

### **Proceedings of the Meeting of Board of Studies held on 18-04-2024**

The Ninth meeting of the Board of Studies of Bio-Technology was held on **18-04-2024 at 2:30 pm through Zoom.**

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

<b>S.NO</b>	<b>Details of Member</b>	<b>Presence/Absence</b>
<b>1.</b>	Dr. Manju Sahni, Head and Associate Professor, PG Department of Chemistry, Kanya Maha Vidyalaya, Jalandhar ( <b>Chairperson</b> )	<b>Present</b>
<b>2.</b>	Dr. Pratap Kumar Pati, Professor & Head, Department of Biotechnology, Guru Nanak Dev University, Amritsar ( <b>Parent University Nominee</b> )	<b>Present</b>
<b>3.</b>	Dr. Neena Caplash, Professor, Department of Biotechnology, Panjab University, Chandigarh ( <b>Outside University Nominee</b> )	<b>Present</b>
<b>4.</b>	Dr. Jagdeep Kaur, Professor, Department of Biotechnology, Panjab University, Chandigarh ( <b>Outside University Nominee</b> )	<b>Absent</b>
<b>5.</b>	Ms. Himadri Mahajan, PhD Scholar, Guru Nanak Dev University, Amritsar ( <b>Alumni</b> )	<b>Present</b>
<b>6.</b>	Dr. Kamaljit Singh, Managing Director, Green Planet Bioproducts, GP tower, 1-Amar Garden, Near Pathankot Chowk, NH-1, Jalandhar ( <b>Industry Expert</b> )	<b>Present</b>
<b>7.</b>	Mrs. Navgeet, Head and Assistant Professor, Department of Biotechnology ( <b>Internal Member</b> )	<b>Present</b>
<b>8.</b>	Dr. Sandeep Kaur Saggu, Assistant Professor, Department of Bio-Technology ( <b>Internal Member</b> )	<b>Present</b>

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 & International Scenario. She took up the agenda items for deliberation one by one with the permission of committee members.

**Item: Bio 9: 2024: 1**

To discuss and approve the minutes of eighth Board of Studies meeting held on 14.06.2023 and Action Taken Report.

The minutes and Action Taken Report of the previous Board of Studies meeting held on 14.06.2023 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 9: 2024: 1**

**Action Taken Report**

S. No.	Agenda Item	Decision taken in Meeting	Action Taken
<b><u>Item: Bio 8: 2023: 2</u></b>	To discuss proposed syllabus of <b>B.Sc. Bio-Technology semester- I and II</b> under Credit Based Continuous Evaluation Grading system with 30% internal assessment for the session 2023-24.	The proposed syllabus and course outcomes of <b>B.Sc. Bio-Technology semester- I-II</b> under Credit Based Continuous Evaluation Grading system for the session 2023-24 was discussed by board members and it was decided to approve the syllabus <b>with 20% internal assessment with following changes:</b>	The syllabus was approved and executed.

<b>Item: Bio 8:</b> <b>2023: 2</b>	<b>BSc Bio-Technology Sem -I</b>  General Microbiology-I Course Code: BBTL-1346	It was decided to: <ul style="list-style-type: none"> <li>• Modify course outcomes.</li> <li>• Shift the topic “Gram positive and Gram-negative bacteria: Introduction, Structure and anatomy of bacterial cell walls and Nature of the Microbial Cell Surface. Types of bacterial flagella. Different types of bacterial staining” from Unit 3 to Unit 2.</li> <li>• Shift the topic “Bacterial Classification: Bacterial classification and taxonomy based on Bergey’s Manual of Determinative bacteriology– General outline only. An introduction to Bacterial Serotypes” has been shifted from Unit 4 to unit 2.</li> <li>• Shift the topic “Microbial culture collection centres, Methods of Microbial preservation: Refrigeration, Cryopreservation, lyophilization, Paraffin method” from unit 4 to unit 3.</li> </ul>	The changes were approved and executed.
	<b>Lab in General Microbiology-I</b>  <b>Course Code: BBTP-1341</b>	It was decided to: <ul style="list-style-type: none"> <li>• Modify course outcomes.</li> <li>• Rearrange the sequence of practical 1-3 have been rearranged.</li> </ul>	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -II</b>  Genetics  Course Code: BBTL-2065	It was suggested to modify course outcomes	The changes were approved and executed.

	<b>BSc Bio-Technology Sem -II</b> Biochemistry-II Course Code: BBTL-2086 Lab in Biochemistry-II Course code: BBTP-2080	It was suggested to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -II</b> General Microbiology-II Course Code: BBTL-2347 Lab in General Microbiology-II Course code: BBTP-2341	It was suggested to modify course outcomes.	The changes were approved and executed.
<b>Item: Bio 8:</b> <b><u>2023: 3</u></b>	To discuss the syllabus of <b>B.Sc. Bio-Technology semester- III to VI</b> under Continuous Evaluation System for the session 2023-24	The proposed syllabus and course outcomes of <b>B.Sc. Bio-Technology semester- III to VI</b> under Continuous Evaluation System <b>with 20% internal assessment</b> for the session 2023-24 was discussed by board members and it was decided to approve the syllabus with following changes:	The syllabus was approved and executed.
	<b>BSc Bio-Technology Sem -III</b> Fundamentals of Biotechnology (Theory and practical) Course code: BBTM-3061	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -III</b> Immunology-I (Practical) Course Code: BBTM-3062 (P)	It was decided to remove the Practical "To perform double immune diffusion" and rearrange the sequence of practicals.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -III</b> Biochemistry-III (Theory and practical) Course Code: BBTM-3085	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -III</b> Molecular Biology (Theory and practical)	It was decided to modify course outcomes.	The changes were approved and executed.

	Course Code: BBTM-3066		
<b>Item: Bio 8:</b> <b><u>2023: 3</u></b>	<b>BSc Bio-Technology Sem -IV</b>  Industrial Biotechnology-I Course Code: BBTM-4061	<p>It was decided to:</p> <ul style="list-style-type: none"> <li>• Modify course outcomes.</li> <li>• Remove the practical “Measurement of bacterial size”, “Metabolic characterization by IMVIC”, “Starter culture preparation, evaluation and application”.</li> </ul> <ul style="list-style-type: none"> <li>• It was decided to add following practical experiments: <ul style="list-style-type: none"> <li>○ Isolation of casein from milk and isoelectric pH of casein.</li> <li>○ Cheese making by bacterial culture method</li> <li>○ Determination of fat content in milk.</li> <li>○ Isolation and screening of protease producing microbes from soil.</li> </ul> </li> </ul>	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -IV</b>  Immunology-II (Theory and Practical) Course code: BBTM: BBTM-4062	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -IV</b>  Biochemistry-IV (Theory and practical) Course code: BBTM-4083	<p>It was decided to modify course outcomes.</p> <p>Practical</p> <p>It was decided to remove:</p> <ul style="list-style-type: none"> <li>• Practical “Isolation of Casein from milk and Isoelectric pH of casein”, “Determination of fat content in milk”, “Estimation of blood cholesterol”.</li> <li>• Add “Estimation of DNA by Diphenyl reaction” and “UV induced mutagenesis”</li> </ul>	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -IV</b>  Skill Development in Biotechnology Course Code: BBTM-4064	<p>It was decided to modify course outcomes.</p> <p>It was decided to:</p> <ul style="list-style-type: none"> <li>• Club Unit 4 with unit 3 due</li> </ul>	The changes were approved and executed.

	(Theory and Practical)	<p>to overlapping of few topics.</p> <ul style="list-style-type: none"> <li>• Add new unit as Unit 4 related to food spoilage and detection.</li> <li>• Remove practical “Isolation of protein concentrates”.</li> </ul>	
<b>Item: Bio 8:</b> <b><u>2023: 3</u></b>	<b>BSc Bio-Technology Sem -V</b>  rDNA Technology-I (Theory and Practical) Course Code: BBTM-5061	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -V</b>  Plant Biotechnology-I (Theory and practical) Course Code: BBTM-5062	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -V</b>  Animal Biotechnology-I (Theory and practical) Course Code: BBTM-5063	It was decided to: <ul style="list-style-type: none"> <li>• Modify course outcomes.</li> <li>• Shift “Introduction to concept of biosafety and biosecurity” to unit 2 from Animal Biotechnology-II.</li> </ul>	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -V</b>  Bioprocess Engineering-I (Theory and practical) Course Code: BBTM-5064	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -V</b>  Biochemical and biophysical Techniques-I (Theory and Practical)  Course Code: BBTM-5065	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -V</b>  Industrial Biotechnology-II (Theory)  Course Code: BBTM-5066	It was decided to modify course outcomes. It was decided to make corrections in one topic of Unit 2 as “SCP: Spirulina from Yeast and Bacteria” and add “symbiotic and non-symbiotic bacteria, phosphate solubilizing bacteria”.	The changes were approved and executed.
<b>Item: Bio 8:</b> <b><u>2023: 3</u></b>	<b>BSc Bio-Technology Sem -VI</b>  rDNA Technology-II (Practical)	It was decided to: <ul style="list-style-type: none"> <li>• Modify course outcomes.</li> <li>• Shift the practical “Isolation</li> </ul>	The changes were approved and executed.

	Course Code: BBTM-6061(P)	of RNA from blood” from Animal Biotechnology-II to rDNA Technology-II.	
	<b>BSc Bio-Technology Sem -VI</b> Animal Biotechnology-II (Theory) Course Code: BBTM-6062	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -VI</b> Plant Biotechnology-II (Theory) Course Code: BBTM-6063	It was decided to modify course outcomes.	The changes were approved and executed.
	<b>BSc Bio-Technology Sem -VI</b> Biochemical and Biophysical Techniques-II Course Code: BBTM-6066	It was decided to: <ul style="list-style-type: none"> <li>• modify course outcomes.</li> <li>• Remove “Casting of horizontal gel and Separation of bio-molecules by electrophoresis” and “Casting of discontinuous PAGE gel and Separation of bio-molecules by electrophoresis” and add “To perform IEF”.</li> </ul>	The changes were approved and executed.
<b><u>Item: Bio 8: 2023: 4</u></b>	To discuss the syllabus and course outcomes of Basic Nutritional Biochemistry of <b>B.Sc. Home Science semester-V</b> and Applied Nutritional Biochemistry of <b>B.Sc. Home Science semester-VI</b> under continuous evaluation system for the session 2023-24.	No changes were suggested.	Syllabus was approved without any changes and executed.
<b><u>Item: Bio 8: 2023: 5</u></b>	To discuss the syllabus and course outcomes of Nutritional Biochemistry of <b>Bachelors in Vocational Bachelor of Vocation (Nutrition, Exercise and Health)</b> under continuous evaluation system for the session 2023-24.	No changes were suggested.	Syllabus was approved and executed.
<b><u>Item: Bio 8: 2023: 6</u></b>	To discuss the syllabus of Nutritional Biochemistry of <b>PG Diploma in Nutrition and Dietetics Semester-I</b> under Credit Based Continuous Evaluation Grading System for the session 2023-24.	No changes were suggested.	Syllabus was approved and executed.

<b><u>I Item: Bio 8: 2023: 7</u></b>	To discuss the list of proposed examiners for above stated courses.	The list of examiners was approved	The list of examiners was approved and sent to COE office.
<b><u>Item: Bio 8: 2023: 8</u></b>	To discuss teaching methodologies adopted in the department and inputs required to upgrade the same in session 2023-24.	Members suggested to conduct more activities at departmental level to build confidence in students.	<p>Various activities were organized in department in session 2023-24:</p> <ul style="list-style-type: none"> <li>• Idea Presentation Competition on Start Up in Biotechnology on 10 August, 2023.</li> <li>• Poster making Competition on Innovation in Bio-Technology held on 23 August, 2023.</li> <li>• Extension lecture on “Be Kind to your Mind-Let’s talk Mental and emotional Health” held on 10 October, 2023.</li> <li>• Extension lecture on “My Story-Motivational session by successful entrepreneur/ Start Up founder held on 17 October, 2023</li> <li>• Educational visit to Sardar Swaran Singh National Institute of Bio-Energy, Kapurthala on 9 Nov, 2023.</li> <li>• Alumni talk on Career and future in Bio-Technology: Research, jobs and Entrepreneurship</li> </ul>



			<p>held on 14 February, 2024.</p> <ul style="list-style-type: none"> <li>• Fermentology Fiesta-Biotechnology journey into flavorful transformations on 21 February, 2024.</li> <li>• Career Counselling: Skill development and entrepreneurship in Sciences, held on 07 March, 2024.</li> <li>• Plantation drive on 28 March, 2024.</li> </ul>
<p><b><u>Item: Bio 8:</u></b> <b><u>2023: 9</u></b></p>	<p>To discuss research inputs and plans of department.</p>	<p>Members suggested to indulge students in research.</p>	<p>Faculty members keep students engaged in number of extension practicals and small research projects.</p> <p><b>Research paper</b></p> <p>Dr. Sandeep Kaur Saggu published review paper entitled “Exploring the role of microbes for the management of persistent organic pollutants” in Journal of Environmental Management” in June, 2023.</p> <p><b>Book chapters</b></p> <p>Dr. Sandeep Kaur Saggu published book chapter entitled “Entrepreneurship in biotechnology: fostering innovation “ in book entitled “Skill Development and Entrepreneurship for Strong India” in</p>

			<p>August, 2023.</p> <p>Ms. Princy published book chapter entitled Sustainable start ups: “Green entrepreneurship for a greener future” in book Skill Development and Entrepreneurship for Strong India” in August, 2023.</p> <p><b>Seed Money Project</b></p> <p>Dr. Sandeep Kaur Saggu was awarded with Seed money Grant of Rs. 1 lakh for project “Isolation and characterization of soil microbes capable of producing bio film degrading enzymes” in March, 2023.</p>
<b><u>Bio 8: 2023: 10</u></b>	To discuss the outcomes of above stated courses and programs.	The outcomes for above stated courses were discussed with the members	The members approved the Bio 8: 2023: 10
<b><u>Bio 8: 2023: 11</u></b>	To discuss the result analysis for the session 2023-24.	The result analysis of different classes was discussed with the members.	The members approved the Bio 8: 2023: 11

**Item: Bio 9: 2024: 2** To discuss proposed syllabus of **B.Sc. Bio-Technology semester-I and II** under Credit Based Continuous Evaluation Grading system for session 2024-25 (Annexure-B).

**Proceedings:**

As per the guidelines of NEP 2020, 4 Years degree Programme Bachelor of Science (Hons.) Bio-Technology has been introduced by Kanya Maha Vidyalaya w.e.f. 2024-25 with total credits 203. The exit levels have been defined in the course scheme as follows:

Course Type	List of Courses	Credits
<b>Semester-I</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>Biochemistry-I</li> <li>Botany-I</li> </ul>	<p>4-0-1</p> <p>4-0-1</p>

	<ul style="list-style-type: none"> <li>General Microbiology-I</li> </ul>	4-0-1
Compulsory Course	<ul style="list-style-type: none"> <li>Punjabi (Compulsory)</li> <li>Basic Punjabi</li> <li>Punjab History and Culture (From Earliest Times to C-320)</li> </ul>	4-0-0
Ability Enhancement Course	<ul style="list-style-type: none"> <li>Communication Skills in English</li> </ul>	3-0-1
Value Added Course	<ul style="list-style-type: none"> <li>Foundation Course</li> </ul>	2-0-0
<b>Total Credits</b>		<b>25</b>
<b>Semester-II</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>Genetics</li> <li>Cell Biology</li> <li>Fundamentals of Biotechnology</li> </ul>	4-0-1 4-0-1 4-0-1
Compulsory Course	<ul style="list-style-type: none"> <li>Punjabi (Compulsory)</li> <li>Basic Punjabi</li> <li>Punjab History and Culture (From Earliest Times to C-320)</li> </ul>	4-0-0
Ability Enhancement Course	<ul style="list-style-type: none"> <li>Communication Skills in English</li> </ul>	3-0-1
Skill Enhancement Course	<ul style="list-style-type: none"> <li>Industrial Biotechnology</li> </ul>	2-0-1
Value Added Course	<ul style="list-style-type: none"> <li>Drug Abuse: Problem, Management and Prevention</li> </ul>	2-0-0
<b>Total Credits</b>		<b>28</b>
<b>Semester-III</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>Gene Structure and Function</li> <li>Biomathematics and Biostatistics</li> <li>Zoology-I</li> <li>Immunology-I</li> </ul>	3-0-1 4-0-1 4-0-1 4-0-1
Multidisciplinary Course	<ul style="list-style-type: none"> <li>Chemistry-I</li> </ul>	3-0-1
Value Added Course	<ul style="list-style-type: none"> <li>Gender Sensitization</li> </ul>	2-0-0
<b>Total Credits</b>		<b>25</b>
<b>Semester-IV</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>Molecular Biology</li> <li>Biochemical and Biophysical Techniques-I</li> <li>Botany-II</li> <li>Biochemistry-II</li> </ul>	4-0-1 4-0-1 3-0-1 4-0-1
Multidisciplinary Course	<ul style="list-style-type: none"> <li>Chemistry-II</li> </ul>	3-0-1
Skill Enhancement Course	<ul style="list-style-type: none"> <li>Skill Development in Biotechnology-I</li> </ul>	2-0-1
Value Added Course	<ul style="list-style-type: none"> <li>Environmental Studies</li> </ul>	1-0-1

<b>Total Credits</b>		<b>28</b>
<b>Semester-V</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>• r-DNA Technology-I</li> <li>• Animal Biotechnology-I</li> <li>• Bioprocess Engineering -I</li> <li>• Environmental Biotechnology</li> </ul>	4-0-1 4-0-1 4-0-1 3-0-1
Multidisciplinary Course	<ul style="list-style-type: none"> <li>• Chemistry-III</li> <li>• Seminar/ Internship/ Community Outreach-I</li> </ul>	3-0-1 0-0-2
Value Added Course	<ul style="list-style-type: none"> <li>• Personality Development</li> </ul>	2-0-0
<b>Total Credits</b>		<b>27</b>
<b>Semester-VI</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>• Fundamental of Bioinformatics</li> <li>• Plant Biotechnology-I</li> <li>• r-DNA technology-II</li> <li>• Ecology &amp; Evolution</li> </ul>	3-0-1 4-0-1 4-0-1 4-0-1
Multidisciplinary Course	<ul style="list-style-type: none"> <li>• Zoology-II</li> </ul>	3-0-1
Skill Enhancement Course	<ul style="list-style-type: none"> <li>• Skill Development in Biotechnology-II</li> </ul>	2-0-1
Value Added Course	<ul style="list-style-type: none"> <li>• Human Rights and Constitutional Duties</li> </ul>	2-0-0
<b>Total Credits</b>		<b>28</b>
<b>Semester-VII</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>• General Microbiology-II</li> <li>• Immunology-II</li> <li>• Biochemistry-III</li> <li>• Food &amp; Nutrition</li> </ul>	3-0-1 3-0-1 3-0-1 3-0-1
Minor	<ul style="list-style-type: none"> <li>• Biochemical and Biophysical Techniques-II</li> <li>• Seminar/ Internship/ Community Outreach-I</li> </ul>	3-0-1 0-0-2
<b>Total Credits</b>		<b>22</b>
<b>Semester-VIII</b>		
Discipline Specific Courses	<ul style="list-style-type: none"> <li>• Animal Biotechnology-II</li> <li>• Plant Biotechnology-II</li> <li>• Industrial Biotechnology-II</li> <li>• Biochemistry-IV</li> </ul>	3-0-1 3-0-1 3-0-1 3-0-1
Minor	<ul style="list-style-type: none"> <li>• Bioprocess Engineering-II</li> </ul>	3-0-1
<b>Total Credits</b>		<b>20</b>

Exit Option 1: NHEQF Level 7: After successful completion of 3 years (6 semesters)

Exit Option 2: NHEQF Level 8: After successful completion of 4 years (8 semesters)

**Scheme Pages of B.Sc. (Bio-Technology) (Honours) Semester-I and II are as follows:**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Hons.) Bio-Technology**  
**Session: 2024-28**  
**Semester-I**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL -1421 BBTL -1031 BBTL -1431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture (From Earliest Times to C-320)	C	4	0	0	4	80	-	20	100
BBTM-1102	Communication Skills in English	AEC	3	0	1	4	50	30	20	100
BBTM -1083	Biochemistry-I	DSC	4	0	1	5	60	20	20	100
BBTM-1074	Botany-I	DSC	4	0	1	5	60	20	20	100
BBTM-1345	General Microbiology-I	DSC	4	0	1	5	60	20	20	100
VACF-1491	*Foundation Course	VAC	2	0	0	2	40	-	10	50
Total Credits						25				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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.

