners will be able to: CO1: Perform the isolation of plant genomic DNA and evaluate its quality and purity using UV–Visible spectrophotometric analysis. CO2: Operate UV–Visible spectrophotometric techniques to determine the concentration, absorption characteristics, and purity of nucleic acid samples. CO3: Demonstrate the principles and applications of Native PAGE and SDS-PAGE for the separation and analysis of proteins. CO4: Analyze genomic sequences using bioinformatics tools to identify open reading frames (ORFs) and exon–intron organization for gene structure annotation and interpretation.
		Books recommended	No changes	THEORY: 1.The reference "Damal. J, Lodish, H. and Baltimore, D. (2007). Molecular Cell Biology, 6th edition, Scientific American Books, Distributed by W. H. Freeman and Co., New York." was replaced with "Lodish, H. F., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H. L., Martin, K. C., Yaffe, M. B. and Amon, A. (2021). *Molecular cell biology* (Vol. 1). New York: WH Freeman." 2.The reference "Bolsover, S. R., Hyams, J. S., S. Shephard, E. A. and White H. A. (1997)

				From Genes to Cells, John Wiley and Sons" was deleted. 3.The reference "Lewin, B. (2007). Gene IX, 9th edition, Jones and Bartlett Publishers." was replaced with "Krebs, J. E., Lewin, B., Goldstein, E. S., & Kilpatrick, S. T. (2013). *Lewin's essential genes*. Jones & Bartlett Publishers." 4.The reference "Nelson, D. L. & Cox, M. M. (2005). Lehninger Principles of Biochemistry, 4th ed., Worth Publishers, New York." was replaced with "Nelson, D. L. & Cox, M. M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman." 5.The reference "Freifelder, D. (2000). Microbial Genetics, Narosa Publishing House" was replaced with "Freifelder, D. (2013). Microbial Genetics, Narosa Publishing House." PRACTICAL 1.The reference "Damal. J, Lodish, H. and Baltimore, D. (2007). Molecular Cell Biology, 6th edition, Scientific American Books, Distributed by W.H. Freeman and Co., New York." was replaced with "Lodish, H. F., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H. L., Martin, K. C., Yaffe, M. B. and Amon, A. (2021). *Molecular cell biology* (Vol. 1). New York: WH Freeman." 2. The reference "Lewin, B. (2007). Gene IX, 9th edition, Jones and Bartlett Publishers." was replaced with "Krebs, J. E., Lewin, B., Goldstein, E. S., & Kilpatrick, S. T.

				(2013). *Lewin's essential genes*. Jones & Bartlett Publishers." 3. The reference "Nelson, D. L. & Cox, M. M. (2005). Lehninger Principles of Biochemistry, 4th ed., Worth Publishers, New York" was replaced with "Nelson, D. L. & Cox, M. M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman." 4.The reference "Freifelder, D. (2000). Microbial Genetics, Narosa Publishing House." was replaced with "Freifelder, D. (2013). Microbial Genetics, Narosa Publishing House."
Sem III	Immunology -I BBTM-3063	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Familiarize with the types and features of immune system **CO2**: Understand the roles of various immune cells and organs involved in immune responses **CO3**: Inculcate knowledge of antigen-antibody interactions, immunogenicity, immunoglobulin structure and classes, and the complement system. **CO4:** Understand the structure and function of MHC class I and II molecules, and their role in T and B cell-mediated immune response.

				New Course Outcomes (Theory): Upon successful completion of this course, the learners will be able to: CO1: Explain the fundamental concepts of innate and adaptive immunity, including immunological memory, specificity, self–non-self recognition, and the terminology associated with the immune system. CO2: Interpret the organization and functions of lymphoid cells, lymphoid organs, and the lymphatic system, and explain their coordinated roles in the generation and regulation of immune responses. CO3: Analyze the structural and functional characteristics of antigens, immunoglobulins, and the complement system, and examine their roles in humoral immune responses. CO4: Evaluate the role of Major Histocompatibility Complex (MHC) molecules and antigen receptors of T and B lymphocytes in antigen recognition, antigen presentation, and adaptive immune responses. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1**: Perform total and differential leucocyte counts to assess immune status. **CO2**: Accurately estimate total red blood cell (RBC) count using standard

				laboratory techniques. **CO3**: Demonstrate the ability to collect blood samples through different methods and separate plasma effectively. **CO4**: Conduct haemagglutination and haemagglutination inhibition assays to study antigen-antibody interactions. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Perform safe blood collection, plasma separation, and hematological investigations using standard laboratory procedures and aseptic techniques. CO2: Determine total and differential blood cell counts and interpret hematological parameters for the assessment of immune and physiological status. CO3: Isolate peripheral blood mononuclear cells (PBMCs) and evaluate cell viability using standard dye exclusion techniques. CO4: Demonstrate antigen–antibody interactions by performing different immunological techniques and analyze the experimental outcomes.
		Course Content	No changes	It was decided to replace practical "Separation and purification of Ig G antibodies

		Books recommended	No changes	from serum using protein A column" with "Ouchterlony Double Immunodiffusion Test." THEORY 1.The reference "Roitt, I. M. Brostoff, J. and Male, D. K. (2012), Immunology, 8th Edition, Elsevier, New York" was replaced with "Murphy, K., & Weaver, C. (2017). *Janeway's immunobiology*. 9th edition. Garland science." 2.The reference "Judy Owen, Jenni Punt, Sharon Stranford, Patricia Jone. (2018), Immunology, 7th Edition. W.H. Freeman and Company, New York/" was replaced with "Punt J., Stranford S.A., Jones P. P., Owen J.A. (2018). *Kuby immunology*. New York: W.H. Freeman, Macmillan Learning." 3.The reference "Abul K. Abbas, Andrew H. H. Lichtman, Shiv Pillai (2011) Cellular and Molecular Immunology; 7th Edition, Saunders" was replaced with "Abbas, A. K., Lichtman, A. H., Pillai, S., Henrickson S. (2025). *Cellular and molecular immunology* (11th ed.). Elsevier." 4.The reference "Doan (2012) Lippincott's Illustrated Reviews Immunology; 2nd Edition, Wolters Kluwer India Pvt." Was replaced with "Flajnik, M. (2022). *Paul's fundamental immunology*. Lippincott Williams & Wilkins." PRACTICAL 1. The reference "Stevans, C.

				D. (1996). Clinical Immunology and Serology: A Laboratory Perspective F. A. Davis Company, Philadelphia" was replaced with "Miller, L. E., & Stevens, C. D. (2023). Clinical immunology and serology." 2.The reference "Celis, K. E. (1998). Cell Biology: A laboratory handbook. Vol-I Academic Press, U.K." was replaced with "Celis, J.E. (2021). Cell Biology: A laboratory handbook Amsterdam; Boston: Elsevier Academic"
Sem III	Internship	Course outcomes	No changes	All the Course Outcomes (CO1–CO4) were modified. **Old Course Outcomes:** After passing this course the student will be able to: CO1: Apply theoretical knowledge in real-life professional and community settings through experiential learning. CO2: Develop practical skills, communication abilities, and professional ethics while working with industries and organizations. CO3: Understand workplace culture, teamwork, and problem-solving approaches in different professional environments. CO4: Prepare and present internship/community outreach reports effectively based on their field experiences. **New Course Outcomes:**

