FACULTY OF LIFE SCIENCES

SYLLABUS

of

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

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

(Semester: I-VI)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2026-27



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 (Bio-Technology) Three Year Degree Programme

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

Session: 2026-27

Semester-I

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTL -1421 BBTL -1031 BBTL -1431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	4-0-0	4	70	-	30	100
BBTM-1102	Communication Skills in English-I	AEC	3-0-2	3-0-1	4	50	20	30	100
BBTM-1063	Biochemistry-I	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM - 1064	Genetics	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-1065	General Microbiology-I	DSC	3-0-2	3-0-1	4	50	20	30	100
USEP-0001	Business Class	SEC	0-0-4	0-0-2	2	-	50	-	50
VACF-1491	*Foundation Course	VAAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					24				

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

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

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

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

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

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTL -2421 BBTL -2031 BBTL -2431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	4-0-0	4	70	-	30	100
BBTM-2102	Communication Skills in English-II	MDC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2483	Cell Biology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2064	Biochemistry-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-2065	General Microbiology-II	DSC	3-0-2	3-0-1	4	50	20	30	100
USEP-0002	Business Class	SEC	0-0-4	0-0-2	2	-	50	-	50
VACD-2161	Drug Abuse and Ethical Education	VAC	4-0-0	4-0-0	4	70	-	30	100
	Total Credits				26				

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

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

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

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

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

Session: 2026-27

Semester-III

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

DSC: **Discipline Specific Courses**
MDC: Multidisciplinary Course
SEC: Skill Enhancement Course
VAC: Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME
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Session: 2026-27
Semester-IV

Course No.	Course Title	Course Type	Hours per week	Credits L-T-P	Total Credits	L	P	CA	Total Marks
BBTM-4061	Molecular Biology	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4062	Biochemical and Biophysical Techniques	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4063	Biochemistry-II	DSC	3-0-2	3-0-1	4	50	20	30	100
BBTM-4084	Chemistry	Minor	3-0-2	3-0-1	4	50	20	30	100
BBTM-4065	Ecology and Evolution	AEC	3-0-2	3-0-1	4	50	20	30	100
VACP-4511	*Personality Development and Gender Sensitization	VAAC	2-0-0	2-0-0	2	35	-	15	50
Total Credits					22				

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

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

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

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

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

C-Compulsory
MDC: Multidisciplinary Course
VAAC: Value Added Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR DEGREE PROGRAMME

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Session: 2026-27

Semester-VI

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

C-Compulsory

MDC: Multidisciplinary Courses

SEC: Skill Enhancement Course

VAC: Value Added Course

Semester-I

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTL -1421
Course Title: Punjabi (Compulsory)
(Theory)

COURSE OUTCOMES

CO1: ਸਰਵੋਤਮ ਪੰਜਾਬੀ ਕਵਿਤਾ ਤੇ ਕਹਾਣੀ ਪੁਸਤਕ ਦੇ ਕਵਿਤਾ ਭਾਗ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਕਵਿਤਾ ਪ੍ਰਤੀ ਦਿਲਚਸਪੀ, ਸੂਝ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਤਾਂ ਕਿ ਉਹ ਆਧੁਨਿਕ ਦੌਰ ਵਿਚ ਚੱਲ ਰਹੀਆਂ ਕਾਵਿ ਧਾਰਾਵਾਂ ਅਤੇ ਕਵੀਆਂ ਬਾਰੇ ਗਿਆਨ ਹਾਸਿਲ ਕਰ ਸਕਣ।ਇਸ ਦਾ ਹੋਰ ਮਨੋਰਥ ਕਵਿਤਾ ਦੀ ਵਿਆਖਿਆ, ਵਿਸ਼ਲੇਸ਼ਣ ਤੇ ਮੁਲੰਕਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ ਵੀ ਹੈ ਤਾਂ ਕਿ ਉਹ ਸਮਕਾਲੀ ਸਮਾਜ ਦੀਆਂ ਸਮੱਸਿਆਵਾਂ ਨੂੰ ਸਮਝ ਸਕਣ ਅਤੇ ਆਲੋਚਨਾਤਮਕ ਦ੍ਰਿਸ਼ਟੀ ਬਣਾ ਸਕਣ।

CO2: ਮੰਚ ਘਰ ਪੁਸਤਕ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਮੁੱਲਵਾਨ ਗਿਆਨ ਦੇਣਾ ਹੈ।