DSC: Discipline Specific Courses

AEC: Ability Enhancement Course

C: Compulsory Course

VAC: Value Added Course

**Bachelor of Science (Hons.) Bio-Technology**  
**Session: 2024-28**  
**Semester-II**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL -2421 BBTL -2031 BBTL -2431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture (From C-320 To 1000 A.D.)	C	4	0	0	4	80	-	20	100
BBTM-2102	Communication Skills in English	AEC	3	0	1	4	50	30	20	100
BBTM -2063	Genetics	DSC	4	0	1	5	60	20	20	100
BBTM-2484	Cell Biology	DSC	4	0	1	5	60	20	20	100
BBTM-2065	Fundamentals of Biotechnology	DSC	4	0	1	5	60	20	20	100
BBTM-2060	Industrial Biotechnology -I	SEC	2	0	1	3	40	20	15	75
VACD-2161	*Drug Abuse: Problem, Management and Prevention	VAC	2	0	0	2	40	-	10	50
Total Credits						28				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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.

DSC: Discipline Specific Courses

AEC: Ability Enhancement Course

C: Compulsory Course

VAC: Value Added Course

**The house approved the Bio 9: 2024: 2**

**Item: Bio 9: 2024: 3** To discuss proposed syllabus of B.Sc. Bio-Technology semester-III and IV under credit-based evaluation system with 20% internal assessment for the session 2024-25.

**Proceedings:**

The Board of Studies members discussed the proposed syllabus of **B.Sc. Bio-Technology semester-III and IV** under credit-based evaluation system with 20% internal assessment for the session 2024-25. It was approved by all the members with no change in syllabus (**Annexure C**).

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

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**

**Session: 2024-25**

**Semester-III**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL-3061	Fundamentals of Biotechnology	C	3	0	0	3	60	-	15	75
BBTL-3062	Immunology-I	C	3	0	0	3	60	-	15	75
BBTL-3083	Chemistry-II	C	2	0	0	2	40	-	10	50
BBTL-3074	Botany-II	C	2	0	0	2	40	-	10	50
BBTL-3085	Biochemistry-III	C	3	0	0	3	60	-	15	75
BBTL-3066	Molecular Biology	C	3	0	0	3	60	-	15	75
BBTP-3067	Lab in Fundamentals of Biotechnology	C	0	0	1	1	-	20	5	25
BBTP-3068	Lab in Immunology-I	C	0	0	1	1	-	20	5	25
BBTP-3089	Lab in Chemistry-II	C	0	0	1	1	-	20	5	25
BBTP-3070	Lab in Botany-II	C	0	0	1	1	-	20	5	25
BBTP-3081	Lab in Biochemistry-III	C	0	0	1	1	-	20	5	25
BBTP-3062	Lab in Molecular Biology	C	0	0	1	1	-	20	5	25
AECE-3221	*Environmental Studies	C	2	-	-	2	30	10	10	50
SECP-3512	*Personality Development	AC	2	-	-	2	40	-	10	50
Total Credits						26				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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**

**AC- Audit course**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**

**Session: 2024-25**

**Semester-IV**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL-4061	Industrial Biotechnology-I	C	3	0	0	3	60	-	15	75
BBTL-4062	Immunology-II	C	3	0	0	3	60	-	15	75
BBTL-4083	Biochemistry-IV	C	3	0	0	3	60	-	15	75
BBTL-4064	Skill Development in Biotechnology	C	2	0	0	2	40	-	10	50
BBTL-4065	Fundamental of Bioinformatics	C	2	0	0	2	40	-	10	50
BBTL-4486	Zoology-II	C	2	0	0	2	40	-	10	50
BBTP-4067	Lab in Industrial Biotechnology-I	C	0	0	1	1	-	20	5	25
BBTP-4068	Lab in Immunology-II	C	0	0	1	1	-	20	5	25
BBTP-4089	Lab in Biochemistry-IV	C	0	0	1	1	-	20	5	25
BBTP-4060	Lab in Skill Development in Biotechnology	C	0	0	1	1	-	20	5	25
BBTP-4061	Lab in Fundamental of Bioinformatics	C	0	0	1	1	-	20	5	25
BBTP-4482	Lab in Zoology-II	C	0	0	1	1	-	20	5	25
BBTF-4063	Industrial/ Institutional Visit	C	0	0	1	1	-	20	5	25
SECS-4522	*Social Outreach	AC	0	0	2	2	-	40	10	50
Total Credits						24				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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**

**AC- Audit course**

**The house approved the Bio 9: 2024: 3**

**Item: Bio9: 2024: 4** To discuss the syllabus of **B.Sc. Bio-Technology semester-V and VI** under continuous evaluation system for the session 2024-25.

**Proceedings:**



The Board of Studies members discussed the proposed syllabus of **B.Sc. Bio-Technology semester-V and VI** under continuous evaluation system for the session 2024-25. It was approved by all the members with no change in syllabus (**Annexure D**).

**The scheme of Bachelor of Science (Bio-Technology) semester-V and VI are as follows:**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**

**Bachelor of Science (Bio-Technology)**

**Session: 2024-25**

Session: 2024-25							
Bachelor of Science (Bio-Technology) Semester-V							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-5061	rDNA Technology-I	C	60	30	18	12	3+3
BBTM-5062	Plant Biotechnology-I	C	60	30	18	12	3+3
BBTM-5063	Animal Biotechnology-I	C	60	30	18	12	3+3
BBTM-5064	Bioprocess Engineering-I	C	60	30	18	12	3+3
BBTM-5065	Biochemical and Biophysical Techniques-I	C	60	30	18	12	3+3
BBTM-5066	Industrial Biotechnology-II	C	60	30	18	12	3+3
SECJ-5551	*Job Readiness course	AC	25	20	-	5	-
Total			360				

**\*Marks of these papers will not be added in total marks and only grades will be provided.**

**C-Compulsory**

**AC- Audit course**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**

**Session: 2024-25**

Bachelor of Science (Bio-Technology) Semester-VI							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-6061	rDNA Technology-II	C	60	30	18	12	3+3
BBTM-6062	Animal Biotechnology-II	C	60	30	18	12	3+3
BBTM-6063	Plant Biotechnology-II	C	60	30	18	12	3+3
BBTM-6064	Bioprocess Engineering-II with Training	C	60	30	18	12	3+3
BBTM-6085	Chemistry-III	C	60	30	18	12	3+3
BBTM-6066	Biochemical and Biophysical Techniques-II	C	60	30	18	12	3+3
BBTS-6087	Term Paper	C	20	-	20	-	-
Total			380				

**C-Compulsory**

**The house approved the Bio 9: 2024: 4**

**Item: Bio 9: 2024:5** To discuss the list of proposed examiners for above stated courses.

**Proceedings:**

The Chairperson discussed and approved the list of proposed examiners for above stated courses with Board of Studies members for the session 2024-25 (**Annexure E**).

**The house approved the Bio 9: 2024: 5**

**Item: Bio 9: 2024:6** To discuss teaching methodologies adopted in the department and inputs required to upgrade the same.

**Proceedings:**

The Chairperson discussed the teaching methodologies adopted in the department and inputs required to upgrade the same the Board of Studies members (**Annexure F**). The members appreciated the teaching methodologies adopted in the department.

**The house approved the Bio 9: 2024: 6**

**Item: Bio 9: 2024: 7** To discuss research inputs and plans of department for session 2024-25.

**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 9: 2024: 7**

**Item: Bio 9: 2024: 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 with no change.

**The house approved the Bio 9: 2024: 8**

**Item: Bio 9: 2024:9** To discuss the result analysis for the session 2023-24.

**Proceedings:**

The Chairperson discussed the result analysis for the session 2023-24 with the Board of Studies member and they approved it.

**The house approved the Bio 9: 2024: 9**

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

Annexure-A

# **Kanya Maha Vidyalaya, Jalandhar City** **(An Autonomous College)**



**Minutes of 8<sup>th</sup> Meeting of Board of Studies**  
**Department of Bio-Technology**  
**Via Zoom video conferencing**  
**Date: 14-06-2023**  
**Time: 03:00 PM**

**KANYA MAHA VIDYALAYA, JALANDHAR**  
**(UGC Autonomous College)**  
**Department of Bio-Technology**

**Proceedings of the Meeting of Board of Studies held on 14-06-2023**

The eighth meeting of the Board of Studies of Bio-Technology was held on **14-06-2023 at 03:00 pm through Zoom.**

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

<b>S. No.</b>	<b>Details of members</b>	<b>Present/Absent</b>
<b>1.</b>	Dr. (Mrs.) Manju Sahni, Associate Professor, Dean Life Sciences ( <b>Chairperson</b> )	<b>Present</b>
<b>2.</b>	Dr. Pratap Kumar Pati, Professor, Department of Biotechnology, Guru Nanak Dev University, Amritsar ( <b>Parent University Nominee</b> )	<b>Present</b>
<b>3.</b>	Dr. Neena Caplash, Professor, Department of Biotechnology, Panjab University, Chandigarh ( <b>Outside University Nominee</b> )	<b>Present</b>
<b>4.</b>	Dr. Jagdeep Kaur, Professor, Department of Biotechnology, Panjab University, Chandigarh ( <b>Outside University Nominee</b> )	<b>Absent</b>
<b>5.</b>	Dr. Kamaljit Singh, Managing Director, Green Planet Bioproducts, GP tower, 1-Amar Garden, Near Pathankot Chowk, NH-1, Jalandhar ( <b>Industry Expert</b> )	<b>Present</b>
<b>6.</b>	Ms. Himadri Mahajan, Resource Person, Central University of Himachal Pradesh, Shahpur ( <b>Alumni</b> )	<b>Present</b>
<b>7.</b>	Ms. Navgeet, Assistant Professor, Department of Bio-Technology, Kanya Maha Vidyalaya, Jalandhar	<b>Present</b>
<b>8.</b>	Dr. Sandeep Kaur Saggu, Assistant Professor, Department of Bio-Technology, Kanya Maha Vidyalaya, Jalandhar	<b>Present</b>

## Agenda

**Item: Bio 8: 2023: 1** To discuss and approve the minutes of seventh Board of Studies meeting held on 09-04-2022 and Action Taken Report (**Annexure A**)

**Item: Bio 8: 2023: 2** To discuss proposed syllabus of **B.Sc. Bio-Technology semester- I and II** under credit-based grading evaluation system with 30% internal assessment for the session 2023-24. (**Annexure B**)

**Item: Bio 8: 2023: 3** To discuss the syllabus of **B.Sc. Bio-Technology semester- III to VI** under continuous evaluation system for the session 2023-24. (**Annexure C**)

**Item: Bio 8: 2023: 4** To discuss the syllabus of Basic & Applied Nutritional Biochemistry of **B.Sc. Home Science semester-V& VI** under continuous evaluation system for the session 2023-24. (**Annexure D**)

**Item: Bio 8: 2023: 5** To discuss the syllabus of Nutritional Biochemistry of **B.Vocational (Nutrition, Exercise and Health)** semester-IV under Credit Based Continuous Evaluation System for the session 2023-24. (**Annexure E**)

**Item: Bio 8: 2023: 6** To discuss the syllabus of Nutritional Biochemistry of **PG Diploma in Nutrition and Dietetics Semester-I** under Credit Based Continuous Evaluation System for the session 2023-24. (**Annexure F**)

**Item: Bio 8: 2023: 7** To discuss the list of proposed examiners for above stated courses. (**Annexure-G**)

**Item: Bio 8: 2023: 8** To discuss teaching methodologies adopted in the department and inputs required to upgrade the same. (**Annexure H**)

**Item: Bio 8: 2023: 9** To discuss research inputs and plans of department for session 2023-24.

**Item: Bio 8:2023: 10** To discuss the outcomes of above stated courses and programs.

**Item: Bio: 2023:11** To discuss the result analysis for the session 2022-23.

**KANYA MAHA VIDYALAYA, JALANDHAR**  
**(UGC Autonomous College)**  
**Department of Bio-Technology**

The chairperson welcomed and introduced the Members of Board of studies. She apprised the members about the programs 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 8: 2023: 1** To discuss and approve the minutes of seventh Board of Studies meeting held on 09-04-2022 and Action Taken Report (**Annexure A**)

**Proceedings:** The proceedings of the previous Board of Studies meeting held on 9<sup>th</sup> April 2022 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 proceedings for approval of the house and they approved it through Zoom meeting. (**Attached herewith as Annexure A**)

**Action Taken Report**

S. No.	Agenda Item	Decision taken in Meeting	Action Taken
<b><u>Item: Bio 7:</u></b> <b><u>2022:3</u></b>	To discuss the syllabus and course outcomes of Biochemistry-I of <b>B.Sc. Bio-Technology semester- I</b> under continuous evaluation system for the session 2022-23.	It was decided to remove topic A310 from Unit 4.	The syllabus was approved and executed.
	To discuss the syllabus and course outcomes of Biochemistry-III of <b>B.Sc. Bio-Technology semester- III</b> under continuous evaluation system for the session 2022-23.	It was decided to add lipid digestion, absorption and transport, types of lipid oxidation – alpha, beta and omega in unit 3 and regulation of cholesterol metabolism in unit 4.	The changes were approved and executed.
	To discuss the syllabus and course outcomes of Industrial Biotechnology-I and Biochemistry-IV of <b>B.Sc. Bio-Technology semester-IV</b> under continuous evaluation system for the session 2022-23.	It was decided to: <ul style="list-style-type: none"> <li>• Add topic “Methods and Principles of Food Processing” in Unit-1</li> <li>• Add “Methods” with primary and screening in Unit-2</li> <li>• Reorganize Unit-4 and, some topics of Industrial Biotechnology-II were</li> </ul>	The changes were approved and executed.

		<p>included to club similar topics.</p> <ul style="list-style-type: none"> <li>• Add practical “Isolation of Amylase producing microbes” and “Screening of cellulase producing microorganism from wood degrading soil” in Industrial Biotechnology-I practical.</li> <li>• Remove practical “To perform an AMES assay to determine the mutagenicity of a compound” from Industrial Biotechnology-I practical.</li> <li>• Reorganize and add more details of topics of Biochemistry-IV.</li> </ul>	
<p><b><u>Item: Bio 7:</u></b> <b><u>2022:3</u></b></p>	<p>To discuss the syllabus and course outcomes of rDNA Technology-I and Industrial Biotechnology-II of <b>B.Sc. Bio-Technology semester-V</b> under continuous evaluation system for the session 2022-23.</p>	<p>It was decided to:</p> <ul style="list-style-type: none"> <li>• Delete antibiotic resistance genes</li> <li>• Add the role of antibiotics and antibiotic resistance genes in a vector</li> <li>• Add copy number regulation</li> <li>• Delete gene identification: Nucleic acid hybridization (Southern and Northern blotting), merits and demerits of nitrocellulose and nylon membrane (N &amp; N+)</li> <li>• Add Gene cloning: Ligation, Transformation Efficiency, Screening of transformants by Gene Inactivation: Antibiotic inactivation and Blue White Selection</li> <li>• Add western blotting</li> <li>• Delete detection system of labelled probes</li> <li>• <b>Add following practical:</b> “Preparation of competent cell” and “Transformation of competent cells by CaCl<sub>2</sub> method” in practical course of rDNA Technology-I to align with theory part.</li> <li>• Confirmation of high molecular weight DNA on</li> </ul>	<p>The changes were approved and executed.</p>



<p><b><u>Item: Bio 7:</u></b></p> <p><b><u>2022:3</u></b></p>		<p>Agarose Gel.</p> <ul style="list-style-type: none"> <li>• To rephrase restriction enzyme digestion of DNA</li> </ul>	
	<p>To discuss the syllabus and course outcomes Industrial Biotechnology-II of <b>B.Sc. Bio-Technology semester-VI</b> under continuous evaluation system for the session 2022-23.</p>	<p><b>It was decided to:</b></p> <ul style="list-style-type: none"> <li>• Reorganize topics of industrial Biotechnology-II to club similar topics.</li> <li>• Add practical: “Alcoholic and Mixed–Acid Fermentation” and “Determination of nitrate reduction by bacteria” from Industrial Biotechnology-I and include it in Industrial Biotechnology-II practicals to align with theory.</li> <li>• Include new practical in list of Industrial Biotechnology-II “Demonstration of wine production by using grape juice”</li> </ul> <p><b>Removed practical:</b> “Plating the milk samples for microbial counting”, “Isolation and identification of microbes from spoiled food sample” and “MBRT Test for determination of milk quality” from practical list of Industrial Biotechnology-II as these were not in sync with theory.</p>	<p>The changes were approved and executed.</p>
	<p>To discuss the syllabus and course outcomes of rDNA Technology-II of <b>B.Sc. Bio-Technology semester-VI</b> under continuous evaluation system for the session 2022-23.</p>	<p><b>It was decided to:</b></p> <ul style="list-style-type: none"> <li>• Delete the role of antibiotics and antibiotic resistance genes in a vector</li> <li>• Shuffle topics between Unit I and II</li> <li>• Elaborate and specify topics Promoters, Induction System, Processing of recombinant proteins</li> <li>• Add Pyrosequencing</li> <li>• <b>Remove</b> ligation reaction from list of rDNA Technology-I practical and include in of rDNA Technology-I practical</li> <li>• <b>Rephrase</b> practical “Transformation of</li> </ul>	<p>After incorporating the changes, the syllabus was approved and executed.</p>