				Upon successful completion of this course, the learners will be able to: CO1: Apply disciplinary knowledge, technical competencies, and standard professional practices to perform assigned tasks effectively in industrial, research, healthcare, or other professional settings. CO2: Analyze workplace processes and real-world challenges to identify problems and recommend appropriate scientific or technical solutions. CO3: Demonstrate professional ethics, effective communication, teamwork, leadership, and responsible workplace behavior while functioning in multidisciplinary professional environments. CO4: Evaluate professional experiences and learning outcomes by preparing, presenting, and defending a comprehensive internship report that demonstrates reflective learning and professional competence.
Sem III	Skill Development in Biotechnology BBTM-3060	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand the types, role, and production techniques of

				biofertilizers and biological nitrogen fixation. **CO2:** Gain knowledge of medicinal plants, phytochemicals, essential oils, and their applications. **CO3:** Learn the basics of nutraceuticals, functional foods, and their health benefits and regulations. **CO4:** Develop entrepreneurial insight into bioindustries, including business planning, funding, and market strategies. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the principles, production processes, quality standards, and agricultural applications of biofertilizers, including the molecular basis of biological nitrogen fixation. CO2: Analyze the therapeutic significance of medicinal plants, phytochemicals, and essential oils, together with their extraction methods and industrial applications. CO3: Evaluate the scientific basis and health-promoting potential of nutraceuticals and functional foods, including nutritional genomics, quality control, and quality assurance practices. CO4: Assess the applications of biofuels, bioenergy,

				bioremediation, and bioentrepreneurship in promoting sustainable development and biotechnology-driven innovation. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Isolate and culture *Rhizobium* for biofertilizer production. **CO2:** Extract and analyze essential oils using distillation and chemical assays. **CO3:** Evaluate antioxidant potential and phytochemical content of essential oils. **CO4:** Assess the antimicrobial activity of essential oils against microbial strains. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Perform the isolation, cultivation, and production of *Rhizobium*-based biofertilizers using standard microbiological techniques. CO2: Demonstrate the extraction of essential oils from plant materials using appropriate distillation techniques. CO3: Analyze the phytochemical composition of essential oils by determining their total polyphenolic and flavonoid contents using

		Books recommended	No changes	standard analytical methods. CO4: Evaluate the antioxidant and antimicrobial potential of essential oils using DPPH and antimicrobial assays, and interpret the experimental findings for their potential biotechnological applications. THEORY 1. The reference "Fundamentals of Foods, Nutrition and Diet Therapy, (English, Mudambi Sumati R.), New Age, A International publication" was replaced with "Oladiji, A. T., Ajayi, E. I., Temidayo, A., Oladiji, O., & Olaley, J. (2024). *Nutrition and Diet in Health*." 2. The reference "Clinical Dietetics and Nutrition, by Antia F P (Author), Oxford publication." was replaced with "Rakshit, A., Meena, V. S., Fraceto, L. F., Parihar, M., Benavides-Mendonza, A., & Singh, H. B. (Eds.). (2024). *Bio-inoculants in Horticultural Crops: Advances in Bio-inoculant, Volume 3*. Elsevier." 3. The reference "Alpers. D. H., Stenson W. F. and Bier D. M., (2002). Manual of Nutritional Therapeutics, 4th edition, Lippincott Williams & Wilkins, Philadelphia, USA." was replaced with "Singh, S., Datta, R., Johri, P., & Trivedi, M. (Eds.). (2022). *Phytopharmaceuticals and biotechnology of herbal plants*. CRC Press." 4. The reference "F. Bakkali, S. Averbeck, D. Averbeck, M.

				Idaomar. (2008). Biological effects of essential oils– A review. Food and Chemical Toxicology 46: 446–475." was replaced with "Kommu, S., Thirumurugan, R., Madupoju, B. (Eds.) (2024). *Text book of Nutraceuticals and Functional Foods: Theory and Applications*. Notion Press." 5. The reference "R. Amorati, M. C. Foti, L. Valgimigli. (2013). Antioxidant Activity of Essential Oils. Journal of Agriculture and Food Chemistry. 61:10835−10847" was replaced with "Gurunathan, B., Sahadevan, R., Zakaria, Z.A. (2021) *Biofuels and Bioenergy: Opportunities and Challenges*. Elsevier." 7. The reference "A Sharma, D. S. Cannoo. (2016). Comparative evaluation of extraction solvents/techniques for antioxidant potential and phytochemical composition from roots of *Nepeta leucophylla* and quantification of polyphenolic constituents by RP-HPLC-DAD. Food Measure. Doi 10.1007/s11694- 016-9349-5" was deleted. 8. The reference "Sharma and D. S. Cannoo. (2013). Phytochemical composition of essential oils isolated from different species of genus NEPETA of Labiatae family: a review. Pharmacophore, 4 (6): 181-211." was deleted. 9. The reference "Sarikurkcu, B. Tepe, D. Daferera, M. Polissiou, Mansur Harmandar. (2008). Studies on the antioxidant activity of the

				essential oil and methanol extract of *Marrubium globosum* subsp. globosum (lamiaceae) by three different chemical assays. Bioresource Technology, 99: 4239–4246." was deleted. PRACTICAL 1. The reference "Fundamentals of Foods, Nutrition and Diet Therapy, (English, Mudambi Sumati R.), New Age International publication." was replaced with "Oladiji, Adenike Temidayo, et al. *Nutrition and Diet in Health*. 2024." 2. The reference "Clinical Dietetics and Nutrition, by Antia F P (Author), Oxford publication." was replaced with "Waste, F. P. (2025). *Emerging methods for oil extraction from food processing waste*. CRC Press: Boca Raton, FL, USA." 3. The reference "Alpers D. H., Stenson W. F. and Bier. D. M., (2002). Manual of Nutritional Therapeutics, 4th edition, Lippincott Williams & Wilkins, Philadelphia, USA." was replaced with Nayik, G. A., & Ansari, M. J. (Eds.). (2023). *Essential oils: extraction, characterization and applications*. Academic Press." 4. The reference "F. Bakkali, S. Averbeck, D. Averbeck, M. Idaomar. (2008). Biological effects of essential oils – A review. Food and Chemical Toxicology 46: 446–475." was replaced with "Al-Harrasi, A., Al-Rawahi, A., Al Hatmi, S. A., & Bhatia, S. (2025). *Medicinal and*

				Aromatic Plants of Oman: Phytochemistry and Ethno-Pharmacological Aspects, Volume 1. CRC Press."
Sem IV	Molecular Biology and BBTM-4061	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand the structure of DNA, experimental evidence supporting DNA as genetic material, and the mechanism of DNA replication in prokaryotes and eukaryotes. **CO2:** Explain the structure and functions of various RNAs, the transcription process in prokaryotes and eukaryotes, and post-transcriptional modifications. **CO3:** Describe the genetic code, the process of protein synthesis and post-translational modifications, and the action of translation inhibitors. **CO4:** Understand DNA recombination mechanisms, types and causes of mutations, and their significance and applications in genetics. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the molecular organization of DNA, experimental evidence establishing DNA as the

				genetic material, and the structural organization of genomes and chromosomes in prokaryotes, eukaryotes, organelles, and viruses. CO2: Analyze the mechanisms of DNA damage and the major DNA repair pathways involved in maintaining genome integrity and cellular stability. CO3: Evaluate the molecular mechanisms of genetic information flow by interpreting the processes of genetic coding, protein synthesis, post-translational modifications, and translational regulation. CO4: Assess the principles of genetic linkage, DNA recombination, and mutation, and appraise their significance in genome evolution, genetic diversity, and biotechnological applications. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Acquire skills in preparing stock solutions for molecular biology experiments. **CO2:** Demonstrate the ability to isolate genomic DNA from plant tissues using standard protocols. **CO3:** Set up agarose gel electrophoresis apparatus and prepare gels for DNA separation. **CO4:** Analyze DNA

				concentration and purity using spectrophotometric and fluorometric methods. **New Course outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Prepare laboratory reagents and stock solutions by following Good Laboratory Practices (GLP) and standard laboratory protocols. CO2: Isolate genomic DNA from human samples and RNA from plant tissues using standard molecular biology techniques. CO3: Estimate the concentration and purity of nucleic acids using fluorometric analysis and analyze the experimental data. CO4: Perform agarose gel preparation and electrophoresis for the separation and visualization of nucleic acids.
		Books recommended	No changes	THEORY 1.The reference "David P. Clark, Nanette J. Pazdernik, Michelle R. McGehee (2018), 3rd edition, Molecular Biology, Academic Cell" was replaced with "Clark, D. P., Pazdernik, N. J., McGehee, M. R., & Rader, B. A. (2025). *Biotechnology: The Technological Applications of Genetics and Genomics*. Elsevier" PRACTICAL