CO3: ਪੈਰ੍ਹਾ ਰਚਨਾ ਅਤੇ ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ ਦੇਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO4: ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ:ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ ਚਿੰਨ੍ਹ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ ਪੜ੍ਹਣ ਨਾਲ ਵਿਦਿਆਰਥੀ ਧੁਨੀਆਂ ਦੀ ਉਚਾਰਨ ਪ੍ਰਣਾਲੀ ਤੋਂ ਵਾਕਫ਼ ਹੋਣਗੇ।

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTL -1421
Course Title: Punjabi (Compulsory)
(Theory)

ਸਮਾਂ ਤਿੰਨ ਘੰਟੇ	**Maximum Marks: 100**
L-T-P	**Theory :70**
4-0-0	**CA :30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ।ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ।ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।

3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ ਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

ਯੂਨਿਟ-I

ਸਰਵੋਤਮ ਪੰਜਾਬੀ ਕਵਿਤਾ ਤੇ ਕਹਾਣੀ (ਸੰਪਾ.ਡਾ.ਰਮਿੰਦਰ ਕੌਰ, ਡਾ. ਮੇਘਾ ਸਲਵਾਨ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ। (ਕਵਿਤਾ ਭਾਗ)

(ਕਵਿਤਾ ਦੀ ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ/ ਵਿਸ਼ਾ ਵਸਤੂ/ ਸਾਰ)

ਯੂਨਿਟ-II

ਮੰਚ ਘਰ

ਡਾ.ਕੁਲਦੀਪ ਸਿੰਘ ਧੀਰ, ਡਾ.ਹਿਰਦੇਜੀਤ ਸਿੰਘ ਭੋਗਲ(ਸੰਪਾ.), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ,ਅੰਮ੍ਰਿਤਸਰ।

(ਵਿਸ਼ਾ ਵਸਤੂ,ਸਾਰ,ਪਾਤਰ ਚਿਤਰਨ)

ਯੂਨਿਟ-III

(ੳ) ਪੈਰ੍ਹਾ ਰਚਨਾ

(ਅ) ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ।

ਯੂਨਿਟ-IV

(ੳ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ:ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ ਚਿੰਨ੍ਹ

(ਅ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ

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Semester-I
Session: 2026-27
Course Code: BBTL -1031
Course Title: Basic Punjabi
(Theory)

COURSE OUTCOMES:

CO1:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨੂੰ ਸਿਖਾਉਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਵਿਚ ਪਾ ਕੇ ਇਕ ਹੋਰ ਭਾਸ਼ਾ ਸਿੱਖਣ ਦਾ ਮੌਕਾ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ।ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਪੈਰ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ ਅਤੇ ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ ਅਤੇ ਮਾਤਰਾਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ) ਲਗਾਖ਼ਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO2:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ ਦੀ ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ (ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ,ਮੂਲ ਸ਼ਬਦ,ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ) ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO3: ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਸ਼ਤੇ ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਆਦਿ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO4:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਵਿਚ ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰ੍ਹਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ਸਿਖਾਉਣਾ ਹੈ।

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Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTL -1031
Course Title: Basic Punjabi
(Theory)

ਸਮਾਂ : 3 ਘੰਟੇ **Maximum Marks: 100**

L-T-P **Theory :70**
4-0-0 **CA :30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ।ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ।ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।

3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠਕ੍ਰਮ

ਯੂਨਿਟ-I

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਪੈਰ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ ਅਤੇ ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ ਅਤੇ ਮਾਤ੍ਰਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ) ਲਗਾਖ਼ਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ।

ਯੂਨਿਟ-II

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ(ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ, ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ)

ਯੂਨਿਟ-III

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਬਤ ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਆਦਿ ਨਾਲ ਸੰਬੰਧਤ।

ਯੂਨਿਟ-IV

ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰ੍ਹਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ।

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTL -1431
Course Title: Punjabi History and Culture
(Theory)

COURSE OUTCOMES:

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab

CO1: Identify and understand the sources and physical features of Punjab

CO 2: To study the earliest civilization (Indus Valley Civilization) and original home of Aryans

CO 3: To examine the Social, Religious and Economic life during Early and Later Vedic Age

CO 4: To comprehend the Buddhist, Jain and Hindu faith and their relevance in the modern times

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTL -1431
Course Title: Punjabi History and Culture
(Theory)

Examination Time: 3 Hours **Max. Marks: 100**
Credits L-T-P: 4-0-0 **Theory: 70**
Contact Hours: 4 Hrs/ Week **CA: 30**

Instructions for the Paper Setter:

Eight questions of equal marks to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Unit I-IV of the syllabus respectively. Candidates are required to attempt five questions in 800 words selecting at least one question from each section. The fifth question may be attempted from any sections. Each question will carry 14 Marks.