		Competent cells by Cacl2 Method” as “Transformation of cells & Confirmation of the transformants for the presence of plasmid by blue white selection”	
<b><u>Item: Bio 7:</u></b> <b><u>2022: 4</u></b>	To discuss the syllabus and course outcomes of Basic Nutritional Biochemistry of <b>B.Sc. Home Science semester-V</b> and Applied Nutritional Biochemistry of <b>B.Sc. Home Science semester-VI</b> under continuous evaluation system for the session 2022-23.	No changes were suggested.	Syllabus was approved without any changes and executed.
<b><u>Item: Bio 7:</u></b> <b><u>2022: 5</u></b>	To discuss the syllabus and course outcomes of Nutritional Biochemistry of <b>Bachelors in Vocational Bachelor of Vocation (Nutrition, Exercise and Health)</b> under continuous evaluation system for the session 2022-23.	No changes were suggested.	Syllabus was approved and executed.
<b><u>Item: Bio 7:</u></b> <b><u>2022: 6</u></b>	To discuss the syllabus and course outcomes of Computer Applications and Bioinformatics of <b>Master of Science Botany Sem-I</b> under Credit Based Continuous Evaluation System for the session 2022-23.	No changes were suggested.	Syllabus was approved and executed.
<b><u>Item: Bio 7:</u></b> <b><u>2022: 7</u></b>	To discuss the list of proposed examiners for above stated courses.	The list of examiners was approved	The list of examiners was approved and sent to COE office.
<b><u>Item: Bio 7:</u></b> <b><u>2022: 8</u></b>	To discuss teaching methodologies adopted in the department and inputs required to upgrade the same in session 2022-23.	Members suggested to conduct more activities at departmental level to build confidence in students.	Various activities were organized in department in session 2022-23: <ul style="list-style-type: none"> <li>• Slogan writing competition on World Diabetes Day held on 14 November, 2022.</li> <li>• Quiz on global Science for global well being held on 22 February, 2023</li> </ul>

			<ul style="list-style-type: none"> <li>• Idea presentation Competition for Entrepreneurship on 25 February, 2023.</li> <li>• Educational cum excursion visit to CSIR-Institute of Himalayan Resource Biotechnology, Palampur from 4-5 Nov, 2022</li> <li>• Industrial visit to Verka on 28 January, 2023.</li> <li>• Educational visit to NABI, Mohali on 13 April, 2023.</li> <li>• Workshop on genetic counselling: Its clinical diagnostic aspects on 12 February, 2023</li> <li>• Workshop on Intellectual Property Rights (IPRs) and IP Management for startup.</li> </ul>
<b><u>Item: Bio 7: 2022: 9</u></b>	To discuss research inputs and plans of department.	Members suggested to indulge students in research.	Faculty members keep students engaged in number of extension practicals and small research projects.

**The house approved the Item: Bio 8: 2023: 1**

**Item: Bio 8: 2023: 2** To discuss proposed syllabus of **B.Sc. Bio-Technology semester- I and II** under credit based grading evaluation system with 30% internal assessment for the session 2023-24 (**Annexure B**).

**Proceedings:**

The proposed syllabus and course outcomes of **B.Sc. Bio-Technology semester- I-II under credit based grading evaluation system** for the session 2023-24 was discussed by board members and they approved the syllabus **with 20% internal assessment** with following changes:

Sem	Name of the course and course code	Sections in which	2022-23	2023-24
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		<b>changes were made</b>		
Sem I	Biochemistry-I Course Code: BBTL-1085	IV	Deleted  To remove topic A310	
Sem I	General Microbiology-I Course Code: BBTL-1346	Course outcomes  Unit 2 and 3          Unit 2 and 4          Unit 3 and 4		<ul style="list-style-type: none"> <li>• Course outcomes were modified.</li> <li>• The topic “Gram positive and Gram negative bacteria: Introduction, Structure and anatomy of bacterial cell walls and Nature of the Microbial Cell Surface. Types of bacterial flagella. Different types of bacterial staining” was shifted from Unit 3 to Unit 2.</li> <li>• The topic “Bacterial Classification: Bacterial classification and taxonomy based on Bergey’s Manual of Determinative bacteriology– General outline only. An introduction to Bacterial Serotypes” has been shifted from Unit 4 to unit 2.</li> <li>• The topic “Microbial culture collection centres, Methods of Microbial preservation: Refrigeration, Cryopreservation, lyophilization, Paraffin method” has been shifted from unit 4 to unit 3.</li> </ul>
Sem I	Lab in General Microbiology-I (Practical)	Course outcomes		<ul style="list-style-type: none"> <li>• Course outcomes have been modified.</li> <li>• The sequence of</li> </ul>

	Course Code: BBTP-1341			practical 1-3 have been rearranged.
Sem II	Genetics (Theory) Course Code: BBTL-2065	Course outcomes		• Course outcomes have been modified.
Sem II	Biochemistry-II (Theory) Course Code: BBTL-2086  Lab in Biochemistry-II Course code: BBTP-2080	Course outcomes		• Course outcomes have been modified.
Sem II	General Microbiology-II (Theory) Course Code: BBTL-2347  Lab in General Microbiology-II Course code: BBTP-2341	Course outcomes		• Course outcomes have been modified.

The course scheme approved for BSc Bio-Technology Sem I-II under Credit Based Evaluation Grading System is as follows:

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**

**Bachelor of Science (Bio-Technology) Semester-I**

**Session: 2023-24**

Course code	Course Title	Course Type	Credits		Total Credits	L	P	CA	Marks
			L	P					
BBTL -1421 BBTL -1031 BBTL -1431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture	C	4	0	4	80	-	20	100
BBTL-1102	Communication Skills in English	C	4	0	4	80	-	20	100
BBTL-1483	Cell Biology	C	3	0	3	40	-	10	50
BBTL-1074	Botany-I	C	3	0	3	40	-	10	50
BBTL-1085	Biochemistry-I	C	3	0	3	40	-	10	50

BBTL-1346	General Microbiology-I	C	3	0	3	40	-	10	50
BBTL-1087	Chemistry-I	C	3	0	3	40	-	10	50
BBTP-1488	Lab in Cell Biology	C	0	1.5	1.5	-	20	5	25
BBTP-1079	Lab in Botany-I	C	0	1.5	1.5	-	20	5	25
BBTP-1080	Lab in Biochemistry-I	C	0	1.5	1.5	-	20	5	25
BBTP-1341	Lab in General Microbiology-I	C	0	1.5	1.5	-	20	5	25
BBTP-1082	Lab in Chemistry-I	C	0	1.5	1.5	-	20	5	25
AECD-1161	*Drug Abuse: Problem Management and Prevention (Compulsory)	AC	2	0	2	40	-	10	50
SECF-1492	*Foundation Course	AC	2	-	2	20		5	25
Total Credits					30.5				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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

AC- Audit course

## SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

### Bachelor of Science (Bio-Technology)

Session: 2023-24

Semester-II

Course No.	Course Title	Course Type	Credits		Total Credits	L	P	CA	Marks
			L	P					
BBTL -2421 BBTL -2031 BBTL -2431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture	C	4	0	4	80	-	20	100
BBTM-2102	Communication Skills in English	C	3	1	4	50	30	20	100
BBTL-2333	Biostatistics	C	3	0	3	40	-	10	50
BBTL-2484	Zoology-I	C	3	0	3	40	-	10	50
BBTL-2065	Genetics	C	3	0	3	40	-	10	50
BBTL-2086	Biochemistry-II	C	3	0	3	40	-	10	50
BBTL-2347	General Microbiology-II	C	3	0	3	40	-	10	50

BBTP-2488	Lab in Zoology-I	C	0	1.5	1.5	-	20	5	25
BBTP-2069	Lab in Genetics	C	0	1.5	1.5	-	20	5	25
BBTP-2080	Lab in Biochemistry-II	C	0	1.5	1.5	-	20	5	25
BBTP-2341	Lab in General Microbiology-II	C	0	1.5	1.5	-	20	5	25
SECM-2492	*Moral Education	AC	-	-	2	20	-	5	25
Total Credits					29				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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

AC- Audit course

**The house approved the Item Bio 8:2023:2 with 20% internal assessment**

**Item: Bio 8: 2023: 3** To discuss the syllabus of **B.Sc. Bio-Technology semester- III to VI** under continuous evaluation system for the session 2023-24 (**Annexure C**).

**Proceedings:**

The proposed syllabus and course outcomes of **B.Sc. Bio-Technology semester- III to VI** under continuous evaluation system **with 20% internal assessment** for the session 2023-24 was discussed by board members and they approved the syllabus with following changes:

Sem	Name of the course and course code	Sections in which changes were made	2022-23	2023-24
Sem III	Fundamentals of Biotechnology (Theory and practical) Course code: BBTM-3061	Course outcomes		Course outcomes have been modified.
Sem III	Immunology-I (Practical) Course Code: BBTM-3062 (P)	Practical		The Practical “To perform double immune diffusion” was removed and the sequence of practical has been arranged.
Sem III	Biochemistry-III (Theory and practical) Course Code:	Course outcomes	<b>Added</b>  In Unit-3, “Lipid digestion, Absorption and transport”, “Types of	Course outcomes have been modified.

	BBTM-3085		lipid oxidation –Alpha, Beta and Omega was included”  In Unit-4, “regulation of Cholesterol metabolism” was included.	
Sem III	Molecular Biology (Theory and practical) Course Code: BBTM-3066	Course outcomes		Course outcomes have been modified.
Sem IV	Industrial Biotechnology-I Course Code: BBTM-4061	Course outcomes  Practical	<p><b>Added</b></p> <ul style="list-style-type: none"> <li>• Introduced topic “Methods and Principles of Food Processing” in Unit-1</li> <li>• “Methods” with primary and screening in Unit-2</li> <li>• Reorganization of Unit-4 was done, some topics of Industrial Biotechnology-II was included to club similar topics.</li> <li>• <b>Added practical</b> “Isolation of Amylase producing microbes” and “Screening of cellulase producing microorganism from wood degrading soil” in Industrial Biotechnology-I practical.</li> <li>• <b>Removed practical</b> “To perform an AMES assay to determine the mutagenicity of a compound” from Industrial Biotechnology-I practical.</li> </ul>	<p>Course outcomes have been modified.</p> <p>The practical “Measurement of bacterial size”, “Metabolic characterization by IMVIC”, “Starter culture preparation, evaluation and application” were removed.</p> <ul style="list-style-type: none"> <li>• It was decided to add:</li> <li>• Isolation of casein from milk and isoelectric pH of casein.</li> <li>• Cheese making by bacterial culture method</li> <li>• Determination of fat content in milk.</li> <li>• Isolation and screening of protease producing microbes from soil.</li> </ul>
Sem IV	Immunology-II (Theory and	Course outcomes		Course outcomes have been modified.



	Practical) Course code: BBTM: BBTM-4062			
Sem IV	Biochemistry-IV (Theory and practical) Course code: BBTM- 4083	Course outcomes  Practical	<b>Reorganization and more detailing of topics</b> of Biochemistry-IV was done for all the units.	Course outcomes have been modified.  Practical It was decided to remove: <ul style="list-style-type: none"> <li>• Remove practical “Isolation of Casein from milk and Isoelectric pH of casein”, “Determination of fat content in milk”, “Estimation of blood cholesterol”.</li> <li>• Add “Estimation of DNA by Diphenyl reaction” and “UV induced mutagenesis”</li> </ul>
Sem IV	Skill Development in Biotechnology Course Code: BBTM-4064 (Theory and Practical)	Course outcomes		Course outcomes have been modified.  It was decided to: <ul style="list-style-type: none"> <li>• Club Unit 4 with unit 3 due to overlapping of few topics.</li> <li>• Add new unit as Unit 4 related to food spoilage and detection.</li> <li>• Remove practical “Isolation of protein concentrates”.</li> </ul>
Sem V	rDNA Technology-I (Theory and Practical) Course Code: BBTM-5061	Course outcomes	<ul style="list-style-type: none"> <li>• <b>Deleted</b> Antibiotic Resistance genes</li> <li>• <b>Added</b> Role of antibiotics and antibiotic resistance genes in a vector</li> <li>• <b>Added</b> Copy Number Regulation</li> <li>• <b>Deleted</b> Gene Identification: Nucleic Acid Hybridization (Southern and Northern blotting)</li> <li>Merits and Demerits of</li> </ul>	Course outcomes have been modified.

			<p>Nitrocellulose and Nylon membrane (N &amp; N+)</p> <ul style="list-style-type: none"> <li>• <b>Added</b> Gene cloning: Ligation, Transformation Efficiency, Screening of transformants by Gene Inactivation: Antibiotic inactivation and Blue White Selection</li> <li>• <b>Added</b> Western blotting</li> <li>• <b>Deleted</b> Detection system of labelled probes</li> </ul> <p><b>Added practical's</b> “Preparation of competent cell” and “Transformation of competent cells by CaCl<sub>2</sub> method” in practical course of rDNA Technology-I to align with theory part.</p> <ul style="list-style-type: none"> <li>• <b>Added</b> Confirmation of High Molecular Weight DNA on Agarose Gel. Rephrased Restriction Enzyme Digestion of DNA</li> </ul>	
Sem V	Plant Biotechnology-I (Theory and practical) Course Code: BBTM-5062	Course outcomes		It was decided to modify course outcomes.
Sem V	Animal Biotechnology-I (Theory and practical) Course Code: BBTM-5063	Course outcomes		It was decided to modify course outcomes. It was decided to shift “Introduction to concept of biosafety and biosecurity” to unit 2 from Animal Biotechnology-II.
Sem V	Bioprocess Engineering-I (Theory and practical) Course Code:	Course outcomes		It was decided to modify course outcomes.

	BBTM-5064			
Sem V	Biochemical and biophysical Techniques-I (Theory and Practical)  Course Code: BBTM-5065	Course outcomes		It was decided to modify course outcomes.
Sem V	Industrial Biotechnology-II (Theory)  Course Code: BBTM-5066	Course outcomes  Unit 2 and 4	<b>Reorganization of topics</b>  Reorganized topics of Industrial Biotechnology-II to club similar topics.  <b>Added</b>  Practical's- "Alcoholic and Mixed-Acid Fermentation" and "Determination of nitrate reduction by bacteria" from Industrial Biotechnology-I and include it in Industrial Biotechnology-II practicals to align with theory.  <ul style="list-style-type: none"> <li>Included new practical in list of Industrial Biotechnology-II "Demonstration of wine production by using grape juice"</li> </ul> <b>Removed practical's</b> "Plating the milk samples for microbial counting", "Isolation and identification of microbes from spoiled food sample" and "MBRT Test for determination of milk quality" from practical list of Industrial Biotechnology-II as	It was decided to modify course outcomes.  It was decided to make corrections in one topic of Unit 2 as "SCP: Spirulina from Yeast and Bacteria" and add "symbiotic and non-symbiotic bacteria, phosphate solubilizing bacteria".

			these were not in sync with theory.	
Sem VI	rDNA Technology-II (Practical)  Course Code: BBTM-6061(P)	Course outcomes  Practical	<ul style="list-style-type: none"> <li>• <b>Deleted</b> Role of antibiotics and antibiotic resistance genes in a vector</li> <li>• Shuffling of topics between Unit I &amp; II</li> <li>• Elaboration and specification of topics Promoters, Induction System, Processing of recombinant proteins</li> <li>• <b>Added</b> Pyrosequencing</li> <li>• <b>Removed</b> Ligation reaction from list of rDNA Technology-I practical and include in rDNA Technology-I practical</li> <li>• <b>Rephrased</b> practical “Transformation of Competent cells by Cacl2 Method” as “Transformation of cells &amp; Confirmation of the transformants for the presence of plasmid by blue white selection”</li> </ul>	It was decided to modify course outcomes.  The practical “Isolation of RNA from blood” was shifted from Animal Biotechnology-II to rDNA Technology-II.
Sem VI	Animal Biotechnology-II (Theory) Course Code: BBTM-6062	Course outcomes		It was decided to modify course outcomes.
Sem VI	Plant Biotechnology-II (Theory) Course Code: BBTM-6063	Course outcomes		It was decided to modify course outcomes.
Sem VI	Biochemical and Biophysical Techniques-II  Course Code:	Course outcomes		It was decided to modify course outcomes. It was decided to: It was decided to remove “Casting of horizontal

	BBTM-6066			gel and Separation of bio-molecules by electrophoresis’ and “Casting of discontinuous PAGE gel and Separation of bio-molecules by electrophoresis” and add “To perform IEF”.
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**The house approved the Bio 8: 2023: 3 with 20% internal assessment without any change in scheme.**  
**(Approved syllabus attached as Annexure C)**

**Item: Bio 8: 2023: 4**

To discuss the syllabus and course outcomes of Basic Nutritional Biochemistry-I of **B.Sc. Home Science Semester-V** and Applied Nutritional Biochemistry of **B.Sc. Home Science semester-VI** under continuous evaluation system for the session 2022-23. (**Annexure-D**)

**Proceedings:**

The Board of Study members discussed the syllabus of Basic Nutritional Biochemistry-I of **B.Sc. Home Science Semester-V** and Applied Nutritional Biochemistry of **B.Sc. Home Science semester-VI** under continuous evaluation system for the session 2023-24 and they approved it without any change.

**(Approved syllabus attached as Annexure-D)**

**The house approved the Bio 8: 2023: 4**

**Bio 8: 2023: 5**

To discuss the syllabus and course outcomes of Nutritional Biochemistry of **Bachelors in Vocational (Nutrition, Exercise and Health)** under continuous evaluation system for the session 2023-24. (**Annexure-E**)

**Proceedings:**

The Board of Study members discussed the syllabus of Nutritional Biochemistry of **Bachelors in Vocational (Nutrition, Exercise and Health) Semester-IV** under continuous evaluation system for the session 2023-24 and they approved it without any change.

**The house approved Bio 8: 2023: 5** (**Approved syllabus attached as Annexure-E**)

**Bio 8: 2023: 6**

To discuss the syllabus of Nutritional Biochemistry of **PG Diploma in Nutrition and Dietetics Semester-I** under Credit Based Continuous Evaluation System for the session 2023-24. (**Annexure F**)

**Proceedings:**

The Board of Study members discussed the syllabus of Nutritional Biochemistry of **PG Diploma in Nutrition and Dietetics Semester-I** under Credit Based Continuous Evaluation System for the session 2023-24 and they approved it without any change.