				1.The reference “Brown TA, Genomes, 3rd ed. Garland Science 2006” was replaced with “Brown, T. A. (2023). *Genomes 5*. CRC Press.”
Sem IV	Biochemical and Biophysical Techniques and BBTM-4062	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand the principles, types, and applications of centrifugation techniques. **CO2:** Explain the theory and principles of basic chromatographic methods. **CO3:** Illustrate the principles and applications of advanced chromatographic techniques. **CO4:** Understand the principles of spectroscopy. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the principles, instrumentation, and applications of centrifugation techniques, including sedimentation theory, centrifuge types, rotor selection, and factors influencing sedimentation. CO2: Analyze the principles

				and applications of chromatographic techniques for the separation, purification, and characterization of biomolecules. CO3: Evaluate the principles, instrumentation, and analytical applications of advanced chromatographic techniques. CO4: Assess the principles, instrumentation, and applications of spectroscopic techniques for qualitative and quantitative biomolecular analysis. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1**: Understand the concept of centrifugation. **CO2**: Perform separation of biomolecules using paper and thin layer chromatography techniques. **CO3**: Apply ion-exchange chromatography for effective separation and purification of proteins. **CO4**: Utilize affinity chromatography for specific protein separation based on molecular interactions. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Demonstrate the

				operation of different centrifugation techniques, including swing-out rotor, angle rotor, and differential centrifugation, for the separation of biological samples. CO2: Perform the separation of biomolecules using paper chromatography and thin-layer chromatography by following standard laboratory procedures. CO3: Analyze the separation and purification of proteins using ion-exchange and affinity chromatography based on their physicochemical properties. CO4: Interpret the experimental results obtained from centrifugation and chromatographic techniques for the qualitative analysis and purification of biomolecules.
		Books recommended	No changes	THEORY AND PRACTICAL 1.The reference "Upadhyay, A., Upadhyay, K. and Nath N. (2005) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India." was replaced with "Upadhyay, A., Upadhyay, K. and Nath N. (2022) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India." 2.The reference "Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England." was replaced with "Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England."

				3.The reference "Boye R (2006) Modern Experimental Biochemistry, Pearson Education, Asia, New Delhi." was deleted.
Sem IV	Ecology and Evolution and BBTM-4065	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** To explain ecological principles including ecosystem structure, species interactions, habitat, niche, and ecological succession. **CO2:** To analyze biodiversity, conservation strategies, and ecosystem functioning in terrestrial and aquatic environments. **CO3:** To understand theories of evolution, origin of life, natural selection, and mechanisms of speciation. **CO4:** To apply concepts of population genetics, molecular evolution, and phylogenetic relationships to study genetic variation and evolutionary processes. **New Course Outcomes (Theory):** After successful completion of this course, the learners will be able to: CO1: Explain the fundamental concepts of ecology, environmental components,

				habitat, niche, trophic interactions, nutrient cycling, and species interactions. CO2: Analyze ecological succession, ecosystem structure and function, energy flow, biogeochemical cycles, and biodiversity conservation strategies for sustainable ecosystem management. CO3: Interpret the principles of organic evolution, origin of life, natural selection, and speciation using classical and modern evolutionary theories. CO4: Apply the principles of population genetics, molecular evolution, phylogenetic reconstruction, and biogeography to explain genetic variation, evolutionary relationships, and species diversification. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Apply ecological techniques such as quadrat and species area-curve methods to study biodiversity and ecosystem parameters. **CO2:** Analyze water quality by estimating dissolved oxygen and total dissolved solids (TDS) in water samples. **CO3:** Differentiate between homologous and analogous structures and explain various types of mimicry in animals from an evolutionary perspective. **CO4:** Study fossils to understand the origin, evolution, and diversity of life forms through geological time.

		Books recommended	No changes	**New Course Outcomes (Practical):** After completion of this practical course, the learners will be to: CO1: Identify ecological sampling methods, homologous and analogous structures, mimicry, and fossils related to ecology and evolution. CO2: Explain the principles of quadrat analysis and water quality assessment using dissolved oxygen (DO) and total dissolved solids (TDS). CO3: Perform ecological sampling and water quality analysis using standard laboratory techniques. CO4: Analyze experimental observations and evolutionary evidence to interpret ecological patterns, adaptations, and evolutionary relationships. THEORY 1. The reference "Test & Evaluation: Life Sciences/ Biotechnology Pranav Kumar, Pathfinder Academy" was deleted. 2. The reference "Animal Behavior: Mechanisms, Ecology, Evolution Lee C Drickamer, McGraw-Hill Higher Education" was replaced with "Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill." 3. The reference "Global Philosophical and Ecological Concepts, Rudi Jansma, Motilal Banarsidass Publishers." was replaced with

				"Jansma, R. (2016). *Global philosophical and ecological concepts*. Motilal Banarsidass Publishers." 4. The reference "Organic Evolution: Evolutionary Biology. Veer Bala Rastogi, Medtech." was replaced with "Rastogi, V. B. (2022). *Organic evolution: Evolutionary Biology*. MedTech Science Press." 5. The reference "Games of Life: Explorations in Ecology, Evolution, and Behavior Karl Sigmund, Dover Publications." was replaced with "Sigmund, K. (2017). *Games of life: Explorations in ecology, evolution, and behavior*. Dover Publications." 6. The reference "Basic Ecology: Fundamentals of Ecology by Eugene P. Odum." was replaced with "Odum, E. P., and Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Cengage Learning India Private Limited." 7. The reference "Elements of Ecology by Smith and Smith." was replaced with "Smith, T. M., & Smith, R. L. (2015). *Elements of ecology*, Global Edition. Pearson Education." 8. The reference "The Theory of Evolution by John Maynard Smith." was replaced with "Maynard Smith, J. (1993). *The theory of evolution*. Cambridge University Press.". PRACTICAL 1. The reference "Test & Evaluation: Life Sciences / Biotechnology. Pranav Kumar, Pathfinder Academy" was deleted. 2. The reference "Animal

				Behavior: Mechanisms, Ecology, Evolution. Lee C Drickamer, McGraw-Hill Higher Education." was replaced with "Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill." 3. The reference "Global Philosophical and Ecological Concepts." was replaced with "Kardong, K.V. (2018). *Vertebrates: Comparative anatomy, function, evolution* (8th ed.). McGraw-Hill Education."
Sem IV	Status report of Industrial/ Institutional Visit BBTF-2063	-	It has been discontinued	-
Sem V	rDNA Technology-I BBTM-5061	Course Outcomes	No Changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Describe the role of DNA modifying enzymes in genetic engineering. **CO2:** Explain various cloning vectors and selection methods in *E. coli*. **CO3:** Apply blotting and transformation techniques in molecular biology. **CO4:** Compare labeling methods and detection systems for DNA/RNA probes. **New Course Outcomes (Theory):**

				Upon successful completion of this course, the learners will be able to: CO1: Explain the properties, mechanisms of action, and applications of DNA-modifying enzymes employed in recombinant DNA technology and molecular cloning. CO2: Analyze the characteristics, selection strategies, and applications of cloning vectors used for gene cloning and recombinant DNA technology in *Escherichia coli*. CO3: Evaluate the principles and applications of nucleic acid hybridization, blotting techniques, and gene transfer methods used in molecular biology and genetic engineering. CO4: Assess the principles, methodologies, and detection strategies of radioactive and non-radioactive nucleic acid labelling for molecular diagnostics and biotechnology research. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Culture *E. coli* and isolate high-quality genomic DNA. **CO2**: Quantify and assess the purity of DNA using spectrophotometry **CO3:** Perform agarose gel electrophoresis and

		Course Content	No Changes	restriction enzyme digestion. **CO4:** Demonstrate the Southern blotting technique for DNA analysis. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Explain the principles underlying bacterial culture, genomic DNA isolation, restriction digestion, agarose gel electrophoresis, and Southern blotting. CO2: Perform bacterial culture, genomic DNA isolation, spectrophotometric quantification, and agarose gel electrophoresis using standard molecular biology protocols. CO3: Analyze DNA quality, restriction enzyme digestion patterns, and electrophoretic profiles to assess the integrity and characteristics of nucleic acid samples. CO4: Evaluate the results of restriction digestion and Southern blotting for the detection and characterization of specific DNA sequences in molecular biology investigations. It was decided to delete following Practicals: 1. Growing of *E. coli* bacterial culture. 2. Agarose Gel Electrophoresis.