Unit-I

1. Physical features of Punjab.
2. Sources of the ancient history of Punjab

Unit-II

3. Harappan Civilization: Social, Economic and Religious life of the Indus Valley People.
4. The Indo-Aryans: Original home

Unit-III

5. Social, Religious life during Early Vedic Age and Later Vedic Age.
6. Economic and Political life during Early Vedic Age and Later Vedic Age.

Unit-IV

7. Rise of Buddhism and Teachings of Buddha.
8. Rise of Jainism and Teachings of Jainism.

Suggested Readings

- B.N. Sharma, Life in Northern India, Delhi. 1966.
- Budha Parkash, Glimpses of Ancient Punjab, Patiala, 1983.
- Chopra, P.N., Puri, B.N., & Das, M. N. (1974). A Social, Cultural & Economic History of India, Vol. I, New Delhi: Macmillan India.
- L. M Joshi (ed.), History and Culture of the Punjab, Art-I, Patiala, 1989 (3rd edition)
- L.M. Joshi and Fauja Singh (ed.), History of Punjab, Vol.I, Patiala 1977.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1102
Course Title: Communication Skills in English-I
(Theory)

COURSE OUTCOMES:

At the end of this course, the students will develop the following skills:

CO1: Reading skills that will facilitate them to become an efficient reader

CO2: Through reading skills, the students will have an ability to have a comprehensive understanding of the ideas in the text and enhance their critical thinking

CO3: Writing skills of students which will make them proficient enough to express ideas in clear and grammatically correct English

CO4: The skill to use an appropriate style and format in writing letters (formal and informal) and resume, memo, notices, agenda, minutes

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Course Code: BBTM-1102
Session: 2026-27
Course Title: Communication Skills in English-I
(Theory)

Total Marks: 100
Examination Time: 3 Hrs. **Theory: 50**
Practical: 20
CA: 30

L-T-P:3-0-2

Instructions for the paper setter and distribution of marks:
The question paper will consist of four sections. The candidate will have to attempt five questions in all selecting one from each section and the fifth question from any of the four sections. Each question will carry 10 marks. Each question can be sub divided into two parts. (10 x 5 = 50)

Unit I

Reading Skills: Reading Tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings.

Unit II

Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/expressions.

Activities:

- Comprehension questions in multiple choice format
- Short comprehension questions based on content and development of ideas

Unit III

Writing Skills: Guidelines for effective writing; writing styles for application, personal letter, official/ business letter.

Activities:

- Formatting personal and business letters.
- Organizing the details in a sequential order

Unit IV

Resume, memo, notices, agenda, minutes, Tips for effective blog writing

Activities:

- Converting a biographical note into a sequenced resume or vice-versa
- Ordering and sub-dividing the contents while making notes.
- Writing notices for circulation/boards
- Writing blogs

Recommended Books:

1) *Oxford Guide to Effective Writing and Speaking* by John Seely.
2) *Business Communication,* by Sinha, K.K. Galgotia Publishers, 2003.
3) *Business Communication* by Sethi, A and Adhikari, B., McGraw Hill Education2009.
4) *Communication Skills* by Raman, M. & S. Sharma, OUP, New Delhi, India (2011).

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Course Code: BBTM-1102
Session: 2026-27
Course Title: Communication Skills in English-I
PRACTICAL / ORAL TESTING

Time: 3 hours **Marks: 20**

Course Contents:

1. Oral Presentation with/without audio visual aids (10 Marks)
2. Group Discussion (05 Marks)
3. Practical File form Syllabi (05 Marks)

Questions:

1. Oral Presentation will be of 5 to 7 minutes duration. (Topic can be given in advance or it can be of student's own choice). Use of audio-visual aids is desirable.
2. Group discussion comprising 8 to 10 students on a familiar topic. Time for each group will be 15 to 20 minutes.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1063
Course Title: Biochemistry-I
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the structure, physicochemical properties, and biological significance of water, pH, buffers, and their role in maintaining biological systems.