**The house approved the Bio 8: 2023: 6 (Approved syllabus attached as Annexure F)**

**Bio 8: 2023: 7**

To discuss the list of proposed Examiners and Evaluators for above stated courses. (**Annexure-G**)

**Proceedings:**

The Chairperson discussed the list of Examiners and Evaluators for above stated courses with Board of Study members and they approved it.

**The house approved the Bio 8: 2023: 7** (Lists attached as **Annexure-G**)

**Bio 8: 2023: 8**

To discuss teaching methodologies adopted in the department and inputs required to upgrade the same for the session 2022-23.

**Proceedings:** The house approved the teaching methodologies and various activities held in the department to enhance teaching learning process. (Lists attached as **Annexure-H**)

**Bio 8: 2023: 9**

To discuss research inputs and plans of department for session 2022-23.

**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 8: 2023: 9**

**Bio 8: 2023: 10** To discuss the outcomes of above stated courses and programs.

**Proceedings:** The chairperson discussed the outcomes for above stated courses with the members (Annexure B and Annexure C)

**The house approved the Bio 8: 2023: 10**

**Bio 8: 2023: 11** To discuss the result analysis for the session 2022-23.

**Proceedings:** The chairperson discussed the result analysis of different classes with the members  
(Annexure I)

**The house approved the Bio 8: 2023: 11 (Attached as Annexure I)**

(Chairperson)

**Dr. (Mrs.) Manju Sahni**

**Dean Life Sciences**

**Kanya Maha Vidyalaya, Jalandhar**

**Annexure-B**  
**FACULTY OF LIFE SCIENCES**  
**SYLLABUS**

**of**

**Bachelor of Science (Hons.) Bio-Technology**  
**(Semester: I-II)**

**(Under Credit Based Continuous Evaluation Grading System)**

**Session: 2024-25**



**The Heritage Institution**  
**KANYA MAHA VIDYALAYA**  
**JALANDHAR**  
**(Autonomous)**



Upon successful completion of this course, students will be able to:

**PSO1:** gain and apply knowledge of biotechnology and science concepts to solve problems related to field of environment and biotechnology.

**PSO2:** design, perform experiments, analyse and interpret data for investigating complex problems in the field of biotechnology and allied fields.

**PSO3:** apply ethical principles and commit to professional ethics and responsibilities and norms of the biotechnological practices.

**PSO4:** design and develop solution to biotechnology problems by applying appropriate tools while keeping in mind safety factor for environment and society.

**PSO5:** to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

**PSO6:** contribute to the biotechnology and allied fields in designing, developing, and providing solutions for product/processes/technology development.

**PSO7:** able to justify societal, health, safety and legal issues and understand the responsibilities in biotechnological engineering practices.

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Hons.) Bio-Technology**  
**Session: 2024-28**  
**Semester-I**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL -1421 BBTL -1031 BBTL -1431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture (From Earliest Times to C-320)	C	4	0	0	4	80	-	20	100
BBTM-1102	Communication Skills in English-I	AEC	3	0	1	4	50	30	20	100
BBTM -1083	Biochemistry-I	DSC	4	0	1	5	60	20	20	100
BBTM-1074	Botany-I	DSC	4	0	1	5	60	20	20	100
BBTM-1345	General Microbiology-I	DSC	4	0	1	5	60	20	20	100
VACF-1491	*Foundation Course	VAC	2	0	0	2	40	-	10	50
Total Credits						25				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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.

DSC: Discipline Specific Courses

AEC: Ability Enhancement Course

C: Compulsory Course

VAC: Value Added Course

**Bachelor of Science (Hons.) Bio-Technology Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1083**

**Course Title: Biochemistry-I  
(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Gain basic knowledge about water and pH.

**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.

**Bachelor of Science (Hons.) Bio-Technology Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1083**

**Course Title: Biochemistry-I  
(Theory)**

**Time: 3 Hrs.**

**Max. Marks: 100**

**L-T-P: 4-0-1**

**Theory: 60**

**Practical: 20**

**CA: 20**

**Instructions for the Paper Setters:** Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

Water and its properties: role of water in life, Structure of water molecules, Physico-chemical properties of water, Dissociation and association constants, pH and buffers. pI, pKa, Hasselbach Hendersson equation and its implications.

**Unit-II**

Carbohydrates: Introduction, Monosaccharides: Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses, epimers, and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Mutarotation, structure and functions of monosaccharide derivatives, Disaccharides; concept of reducing and non-reducing sugars, Haworth projections of maltose, lactose, and sucrose, Structural and functional properties of polysaccharides: storage polysaccharides - starch and glycogen; Structural polysaccharides - cellulose, and chitin; Heteropolysaccharides: Glycosaminoglycans, Peptidoglycan, proteoglycan, glycoproteins

**Unit-III**

Lipids: Biological importance, Classification of lipids and fatty acids. General structure and function of major lipid subclasses, acylglycerols, phosphoglycerides, sphingolipids, glycosphingolipids and terpenes, sterols, steroids: Prostaglandins.

#### **Unit-IV**

Proteins: Biological importance, Structure of amino acids, non-protein and rare amino acids and their chemical reactions. Structural organization of proteins (Primary, Secondary, Tertiary, Quaternary and domain structure, protein classification and function. Forces stabilizing primary, secondary, and tertiary protein structures.

#### **Books Recommended:**

1. Voet, D., Voet, J.G. and Prait, C.W. (2018). Principles of Biochemistry, 5<sup>th</sup> Edition, Wiley.
2. Stryer, L. (2015). Biochemistry, 8<sup>th</sup> Edition, W.H. Freeman and Company, New York
3. Berg, J.M., Tymoczko, J. L. And Stryer, L. (2019). Biochemistry, 9<sup>th</sup> Edition, Freeman.
4. Mathew, C.K., Van, K.E. and Anthern, K.G. (2012). Biochemistry 4<sup>th</sup> Edition, Addison Wesley.
5. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2017). Principles of Biochemistry, 7<sup>th</sup> Edition, CBS Publishers and Distributors, New Delhi.

**Bachelor of Science (Hons.) Bio-Technology Semester-I**  
**Session: 2024-25**  
**Course Code: BBTM-1083(P)**  
**Course Title: Biochemistry-I**  
**(Practical)**

**COURSE OUTCOMES:**

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

**Bachelor of Science (Hons.) Bio-Technology) Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1083(P)**

**Course Title: Biochemistry-I  
(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Verification of Beer Lamberts Law for p-nitrophenol or cobalt chloride.
2. Determination of pKA value of p-nitrophenol.
3. Estimation of carbohydrate in given solution by anthrone method.
4. Study the presence of reducing/ non-reducing sugar in biological samples.
5. Protein estimation by Lowry's method.
6. Protein estimation by Bradford method.
7. Protein estimation by Biuret method.
8. The determination of acid value of a fat.
9. The determination of saponification value of a fat.

**Books Recommended:**

1. Plummer D.T. (2017). An Introduction to Practical Biochemistry, 3<sup>rd</sup> Edition Tata McGraw Hill Education.
2. Sawhney, S.K. and Singh, R. (2014). Introductory Practical Biochemistry, Narosa Publishing House.
3. Wilson, K. And Walker, J. (2018). Principles and Techniques of Biochemistry, 8<sup>th</sup> Edition, McGraw Hill Education.

**Bachelor of Science (Hons.) Bio-Technology Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1345**

**Course Title: General Microbiology-I  
(Theory)**

**COURSE OUTCOMES:**

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.



**Bachelor of Science (Hons.) Bio-Technology Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1345**

**Course Title: General Microbiology-I  
(Theory)**

**Time: 3 Hrs.**

**Max. Marks:100**

**L-T-P: 4-0-1**

**Theory: 60**

**Practical: 20**

**CA: 20**

**Instructions for the Paper Setters:** Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

Introduction to microbiology- Evolution and scope of microbiology, Historical perspective and important discoveries related to microbiology. Relationship between microbiology and biotechnology- The microbial biotechnology. The morphology and fine structure of Bacteria, Fungi, Neurospora, Yeast, algae and Viruses (Bacteriophages). Microbes in extreme environments- the thermophiles, halophiles, acidophiles, psychrophiles and alkalophiles.

**Unit-II**

Gram-positive and Gram-negative bacteria: Introduction, structure and anatomy of bacterial cell walls and nature of the microbial cell surface. Types of bacterial flagella. Different types of bacterial staining. Bacterial classification: Bacterial classification and taxonomy based on Bergey's Manual of Determinative bacteriology– General outline only. An introduction to Bacterial Serotypes.

**Unit-III**

Microbial culture collection centers, Methods of microbial preservation: Refrigeration, cryopreservation, lyophilization, Paraffin method. Basic concept of microbial growth and culture media and its components, Sterilization-Basic concept, physical and chemical methods of sterilization. Bacterial nutrition-Introduction, nutritional forms of bacteria, Basic concept of transport mechanisms of nutrients across microbial cell membranes: Facilitated diffusion, Active transport and group translocation.

## **Unit-IV**

Principles and application of bright field, dark field, phase contrast, fluorescence and immunofluorescence, electron microscopy (Scanning electron microscopy & transmission electron microscopy).

### **Books Recommended:**

1. Davis, B.D., Dulbecco. R., Eisen, H.N. and Ginsberg, H.S. (1990). Microbiology: 4th Edition, Harper & Row, Publishers, Singapore.
2. Stanier, R.Y. (1999). General microbiology, MacMillan Press, London.
3. Tortora, G.J., Funke, B.R. and Case, C.L. (2015). Microbiology: An introduction, 12th Edition, Pearson College Div.
4. Willey, J., Sherwood, L. And Wooverton, C. J. (2017). Prescott's Microbiology, 10th Edition, McGraw-Hill Education/ Asia
5. Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. (2010). Microbiology: An application-based approach, Tata McGraw Hill.
6. Purohit, S.S. (2006). Microbiology: Fundamentals and Applications, 7th Edition, Agrobios (India).

**Bachelor of Science (Hons.) Bio-Technology Semester-I**  
**Session: 2024-25**  
**Course Code: BBTM-1345(P)**  
**Course Title: General Microbiology-I**  
**(Practical)**

**COURSE OUTCOMES:**

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.

**Bachelor of Science (Hons.) Bio-Technology Semester-I**

**Session: 2024-25**

**Course Code: BBTM-1345(P)**

**Course Title: General Microbiology-I  
(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Introduction to microbiology laboratory and its equipments.
2. Cleaning of glassware.
2. Preparation of cotton plugs
3. Preparation of media, and aseptic techniques of sterilization.
4. Isolation of micro-organism from air, water and soil samples. Dilution, spread plating and pour plating, Colony purification.
5. Identification of bacteria by simple staining, negative staining, and Gram staining.
6. Detection of specific bacteria by Wet mount preparation method and Hanging drop mount method.
7. To preserve bacteria by short term preservation methods like direct transfer to subculture, Immersion in oil, cryopreservation.

**Books Recommended:**

1. Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10<sup>th</sup> Edition, Pearson Education India.
2. Dubey R.C. and Maheshwari (2012). Practical Microbiology 5<sup>th</sup> edition: S. Chand and company ltd. New Delhi.
3. Leooffee, M.J. and Pierce, B.E. (2015). Microbiology: Laboratory Theory and Application, 3<sup>rd</sup> Edition, Morton Pub. Co.
4. Sastry, A.S. and Bhat, S. (2018). Essentials of Practical microbiology. Jaypee Brothers Medical Publishers.

# **Semester-II**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Hons.) Bio-Technology**  
**Session: 2024-28**  
**Semester-II**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL -2421 BBTL -2031 BBTL -2431	Punjabi (Compulsory) <sup>1</sup> Basic Punjabi <sup>2</sup> Punjab History and Culture (From C-320 To 1000 A.D.)	C	4	0	0	4	80	-	20	100
BBTM-2102	Communication Skills in English-II	AEC	3	0	1	4	50	30	20	100
BBTM -2063	Genetics	DSC	4	0	1	5	60	20	20	100
BBTM-2484	Cell Biology	DSC	4	0	1	5	60	20	20	100
BBTM-2065	Fundamentals of Biotechnology	DSC	4	0	1	5	60	20	20	100
BBTM-2060	Industrial Biotechnology -I	SEC	2	0	1	3	40	20	15	75
VACD-2161	*Drug Abuse: Problem, Management and Prevention	VAC	2	0	0	2	40	-	10	50
Total Credits						28				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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.

DSC: Discipline Specific Courses

AEC: Ability Enhancement Course

C: Compulsory Course

VAC: Value Added Course

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2063**

**Course Title: Genetics**

**(Theory)**

**COURSE OUTCOMES:**

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

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2063**

**Course Title: Genetics**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 4-0-1**

**Max. Marks: 100**

**Theory: 60**

**Practical: 20**

**CA: 20**

**Instructions for the Paper Setter:** Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit - I**

**Mendel's Laws of Inheritance:** Principle of segregation and independent assortment, Monohybrid, dihybrid, and trihybrid crosses, back cross and test cross, concept of probability

**Interaction of Genes:** Incomplete inheritance and co-dominance, pleiotropism, modification of **F2** ratios: epistasis, complementary genes, supplementary genes, inhibitory genes, duplicate genes, lethality, and collaborators genes. Multiple allelism.

**Unit – II**

**Linkage:** Coupling and repulsion hypothesis, chromosomal theory of linkage, complete and incomplete linkage, linkage groups and significance of linkage.

**Crossing Over:** Introduction, mechanism of meiotic crossing over, types of crossing over, factors affecting it and its significance.

**Mutation:** Spontaneous versus induced mutations, types of mutations, mutations rate and frequency, Mutagens: Physical and chemical, the molecular basis of mutations. Significance and practical applications of mutation.

**Unit – III**

**Basic Microbial Genetics:** Conjugation, transduction, transformation



**Extra Chromosomal (Cytoplasmic) Inheritance:** features; inheritance of mitochondrial DNA, chloroplast DNA, kappa articles in Paramecium, Sigma factor in Drosophila, cytoplasmic male sterility (CMS) in maize.

**Chromosomal aberrations:** Structural: deletion, duplication, inversion, translocation; Numerical: polyploidy, aneuploidy; significance of chromosomal aberrations.

## **Unit – IV**

**Organization of Chromosomes:** The structure of prokaryotic and eukaryotic chromosome, centromere, and telomere structure, euchromatin and heterochromatin, Special chromosomes: Polytene chromosomes and lampbrush chromosomes, satellite DNA, supercoiling of DNA.

**Human Genetics:** Population genetics, Hardy Weinberg law, Pedigree analysis, Karyotyping, genetic disorders.

### **Books Recommended:**

1. Gupta, P.K. (2018). Genetics, 5<sup>th</sup> Revised Edition, Rastogi Publications.
2. Hartl, D.L., Cochrane, B. (2017). Genetics: Analysis of Genes & Genomes 9<sup>th</sup> Edition. Jones & Bartlett Publishers.
3. Brooker, R.J. (2017). Genetics: Analysis and Principles, McGraw-Hill Education.
4. Pierce, B. (2016). Genetics: A conceptual approach, 6<sup>th</sup> Edition, WH Freeman.
5. Snustad and Simmons (2015). Principles of Genetics, 7<sup>th</sup> Edition, John Wiley & Sons

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2063(P)**

**Course Title: Genetics**

**(Practical)**

**COURSE OUTCOMES:**

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.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2063(P)**

**Course Title: Genetics**

**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Demonstration of Law of segregation and independent assortment (use of colored beads, capsules etc.).
2. Numerical problems on Mendelism and on modified F<sub>2</sub> ratios.
3. Numerical problems on paternity disputes (Blood groups)
4. Segregation demonstration in preserved material
5. Study of polytene chromosomes from permanent slides.
6. Dermatographics: Palm print taking and fingertip patterns.
7. Preparation and study of mitosis slides from onion root tips by squash method.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**  
**Session: 2024-25**  
**Course Code: BBTM-2065**  
**Course Title: Fundamentals of Biotechnology**  
**(Theory)**

**COURSE OUTCOMES**

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.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**  
**Session: 2024-25**  
**Course Code: BBTM-2065**  
**Course Title: Fundamentals of Biotechnology**  
**(Theory)**

**Time: 3 Hours**  
**L-T-P: 4-0-1**

**Max. Marks: 100**  
**Theory: 60**  
**Practical: 20**  
**CA: 20**

**Instructions for the Paper Setter:** Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

### **UNIT-I**

#### **Emergence, scope and basics of biotechnology**

Historical perspective, Appraise the interplay of science and technology in the development of biotechnology, Definition and areas of biotechnology, Overview - DNA, gene, gene expression, Recombinant DNA technology. **Role of Bacteria (*E. coli*), Yeast, Viruses (bacteriophages), *Drosophila melanogaster*, *Caenorhabditis elegans*, *Arabidopsis thaliana* as workhorses of biotechnology. Biotechnology research in India. biotechnology institutions in India (Public and private Sector), Biotech success stories, Biotech policy initiatives. careers and employment opportunities in biotechnology.**

### **UNIT-II**

#### **Applications of Biotechnology: An Overview**

Applying biotechnology to modern life styles: Healthcare – Biopharma : Recombinant human insulin, Recombinant hepatitis B vaccine; molecular diagnostics : PCR for infectious disease (viral / bacterial), blood screening and genetic testing, Gene therapy (for Alzheimer's disease), genetic counseling; Agriculture and food production (Genetically engineered food, seed banks, aquaculture); Green biotechnology (bioremediation, biofuels, conservation); Forensics & biodefense; Evo Devo (The development of life and human family tree); careers and employment opportunities in biotechnology.

### **UNIT-III**

## **Bio business and IPRs in Biotechnology**

Commercialization of biotechnology: concerns and consequences, biotechnology industry practices and Government regulations, concept and market potential of Bio business, Requirements and objectives of patent, patentable and non-patentable inventions, process of writing and filing a patent, patenting genes/ gene fragments /SNPs/ proteins / stem cells. Patents related to bacteria, viruses, fungi and medicinal plants, plant breeder's right. IPR: introduction, types (trade secret, copyright, trademark)

## **UNIT-IV**

### **Biotechnology & Society**

Ethical Issues & Regulating the use of Biotechnology: Human cloning, GM microorganisms, Food & Food ingredients, stem cells; Public Perception of Biotechnology: Consuming GM foods, GMOs and environment, antibiotic resistance; The future of Biotechnology.