		Books recommended	No changes	THEORY 1. The reference "Principles of Gene Manipulation and Genomics Kindle Edition,2013, by Sandy B. Primrose, Richard Twyman, Wiley-Blackwell." was replaced with "Primrose, S. B., & Twyman, R. M. (2014). *Principles of gene manipulation and genomics*. Wiley-Blackwell" 2.The reference "Gene Cloning and DNA Analysis: An Introduction, 2010, by T. A Brown, Blackwell Publishing." was replaced with "Brown, T. A. (2025). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons. PRACTICAL 1.The reference "Brown TA, Genomes, 3rd ed. Garland Science 2006." was replaced with "Brown, T. A. (2023). *Genomes 5*. CRC Press."
Sem V	Animal Biotechnology-I BBTM-5062	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Learn about the different aseptic techniques used in Animal Tissue Culture (ATC). **CO2:** Know about the different sources, types and eradication of contamination. **CO3:** Study the different

				culture media and reagents used in ATC. **CO4:** Study primary culture and establishment of cell line culture **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the principles, laboratory design, aseptic techniques, cryopreservation methods, and characteristics of normal and transformed cells in animal tissue culture. CO2: Analyze the sources, types, prevention, and control of contamination, laboratory biosafety practices, and cleanroom facilities required for safe and effective animal tissue culture. CO3: Evaluate the composition, physicochemical properties, and applications of culture media and reagents, including serum-supplemented, serum-free, and conditioned media, for the cultivation of animal cells. CO4: Assess the methodologies for primary and established cell culture, cell isolation, cultivation, growth kinetics, and cell proliferation analysis for applications in animal tissue culture research. **Old Course Outcomes (Practical):**

		Course		After passing this course the student will be able to: **CO1:** Identify sources of contamination and apply decontamination measures effectively. **CO2**: Prepare Hanks Balanced Salt Solution and Minimal Essential Growth Medium. **CO3:** Separate serum from blood samples. **CO4:** Isolate and culture macrophages from blood samples. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Explain the sources of contamination and the decontamination measures essential for maintaining aseptic conditions in an animal tissue culture laboratory. CO2: Prepare balanced salt solutions, culture media, and serum by following standard protocols. CO3: Perform the isolation and culture of lymphocytes from peripheral blood using aseptic techniques and appropriate cell culture procedures. CO4: Analyze the quality of prepared media, serum, and cultured cells by interpreting laboratory observations and assessing their suitability for animal tissue culture applications. It was decided to revise the

		Content Books recommended	No changes No changes	Practical "Isolation of lymphocytes from blood for culturing" to "Isolation and Culture of Lymphocytes from Peripheral Blood" THEORY 1.The reference "Freshney, R. I (2015) Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. 7th Edition, John Wiley and Sons, New Delhi." was replaced with "Freshney, R. I. and Davis A. C. (2021). *Culture of animal cells: A manual of basic technique and specialized applications* (8th ed.). John Wiley & Sons." 2.The reference "Simons, J. Victor Small, Tony Hunter and David Shotton. Academic Press. USA, 2005" was deleted. 3. The reference "Basic Cell Culture: A Practical Approach, 2nd ed. Edited by John Davis Oxford University Press, Oxford and New York. 2002" was replaced with "Davis, J. M. (2004). Basic cell culture: a practical approach. In *Basic cell culture: a practical approach*." PRACTICAL 1. The reference "Freshney, R. I (2015) Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. 7th Edition, John Wiley and Sons, New Delhi." was replaced with "Freshney, R. I. and Davis A. C. (2021). *Culture of animal*

				cells: A manual of basic technique and specialized applications (8th ed.). John Wiley & Sons." 2. The reference "Simons, J. Victor Small, Tony Hunter and David Shotton. Academic Press. USA, 2005" was deleted.
Sem V	Bioprocess Engineering-I and BBTM-5063	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Understand the fundamental principles of chemical engineering and biochemical engineering. **CO2**: Understand microbial growth kinetics **CO3**: Understand the feedback system and know the effect of physico-chemical parameters on the product synthesis. **CO4:** To study about sterilization of fermenter. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the fundamental principles of biochemical engineering, including heat and mass transfer, diffusion phenomena, oxygen transfer mechanisms, and microbial

				culture systems used in bioprocesses. CO2: Analyze microbial growth kinetics and evaluate the influence of kinetic parameters, substrate utilization, product formation, and biomass productivity on bioprocess performance. CO3: Evaluate the regulatory mechanisms governing microbial metabolism and product formation, including feedback regulation and the effects of environmental factors on bioprocess efficiency. CO4: Assess the principles, methods, and process design of sterilization systems employed in bioprocessing for ensuring aseptic operation and product quality. Old Course Outcomes (Practical): After passing this course the student will be able to: **CO1**: Study growth curve of microorganisms while growing them in different media under optimal conditions. **CO2**: Determine the specific growth rate and generation time of a bacterium. **CO3**: Study the effect of physico-chemical parameters on microbial growth **CO4**: Perform assay of enzyme produced using fermentation. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the

				learners will be able to: CO1: Explain the principles of microbial growth, fermentation processes, and sterilization techniques employed in bioprocess engineering. CO2: Perform microbial cultivation, determine growth kinetics, and evaluate specific growth rate and generation time using standard fermentation techniques. CO3: Analyze the influence of process parameters, including temperature, pH, and aeration, on microbial growth and bioprocess performance. CO4: Evaluate enzyme production and activity in bioreactor or shaking flask systems and interpret the experimental outcomes for process optimization.
		Books recommended	No changes	THEORY 1. The reference "Stanbury, P. F., Whitaker, A. and Hall, S.J. (2001), Principles of Fermentation Technology 2nd ed., Pergamon Press, Oxford." was replaced with "Stanbury, P. F., Whitaker, A., & Hall, S. J. (2026). *Principles of fermentation technology* (3rd ed.). Elsevier Science." 2. The reference "Young, M. Y. (2000), Comprehensive Biotechnology (Vol. 1-4), Pergamon Press, Oxford." was replaced with "Moo-Young, M. (2019). *Comprehensive biotechnology*. Elsevier. 3. The reference "Young, M.

				Y. (1996), Environmental Biotechnology, Principles & Applications, Kluwer Academic Publications, New Delhi." was replaced with "Moo-Young, M., Anderson, W. A., & Chakrabarty, A. M. (Eds.). (2014). *Environmental biotechnology: principles and applications*. Springer Science & Business Media." 4. The reference "Bailary, J. E. and Ollis, D.F. (1986), Biochemical Engineering Fundamentals, McGraw Hills, N.Y." was replaced with "Bailey, J. E., & Ollis, D. F. (2018). *Biochemical engineering fundamentals*. McGraw-Hill." PRACTICAL 1. The reference "Cappuccino J.G., Sherman N. (2007). Microbiology: A laboratory (Pearson Benjamin Cummings)." was replaced with "Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10th Edition, Harlow, Addition-Wesley."
Sem V	Environmental Biotechnology and BBTM-5064	- Course Outcomes	- -	A new course, "Environmental Biotechnology" (Course Code: BBTM-6064), was introduced. **Old Course Outcomes (Theory):** After passing this course the student will be able to: CO1: Understand environmental pollution, wastewater treatment, and pollution control technologies.

				CO2: Acquire knowledge of biomass, biofuels, and their applications. CO3: Understand biological nitrogen fixation and biofertilizers. CO4: Gain knowledge of bioremediation and biodegradation of environmental pollutants. **New Course Outcomes (Theory):** Upon successful completion of this course, the learners will be able to: CO1: Explain the causes and impacts of environmental pollution and the principles of biotechnological approaches employed for pollution monitoring, wastewater treatment, solid waste management, and environmental protection. CO2: Analyze the sources, production technologies, and applications of biomass and biofuels, and examine their potential for sustainable energy generation and environmental sustainability. CO3: Evaluate the molecular mechanisms of biological nitrogen fixation and the role of biofertilizers in enhancing agricultural productivity and promoting sustainable farming practices. CO4: Assess the applications of bioremediation technologies and microbial processes for the remediation of environmental pollutants and the development of sustainable environmental management strategies.