CO2: Classify and interpret the structure, properties, and biological functions of carbohydrates and lipids, and relate them to cellular metabolism and physiological processes.

CO3: Analyze the structural organization, classification, and functional significance of proteins, amino acids, and the forces governing protein stability.

CO4: Evaluate the relationship between the structure and function of major biomolecules and their importance in maintaining normal biological functions and metabolic activities.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1063
Course Title: Biochemistry-I
(Theory)

Time: 3 Hours **Max. Marks: 100**

L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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, Biological Importance, 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. Heilman, D., Woski, S., Voet, D., Voet, J. G., & Pratt, C. W. (2024). *Fundamentals of Biochemistry*. John Wiley & Sons.

2. Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins.

3. Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.

4.Jain, J.L., Jain, S. & Jain, N. (2023). *Fundamentals of Biochemistry*. 9th Edition. S. Chand Publishing.

6. Nelson, D.L. & Cox, M.M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1063
Course Title: Biochemistry-I
(Practical)

COURSE OUTCOMES:

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

CO1: Explain the principles of spectrophotometric analysis and biochemical assays used for the qualitative and quantitative estimation of biomolecules.

CO2: Perform biochemical experiments to estimate carbohydrates, proteins, and lipid parameters using standard laboratory techniques.

CO3: Analyze experimental data to determine pKa values, verify Beer-Lambert's law, and differentiate reducing and non-reducing sugars.

CO4: Evaluate the accuracy and reliability of biochemical experimental results using appropriate calculations and laboratory practices.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1063
Course Title: Biochemistry-I
(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. 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. The determination of acid value of a fat.

Books Recommended:

1. Plummer D (2006) An introduction to Practical Biochemistry. Tata McGraw Hill Publishing Co., New Delhi.
2. Sawhney, S.K. and Singh, R. (2001). Introductory Practical Biochemistry, Narosa Publishing House.
3. Wilson, K. And Walker, J. (2010). Principles and Techniques of Biochemistry, 8th Edition, McGraw Hill Education.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1064
Course Title: Genetics
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the principles of Mendelian inheritance, gene interactions, linkage, crossing over, mutation, and chromosome organization.

CO2: Apply the principles of classical, microbial, and cytoplasmic genetics to solve problems related to inheritance, recombination, and chromosomal abnormalities.

CO3: Analyze the genetic basis of mutations, chromosomal aberrations, population genetics, and human genetic disorders using appropriate genetic principles.

CO4: Evaluate genetic data using pedigree analysis, karyotyping, and Hardy–Weinberg equilibrium to interpret patterns of inheritance and assess genetic disorders.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1064
Course Title: Genetics
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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 (Macromolecular organization and ultrastructure), karyotype, ideogram, centromere, and telomere structure, significance of telomerase, 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, 5th Revised Edition, Rastogi Publications.
2. Hartl, D.L. and Jones, E.W., 2019. *Genetics: analysis of genes and genomes*. Jones & Bartlett Learning.
3. Brooker, R.J. (2021). *Genetics: Analysis and Principles*. 7th Edition. McGraw-Hill Education.
4. Snustad and Simmons (2016). Principles of Genetics, 7th Edition, John Wiley & Sons
5. Singh, B.D. (2022). *Genetics*. 6th Revised Edition. Kalyani Publishers.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1064
Course Title: Genetics
(Practical)

COURSE OUTCOMES:

After successful completion of this practical course, the students will be able to:

CO1: Apply the principles of Mendelian genetics and probability to solve numerical problems and demonstrate patterns of inheritance.

CO2: Analyze genetic traits and inheritance patterns using blood group data, dermatoglyphics, and preserved genetic materials.

CO3: Examine chromosomal structures and stages of cell division through microscopic observation of polytene chromosomes and mitotic chromosomes.

CO4: Evaluate genetic observations and experimental data to interpret inheritance patterns and chromosomal behavior using appropriate laboratory techniques.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1064
Course Title: Genetics
(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. Demonstration of Law of segregation and independent assortment (use of colored beads, capsules etc.).

2. Numerical problems on Mendelism and on modified F2 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.

Books Recommended:

1. Caroll, S., Dubley J., Griffiths A.J.F., Wessler, S.R. (2015). An introduction to Genetic Analysis , 11 Edition, WH Freeman.
2. Pierce, B.A. (2020). *Genetics: A Conceptual Approach*. 7th Edition. W.H. Freeman/Macmillan Learning.
3. Singh, B.D. (2022). *Genetics*. 6th Revised Edition. Kalyani Publishers.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1065
Course Title: General Microbiology-I
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the evolution, scope, diversity, structure, and significance of microorganisms, including their role in biotechnology and various industrial, agricultural, healthcare, and environmental applications.