### **Books Recommended:**

1. David P Clark & Nanette J. Pazdernik (2017) Biotechnology – Applying the Genetic Revolution, Elsevier Academic Press.
2. Bernard R Glick, Jack J Pasternak and Cheryl L Patten (2010) Molecular Biotechnology: Principles and applications of Recombinant DNA, ASM Press.
3. Singh, B.D. (2018). Biotechnology expanding horizons, Kalyani Publishers, New Delhi.
4. Singh, I. and Kaur, B (2010) Patent law and Entrepreneurship, 3rd Edition, Kalyani Publishers.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**  
**Session: 2024-25**  
**Course Code: BBTM-2065(P)**  
**Course Title: Fundamentals of Biotechnology**  
**(Practical)**

**COURSE OUTCOMES:**

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.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**  
**Session: 2024-25**  
**Course Code: BBTM-2065(P)**  
**Course Title: Fundamentals of Biotechnology**  
**(Practical)**

**Time: 3 hours**

**Practical marks: 20**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Good laboratory practices followed in biotechnology laboratory
2. Introduction, use and maintenance of basic equipments in a biotechnology laboratory (Auto-pipettes, weighing balance, pH meter, water bath, dry bath, spectrophotometer, centrifuges, light microscope, electrophoretic apparatus, vortex mixer, magnetic stirrer, rocker, laminar hoods, autoclave, sonicator, UV transilluminator, hot air oven, BOD incubator)
3. Handling and disposal of hazardous reagents (acids, carcinogenic chemicals like acrylamide, ethidium bromide) and concept of chemical hoods.
4. Different steps for patent with the help of example.



**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2060**

**Course Title: Industrial Biotechnology-I  
(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the basics of microbial industrial processes.

**CO2:** Understand the isolation, maintenance, and preservation of industrially important microbes

**CO3:** Understand different strain improvement method required for industrial important microbes

**CO4:** Understand industrial production of primary and secondary metabolite and fermentation of dairy products, fermented foods, and enzymes.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2060**

**Course Title: Industrial Biotechnology-I**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 2-0-1**

**Max. Marks: 75**

**Theory: 40**

**Practical: 20**

**CA: 15**

**Instructions for the Paper Setter:** Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

**Unit-I**

Introduction: Basic concept of agriculture and food processing as industry, methods and principles of food processing, differences between microbial industrial processes and chemical industrial processes.

**Unit-II**

General study and characterization of Industrially important microbes. Methods of isolation, screening (primary and secondary methods), selection and identification, maintenance, and preservation of industrially important microbial cultures.

**Unit-III**

Strain improvement of industrial important microbes: by using mutational programme and recombination systems (parasexual cycle, protoplast fusion and recombinant DNA techniques), isolation of mutants (induced, auxotrophic, resistant and revertant mutants), inoculums development, media formulation and process optimization of industrial and agro industrial microbes.

**Unit-IV**

Introduction to primary and secondary metabolites production. Production of Tetracycline and penicillin, Dairy products like curd, yoghurt, cheese, bread. Fermented foods-Pickles, Sauerkraut, Enzyme production-Amylases, cellulases, proteases in leather industries.

**Books Recommended:**

1. Wittmann, C. and Liao, J. (2017). Industrial Biotechnology: Products and Processes (Advanced Biotechnology), Vol. 4 Wiley-VCH.
2. Singh B.D. (2016). Biotechnology: Expanding horizons, Kalyani Publishers / Lyall Bk Depot
3. Chakraborty, P.K. (2013). Agro and Industrial Biotechnology, Black Prints
4. Tyagi, N. (2012). Industrial Microbiology and Biotechnology, Agrotech Press.
5. Casida, L.E.J.R. (2007). Industrial Microbiology, New Age International Publishers
6. Okafor N, Okeke B.C. (2018). Modern Industrial Microbiology and Biotechnology, 2<sup>nd</sup> edition, CRC Press.

**Bachelor of Science (Hons.) Bio-Technology Semester-II**

**Session: 2024-25**

**Course Code: BBTM-2060(P)**

**Course Title: Industrial Biotechnology-I  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Isolate milk protein and determine fat content in milk

**CO2:** Learn the process of cheese making

**CO3:** Isolate microbes from soil

**CO4:** Screen industrially important enzyme producing microbes

**Bachelor of Science (Hons.) Bio-Technology Semester-II**  
**Session: 2024-25**  
**Course Code: BBTM-2060(P)**  
**Course Title: Industrial Biotechnology-I**  
**(Practical)**

**Time: 3 Hrs**

**Practical Marks: 20**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments**

1. Isolation of microbial cells by serial dilution-spread plate method.
2. Measurement of bacterial size.
3. Metabolic Characterization by IMVIC test
4. Alcoholic and Mixed–Acid Fermentation.
5. Starter culture preparation, evaluation and application.
6. Determination of nitrate reduction by bacteria.

**Books Recommended:**

1. Cappuccino J.G., Sherman N. (2007). Microbiology: A laboratory (Pearson Benjamin Cummings).
2. Plummer D.T. (2004). An introduction to practical biochemistry (Tata McGraw Hill Publishers Co. Ltd., New Delhi).
3. Bansal, D.D., K Hardori, R., Gupta, M.M. (1985). Practical biochemistry (Standard Publication Chandigarh).
4. Dubey R.C. and Maheshwari (2012) Practical Microbiology 5th edition: S. Chand and company ltd. New Delhi.

Annexure-C

# **FACULTY OF LIFE SCIENCES**

## **SYLLABUS**

**Of**

**Bachelor of Science Bio-Technology (Semester: III-IV)**

**(Under Credit Based Continuous Evaluation Grading System)**

**Session: 2024-25**



**The Heritage Institution**  
**KANYA MAHA VIDYALAYA**  
**JALANDHAR**  
**(Autonomous)**

Upon successful completion of this course, students will be able to:

**PSO1:** gain and apply knowledge of biotechnology and science concepts to solve problems related to field of environment and biotechnology.

**PSO2:** design, perform experiments, analyse and interpret data for investigating complex problems in the field of biotechnology and allied fields.

**PSO3:** apply ethical principles and commit to professional ethics and responsibilities and norms of the biotechnological practices.

**PSO4:** design and develop solution to biotechnology problems by applying appropriate tools while keeping in mind safety factor for environment and society.

**PSO5:** to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

**PSO6:** contribute to the biotechnology and allied fields in designing, developing, and providing solutions for product/processes/technology development.

**PSO7:** able to justify societal, health, safety and legal issues and understand the responsibilities in biotechnological engineering practices.

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**  
**Session: 2024-25**  
**Semester-III**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL-3061	Fundamentals of Biotechnology	C	3	0	0	3	60	-	15	75
BBTL-3062	Immunology-I	C	3	0	0	3	60	-	15	75
BBTL-3083	Chemistry-II	C	2	0	0	2	40	-	10	50
BBTL-3074	Botany-II	C	2	0	0	2	40	-	10	50
BBTL-3085	Biochemistry-III	C	3	0	0	3	60	-	15	75
BBTL-3066	Molecular Biology	C	3	0	0	3	60	-	15	75
BBTP-3067	Lab in Fundamentals of Biotechnology	C	0	0	1	1	-	20	5	25
BBTP-3068	Lab in Immunology-I	C	0	0	1	1	-	20	5	25
BBTP-3089	Lab in Chemistry-II	C	0	0	1	1	-	20	5	25
BBTP-3070	Lab in Botany-II	C	0	0	1	1	-	20	5	25
BBTP-3081	Lab in Biochemistry-III	C	0	0	1	1	-	20	5	25
BBTP-3062	Lab in Molecular Biology	C	0	0	1	1	-	20	5	25
AECE-3221	*Environmental Studies	C	2	0	0	2	30	10	10	50
SECP-3512	*Personality Development	AC	2	0	0	2	40	-	10	50
Total Credits						26				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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**

**AC- Audit course**



**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**  
**Session: 2024-25**  
**Semester-IV**

Course No.	Course Title	Course Type	Credits			Total Credits	L	P	CA	Total Marks
			L	T	P					
BBTL-4061	Industrial Biotechnology-I	C	3	0	0	3	60	-	15	75
BBTL-4062	Immunology-II	C	3	0	0	3	60	-	15	75
BBTL-4083	Biochemistry-IV	C	3	0	0	3	60	-	15	75
BBTL-4064	Skill Development in Biotechnology	C	2	0	0	2	40	-	10	50
BBTL-4065	Fundamental of Bioinformatics	C	2	0	0	2	40	-	10	50
BBTL-4486	Zoology-II	C	2	0	0	2	40	-	10	50
BBTP-4067	Lab in Industrial Biotechnology-I	C	0	0	1	1	-	20	5	25
BBTP-4068	Lab in Immunology-II	C	0	0	1	1	-	20	5	25
BBTP-4089	Lab in Biochemistry-IV	C	0	0	1	1	-	20	5	25
BBTP-4060	Lab in Skill Development in Biotechnology	C	0	0	1	1	-	20	5	25
BBTP-4061	Lab in Fundamental of Bioinformatics	C	0	0	1	1	-	20	5	25
BBTP-4482	Lab in Zoology-II	C	0	0	1	1	-	20	5	25
BBTF-4063	Industrial/ Institutional Visit	C	0	0	1	1	-	20	5	25
SECS-4522	*Social Outreach	AC	0	0	2	2	-	40	10	50
Total Credits						24				

<sup>1</sup> Special Course in lieu of Punjabi (Compulsory)

<sup>2</sup> 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**

**AC- Audit course**

# **B.Sc. Bio-Technology Semester-II**

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3061**  
**Fundamentals of Biotechnology**  
**(Theory)**

**COURSE OUTCOMES**

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.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3061**  
**Fundamentals of Biotechnology**  
**(Theory)**

**Time: 3 Hours**  
**L-T-P: 3-0-0**

**Max. Marks: 75**  
**Theory: 60**  
**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question carries 12 marks.

**UNIT-I**

**Emergence, scope and basics of biotechnology**

Historical perspective, Appraise the interplay of science and technology in the development of biotechnology, Definition and areas of biotechnology, Overview - DNA, gene, gene expression, Recombinant DNA technology. Role of Bacteria (*E. coli*), Yeast, Viruses (bacteriophages), *Drosophila melanogaster*, *Caenorhabditis elegans*, *Arabidopsis thaliana* as workhorses of biotechnology. Biotechnology research in India. biotechnology institutions in India (Public and private Sector), Biotech success stories, Biotech policy initiatives.

**UNIT-II**

**Applications of Biotechnology: An Overview**

Applying biotechnology to modern life styles: Healthcare – Biopharma : Recombinant human insulin, Recombinant hepatitis B vaccine; molecular diagnostics : PCR for infectious disease (viral / bacterial), blood screening and genetic testing, Gene therapy (for Alzheimer's disease), genetic counseling; Agriculture and food production (Genetically engineered food, seed banks, aquaculture); Green biotechnology (bioremediation, biofuels, conservation); Forensics & biodefense; Evo Devo (The development of life and human family tree); careers and employment opportunities in biotechnology.

**UNIT-III**

**Bio business and IPRs in Biotechnology**

Commercialization of biotechnology: concerns and consequences, biotechnology industry practices and Government regulations, concept and market potential of Bio business, Requirements and objectives of patent, patentable and non-patentable inventions, process of writing and filing a patent, patenting genes/ gene fragments /SNPs/ proteins / stem cells. Patents

related to bacteria, viruses, fungi and medicinal plants, plant breeder's right. IPR: introduction, types (trade secret, copyright, trademark)

## **UNIT-IV**

### **Biotechnology & Society**

Ethical Issues & Regulating the use of Biotechnology: Human cloning, GM microorganisms, Food & Food ingredients, stem cells; Public Perception of Biotechnology: Consuming GM foods, GMOs and environment, antibiotic resistance; The future of Biotechnology.

#### **Books Recommended:**

1. David P Clark & Nanette J. Pazdernik (2017) Biotechnology – Applying the Genetic Revolution, Elsevier Academic Press.
2. Bernard R Glick, Jack J Pasternak and Cheryl L Patten (2010) Molecular Biotechnology: Principles and applications of Recombinant DNA, ASM Press.
3. Singh, B.D. (2018). Biotechnology expanding horizons, Kalyani Publishers, New Delhi.
4. Singh, I. and Kaur, B (2010) Patent law and Entrepreneurship, 3rd Edition, Kalyani Publishers.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3062**  
**Immunology-I**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Familiarize with the immune system

**CO2:** Know about different immune cells providing immunity

**CO3:** Inculcate the knowledge of immune response towards microorganisms.

**CO4:** Understand Major Histocompatibility system in relation to disease susceptibility

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3062**  
**Immunology-I**  
**(Theory)**

**Time: 3 Hours**  
**L-T-P: 3-0-0**

**Max. Marks: 75**  
**Theory: 60**  
**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

Types of immunity-innate and adaptive, features of immune response-memory, specificity, and recognition of self and non-self. Terminology used in the study of immune system. Active and passive immunization

**Unit-II**

Lymphoid cells, heterogeneity of lymphoid cells; T-cells, B-cells, null cells; monocytes, polymorphs, primary and secondary lymphoid organs-thymus, Bursa of fabricius, spleen, lymph nodes, lymphatic system, Mucosa Associated Lymphoid Tissue (MALT), lymphocyte traffic.

**Unit-III**

Introduction of antigen and antibody, epitope (B cell & T Cell epitope), Introduction to immunogen, molecular basis of immunogenicity and antigenicity, factors influencing immunogenicity. Immunoglobulins: classes and structure, affinity, and avidity. Antigen-antibody interaction. Complement fixing antibodies and complement cascade: Classical, alternative and lectin pathway.

**Unit-IV**

MHC class I and class II molecules, structure and function of class I and class II MHC molecules. Organization of Major Histocompatibility complex (MHC) and inheritance, regulation of MHC expression and disease susceptibility. T and B Cells and their response, structure of T-cell antigen receptors: TCR-CD3 complex.

**Books Recommended:**

1. Punt, J., Stranford, S., Johns, P. And Owen, J.A (2018). Kuby Immunology, 8<sup>th</sup> Edition. W.H. Freeman and Company, New York.
2. Delves, P. J., Martin, S. J., Burton, D. R. and Roitt, I.M. (2017). Roitt's Essential Immunology, Wiley Blackwell Publishers.

3. Paul, W.E. (2012). Fundamental Immunology, 7<sup>th</sup> Edition, LWW Publishers.
4. Kanfmann, S.H.E., Sher A. and Ahmed, R. (2002). Immunology of Infectious Diseases, ASM Press, Washington, D.C.
5. Roitt, I.M. Brostoff, J. and Male, D.K. (2012). Immunology, 8<sup>th</sup> Edition, Mosby publishers.



**Bachelor of Science (Bio-Technology) Semester-III**

**Session: 2024-25**

**Course Code: BBTL-3085**

**Biochemistry-III**

**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Develop an understanding of carbohydrates metabolisms in cell

**CO2:** Understand the basics of Kreb's cycle and electron transport chain.

**CO3:** Know the concept of lipid catabolism and its regulation

**CO4:** Understand the various pathways for lipid anabolism along with cholesterol metabolism

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3085**  
**Biochemistry-III**  
**(Theory)**

**Time: 3 Hours**  
**L-T-P: 3-0-0**

**Max. Marks: 75**  
**Theory: 60**  
**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**UNIT-1**

Carbohydrate metabolism: - Biosynthesis and degradation of carbohydrates, glycolysis, gluconeogenesis, feeder's pathways for glycolysis, regulation of carbohydrates metabolism.

**UNIT-II**

Kreb's cycle: - Amphibolic nature of kreb's cycle, regulation and enzymes of kreb's cycle, glyoxylate pathway. Electron transport chain: - Mitochondrial electron chain, oxidative phosphorylation, chemiosmotic hypothesis, ATP synthase and regulation of ATP synthesis

**UNIT-III**

Lipid digestion, absorption and transport. Lipid Catabolism: Oxidation of fatty acids (Alpha, Beta, Omega oxidation), degradation of triacylglycerol, phosphoglycerides, sphingolipids, regulation of lipid metabolism.

**UNIT-IV**

Lipid anabolism: Synthesis of fatty acids, triacylglycerol, phosphoglycerides, sphingolipids, cholesterol, and regulation of cholesterol metabolism.

**Books Recommended:**

1. Voet, D., Voet, J.G. and Prait, C.W. (2018). Principles of Biochemistry, 5<sup>th</sup> Edition, Wiley.
2. Stryer, L. (2015). Biochemistry, 8<sup>th</sup> Edition, W.H. Freeman and Company, New York
3. Berg, J.M., Tymoczko, J. L. And Stryer, L. (2011). Biochemistry, 7<sup>th</sup> Edition, Freeman.

4. Nelson, D.L. and Cox, M.M. (2013). Principles of Biochemistry, 7<sup>th</sup> Edition, Freeman
5. Mathew, C.K., Van, K.E. and Anthern, K.G. (2012). Biochemistry 4<sup>th</sup> Edition, Addison Wesley.
6. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2017). Principles of Biochemistry, 7<sup>th</sup> Edition, CBS Publishers and Distributors, New Delhi.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTL-3066**  
**Molecular Biology**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand genetic material of a cell and DNA replication.

**CO2:** Know the basics of DNA recombination

**CO3:** Understand transcription and RNA processing

**CO4:** Know genes expression and regulation in a cell.

**Bachelor of Science (Bio-Technology) Semester-III**

**Session: 2024-25**

**Course Code: BBTL-3066**

**Molecular Biology  
(Theory)**

**Time: 3 Hours**

**L-T-P: 3-0-0**

**Max. Marks: 75**

**Theory: 60**

**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

DNA as genetic material, Structure of DNA, types of DNA, modes of replication of DNA in prokaryotes and eukaryotes, DNA polymerases, the replication complex: Pre-priming proteins, fidelity of replication. mechanism of replication.

**Unit - II**

DNA recombination in prokaryotes and eukaryotes: molecular mechanisms, Holiday junction model, DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair, insertion elements and transposons: Bacterial and eukaryotic transposons.

**Unit-III**

**Transcription and RNA processing**

RNA structure and types of RNA, transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, initiation, elongation and termination of RNA chains, Transcription in eukaryotes: eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

**UNIT IV**

**Regulation of gene expression and translation**

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system): lac, his, trp operons, genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, charging of tRNA, aminoacyl tRNA synthetases, mechanism of

initiation, elongation and termination of polypeptides, fidelity of translation, inhibitors of translation, regulation, posttranslational modifications of proteins

**Books Recommended:**

1. Adams, R. L. P., Knowler, J. T., and Leader, D. P. (1992). The Biochemistry of Nucleic acids, 11<sup>th</sup> Edition, Champman and Hall, The New York/London/Tokyo/Melbourne/Madras.
2. Bolsover, S. R., Hyams, J. S., S. Shephard, E. A. and White H. A. (1997). From Genes to Cells., John Wiley and Sons.
3. Krebs, J E, Goldstein, ES, Kilpatrick, ST (2017). Lewin's Gene XII, Jones and Bartlett publishers, Inc.
4. Maulik, S. and Patel, S. D. (1997). Molecular Biotechnology Therapeutic Application and Strategies, John Wiley & Sons.
5. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell.
6. Strachan, T. and Read, A. (2010). Human Molecular Genetics, Garland Science
7. Pierce, B. (2016). Genetics: A conceptual approach, 6<sup>th</sup> Edition, WH Freeman.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3067**  
**Lab in Fundamentals of Biotechnology**  
**(Practical)**

**COURSE OUTCOMES:**

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.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3067**  
**Lab in Fundamentals of Biotechnology**  
**(Practical)**

**Time: 3 Hrs.**  
**L-T-P: 0-0-1**

**Max. Marks: 20**  
**CA: 5**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

5. Good laboratory practices followed in biotechnology laboratory
6. Introduction, use and maintenance of basic equipments in a biotechnology laboratory (Auto-pipettes, weighing balance, pH meter, water bath, dry bath, spectrophotometer, centrifuges, light microscope, electrophoretic apparatus, vortex mixer, magnetic stirrer, rocker, laminar hoods, autoclave, sonicator, UV transilluminator, hot air oven, BOD incubator)
7. Handling and disposal of hazardous reagents (acids, carcinogenic chemicals like acrylamide, ethidium bromide) and concept of chemical hoods.
8. Different steps for patent with the help of example.