				Old Course Outcomes (Practical): After passing this course the student will be able to: CO1: Perform analysis of water quality and wastewater pollution parameters. CO2: Isolate and cultivate environmentally important microorganisms. CO3: Understand vermicomposting and biofertilizer production techniques. CO4: Demonstrate bioremediation of environmental pollutants using microorganisms. **New Course Outcomes (Practical):** Upon successful completion of this practical course, the learners will be able to: CO1: Explain the principles and significance of environmental quality assessment, biofertilizer production, vermicomposting, and bioremediation in sustainable environmental management. CO2: Perform physicochemical and microbiological analyses of environmental samples, including drinking water quality assessment, determination of BOD and COD, and isolation and cultivation of environmentally significant microorganisms. CO3: Analyze the efficiency of cellulolytic microorganisms, *Rhizobium*, vermicomposting, and fungal strains in waste degradation,

		Books recommended	-	biofertilizer production, and dye bioremediation. CO4: Evaluate experimental findings to assess the effectiveness of biotechnological approaches for pollution control, waste management, and environmental sustainability. THEORY 1. The reference “Manahan, S. E. (2000), Environmental Science and Technology, Lewis Publishers, New York.” was replaced with “Manahan, S. E. (2022). *Environmental chemistry*. CRC press.” 2. The reference “Anderson, D. & Conning, D. M. (1984). Experimental Toxicology, Royal Society of Chemistry.” was replaced with “Anderson, D., & Conning, D. M. (1993). *Experimental toxicology*. Royal Society of Chemistry.” 3. The reference “David, T. G. (1984). Microbial Degradation of Organic Compounds, Marcel Dekkar Inc., New York.” was replaced with “Young, L. Y., & Cerniglia, C. E. (Eds.). (1995). *Microbial transformation and degradation of toxic organic chemicals* (pp. xii+-654)” 4. The reference “Omenn, G. E. (1987). Environmental Biotechnology, Plenum Press, New York.” was replaced with “Omenn, G. S. (2013). *Environmental biotechnology: reducing risks from environmental chemicals through biotechnology*. Springer Science & Business Media.”

				PRACTICAL 1. The reference "Anderson, D. & Conning, D. M. (1984). Experimental Toxicology, Royal Society of Chemistry." was replaced with "Anderson, D., & Conning, D. M. (1993). *Experimental toxicology*. Royal Society of Chemistry." 2. The reference "David, T. G. (1984). Microbial Degradation of Organic Compounds, Marcel Dekkar Inc., New York." was replaced with "Young, L. Y., & Cerniglia, C. E. (Eds.). (1995). *Microbial transformation and degradation of toxic organic chemicals* (pp. xii+-654)."
Sem V	Internship BBTI-5066	Course outcomes	-	All the Course Outcomes (CO1–CO4) were modified. **Old Course Outcomes:** After passing this course the student will be able to: CO1: Apply theoretical knowledge in real-life professional and community settings through experiential learning. CO2: Develop practical skills, communication abilities, and professional ethics while working with industries and organizations. CO3: Understand workplace culture, teamwork, and problem-solving approaches in different professional environments. CO4: Prepare and present internship/community outreach reports effectively based on their field experiences.

				New Course Outcomes: After passing this course the student will be able to: CO1: Apply theoretical knowledge in real-life professional and community settings through experiential learning. CO2: Develop practical skills, communication abilities, and professional ethics while working with industries and organizations. CO3: Understand workplace culture, teamwork, and problem-solving approaches in different professional environments. CO4: Prepare and present internship/community outreach reports effectively based on their field experiences.
Sem VI	Fundamentals of Bioinformatics and BBTM-6061	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. Old Course Outcomes (Theory): After passing this course the student will be able to: **CO1:** understand the basic principles and concepts of computer and data storage devices. **CO2:** understand the basic principles of bioinformatics and sequence alignment. **CO3:** know about scoring matrices and database

				searching **CO4:** know about primary and secondary databases. **NEW COURSE OUTCOMES (THEORY):** After successful completion of this course, the learners will be able to: CO1: Explain the fundamental concepts of computers, computer organization, hardware, software, storage devices, and input/output devices and their relevance in bioinformatics. CO2: Apply the principles of bioinformatics, including pairwise sequence alignment algorithms, scoring matrices (PAM and BLOSUM), and multiple sequence alignment methods for biological sequence analysis. CO3: Analyze biological sequence data using BLAST and interpret sequence alignment results for comparative analysis of nucleotide and protein sequences. CO4: Utilize major biological databases and bioinformatics resources, for retrieval, annotation, and interpretation of biological information. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Use of basic computer features.

				CO2: Extraction of data from bioinformatics software and tools. **CO3:** Sequence alignment using bioinformatics tools. **CO4:** Predication of protein functions. **New Course Outcomes (Practical):** After successful completion of this course, the learners will be able to: CO1: Explain the applications of MS Office tools, biological databases, and standard biological sequence formats used in bioinformatics. CO2: Retrieve biological information from online databases, including NCBI, EMBL, UniProt, and PubMed, using appropriate search strategies. CO3: Perform biological sequence analysis using BLAST, Clustal Omega, and standard sequence formats (FASTA and GenBank). CO4: Analyze protein sequences to identify conserved domains and functional motifs using PFAM and PROSITE.
		Books recommended	No changes	THEORY AND PRACTICAL 1. The reference "Sinha P. K. (2001). Fundamental of Computers. BPB Publication, New Delhi" was replaced with "Pradeep, K., & Priti, S. (2004). Computer Fundamentals. BPB

				Publications." 2. The reference "Baxevais B. F. and Quellette F. (2004). Bioinformatics a Practical Guide to the Analysis of Genes and Proteins. Wiley-Interscience" was replaced with "Baxevanis A. D. and Ouellette B.F.F. (2011). Bioinformatics a Practical Guide to the Analysis of Genes and Proteins. (3rd Edition) Wiley-Interscience"
Sem VI	Plant biotechnology-I and BBTM-6062	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course outcomes (Theory):** After passing this course the student will be able to: **CO1:** Explain totipotency, differentiation, and tissue culture lab organization and sterilization techniques. **CO2:** Describe culture media components and functions of major plant growth regulators. **CO3:** Demonstrate organogenesis, somatic embryogenesis, and micropropagation techniques. **CO4:** Understand haploid/triploid production, embryo rescue, and somaclonal variation. **New Course Outcomes (Theory):** After successful completion of this course, the learners will be able to:

				CO1: Describe the fundamental concepts of plant tissue culture, cellular totipotency, tissue competency, laboratory organization, and sterilization techniques. CO2: Explain the composition of culture media and the roles of plant growth regulators in the growth and development of plant tissues under in vitro conditions. CO3: Apply the principles of organogenesis, somatic embryogenesis, micropropagation, and acclimatization for in vitro plant regeneration and multiplication. CO4: Analyze the applications of haploid and triploid production, embryo, ovule and ovary culture, and somaclonal variation in plant improvement and crop biotechnology. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Get acquainted with functions and operations of PTC lab and various instruments used in plant tissue culture. **CO2:** Learn sterilization process required in plant tissue culture. **CO3:** Prepare media to be used in plant tissue culture. **CO4:** Select, prepare,

				sterilize and inoculate explant for culture initiation. **New Course Outcomes (Practical):** After successful completion of this practical course, the learners will be able to: CO1: Identify the laboratory infrastructure, essential instruments, culture vessels, and sterilization methods used in plant tissue culture. CO2: Explain the principles of laboratory organization, aseptic techniques, culture media preparation, and sterilization procedures employed in plant tissue culture. CO3: Perform the preparation of stock solutions, Murashige and Skoog (MS) medium, sterilization of culture materials, and aseptic inoculation of explants for in vitro culture establishment. CO4: Analyze the suitability of explants, culture media, and sterilization procedures for the successful establishment of contamination-free plant tissue cultures.
Sem VI	rDNA Technology-II and BBTM-6063	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** Explain different cloning and expression

				vectors used in molecular biology. **CO2:** Describe genomic and cDNA cloning techniques along with linker and adapter strategies. **CO3:** Understand the principles and applications of PCR and microarray technologies. **CO4:** Analyze DNA sequencing methods and apply site-directed mutagenesis techniques. **New Course Outcomes (Theory):** After successful completion of this course, the learners will be able to: CO1: Describe the structure, characteristics, and applications of cloning and expression vectors used in recombinant DNA technology. CO2: Explain the principles and methodologies of genomic cloning, cDNA cloning, PCR, microarray technology, and DNA sequencing. CO3: Apply the concepts of recombinant DNA technology to the selection of appropriate cloning strategies, vectors, and molecular techniques for gene manipulation and analysis. CO4: Analyze gene modification approaches for their applications in biotechnology and genetic

				engineering. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Isolate and analyze plasmid DNA. **CO2:** Perform restriction digestion using different enzymes. **CO3:** Prepare competent cells and carry out transformation using the $CaCl_2$ method. **CO4:** Perform Polymerase Chain Reaction (PCR). **New Course Outcomes (Practical):** After successful completion of this practical course, the learners will be able to: CO1: Identify the principles and laboratory requirements for plasmid isolation, ligation, transformation, and PCR techniques. CO2: Explain the principles underlying plasmid isolation, preparation of competent cells, transformation, and polymerase chain reaction (PCR). CO3: Perform plasmid DNA isolation, ligation, competent cell preparation, bacterial transformation, and PCR using standard molecular biology protocols. CO4: Analyze the outcomes