CO2: Apply the principles of bacterial classification, staining techniques, microbial cultivation, preservation, nutrition, and sterilization in microbiological studies.

CO3: Analyze the structural, physiological, and nutritional characteristics of microorganisms and the mechanisms involved in microbial growth and nutrient transport.

CO4: Evaluate the principles, applications, and limitations of different microscopic techniques used for the observation and characterization of microorganisms.

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

Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1065
Course Title: General Microbiology-I
(Theory)

Time: 3 Hours **Max. Marks: 100**

L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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 and its applications in various fields such as healthcare, agriculture, industry, and environment, offering diverse career opportunities. 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 isolation of pure cultures, Methods of microbial preservation: Refrigeration, cryopreservation, lyophilization, Paraffin method. Basic concept of microbial growth, physiology of microorganisms, 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 and 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. Tortora, G., Tortora, G. J., Funke, B. R., Case, C. L., Weber, D., & Bair, W. B. (2024). *Microbiology: an introduction*.
3. Pelczar, M.J., Chan, E.C.S. & Krieg, N.R. *Microbiology*. 7th Edition. McGraw-Hill.
4. Purohit, S.S. (2006). Microbiology: Fundamentals and Applications, 7th Edition, Agrobios (India).
5. Sherwood, L., Prescott, L. M., Sherwood, L. M., & Woolverton, C. J. (2017). *Prescott's microbiology*. McGraw-Hill Education.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1065
Course Title: General Microbiology-I
(Practical)

COURSE OUTCOMES:

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

CO1: Explain microbiology laboratory safety practices, aseptic techniques, sterilization methods, and the functions of common microbiological equipment.

CO2: Perform the preparation, sterilization, isolation, cultivation, purification, and preservation of microorganisms using standard microbiological techniques.

CO3: Analyze the morphological characteristics of bacteria, fungi, yeast, and algae using staining methods and microscopic examination.

CO4: Evaluate microbial cultures based on colony characteristics, staining reactions, and motility tests for their identification and characterization.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-1065
Course Title: General Microbiology-I
(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. Introduction to microbiology laboratory, laboratory safety and common microbiological equipment.
2. Cleaning of glassware and aseptic techniques of sterilization by physical and chemical methods.
3. Preparation of culture media, cotton plugging and its sterilization by autoclaving.
4. Isolation of Microorganisms from Air, Water, and Soil Samples by Serial Dilution, Spread Plate, and Pour Plate Techniques; Observation of Colony Characteristics and Purification of bacterial cultures.
5. Study of the morphology of fungi, yeast, and algae by staining techniques.
6. Identification of bacteria by simple staining, negative staining, and Gram staining.
7. Observation of Bacterial motility by wet mount and hanging drop techniques.
8. Preservation of bacterial cultures by short term preservation methods: Periodic transfer to subculture, Mineral oil overlay, and cryopreservation.

Books Recommended:

1. Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10th Edition, Pearson Education India.
2. Dubey, R. C., & Maheshwari, D. K. (2023). *A textbook of microbiology*. S. Chand Publishing.
3. Leooffee, M.J. and Pierce, B.E. (2019). Microbiology: Laboratory Theory and Application, 1st Edition, Morton Publishing Company.
4. Sastry, A. S. (2021). *Essentials of Practical Microbiology*. JP Medical Ltd.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: USEP-0001
Course Title: Business Class
(Practical)

COURSE OUTCOMES:

After studying this course, students will be able to:

CO1: Launch and manage a business by identifying opportunities, developing innovative solutions, and creating a sustainable business model.

CO2: Apply effective marketing and sales strategies using both digital and traditional platforms to acquire and retain customers.

CO3: Analyze financial performance using key business metrics to make informed decisions and ensure business sustainability.

CO4: Scale a business by implementing operational systems, automation tools, and technology-driven solutions for long-term growth.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: USEP-0001
Course Title: Business Class
(Practical)

Time: 3 Hours **Max. Marks: 50**

L-T-P: 0-0-2

Introduction: This course provides students with a holistic framework to develop entrepreneurial skills across the student's journey. The curriculum covers core principles of entrepreneurship, including identifying business opportunities, setting up operations, marketing, scaling, and financial management.