**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3068**  
**Lab in Immunology-I**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Collect blood sample by different methods.

**CO2:** Calculate Differential leucocyte count, Total Leucocytes Count and RBC count in the given blood sample

**CO3:** Perform blood group testing

**CO4:** Perform dye exclusion method to isolate mononuclear cells from peripheral blood.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3068**  
**Lab in Immunology-I**  
**(Practical)**

**Time: 3 Hrs.**  
**L-T-P: 0-0-1**

**Marks: 20**  
**CA: 5**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Collection of blood sample by different methods.
2. Blood group testing.
3. Differential Leucocytes Count.
4. Total Leucocytes Count.
5. Total RBC count
6. Separation of serum and plasma from blood.
7. Isolation of mononuclear cells from peripheral blood and to check their viability by dye exclusion method.

**Books Recommended:**

1. Celis, J.E., Hunter, T. and Carter, N (2005). Cell Biology: A laboratory handbook. 3<sup>rd</sup> Edition, Vol-III, Academic Press, U.K.
2. Stevans, C.D. (2017). Clinical Immunology and Serology: A Laboratory Perspective 4<sup>th</sup> Edition, F.A Davis Company, Philadelphia.
3. Hay, F.C. and Westwood O.M.R. (2002). Practical Immunology, 4<sup>th</sup> Edition, Wiley Blackwell.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3081**  
**Lab in Biochemistry-III**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the importance of absorbance maxima

**CO2:** Determine sugar in the given sample

**CO3:** Perform spectral analysis of plant pigments

**CO4:** Separate lipids and other macromolecules from a given sample

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3081**  
**Lab in Biochemistry-III**  
**(Practical)**

**Time: 3 Hrs.**  
**L-T-P: 0-0-1**

**Practical Marks: 20**  
**CA: 5**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Carbohydrate estimation by Dubois method.
2. Determination of reducing sugar using 3,5 dinitrosalicylic acid.
3. (a) Absorbance curve of two dyes  
(b) Spectral analysis of various plant pigments
4. Separation of lipids from wheat grains.
5. Separation of macromolecules using thin layer chromatography.

**Books Recommended:**

1. Celis, J.E., Hunter, T. and Carter, N (2005). Cell Biology: A laboratory handbook. 3<sup>rd</sup> Edition, Vol-III, Academic Press, U.K.
2. Stevans, C.D. (2017). Clinical Immunology and Serology: A Laboratory Perspective 4<sup>th</sup> Edition, F.A Davis Company, Philadelphia.
3. Hay, F.C. and Westwood O.M.R. (2002). Practical Immunology, 4<sup>th</sup> Edition, Wiley Blackwell.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3062**  
**Lab in Molecular Biology**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Isolate genomic DNA and RNA from given samples.

**CO2:** Perform agarose gel electrophoresis for a given DNA sample.

**CO3:** Quantify and determine purity of RNA and DNA.

**CO4:** Do SDS-PAGE electrophoresis of different protein samples.

**Bachelor of Science (Bio-Technology) Semester-III**  
**Session: 2024-25**  
**Course Code: BBTP-3062**  
**Lab in Molecular Biology**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**L-T-P: 0-0-1**

**CA: 5**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments**

1. Isolation of genomic DNA from plants by CTAB method.
2. Isolation of genomic DNA from blood and perform agarose gel electrophoresis.
3. Quantification and determination of purity of DNA.
4. To perform RNA isolation from plants.
5. Quantification and determination of purity of RNA.
6. SDS-Page electrophoresis of different protein samples.

**Books Recommended:**

1. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell
2. Sambrook J. and Green M. R. (2013). Molecular Cloning: A Laboratory Manual, 4<sup>th</sup> Edition, CSHL.
3. Brown T.A (2017). Genomes, 3<sup>rd</sup> Edition, Garland Science.

# **B.Sc. Bio-Technology Semester-IV**

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2023-24**  
**Course Code: BBTL-4061**  
**Industrial Biotechnology-I**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the basics of microbial industrial processes.

**CO2:** Understand the isolation, maintenance, and preservation of industrially important microbes

**CO3:** Understand different strain improvement method required for industrial important microbes

**CO4:** Understand industrial production of primary and secondary metabolite and fermentation of dairy products, fermented foods, and enzymes.



**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2023-24**

**Course Code: BBTL-4061**

**Industrial Biotechnology-I**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 3-0-0**

**Max. Marks: 75**

**Theory: 60**

**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

Introduction: Basic concept of agriculture and food processing as industry, methods and principles of food processing, differences between microbial industrial processes and chemical industrial processes.

**Unit-II**

Industrially important microbes, screening (primary and secondary methods), selection and identification, maintenance, and preservation of industrially important microbial cultures.

**Unit-III**

Strain improvement of industrial important microbes: by using mutational programme and recombination systems (parasexual cycle, protoplast fusion and recombinant DNA techniques), isolation of mutants (induced, auxotrophic, resistant and revertant mutants), inoculums development, media formulation and process optimization of industrial and agro industrial microbes.

**Unit-IV**

Introduction to primary and secondary metabolites production. Dairy products like curd, yoghurt, cheese, bread. Fermented foods-Pickles, Sauerkraut, Enzyme production-Amylases, cellulases, proteases in leather industries.

**Books Recommended:**

7. Wittmann, C. and Liao, J. (2017). Industrial Biotechnology: Products and Processes (Advanced Biotechnology), Vol. 4 Wiley-VCH.
8. Singh B.D. (2016). Biotechnology: Expanding horizons, Kalyani Publishers / Lyall Bk Depot
9. Chakraborty, P.K. (2013). Agro and Industrial Biotechnology, Black Prints
10. Tyagi, N. (2012). Industrial Microbiology and Biotechnology, Agrotech Press.
11. Casida, L.E.J.R. (2007). Industrial Microbiology, New Age International Publishers
12. Okafor N, Okeke B.C. (2018). Modern Industrial Microbiology and Biotechnology, 2<sup>nd</sup> edition, CRC Press.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2023-24**

**Course Code: BBTL-4062**

**Immunology-II**

**(Theory)**

**COURSE OUTCOMES:**

After passing this course, student will be able to

**CO1:** Familiarize with antigens and antibodies.

**CO2:** Understand different types of immunodiffusion techniques.

**CO3:** Have sound knowledge of how immune system deals with various pathogens, and different cell types involved in the prevention of disease.

**CO4:** Know about the concept, synthesis, and action mechanism of vaccines.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2023-24**

**Course Code: BBTL-4062**

**Immunology-II**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 3-0-0**

**Max. Marks: 75**

**Theory: 60**

**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**Unit-I**

T-cell subsets and surface markers, T-dependent and T-independent antigens, adjuvants, monoclonal antibodies: its production and uses.

**Unit-II**

Various types of immunodiffusions and immunoelectrophoretic procedures. Immunoblot, ELISA, RIA, agglutination of pathogenic bacteria, Hemagglutination and hemagglutination inhibition.

**Unit-III**

Immune invasion: mechanism used by parasites, regulation of immune invasion, immunity to viruses, intracellular and extracellular bacteria, immunopathological consequences of parasitic infections.

**Unit-IV**

Whole organism vaccine, Types of vaccines: purified macromolecules as vaccine, recombinant antigen vaccine, recombinant vector vaccine, synthetic peptide vaccine, multivalent subunit vaccine, DNA Vaccine, RNA Vaccine.

**Books Recommended:**

1. Abbas, A.K. Litchman, A.H. and Pillai, S. (2017). Cellular and Molecular Immunology, 9<sup>th</sup> Edition, Elsevier.
2. Benjamni, E., Coico, R. and Sunshine, G. (2015). Immunology: A short course, 7<sup>th</sup> Edition, New York, Wiley- Wiley-Blackwell.
3. Delves, P. J., Martin, S. J., Burton, D. R. and Roitt, I.M. (2017). Roitt's Essential Immunology, Wiley Blackwell Publishers.

4. Roitt, I., Brostoff, J. and Male, D. (2001). Immunology, 6<sup>th</sup> Edition, Mosby.
5. Kanfmann S.H.E., Sher, A., Ahmed, R. (2002). Immunology of infectious Diseases, ASM Press, Washington D.C.
6. Butler, M. (2004). Animal Cell culture and Technology, 2<sup>nd</sup> Edition, Garland Science.
7. Punt, J., Stranford, S., Johns, P. And Owen, J.A (2018). Kuby Immunology, 8<sup>th</sup> Edition, W.H. Freeman and Company, New York.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTL-4083**

**Biochemistry-IV**

**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Know the basics of amino acid biosynthesis and their regulation.

**CO2:** Have knowledge of degradation pathways of amino acids along with disorders of amino acid metabolism

**CO3:** Understand the biosynthetic pathways of purines and pyrimidines nucleotides

**CO4:** Know the degradative pathways of purines and pyrimidines

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTL-4083**

**Biochemistry-IV**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 3-0-0**

**Max. Marks: 75**

**Theory: 60**

**CA: 15**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

**UNIT-I**

Amino acid metabolism: Overview of amino acid metabolism. Glucogenic and ketogenic amino acids. Biosynthesis of essential amino acids, regulation of amino acid biosynthesis by feedback inhibition

**UNIT-II**

Amino acid metabolism: Transamination reactions of amino acids, deamination and decarboxylation reactions, role of pyridoxal phosphate, urea cycle and inherited defects of urea cycle. Catabolism of essential amino acids, disorders of amino acids metabolism, phenylketonuria, alkaptonuria, maple syrup urine disease, methylmalonic academia (MMA), homocystinuria

**UNIT-III**

Nucleic acid metabolism: Structure of purine and pyrimidine bases, nucleosides, and nucleotides. Biologically important nucleotides. Biosynthesis of purines and pyrimidines nucleotides. Clinical significance of purine biosynthetic pathway.

**UNIT-IV**

Nucleic acid metabolism: Degradation of purines and pyrimidines, nucleotides, salvage pathway, regulation of nucleotide biosynthesis.

**Books Recommended:**

1. Jain, J. L., Jain, S. and Jain. N. (2016). Fundamentals of Biochemistry, S. Chand & Company Ltd., New Delhi.
2. Rawn, J.D. (1989). Biochemistry, Niel Patterson Publications, North Carolina.

3. Berg, J.M., Tymoczko, J.L., Gatto, G.L., Stryer, L. (2015). Biochemistry, 4<sup>th</sup> Edition., W.H. Freeman & Co., San Francisco.
4. Voet, D., Voet, J.G. (2012). Fundamentals of Biochemistry, John Wiley and Sons, New York.
5. Nelson, D.L. and Cox, M.M. (2017). Lehninger's Principles of Biochemistry, 7<sup>th</sup> Edition., WH Freeman, New York.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTL-4064**

**Skill Development in Biotechnology  
(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Acquire the knowledge of food fermentation industry

**CO2:** To gain the knowledge about various adulterants in food along with principles of government regulatory bodies

**CO3:** Understand the nutritional aspects of the biomolecules, balanced diet and disorders related to nutrition.

**CO4:** Understand food spoilage and detection



**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTL-4064**

**Skill Development in Biotechnology**

**(Theory)**

**Time: 3 Hours**

**L-T-P: 2-0-0**

**Max. Marks: 50**

**Theory: 40**

**CA: 10**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

**Food biotechnology**

**Unit-I**

Commercial potential of food fermentation industry; novel food ingredients: Low calorie sweetener, plant tissue culture and naturally produced flavor modifiers, natural food coloring agents; nutraceuticals: Probiotics, food spoilage: Detection and mechanism of food borne infections (*Clostridium*, *Salmonella*, *Staphylococcus*, *Aspergillus* sp.)

**Unit-II**

Introduction to HACCP plan, preservation: thermal processing, cold preservation, chemical preservatives, food dehydration, food irradiation, biological control; quality assurance: biochemical/ microbial testing of food adulterants: milk, butter, oil, jams, jellies, government regulatory practices and policies (FSSAI, FDA etc.), food packaging: need and ways (glass, metal, plastics, molded pulp, and aluminium foil).

**Dietetics and nutrition management**

**Unit-III**

Energy value of biomolecules: carbohydrates, fats and proteins, basal metabolic rate definition and its measurement, factors affecting BMR, energy requirements of human beings, energy requirements in different age groups and special conditions (pregnant ladies and lactating mothers), different dietary types, requirements, utilization, and functions. Methods of protein determination, amino acid imbalance, protein requirements, utilization and functions, nutritional aspects of vitamins and minerals, food processing and loss of nutrients during processing and cooking, naturally occurring anti-nutrients, balanced diet, recommended dietary allowances for different categories of human beings, disorders related to nutrition-protein energy malnutrition, starvation, and obesity.

## **Unit-IV**

### **Food spoilage and detection**

Intrinsic and extrinsic factors responsible for food spoilage, microorganisms involved in food spoilage: fruits, vegetables, meat, eggs, bread, methods of detection of food spoilage: Traditional approaches: SCP, Breeds smear, identification of specific organisms by using selective and differential media. New approaches: use of gene probes, RDT, bioluminescence.

#### **Books Recommended:**

1. Frazier, W.C. and Westhoff, D.C. (2013). Food microbiology (Tata McGraw-Hill publishing Co. Ltd).
2. Admas, M.R. and Moss, M.O. (2015). Food microbiology, 4<sup>th</sup> Edition, Royal Society of Chemistry).
3. SriLakshmi B. (2018). Food science, 7<sup>th</sup> Edition, New Age International Publishers, India.
4. Jay J.M., Loessner M.J. and Golden D.A. (2006). Modern Food Microbiology, 7<sup>th</sup> Edition, Springer India.
5. Sivasankar B. (2004). Food processing and preservation, 1<sup>st</sup> Edition, Prentice-Hall of India Pvt. Ltd, New Delhi.
6. Michael P. Doyle, Larry R. Beuchat (2007). Food Microbiology: Fundamentals and Frontiers, 3<sup>rd</sup> Edition, ASM Press.

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTL-4065**  
**Fundamentals of Bioinformatics**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand basics of computer and data storage devices

**CO2:** Understand basics of bioinformatics and sequence alignment

**CO3:** Know about scoring matrices and database searching

**CO4:** Know about primary and secondary databases

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTL-4065**  
**Fundamentals of Bioinformatics**  
**(Theory)**

**Time: 3 Hours**  
**L-T-P: 2-0-0**

**Max. Marks: 50**  
**CA: 10**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

**UNIT-I**

Computers: General introduction to computers, organization of computers, computer hardware and software.  
Data Storage Devices: Primary and secondary, storage devices. Input/Output device: Key-tape/diskette devices, light pen mouse and joystick. Printed output: Serial, line, page, printers; plotters, visual output; voice response units.

**UNIT-II**

Introduction to bioinformatics: History, milestones and applications, local and global alignments, gap Penalties, pairwise sequence alignments (Needleman-Wunsch, Smith-Watermann Algorithms), significance of sequence alignment.

**UNIT-III**

**Scoring Matrices:** PAM, BLOSUM,

**Multiple Sequence Alignment:** Progressive alignment, iterative alignment methods,

**Database Searching:** BLAST and its types

**UNIT-IV**

Primary and secondary databases, online resources of bioinformatics: Introduction: NCBI, EBI, DDBJ, Expasy, PUBMED, PDB, UNIPROT, Pfam, Prosite.

**Books Recommended:**

1. Norton's P. (2017). Introduction to Computing Fundamental, 7<sup>th</sup> Edition, McGraw Hill Education, New Delhi.
2. Sinha P.K. (2010). Fundamental of Computers, 8<sup>th</sup> Edition, BPB Publication, New Delhi.

3. Jin Xiong. (2006) Essential Bioinformatics. Cambridge University Press.
4. Baxevas B.F. and Quellette F. (2004). Bioinformatics a Practical Guide to the Analysis of Genes and Proteins, 3<sup>rd</sup> Edition, Wiley-Interscience

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTP-4067**

**Lab in Industrial Biotechnology-I  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Isolate milk protein and determine fat content in milk

**CO2:** Learn the process of cheese making

**CO3:** Isolate microbes from soil

**CO4:** Screen industrially important enzyme producing microbes

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTP-4067**

**Lab in Industrial Biotechnology-I**

**(Practical)**

**Time: 3 Hrs.**

**Max. Marks: 20**

**L-T-P: 0-0-1**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments**

1. Isolation of casein from milk and isoelectric pH of casein.
2. Cheese making by bacterial culture method
3. Determination of fat content in milk.
4. Isolation and screening of amylase producing microbes from soil.
5. Isolation and screening of protease producing microbes from soil.
6. Isolation and screening of cellulase producing microorganism from wood degrading soil.

**Books Recommended:**

5. Cappuccino J.G., Sherman N. (2007). Microbiology: A laboratory (Pearson Benjamin Cummings).
6. Plummer D.T. (2004). An introduction to practical biochemistry (Tata McGraw Hill Publishers Co. Ltd., New Delhi).
7. Bansal, D.D., K Hardori, R., Gupta, M.M. (1985). Practical biochemistry (Standard Publication Chandigarh).
8. Dubey R.C. and Maheshwari (2012) Practical Microbiology 5th edition: S. Chand and company ltd. New Delhi.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2023-24**

**Course Code: BBTP-4068**

**Lab in Immunology-II  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Learn about vaccines.

**CO2:** Study immunodiagnostic tests.

**CO3:** Perform immunoprecipitation reactions.

**CO4:** Learn protein purification methods.



**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2023-24**  
**Course Code: BBTP-4068**  
**Lab in Immunology-II**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**L-T-P: 0-0-1**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments**

1. Preparation of vaccine chart of child, highlighting optional vaccines
2. Haemagglutination assay
3. Haemagglutination inhibition assay
4. Double immunodiffusion test using specific antibody and antigen Line of identity, partial identity, and non-identity
5. Single immunodiffusion test using specific antibody and antigen
6. Direct and indirect ELISA
7. To perform Immunoelectrophoresis.
8. Separation and purification of IgG antibodies from Serum using protein A column.