		Books recommended	No changes	of transformation and PCR experiments to verify successful gene transfer and amplification. THEORY and PRACTICAL 1. The reference "Principles of Gene Manipulation and Genomics Kindle Edition,2013, by Sandy B. Primrose, Richard Twyman, Wiley-Blackwell" was replaced with "Primrose, S. B., & Twyman, R. M. (2014). *Principles of gene manipulation and genomics*. Wiley-Blackwell" 2. The reference "Gene Cloning and DNA Analysis: An Introduction, 2010, by T. A Brown, Blackwell Publishing." was replaced with "Brown, T. A. (2025). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons."
Sem VI	Ecology and Evolution and BBTM-6064	Course Outcomes	-	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After passing this course the student will be able to: **CO1:** To explain ecological principles including ecosystem structure, species interactions, habitat, niche, and ecological succession. **CO2:** To analyze biodiversity, conservation strategies, and ecosystem functioning in terrestrial and aquatic environments.

				CO3: To understand theories of evolution, origin of life, natural selection, and mechanisms of speciation. **CO4:** To apply concepts of population genetics, molecular evolution, and phylogenetic relationships to study genetic variation and evolutionary processes. **New Course Outcomes (Theory):** After successful completion of this course, the learners will be able to: CO1: Explain the fundamental concepts of ecology, environmental components, habitat, niche, trophic interactions, nutrient cycling, and species interactions. CO2: Analyze ecological succession, ecosystem structure and function, energy flow, biogeochemical cycles, and biodiversity conservation strategies for sustainable ecosystem management. CO3: Interpret the principles of organic evolution, origin of life, natural selection, and speciation using classical and modern evolutionary theories. CO4: Apply the principles of population genetics, molecular evolution, phylogenetic reconstruction, and biogeography to explain genetic variation, evolutionary relationships, and species diversification. **Old Course Outcomes (Practical):** After passing this course the student will be able to: **CO1:** Apply ecological

				techniques such as quadrat and species area-curve methods to study biodiversity and ecosystem parameters. **CO2:** Analyze water quality by estimating dissolved oxygen and total dissolved solids (TDS) in water samples. **CO3:** Differentiate between homologous and analogous structures and explain various types of mimicry in animals from an evolutionary perspective. **CO4:** Study fossils to understand the origin, evolution, and diversity of life forms through geological time. **New Course Outcomes (Practical):** After completion of this practical course, the learners will be to: CO1: Identify ecological sampling methods, homologous and analogous structures, mimicry, and fossils related to ecology and evolution. CO2: Explain the principles of quadrat analysis and water quality assessment using dissolved oxygen (DO) and total dissolved solids (TDS). CO3: Perform ecological sampling and water quality analysis using standard laboratory techniques. CO4: Analyze experimental observations and evolutionary evidence to interpret ecological patterns, adaptations, and evolutionary relationships. THEORY **Books Recommended:**

		Books recommended	-	1. The reference "Test & Evaluation: Life Sciences/ Biotechnology Pranav Kumar, Pathfinder Academy" was deleted. 2. The reference "Animal Behavior: Mechanisms, Ecology, Evolution Lee C Drickamer, McGraw-Hill Higher Education" was replaced with "Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill." 3. The reference "Global Philosophical and Ecological Concepts, Rudi Jansma, Motilal Banarsidass Publishers." was replaced with "Jansma, R. (2016). *Global philosophical and ecological concepts*. Motilal Banarsidass Publishers." 4. The reference "Organic Evolution: Evolutionary Biology. Veer Bala Rastogi, Medtech." was replaced with "Rastogi, V. B. (2022). *Organic evolution: Evolutionary Biology*. MedTech Science Press." 5. The reference "Games of Life: Explorations in Ecology, Evolution, and Behavior Karl Sigmund, Dover Publications." was replaced with "Sigmund, K. (2017). *Games of life: Explorations in ecology, evolution, and behavior*. Dover Publications." 6. The reference "Basic Ecology: Fundamentals of Ecology by Eugene P. Odum." was replaced with "Odum, E. P., and Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Cengage Learning India

				Private Limited." 7. The reference "Elements of Ecology by Smith and Smith." was replaced with "Smith, T. M., & Smith, R. L. (2015). *Elements of ecology*, Global Edition. Pearson Education." 8. The reference "The Theory of Evolution by John Maynard Smith." was replaced with "Maynard Smith, J. (1993). *The theory of evolution*. Cambridge University Press.". PRACTICAL 1. The reference "Test & Evaluation: Life Sciences / Biotechnology. Pranav Kumar, Pathfinder Academy" was deleted. 2. The reference "Animal Behavior: Mechanisms, Ecology, Evolution. Lee C Drickamer, McGraw-Hill Higher Education." was replaced with "Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill." 3. The reference "Global Philosophical and Ecological Concepts." was replaced with "Kardong, K.V. (2018). *Vertebrates: Comparative anatomy, function, evolution* (8th ed.). McGraw-Hill Education."
Sem VI	Skill Development in Biotechnology-II BBTM-6060	Course Outcomes	No changes	All the Course Outcomes (CO1–CO4) of both theory and practical courses were modified. **Old Course Outcomes (Theory):** After successful completion of the course, students will be able to:

				CO1: Demonstrate knowledge of phlebotomy techniques, blood sample collection, anticoagulants, and hematological investigations. CO2: Understand the principles and clinical applications of major diagnostic techniques. CO3: Explain the concepts of cancer biology, tumor markers, vector-borne diseases, and molecular diagnostic methods. CO4: Apply the principles of biomedical waste management, infection control, and safe disposal methods for infectious and non-infectious biomedical waste. **New Course Outcomes (Theory):** After successful completion of this course, learners will be able to: CO1: Explain the principles of phlebotomy, hematological investigations, and diagnostic techniques used in clinical laboratory practice. CO2: Apply appropriate laboratory and diagnostic procedures for the analysis of hematological parameters and the diagnosis of human diseases. CO3: Analyze the role of tumor markers, molecular diagnostic techniques, and PCR-based methods in the detection and diagnosis of

				infectious diseases and cancer. CO4: Evaluate biomedical waste management practices and biorisk management strategies for infection prevention, laboratory safety, and regulatory compliance. **Old Course Outcomes (Practical):** After successful completion of the practical course, students will be able to: 1. Evaluate the antioxidant potential and antimicrobial activity of essential oils using standard biochemical techniques. 2. Perform and interpret metabolic assessments. 3. Analyze biochemical parameters for assessment of health status. 4. Estimate blood glucose levels and understand their clinical significance in disease diagnosis and monitoring. **New Course Outcomes (Practical):** After successful completion of this practical course, learners will be able to: CO1: Explain the principles of blood collection, peripheral blood smear preparation, and hematological investigations used in clinical diagnostics. CO2: Perform hematological procedures using standard laboratory techniques. CO3: Analyze clinical diagnostic reports for disease interpretation. CO4: Evaluate biomedical waste segregation and

		Course Content	No changes	disposal practices in accordance with Biomedical Waste Management Guidelines to ensure laboratory safety and infection control. It was decided to: • Expand the scope from biomedical waste management to include sources, transmission, investigation, prevention, and control of biomedical infections. • Introduce the topics such as risk assessment and risk mitigation. • Add decontamination methods (physical and chemical), along with sterilization and disinfection practices. • Update waste management to include segregation and disposal of non-infectious waste, infectious sharp waste, and infectious non-sharp waste. • Include handling and disposal of ethidium bromide (EtBr) waste. • Add biological spill management and Biomedical Waste Management Guidelines. • Removed the non-standard terms "causative methods" and "transmission methods", replacing them with the scientifically appropriate terminology "sources and transmission of biomedical infections."

				Following modifications were suggested • The practical on "Investigating the Antioxidant Potential of Oils by DPPH Assay" was replaced with "Collection of Blood Sample and Preparation of Peripheral Blood Smear." • The practical on "Antimicrobial Activity of Essential Oils" was replaced with "Determination of Bleeding Time and Clotting Time." • The practical on "Estimation of Basal Metabolic Rate (BMR)" was replaced with "Determination of ESR and Packed Cell Volume (PCV)." • The practical on "Estimation of Lipid Profile" was replaced with "Interpretation of Diagnostic Reports (CBC, X-ray, ECG, CT/MRI Images)." • The practical on "Estimation of Blood Glucose" was replaced with "Segregation and Disposal of Biomedical Waste according to Biomedical Waste Management Guidelines." THEORY AND PRACTICAL 1. The reference “Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2nd edition Bhalani Publishing House, Mumbai, India.” was replaced with “McPherson, R. A., & Pincus, M. R. (2021). *Henry's clinical diagnosis and management by laboratory methods E-book*. Elsevier Health Sciences.” 2. The reference “Martin R.

				Howard & Peter J Hamilton (2013). Text Book of Hematology, 4 th edition, Churchill Livingstone." was replaced with "Kumar, V., Abbas, A. K., & Aster, J. C. (2024). Robbins & Cotran Pathologic Basis of Disease. 11th, editor." 3. The reference "Robert A. Weinberg (2023). The Biology of Cancer, 3rd Edition. W W Norton & Co Inc." was replaced with "World Health Organization. (2025). *Water, sanitation, hygiene, environmental cleaning and waste management in health care facilities: 2023 data update and special focus on primary health care*. World Health Organization." 4. The reference "Lauren Pecorino (2012). Molecular Biology of Cancer, 3rd Edition, Oxford." was replaced with "Turgeon, M. L. (2005). *Clinical hematology: theory and procedures*. Lippincott Williams & Wilkins." 5. The reference "Singh A., Bachheti P. (2017). Hematology & Blood Banking, 2nd Edition, Vayu Edition of India." was replaced with "Tille, P. M. (2013). *Bailey & Scott's Diagnostic Microbiology-E-Book: Bailey & Scott's Diagnostic Microbiology-E-Book*. Elsevier Health Sciences."

Sem VII	Industrial Biotechnology-I Course Code: BBTM-1060	Course Code	No changes	The course "Industrial Biotechnology-I" (BBTM-1060) was shifted to Semester VII, and its course code was changed to BBTM-7060 for the Batch 2026–30.

The house approved the Bio 11: 2026:

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Bio-Technology) Three Year Degree Programme

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme

Session: 2026-27

Semester-III

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-3061	Gene Structure and Function	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3332	Biomathematics and Biostatistics	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3063	Immunology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3484	Zoology	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTI-3065	Internship	CCFR	0-0-4	0-0-2	2	-	50	-	50
BBTM-3060	Skill Development in Biotechnology	SEC	3-0-2	3-0-1	4	50	20	30	100
VACE 3221	Environmental Studies (Compulsory)	VAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					24				

DSC: **Discipline Specific Course**
MDC: Multidisciplinary Course
CCFR: Co-curricular Field Work and Report Writing
SEC: Skill Enhancement Course
VAC: Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Session: 2026-27
Semester-IV

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-4061	Molecular Biology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4062	Biochemical and Biophysical Techniques	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4083	Biochemistry-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4084	Chemistry	Minor	3-0-2	3-0-1	4	50	20	30	100
BBTM-4065	Ecology and Evolution	AEC	3-0-2	3-0-1	4	50	20	30	100
VACP-4511	*Personality Development and Gender Sensitization	VAAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					22				

*__Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided__.

DSC: **Discipline Specific Course**
AEC: Ability Enhancement Course
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Session: 2026-27
Semester-V

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-5061	rDNA Technology-I	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-5062	Animal Biotechnology-I	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-5063	Bioprocess Engineering-I	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-5064	Environmental Biotechnology	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-5085	Chemistry III	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTI-5066	Internship	CCFR	0-0-4	0-0-2	2	-	50	-	50
VACJ-5551	*Job readiness	VAAC	2-0-0	2-0-0	2	35	-	15	50
				Total Credits	28				

***Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided**.

C: Compulsory Course
MDC: Multidisciplinary Course
CCFR: Co-curricular Field Work and Report Writing
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Session: 2026-27
Semester-VI

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-6061	Fundamental of Bioinformatics	C	3-0-2	3-0-1	4	50	20	30	100
BBTM-6062	Plant Biotechnology-I	C	4-0-0	4-0-1	5	50	20	30	100
BBTM-6063	rDNA Technology-II	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-6064	Ecology and Evolution	C	4-0-2	4-0-1	5	50	20	30	100
BBTM-6485	Zoology-II	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTM-6060	Skill Development in Bio-Technology-II	SEC	3-0-2	3-0-1	4	50	20	30	100
VACH-6401	Human Rights and Constitutional Duties	VAC	2-0-0	2-0-0	2	35	-	15	50
				Total Credits	29				

C: Compulsory Course
MDC: Multidisciplinary Courses
SEC: Skill Enhancement Course
VAC: Value Added Course

The BOS members recommended that the syllabus for the entire B.Sc. Bio-Technology Batch (2026–2030), covering Semesters I to VIII under the Credit Based Continuous Evaluation Grading System (CBCEGS) with 30% internal assessment, be framed. The approved schemes for the B.Sc. Bio-Technology Batch (2026–2030) is as follows:

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Bio-Technology) Three Year Degree Programme

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme

Batch: 2026-30

Semester-I

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTL -1421 BBTL -1031 BBTL -1431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	4-0-0	4	70	-	30	100
BBTM-1102	Communication Skills in English-I	AEC	3-0-2	3-0-1	4	50	20	30	100
BBTM-1083	Biochemistry-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM - 1064	Genetics	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-1345	General Microbiology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
USEP-0001	Entrepreneurship Mindset-I	SEC	0-0-4	0-0-2	2	-	50	-	50
VACF-1491	*Foundation Course	VAAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					24				

[1] Special Course in lieu of Punjabi (Compulsory)

[2] Special Course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab

***Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided**.

C: Compulsory Course
AEC: Ability Enhancement Course
DSC: **Discipline Specific Course**
SEC: Skill Enhancement Course
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Bio-Technology) Three Year Degree Programme

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme

Batch: 2026-30

Semester-II

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTL -2421 BBTL -2031 BBTL -2431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	4-0-0	4	70	-	30	100
BBTM-2102	Communication Skills in English-II	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2483	Cell Biology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2084	Biochemistry-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2345	General Microbiology-II	DSC	3-0-2	3-0-1	4	50	20	30	100
USEP-0002	Entrepreneurship Mindset-II	SEC	0-0-4	0-0-2	2	-	50	-	50
VACD-2161	Drug Abuse and Ethical Education	VAC	4-0-0	4-0-0	4	70	-	30	100
	Total Credits				26				

[1] Special Course in lieu of Punjabi (Compulsory)

[2] Special Course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab

C: Compulsory Course
MDC: Multidisciplinary Course
DSC: Discipline Specific Course
SEC: Skill Enhancement Course
VAC: Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Bio-Technology) Three Year Degree Programme

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme

Batch: 2026-30

Semester-III

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-3061	Gene Structure and Function	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3332	Biomathematics and Biostatistics	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3063	Fundamentals of Biotechnology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-3084	Biochemistry III	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTI-3065	Internship	CCFR	0-0-4	0-0-2	2	-	50	-	50
BBTM-3060	Skill Development in Biotechnology	SEC	3-0-2	3-0-1	4	50	20	30	100
VACE 3221	Environmental Studies	VAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					24				

DSC: **Discipline Specific Course**
MDC: Multidisciplinary Course
CCFR: Co-curricular Field Work and Report Writing
SEC: Skill Enhancement Course
VAC: Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Batch: 2026-30
Semester-IV

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-4061	Molecular Biology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4062	Biochemical and Biophysical Techniques	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4083	Biochemistry-IV	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4084	Chemistry	Minor	3-0-2	3-0-1	4	50	20	30	100
BBTM-4485	Zoology	AEC	3-0-2	3-0-1	4	50	20	30	100
VACP-4511	*Personality Development and Gender Sensitization	VAAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					22				

***Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided**.

DSC: **Discipline Specific Course**
AEC: Ability Enhancement Course
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Batch: 2026-30
Semester-V

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-5061	rDNA Technology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-5062	Animal Biotechnology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-5063	Bioprocess Engineering-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-5074	Botany-I	MDC	3-0-2	3-0-1	4	50	20	30	20
BBTI-5065	Internship	CCFR	0-0-4	0-0-2	2	-	50	-	50
BBTS-5066	Term paper	DSC	0-0-2	0-0-1	1	50	20	30	100
BBTM-5060	Food and Nutrition	SEC	3-0-2	3-0-1	4	50	20	30	100
VACJ-5551	*Job Readiness	VAAC	2-0-0	2-0-0	2	35	-	15	50
				Total Credits	25				

***Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided**.

DSC: Discipline Specific Course
MDC: Multidisciplinary course
CCFR: Co-curricular Field Work and Report Writing
SEC: Skill Enhancement Course
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Bio-Technology) Three Year Degree Programme

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme

Batch: 2026-30

Semester-VI

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-6061	rDNA Technology-II	DSC	3-0-2	3-0-1	**4**	50	20	30	100
BBTM-6062	Animal Biotechnology-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-6063	Bioprocess Engineering-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-6064	Fundamental of Bioinformatics	Minor	3-0-2	3-0-1	4	50	20	30	100
BBTM-6075	Botany-II	AEC	3-0-2	3-0-1	4	50	20	30	100
VACH-6401	Human Rights and Constitutional Duties	VAC	2-0-0	2-0-0	2	35	-	15	50
				Total Credits	22				

DSC: Discipline Specific Courses

AEC: Ability Enhancement Courses

VAC: Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Batch: 2026-30
Semester-VII

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTL-7111	AI in Biotechnology	Minor	4-0-0	4-0-0	4	70	-	30	100
BBTL-7062	Bio-Entrepreneurship	DSC	4-0-0	4-0-0	4	70	-	30	100
BBTM-7063	Advanced Analytical Techniques	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-7064	Plant Biotechnology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-7065	Immunology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTI-7066	Internship	CCFR	0-0-4	0-0-2	2	-	50	-	50
BBTM-7060	Industrial Biotechnology-I	SEC	3-0-2	3-0-1	4	50	20	30	100
				Total Credits	26				

***Credits of these papers will not be added towards SGPA/CGPA and only grades will be provided**.

DSC: Discipline Specific Course
CCFR: Co-curricular Field Work and Report Writing
SEC: Skill Enhancement Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Batch: 2026-30
Semester-VIII

Course No.	Course Title	Course Type	Credit hours	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-8061	Ecology and Evolution	Minor	3-0-2	3-0-1	4	50	20	30	100
BBTM-8062	Plant Biotechnology-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-8063	Research Methodology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-8064	Immunology-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-8060	Industrial Biotechnology-II	SEC	3-0-2	3-0-1	4	50	20	30	100
				Total Credits	20				

DSC: Discipline Specific Course
SEC: Skill Enhancement Course

The house approved the Bio 11: 2026: 2

Item: Bio 11: 2026: 3 To discuss the syllabus of Introduction to Bacteriology and Virology and Basics of Microbiology-I of **B.Sc. Medical Laboratory Technology Semester- III** and Basics of Microbiology-II for **BSc Medical Laboratory Technology-IV** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27 **(Annexure D).**

Proceedings:

The Board of Studies members discussed the proposed syllabus of Introduction to Bacteriology and Virology and Basics of Microbiology-I of **B.Sc. Medical Laboratory Technology Semester- III** and Basics of Microbiology-II for **BSc Medical Laboratory Technology-IV** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27. It was approved by all the members (**Annexure D**).

The scheme of Bachelor of Science (Medical Laboratory Technology) semester-III and IV are as follows:

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of four year degree programme

Session: 2026-27

Bachelor of Science (Honours) (Medical Laboratory Technology) (Semester -III)											
Course Code	**Course Title**	**Course Type**	**Total Credits (L-T-P)**	**Credit Hours**			**Total Marks**	**Marks**			**Exam Time in Hrs**
				L	**T**	**P**		**L**	**P**	**CA**	
BMLL-3064	Introduction to Bacteriology and Virology	DSC	3-0-0	3	-	-	100	70	-	30	3
BMLP-3064	Introduction to Bacteriology and Virology Lab	DSC	0-0-1	-	-	2	50	-	35	15	3
BMLL-3065	Basics of Microbiology-I	DSC	3-0-0	3	-	-	100	70	-	30	3
BMLP-3065	Basics of Microbiology-I Lab	DSC	0-0-1	-	-	2	50	-	35	15	3

DSC: Discipline Specific Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

Session: 2026-27

Bachelor of Science (Honours) (Medical Laboratory Technology) (Semester -IV)											
Course Code	**Course Title**	**Course Type**	**Total Credits (L-T-P)**	**Credit Hours**			**Total Marks**	**Marks**			**Exam Time in Hrs**
				L	**T**	**P**		**L**	**P**	**CA**	
BMLL-4064	Basics of Microbiology-II	DSC	3-0-0	3	-	-	100	70	-	30	3
BMLP-4064	Basics of Microbiology-II Lab	DSC	0-0-1	-	-	2	50	-	35	15	3

DSC-Discipline Specific Course

The house approved the Bio 11: 2026: 3

Item: Bio 11: 2026: 4 To discuss the syllabus of Fundamentals of Microbiology of **Bachelor of Medical Laboratory Science Semester- II** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27 **(Annexure E).**
Proceedings:

The Board of Studies members discussed the proposed syllabus of Fundamentals of Microbiology of **Bachelor of Medical Laboratory Science Semester- II** under Credit Based Continuous Evaluation Grading System with 30% internal assessment for the session 2026-27. It was approved by all the members (**Annexure E**).

The scheme of Bachelor of Medical Laboratory Science semester-II are as follows:

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of four year degree programme

Session: 2026-27

Bachelor of Medical Laboratory Science (Semester -II)											
Course Code	**Course Title**	**Course Type**	**Total Credits (L-T-P)**	**Credit Hours**			**Total Marks**	**Marks**			**Exam Time in Hrs**
				L	**T**	**P**		**L**	**P**	**CA**	
BMLL-2065	Fundamentals of Microbiology	DSC	4-0-0	4	-	-	100	70	-	30	3
BMLP-2065	Fundamentals of Microbiology Lab	DSC	0-0-2	-	-	4	50	-	35	15	3

DSC-Discipline Specific Course

The house approved the Bio 11: 2026: 4

Item: Bio 11: 2026: 5 To discuss the list of proposed examiners for above stated courses **(Annexure F).**

Proceedings:

The Chairperson discussed and approved the list of proposed examiners for above stated courses with Board of Studies members for the session 2026-27 (**Annexure F**).

The house approved the Bio 11: 2026: 5

Item: Bio 11: 2026: 6 To discuss teaching methodologies adopted in the department and inputs required to upgrade the same **(Annexure G)**.

Proceedings:

The Chairperson discussed the teaching methodologies adopted in the department. The members appreciated the teaching methodologies adopted in the department.

The house approved the Bio 11: 2026: 6

Item: Bio 11: 2026: 7 To discuss research inputs and plans of department for session 2026-27 **(Annexure H).**

Proceedings:

The house highly appreciated that the faculty members are actively involved in research and said their input reflects from their publications. They have also encouraged the faculty members to indulge themselves more in research and writing papers.

The house approved the Bio 11: 2026: 7

Item: Bio 11: 2026: 8 To discuss the outcomes of above stated courses and programs.

Proceedings:

The Chairperson discussed the outcomes of above stated courses and programs with the Board of Studies members. The members approved the outcomes of above stated courses.

The house approved the Bio 11: 2026: 8

Item: Bio 11: 2026: 9 To discuss the result analysis for the session 2025-26 F **(Annexure I)**.

Proceedings:

The Chairperson discussed the result analysis for the session 2025-26 with the Board of Studies member and they approved it.

The house approved the Bio 11: 2026: 9

(Chairperson)
Mrs. Manju Sahni,
Head and Associate Professor,
PG Department of Chemistry,
Kanya Maha Vidyalaya, Jalandhar