**Books Recommended:**

1. Stevans, C.D. (2003). Clinical Immunology and Serology: A Laboratory Perspective 2<sup>nd</sup> Edition, F.A Davis Company, Philadelphia.
2. Celis, J.E., Hunter, T. and Carter, N. (2005). Cell Biology: A laboratory handbook. 3<sup>rd</sup> Edition, Vol-III, Academic Press, U.K.
3. Hay, F.C. and Westwood O.M.R. (2002). Practical Immunology, 4<sup>th</sup> Edition, Wiley Blackwell

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTP-4089**

**Lab in Biochemistry-IV  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Quantitatively estimate amino acids

**CO2:** Acquire skills to perform protein purification by using salt precipitation

**CO3:** Estimate nucleic acid concentration

**CO4:** Understand effect of mutagens on bacteria

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTP-4089**  
**Lab in Biochemistry-IV**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**L-T-P: 0-0-1**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Quantitative estimation of amino acids using the Ninhydrin reaction.
2. Purification of protein using salt precipitation.
3. Estimation of DNA by Diphenyl reaction
4. UV induced mutagenesis

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTP-4060**  
**Lab in Skill Development in Biotechnology**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Check different food adulterants in the given products.

**CO2:** Determine crude fibre and protein content in food samples.

**CO3:** Give quality index of fats content in different food samples.

**CO4:** Calculate amount of energy expended by a human while at rest.

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTP-4060**  
**Lab in Skill Development in Biotechnology**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**L-T-P: 0-0-1**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Detection of adulteration in food (oil, butter).
2. Determination of crude fibre content in wheat and chickpea.
3. Determination of gluten content in wheat flour.
4. Determination of fat content in different food products.
5. Determine the BMR.

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTP-4061**

**Lab in Fundamentals of Bioinformatics  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Use and perform MS -office

**CO2:** Know and use various databases

**CO3:** Perform sequence alignment

**CO4:** Perform prediction of protein functional domain

**Bachelor of Science (Bio-Technology) Semester-IV**  
**Session: 2024-25**  
**Course Code: BBTP-4061**  
**Lab in Fundamentals of Bioinformatics**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 20**

**L-T-P: 0-0-1**

**Instructions for the practical Examiner:** Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Ms-Office: word, Excel, Power-point
2. Introduction about various Databases: NCBI, EMBL, UNIPROT, PUBMED
3. GenBank Format, FASTA format etc
4. Basic Local Alignment Search tools (BLAST)
5. Multiple Sequence Alignment using Clustal Omega
6. Prediction of protein functional domain using PFAM/PROSITE

**Bachelor of Science (Bio-Technology) Semester-IV**

**Session: 2024-25**

**Course Code: BBTF-4063**

**Industrial/ Institutional Visit**

**Time: 3 Hours**

**L-T-P: 0-0-1**

**Max. Marks: 25**

**Practical Marks: 20**

**CA:05**

**Note:**

Students will go for a visit to industry/institute and the students will be required to submit written report for the same which will be evaluated.



Annexure-D

**FACULTY OF LIFE SCIENCES**  
**SYLLABUS**  
**Of**

**Bachelor of Science Bio-Technology (Semester: V-VI)**  
**(Under Continuous Evaluation System)**

**Session: 2024-25**



**The Heritage Institution**  
**KANYA MAHA VIDYALAYA**  
**JALANDHAR**  
**(Autonomous)**

Upon successful completion of this course, students will be able to:

**PSO1:** gain and apply knowledge of biotechnology and science concepts to solve problems related to field of environment and biotechnology.

**PSO2:** design, perform experiments, analyse and interpret data for investigating complex problems in the field of biotechnology and allied fields.

**PSO3:** apply ethical principles and commit to professional ethics and responsibilities and norms of the biotechnological practices.

**PSO4:** design and develop solution to biotechnology problems by applying appropriate tools while keeping in mind safety factor for environment and society.

**PSO5:** to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

**PSO6:** contribute to the biotechnology and allied fields in designing, developing, and providing solutions for product/processes/technology development.

**PSO7:** able to justify societal, health, safety and legal issues and understand the responsibilities in biotechnological engineering practices.

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**

**Bachelor of Science (Bio-Technology)**

**Session: 2024-25**

Bachelor of Science (Bio-Technology) Semester-V							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-5061	rDNA Technology-I	C	60	30	18	12	3+3
BBTM-5062	Plant Biotechnology-I	C	60	30	18	12	3+3
BBTM-5063	Animal Biotechnology-I	C	60	30	18	12	3+3
BBTM-5064	Bioprocess Engineering-I	C	60	30	18	12	3+3
BBTM-5065	Biochemical and Biophysical Techniques-I	C	60	30	18	12	3+3
BBTM-5066	Industrial Biotechnology-II	C	60	30	18	12	3+3
SECJ-5551	*Job Readiness course	AC	25	20	-	5	-
Total			360				

**\*Marks of these papers will not be added in total marks and only grades will be provided.**

**C-Compulsory**

**AC- Audit course**

**Kanya Maha Vidyalaya, Jalandhar (Autonomous)**  
**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME**  
**Bachelor of Science (Bio-Technology)**  
**Session: 2024-25**

Bachelor of Science (Bio-Technology) Semester-VI							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-6061	rDNA Technology-II	C	60	30	18	12	3+3
BBTM-6062	Animal Biotechnology-II	C	60	30	18	12	3+3
BBTM-6063	Plant Biotechnology-II	C	60	30	18	12	3+3
BBTM-6064	Bioprocess Engineering-II with Training	C	60	30	18	12	3+3
BBTM-6085	Chemistry-III	C	60	30	18	12	3+3
BBTM-6066	Biochemical and Biophysical Techniques-II	C	60	30	18	12	3+3
BBTS-6087	Term Paper	C	20	-	20	-	-
Total			380				

**C-Compulsory**

# **B.Sc. Bio-Technology Semester-V**

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5061**  
**rDNA Technology-I**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the concept of rDNA technology and tools used in recombinant DNA technology.

**CO2:** Know about cloning vectors used in recombinant DNA technology.

**CO3:** Understand gene cloning and different methods of transformation.

**CO4:** Know labelling of nucleic acids.

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5061**

**rDNA Technology-I  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

Introduction to genetic engineering. Why gene cloning and DNA analysis is important. What is clone, how to clone a gene: Overview of the procedure.

Tools in Recombinant DNA Technology: Restriction and modifying enzymes, Type I, Type II and Type III enzymes and their characteristic features; restriction sequences, isoschizomers, rare cutting enzymes, enzyme cutting similar sequence in different manner.

DNA modifying enzymes: Characteristics and applications of Nucleases – DNase and RNase, DNA-Pol I, Klenow fragment, T4DNA polymerase, T7 DNA polymerase, T4 Polynucleotide kinase, Phosphatase, Reverse transcriptase, Taq polymerase and Ligase. Terminal deoxynucleotidyl transferase, reverse transcriptase. RNase-H, DNase-I, Nuclease S-I

**Unit-II**

Cloning vectors: Basic features of plasmids, role of antibiotics and resistance genes in a vector, multiple cloning site, copy number regulation, pBR 322, pUC 8, Bacteriophage  $\lambda$  based vectors: insertional and replacement vectors, phagemid, cosmid, fosmid. Isolation and purification of DNA from bacteria, plants, animals and soil.

**Unit-III**

Gene Cloning: Ligation, methods of transformation:  $\text{CaCl}_2$ , electroporation, transfection, micro projectile. Transformation efficiency, screening of transformants by gene inactivation: antibiotic inactivation and blue white selection.

**Unit-IV**

Labelling of DNA and RNA- Radioactive labelling (Nick Translation, Random priming, nd Labelling), Non-Radioactive labelling (Direct & indirect non isotopic labelling), gene identification: Nucleic acid hybridization (Southern and northern blotting), western blotting.

**Books Recommended:**

1. Primrose, SB and Twyman, R. (2013). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4<sup>th</sup> Edition, CSHL.
3. Brown TA. (2017) Genomes, 4<sup>th</sup> Edition, Garland Science.
4. Glick, B. R., & Pasternak, J. J (2010). Molecular biotechnology- principles and applications of recombinant DNA. Washington: ASM Press.
5. Clark, D. P. & Pazdernik, N. J. (2009). Biotechnology- applying the genetic revolution. USA: Elsevier Academic Press.



**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5061(P)**  
**rDNA Technology-I**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Isolate genomic DNA.

**CO2:** Quantify DNA using Spectrophotometry.

**CO3:** Learn electrophoresis.

**CO4:** Perform and understand concept of cloning and transformation

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5061(P)**

**rDNA Technology-I  
(Practical)**

**Time: 3 Hrs.**

**Max. Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Isolation of genomic DNA from bacteria.
2. Confirmation of high molecular weight DNA on agarose gel.
3. To perform spectrophotometric quantification of DNA for determination of purity.
4. Restriction enzyme digestion of isolated DNA.
5. Preparation of competent cells
6. Transformation of competent cells by  $\text{CaCl}_2$  method.

**Books Recommended:**

1. Primrose, SB and Twyman, R. (2013). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4<sup>th</sup> Edition, CSHL.
3. Brown TA. (2017) Genomes, 4<sup>th</sup> Edition, Garland Science

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5062**  
**Plant Biotechnology-I**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Study the macronutrients and micronutrients and their deficiency symptoms in plants.

**CO2:** Know about the different physiological functions and biosynthesis of major plant growth regulators.

**CO3:** Understand the concept of totipotency and differentiation.

**CO4:** Understand the different methods of gene transfer in plants.

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5062**

**Plant Biotechnology-I  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

Introduction to plant tissue culture and its historical background, Plant nutrition: macronutrients and micronutrients and their deficiency symptoms. Plant tissue culture media: types, components, and their role.

**Unit-II**

Physiological functions and biosynthesis of major plant growth regulators such as auxin, cytokinin, gibberellins and abscisic acid.

**Unit-III**

Totipotency, factors affecting cellular totipotency, cell differentiation, dedifferentiation and redifferentiation of cells. Tissue competency, plant-explant-plant concept. Factors influencing plant tissue culture: Genotypic, physiological, biochemical, and other extrinsic factors.

**Unit IV**

Transgenic plant biotechnology: Methods of gene transfer - Direct (Electroporation, microprojectile, microinjection, PEG mediated, DEAE Dextran mediated methods) and indirect (agrobacterium mediated gene transfer).

**Books Recommended:**

- 1.Taiz, L and Zeiger, E. (2014). Plant Physiology, 6th Edition, Sinauer Associates.
- 2.Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
- 3.Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.

4.Smith, RH. (2012) Plant tissue culture: techniques and experiments, Gulf professional publishing

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5062 (P)**  
**Plant Biotechnology-I**  
**(Practical)**

**COURSE OUTCOMES:**

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 laboratory.

**CO2:** Learn sterilization process required in plant tissue culture.

**CO3:** Prepare media to be used in plant tissue culture.

**CO4:** Select and inoculate explant.

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5062 (P)**

**Plant Biotechnology-I  
(Practical)**

**Time: 3 Hrs.**

**Max. Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. To study functions and operations of various instruments required for plant tissue culture (pH meter, autoclave, laminar air-flow, incubators, oven, distillation unit etc).
2. Laboratory design set up for a PTC Laboratory.
3. Cleaning of glassware, plasticware and contaminated cultures.
4. Different types of enclosure used in plant tissue culture.
5. Preparation of stock solutions of Murashige and Skoog (1962) medium.
6. Preparation of Murashige and Skoog's medium from stock solutions.
7. Different sterilization process (Instruments, glassware and thermolabile and thermostable components)
8. Selection, preparation, sterilization, and inoculation of explants.

**Books Recommended:**

1. Taiz, L and Zeiger, E. (2014). Plant Physiology, 6th Edition, Sinauer Associates.
2. Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
3. Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.
4. Smith, RH. (2012) Plant tissue culture: techniques and experiments, Gulf professional publishing

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5063**  
**Animal Biotechnology-I**  
**(Theory)**

**COURSE OUTCOMES:**

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



**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5063**

**Animal Biotechnology-I  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

Historical background, advantages and disadvantages of animal tissue culture, design and layout of ATC Lab, equipments used in ATC Lab, aseptic techniques in ATC- Sterilization of culture media, glassware and tissue culture laboratory. Growth and viability of cells in culture, cryopreservation and retrieval of cells from frozen storage, transportation of cells. characteristics of normal and transformed cells.

**Unit- II**

Contamination- sources, types, monitoring and eradication of contamination, cross contamination. Safety considerations in ATC laboratory, clean environment – P1, P2, P3, P4 facility and their applications. Introduction to concept of biosafety and biosecurity.

**Unit-III**

Culture media and reagents-Types of cell culture media, physiochemical properties, balanced salt solution, constituents of serum, serum free media (SFM), design of SFM, advantages and disadvantages of serum supplemented and serum free media, conditioned media

**Unit-IV**

Primary culture and established cell line culture (finite & continuous cell lines), isolation of cells- Enzyme digestion, perfusion and mechanical disaggregation. Culture of attached cells and cells in suspension, phases of cell growth and determination of cell growth data (calculation of *in vitro* age, multiplication rate, population doubling time, cell counting, phases of cell cycle)

### **Books Recommended**

1. Gareth, EJ. (2016). Human Cell Culture Protocols, Humara Press.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.
3. Julio, E., Celis (2006). Cell Biology-A laboratory hand book, Vol. I-IV, Academic Press, New York.
4. Freshney, RT. (2016), Culture of Animal Cells 7<sup>th</sup> Edition, John Wiley and Sons, New York

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5063(P)**  
**Animal Biotechnology-I**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Perform different sterilization techniques in ATC lab.

**CO2:** Prepare media used in animal tissue culture

**CO3:** Isolate lymphocytes and macrophages from blood.

**CO4:** Check cell viability

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5063(P)**

**Animal Biotechnology-I**

**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Sterilization techniques: Theory and Practical -Glass ware sterilization -Media sterilization  
-Laboratory Sterilization
2. Sources of contamination and decontamination measures.
3. Preparation of Hanks Balanced Salt Solution
4. Preparation of Minimal Essential Growth medium.
5. Isolation of lymphocytes for culturing and perform cell viability test.
6. Isolation of macrophages from blood for culturing

**Book Recommended:**

1. Freshney, RT. (2016), Culture of Animal Cells. 7<sup>th</sup> Edition, John Wiley and Sons, New Delhi.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5064**  
**Bioprocess Engineering-I**  
**(Theory)**

**COURSE OUTCOMES:**

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.

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**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5064**

**Bioprocess Engineering-I  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

**Introduction:** Fundamental principles of chemical Engineering and biochemical engineering. Fourier's Laws of heat transfer, molecular diffusion, diffusion theory, role of diffusion in bioprocessing, oxygen transfer methodology in bioreactors and factors affecting oxygen transfer, types of microbial culture: Batch, fed batch and continuous culture.

**Unit-II**

**Microbial growth Kinetics:** Simple kinetics of microbial growth, yield coefficient, doubling time, specific growth rate, substrate inhibition kinetics, product inhibition kinetics, metabolic and biomass productivities.

**Unit-III**

Introduction to multistage feedback systems: Internal and external feedback systems, effector molecules (Enzyme inhibitors and enzyme activators) and their kinetics, effect of temperature, pH and inducer on product synthesis.

**Unit-IV**

**Sterilization:** Introduction, air and media sterilizations, design of batch sterilization process, Methods of batch sterilization, Del factor, sterilization cycle, continuous sterilization of feeds and liquid wastes, filter sterilization, sterilization of fermenters.

**Books Recommended:**

1. Stanbury, PF, Whitaker, A. and Hall, SJ. (2016). Principles of Fermentation Technology 2<sup>nd</sup> Edition., Pergamon Press, Oxford.
2. Young, MY. (2000). Comprehensive Biotechnology (Vol. 1-4), Pergamon Press, Oxford.

3. Young, MY. (1996). Environmental Biotechnology, Principles & Applications, Kluwer Academic Publications, New Delhi.
4. Bailary, JE. and Ollis, DF. (1986). Biochemical Engineering Fundamentals, McGraw Hills, New York.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5064 (P)**  
**Bioprocess Engineering-I**  
**(Practical)**

**COURSE OUTCOMES:**

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.



**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5064(P)**

**Bioprocess Engineering-I  
(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. To study the growth curve of microorganism.
2. To determine the specific growth rate and generation time of a bacterium during submerged fermentation.
3. Demonstration of sterilization of fermenter and other accessories.
4. To study the effect of temperature, pH and aeration on growth of microbes.
5. Production and assay of an enzyme in a bioreactor/shaking flask along with method of validation.

**Books Recommended:**

1. Cappuccino JG., Sherman N. (2007). Microbiology: A laboratory, Pearson Benjamin Cummings.
2. Plummer DT. (2004). An introduction to practical biochemistry, Tata McGraw Hill Publishers Co. Ltd., New Delhi.
3. Bansal, DD., K Hardori, R., Gupta, MM. (1985). Practical biochemistry, Standard Publication Chandigarh.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5065**  
**Biochemical and Biophysical Techniques-I**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Gain fundamental knowledge about centrifugation.

**CO2:** Understand the different types of chromatography techniques.

**CO3:** Learn basic principles of spectroscopy

**CO4:** Understand the principles and instrumentation of NMR and ESR.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5065**  
**Biochemical and Biophysical Techniques-I**  
**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

Centrifugation: Basic principles of sedimentation, theory and applications of preparative and analytical centrifugation, differential and density gradient centrifugation, types of centrifugation machines and rotors, sedimentation co-efficient, factors affecting sedimentation coefficient, care of rotors.

**Unit - II**

Chromatography: Partition Coefficient, theory and principle of paper and column chromatography, two-dimensional chromatography, gel exclusion chromatography, principle and applications of paper, thin layer, ion-exchange, and affinity chromatography.

**Unit III**

Gas Liquid Chromatography, High Performance Liquid chromatography, Fast Protein Liquid Chromatography.

**Unit IV**

Spectroscopy: Basic principle, Lambert Beer's law, absorption spectrum, theory and principles of single and double beam UV/Visible spectroscopy, Basic principle and instrumentation of NMR and ESR

**Books Recommended:**

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.

**3.** Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.

**4.** Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman.

**5.** Mousumi, D. (2011). Tools and techniques of biotechnology. Jaipur, India: Pointer Publisher.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5065**  
**Biochemical and Biophysical Techniques-I**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the concept of centrifugation.

**CO2:** Study sedimentation using different rotors.

**CO3:** Separate proteins by different chromatography methods.

**CO4:** Separate biomolecules by different chromatography techniques.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5065(P)**  
**Biochemical and Biophysical Techniques-I**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. To study sedimentation using swing bucket rotor and angle rotor.
2. To study differential centrifugation.
3. To study separation of bio-molecules by paper and thin layer chromatography.
4. Separation of proteins by ion-exchange column chromatography
5. Separation of proteins by affinity column chromatography.

**Books Recommended:**

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman & Co.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5066**  
**Industrial Biotechnology-II**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Know about the production of antibiotics and solvents along with xenobiotic degradation and fuel biotechnology.

**CO2:** Understand concept of biotransformation and microbial production of organic acids, vitamins, and amino acids

**CO3:** Know about transgenic crops along with study of various biocontrol agents.

**CO4:** Know about the concept of biological nitrogen fixation

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5066**  
**Industrial Biotechnology-II**  
**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**  
**Theory: 30**  
**Practical: 18**  
**CA: 12**

**Instructions for the Paper Setters:**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-I**

Antibiotics production: Penicillin and streptomycin, pharmaceutical drugs, solvent production: Acetone, butanol and ethanol. Biodegradation of xenobiotic compound. Fuel biotechnology: Types of biofuels and feedstocks for production of biofuel, biogas production, industrial alcohol production

**Unit-II**

Biotransformation, organic acids: production of citric Acid and acetic acid, microbial production of vitamin B12 and vitamin C, amino acids: Glutamic acid and lysine production, alcoholic beverages: wine, beers.

**Unit-III**

Introduction to BT gene, transgenic crops (BT cotton and maize) and their potentials in agro industry, SCP: Spirulina from Yeast and Bacteria, soil treatment with microbes, vermicomposting, production of bacterial biofertilizers, biocontrol agent and their significance, mycorrhizal fungi,

**Unit-IV**

BNF and its significance, diazotrophes and their characterization, microbial association and their interaction with plants, nitrogen cycle and role of nitrogen fixing microbes in sustainable agriculture, symbiotic and non-symbiotic bacteria, phosphate solubilizing bacteria.

**Books Recommended:**



1. Wittmann, C. and Liao, J. (2017). Industrial Biotechnology: Products and Processes (Advanced Biotechnology), Vol. 4 Wiley-VCH.
2. Singh B.D. (2016). Biotechnology: Expanding horizons, Kalyani Publishers / Lyall Bk Depot
3. Chakraborty, P.K. (2013). Agro and Industrial Biotechnology, Black Prints
4. Tyagi, N. (2012). Industrial Microbiology and Biotechnology, Agrotech Press.
5. Casida, L.E.J.R. (2007). Industrial Microbiology, New Age International Publishers
6. Okafor N, Okeke B.C. (2018). Modern Industrial Microbiology and Biotechnology, 2<sup>nd</sup> edition, CRC Press.

**Bachelor of Science (Bio-Technology) Semester-V**  
**Session: 2024-25**  
**Course Code: BBTM-5066(P)**  
**Industrial Biotechnology-II**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the concept of additive and synergistic effect of antibiotics

**CO2:** Perform different types of fermentation

**CO3:** Isolate nitrate reducing bacteria from the environment

**CO4:** Learn about wine production

**Bachelor of Science (Bio-Technology) Semester-V**

**Session: 2024-25**

**Course Code: BBTM-5066(P)**

**Industrial Biotechnology-II  
(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Alcoholic and mixed–acid fermentation.
2. Additive and synergistic effect of two antibiotics on the above microorganism.
3. Minimum inhibitory concentration of an antibiotics for the above microorganism.
4. Demonstration of wine production by using grape juice.
5. Determination of nitrate reduction by bacteria.

**Books Recommended:**

1. Cappuccino J.G., Sherman N. (2007). Microbiology : A Laboratory (Pearson Benjamin Cummings).
2. Plummer D.T. (2004). An introduction to Practical Biochemistry (Tata McGraw Hill Publishers Co. Ltd., New Delhi).
3. Bansal, D.D., K. Hardori, R., Gupta, M.M. (1985). Practical Biochemistry (Standard Publication Chandigarh).
4. Dubey R.C. and Maheshwari (2012) Practical Microbiology 5th Edition : S. Chand and Company Ltd., New Delhi.

# **B. Sc. Bio-Technology Semester-VI**

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6061**

**rDNA Technology-II**

**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand basics of cloning vectors.

**CO2:** Understand basics of expression vectors.

**CO3:** Understand the concept of gene amplification.

**CO4:** Understand different generations of sequencing.

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6061**

**rDNA Technology-II**

**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**UNIT-I**

Cloning vectors: Shuttle vectors and BAC, overview of cloning, genomic cloning in Lambda vector, screening of recombinants, calculating number of clones that have to be screened, linker, adapters, different strategies for cDNA cloning- self priming and adaptor/linker methods. Cloning vectors for Eukaryotes (yeast vectors, YAC, viral vectors, Ti and Ri plasmids)

**UNIT-II**

Gene expression: expression vectors with respect to different promoters (lac, tac, T5, T7, lamda) and their induction system, signal sequences (omp), tags (His, GST, MBP and IMPACT), selection of host with respect to promoter, processing of recombinant proteins: soluble proteins, inclusion body, protein refolding

**UNIT-III**

Basics of PCR, primer designing, various types of PCR, applications of PCR, PCR based methods of site directed mutagenesis (overlap extension and cassette mutagenesis), random mutagenesis and gene cloning

**UNIT-IV**

DNA Sequencing: Sanger-Coulson method (chain termination method), Maxam- Gilbert method (chemical degradation of DNA), new generation sequencing (Illumina (Solexa) HiSeq, pyrosequencing), Ion Torrent technology, Single-molecule real-time (SMRT)

sequencing, fundamental concepts and applications of microarray, phage display and selection of mutant peptides, yeast two hybrid assay.

**Books Recommended:**

1. Primrose, S.B. and Twyman, R. (2013). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell.
2. Sambrook, J. and Green M.R. (2012) Molecular Cloning: A Laboratory Manual, 4<sup>th</sup> Edition, CSHL.
3. Brown, T.A. (2017) Genomes, 4<sup>th</sup> Edition, Garland Science.
4. Glick, B. R., and Pasternak, J. J (2003). Molecular biotechnology- Principles and applications of recombinant DNA, ASM Press, Washington.
5. Clark, D. P. and Pazdernik, N. J. (2009). Biotechnology- applying the genetic revolution, Elsevier Academic Press.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6061(P)**  
**rDNA Technology-II**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Perform cloning.

**CO2:** Understand the concept of transformation

**CO3:** Isolate RNA from given samples.

**CO4:** Amplify genes using PCR.



**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6061(P)**

**rDNA Technology-II  
(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Isolation of plasmid DNA
2. Digestion of plasmid with three different restriction enzymes.
3. To perform ligation reaction
4. Transformation of cells and confirmation of the transformants for the presence of plasmid by blue white selection
5. Isolation of RNA from blood.
6. To perform polymerase chain reaction

**Books Recommended:**

1. Primrose, SB and Twyman, R. (2013). Principles of Gene Manipulation and genomics, 8<sup>th</sup> Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4<sup>th</sup> Edition, CSHL.
3. Brown TA. (2017) Genomes, 4<sup>th</sup> Edition, Garland Science

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6062**  
**Animal Biotechnology-II**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand the basics of organotypic and histotypic culture along with tissue engineering.

**CO2:** Understand about transfection methods and expression vectors

**CO3:** Know about monoclonal antibodies and stem cells and their benefit for human.

**CO4:** Understand the role of genetic engineering in the improvement of animal cell for human welfare.

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6062**

**Animal Biotechnology-II**

**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit- I**

Commonly used animal cell line, their origin and characteristics (WI-38, MRC-5, IMR-90, HEK-293, HeLa, A 549), differentiation of cells, organotypic and histotypic cultures: Organotypic culture: Gas and nutrient exchange, structure integrity, growth, differentiation, advantages and applications. Methods, advantages and applications of histotypic culture. Three dimensional culture and tissue engineering: Concept of tissue engineering, components of tissue engineering, cells imaging in 3D construct.

**Unit- II**

Transfection methods (calcium phosphate precipitation, DEAE-Dextran- mediated transfection, lipofection, electroporation, retroviral infection, microinjection), promoters, expression vectors and detection of transgenics, need to express proteins in animal cells.

**Unit- III**

Applications: Cell fusion and production of monoclonal antibodies; scale up methods for propagation of anchorage dependent and suspension cell culture; Bioreactors for large scale culture of cells; micro carrier cultures; Stem cells- Basics, embryonic and adult stem cells and their applications, transdifferentiation.

**Unit-IV**

Genetic engineering in animal Cells: Methodology for transgenic animals (Mice, rabbit, cattle, goat, sheep, pigs, fish) production of regulatory proteins, blood products, vaccines and hormones,

transgenic animal as bioreactor, animal cloning- IVF & embryo transfer, benefits and concerns surrounding the use of animal biotechnology.

### **Books Recommended**

1. Gareth, EJ. (1996). Human Cell Culture Protocols, Humara Press.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.
3. Julio, E., Celis (1998). Cell Biology-A laboratory hand book, Vol. I-IV, 2<sup>nd</sup> Edition, Academic Press, New York.
4. Freshney, RT. (2016), Culture of Animal Cells 7<sup>th</sup> Edition, John Wiley and Sons, New York.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6062(P)**  
**Animal Biotechnology-II**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Maintain cultures of animal cells and established cell lines with good viability, minimal contamination and appropriate documentation.

**CO2:** Perform supportive tasks relevant to cell culture, including preparation and evaluation of media, cryopreservation and recovery, and assessment of cell growth and health.

**CO3:** Recognise and troubleshoot problems common to routine cell culture.

**CO4:** To Learn different methods and techniques of animal tissue culture.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6062(P)**  
**Animal Biotechnology-II**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Seeding of cell line.
2. Maintenance of a cell line and check doubling time.
3. Observation of adherent (Fibroblastic, epithelial) and suspension cultures (Lymphoblast).
4. To perform trypsinization of cells.
5. Cell counting by hemocytometer
6. Determination of the IC<sub>50</sub> value of a drug using MTT assay

**Book Recommended:**

1. Freshney, RT. (2016), Culture of Animal Cells. 7<sup>th</sup> Edition, John Wiley and Sons, New Delhi.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6063**  
**Plant Biotechnology-II**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Understand basic concepts of micropropagation.

**CO2:** Understand the concept of embryo culture and somaclonal variations.

**CO3:** Learn the concept of protoplast fusion and somatic cell hybridization

**CO4:** Understand the secondary metabolite production in bioreactors.

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6063**

**Plant Biotechnology-II  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**

**Theory: 30**

**Practical: 18**

**CA: 12**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit I**

Micropropagation methods (axillary bud, shoot-tip and meristem culture), Stages of micropropagation, Factors affecting micropropagation and technical problems, Applications of micropropagation, Acclimatization of tissue culture raised plants. Modes of regeneration, Somatic embryogenesis and organogenesis, Types of somatic embryogenesis, Applications of somatic embryogenesis.

**Unit II**

Haploid and triploid plant production through tissue culture; ovary and ovule culture; embryo culture and rescuing hybrid embryos; somaclonal variations, selection of variant cell lines and its applications.

**Unit-III**

Protoplast isolation and culture, viability of protoplasts, protoplast fusion, selection of somatic hybrids and cybrids, applications of somatic cell hybridization.

**Unit-IV**

Cell suspension culture, production of secondary metabolites by plant tissue culture, immobilized plant cell culture, use of bioreactors in secondary metabolite production, transgenic approaches in secondary metabolite production.

**Books Recommended:**

1. Bhojwani, S.S, and Razdan, M.K. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.



2. Razdan, M.K. (2019) Introduction to Plant tissue culture, Science Publishers.
3. Singh, B.D. (2021) Biotechnology expanding horizons, Kalyani Publishers, New Delhi.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6063(P)**  
**Plant Biotechnology-II**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Perform micropropagation techniques.

**CO2:** Learn different pathways of plant regeneration under *in vitro* conditions.

**CO3:** Understand techniques of establishing cell suspension cultures

**CO4:** Carry out plant tissue culture experiments with different explants.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6063(P)**  
**Plant Biotechnology-II**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Micropropagation and its different steps.
2. Significance of growth hormones in culture medium.
3. Induction of callus from different explants.
4. To study regeneration of shoots/embryos.
5. Raising of cell suspension cultures.
6. Anther culture, ovary culture and embryo rescue.

**Books Recommended:**

1. Taiz, L and Zeiger, E. (2014). Plant Physiology, 6th Edition, Sinauer Associates.
2. Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
3. Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.
4. Smith, RH. (2000) Plant tissue culture: techniques and experiments, Gulf professional publishing

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6064**  
**Bioprocess Engineering-II with Training**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Learn about the design of a fermenter and how to use it.

**CO2:** Study about all the parameters to be considered while operating a fermenter.

**CO3:** Study about different techniques of downstream processing.

**CO4:** Learn about effluent treatment and fermentation economics.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6064**  
**Bioprocess Engineering-II with Training**  
**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**  
**Theory: 30**  
**Practical: 18**  
**CA: 12**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

**Unit-1**

Design of a fermenter: Introduction, fermenter for microbial, animal and plant cell culture, aseptic operation of fermenter, impeller and spargers, batch, fed batch, C.S.T.B.R, plug flow and air loop bioreactors and its kinetics.

**Unit-II**

Control and measurement equipments of fermenter (Temperature and pH control system, flow measurement, foam sensing, pressure control and D.O. probes, operation and agitation and its kinetics.

**Unit-III**

Downstream processing: Introduction, removal of microbial cells and other solid matters. Foam separation, filtration, industrial filters and its principles, centrifugation and industrial centrifuges, cell disruption, aqueous two-phase extraction system, basics concept of super critical fluid extraction and whole broth processing.

**Unit-IV**

Effluent treatment- Primary, secondary and tertiary treatment, aerobic and anaerobic slug treatment process, fermentation economics.

**Books Recommended:**

- 1.Stanbury, PF, Whitaker, A. and Hall, SJ. (2016). Principles of Fermentation Technology 2<sup>nd</sup> Edition., Pergamon Press, Oxford.
- 2.Young, MY. (2000). Comprehensive Biotechnology (Vol. 1-4), Pergamon Press, Oxford.
- 3.Young, MY. (1996). Environmental Biotechnology, Principles & Applications, Kluwer Academic Publications, New Delhi.
- 4.Bailary, JE. and Ollis, DF. (1986). Biochemical Engineering Fundamentals, McGraw Hills, New York.

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTM-6064(P)**

**Bioprocess Engineering-II  
(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Undergo two-week training in fermentation technology in industry/institute and learn practical aspects of fermentation technology

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6064(P)**  
**Bioprocess Engineering-II**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Note:**

Students will go for at least two-week training in industry/institute and the students will be required to submit written report of their training which will be evaluated by the teacher who has taught theory course.



**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6066**  
**Biochemical and Biophysical Techniques-II**  
**(Theory)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Illustrate the working principles of electrophoresis technique.

**CO2:** Learn applications of electrophoresis techniques.

**CO3:** Understand the concepts of spectrophotometry and applications of different types of spectrophotometry.

**CO4:** To understand radioisotopy and instruments used for detecting and measuring radiation

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6066**  
**Biochemical and Biophysical Techniques-II**  
**(Theory)**

**Time: 3 Hours**

**Max. Marks: 60**  
**Theory: 30**  
**Practical: 18**  
**CA: 12**

**Instructions for the Paper Setter**

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 Marks.

**UNIT-I**

Electrophoresis: Factors affecting electrophoretic mobility, types of electrophoresis, basic principle, theory and application of native, SDS-PAGE and agarose gel electrophoresis, use of solubilizers in electrophoresis.

**UNIT-II**

Introduction to IEF (Iso-electric focusing), Two-dimensional gel electrophoresis and capillary electrophoresis, applications of electrophoresis in biology for isolation of biomolecules based on charge and molecular weight.

**UNIT III**

Mass spectroscopy: Ionization methods and Analyzers, MALDI TOF and MALDI Q, applications of mass spectroscopy in biology for qualitative and quantitative determination of bio-molecules, introduction to fluorescence spectroscopy

**UNIT-IV**

Radioisotopic techniques: Basic concepts of radioisotopy, theory and applications of Geiger-Muller tube, solid and liquid scintillation counters, primary and secondary flours. Safety rules for radioisotopic studies.

### **Books Recommended:**

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman.
5. Mousumi, D. (2011). Tools and techniques of biotechnology. Jaipur, India: Pointer Publisher.

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6066(P)**  
**Biochemical and Biophysical Techniques-II**  
**(Practical)**

**COURSE OUTCOMES:**

After passing this course the student will be able to:

**CO1:** Prepare standard curve of protein

**CO2:** Prepare standard curve of DNA

**CO3:** Separate biomolecules by Native PAGE

**CO4:** Separate bio-molecules by IEF

**Bachelor of Science (Bio-Technology) Semester-VI**  
**Session: 2024-25**  
**Course Code: BBTM-6066(P)**  
**Biochemical and Biophysical Techniques-II**  
**(Practical)**

**Time: 3 Hrs.**

**Practical Marks: 18**

**Instructions for the practical Examiner:**

Question paper is to be set on the spot jointly by the internal and external examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

**Experiments:**

1. Preparation of standard curve of protein
2. Preparation of standard curve of DNA.
3. Casting of Native-PAGE gel and separation of bio-molecules by electrophoresis.
4. To perform IEF.

**Books Recommended:**

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman & Co.

**Bachelor of Science (Bio-Technology) Semester-VI**

**Session: 2024-25**

**Course Code: BBTS-6087**

**Term Paper**

**(Seminar)**

**Time: 3 Hrs.**

**Max. Marks: 20**

**Instructions:**

Term paper on recent advances in Life Sciences using Internet and Library based resources.  
To be presented as hard copy/ CD. Viva/ Seminar to be conducted by a panel of three internal examiners.

**Annexure-F**  
**Department Of Bio-Technology**  
**Session: 2024-25**  
**Teaching Methodologies**

Teaching Methodologies adopted in the Department:

- ICT based Teaching
- Hands-on-practice in labs.
- Summer Training at various research Institutes like CSIR-IHBT, Palampur, NIT, Jalandhar, CSIR-IGIB, Delhi, et.
- Industrial Trainings at different industries like Verka Milk Plant, Cremica etc.
- Extension Lectures and Experimental Workshops by renowned experts etc.
- Different competitions at Department Level like Power point competition, poster making competition, quiz, slogan writing competition, Fermentology fiesta, idea presentation, etc.
- Student mentoring to resolve personal problems of students.
- Remedial classes for weak and advanced learners.
- Online assignments to students to expose students to recent research.
- Online Teaching through LMS, Learning Management System of our college.
- Extended practicals and small research projects to students.
- Expert Talks, Workshops are organized to give exposure to recent research in sciences.
- Alumni talks and career counseling sessions to make students aware about the scope and career opportunities in biotechnology.