The aim of this course is to ensure that, by the end, learners acquire essential entrepreneurial competencies such as strategic thinking, practical application, founders & growth mindset, operational skills, and foundational financial literacy.

Learning Objectives

By the end of this course, students will be able to:

- Understand and apply entrepreneurial principles to real-world business situations.
- Develop and implement business strategies across different industries.
- Use digital tools, including AI, to enhance and automate business operations.
- Build sustainable business models, manage financials, and scale operations.

Entrepreneurial Specialization Tracks: Skill Development and Business Implementation:

Throughout the program, students will select one of the following five specialized tracks **using the** "Punjab Entrepreneurship Mindset Programme" App, designed to provide a structured pathway for developing entrepreneurial skills and implementing business ventures.

1. E-commerce:
In this track, students will learn how to build, manage, and scale an online business. From setting up an e-commerce platform to managing digital marketing strategies, inventory, and customer experience, this specialization provides the tools needed to succeed in the rapidly growing digital marketplace.

2. Content Creation:
This track focuses on empowering students to create, curate, and market digital content across various platforms. Students will learn how to build a personal or brand identity, develop engaging content, and monetize their platforms, whether through social media, video production, blogging, or influencer marketing.

3. Professional Services:
In this track, students will learn how to capitalize on freelance and contract-based opportunities. They will explore strategies for building a sustainable service-based business, manage client relationships, and maximize the flexibility that comes with this track.

4. Retail Business: This track introduces students to the fundamentals of starting and managing small-scale retail ventures. Learners will discover how to identify in-demand products, source suppliers, set up shop (physical or home-based), and attract local customers. Emphasis will be placed on practical steps like pricing, promotion, customer service, and building repeat sales to establish a steady income stream.

5. Miscellaneous: This track gives students the freedom to explore unique and diverse business ideas that don't fit into one category. Learners can identify opportunities around them, test simple solutions, and create small ventures based on local needs or personal interests. The focus is on creativity, problem-solving, and learning how to turn everyday ideas into earning opportunities.

The focus is on practical application, with students engaging in real-world projects that culminate in the creation and scaling of a business.

Registration on the APP

For Android Users:

Step 1: Click the following link to download and install the App:
https://drive.google.com/file/d/1zgfoFWN0Y1zWINF_gMpbGvIyeQ10WPM2/view?usp=drivesdk

Step 2: Register by providing your details and generate OTP. (If the OTP is not generated, use the last six digits of your mobile number as the OTP.)

Step 3: Open the tasks and complete them by giving your feedback and attempting the AI-based Quiz.

For iPhone Users:

Step 1: Click on this link:
https://punjabstartup.com/

Step 2: Sign up to create an account and generate OTP.

Step 3: Fill in your personal and educational details. After your account is created, open the tasks and complete them by giving your feedback and attempting the AI-based Quiz.

Content Creation

Week / Milestone	Milestone	Description
1	Start your journey as a content creator	Learn how to reach thousands of followers online by creating content.
2	Decide your content topic	Explore different topics and finalize one topic on which you

		will create content.
3	Start your own content channel	Launch your official channel on YouTube or Instagram and start building your audience.
4	Plan your first week content calendar	Learn how to create a simple weekly content calendar that would keep your audience engaged and make them follow you.
5	Plan and record your first video	Learn how to create a clean and catchy script for your first video and shoot it using your phone.
6	Edit and launch your first video	Learn how to edit your video with trendy music and cool effects and launch your channel with the first video.
7	Reach first 100 followers	Use WhatsApp and your personal Instagram account to tell people about your channel and reach your first 100 followers/subscribers.
8	Master the skill of engaging people with your content	Learn how to connect with your audience so they stay engaged and feel involved.
9	Follow latest trends and famous influencers to grow your channel	Learn how to use trending topics and tag well-known channels or creators to boost your reach and attract more followers.
10	Learn how you can make money from your content	Discover how to do brand deals and promote brands or products your followers truly care about.
11	Make your first partnership	Reach out to 10 brands for partnership and turn one into your first paid deal.
12	Plan your business growth	Create a 1-month plan on what to post weekly to grow your followers and earn money.

E-Commerce

Week / Milestone	Milestone	Description
1	Learn how to start selling online	Learn what an E-commerce business is and how you can start selling online in less than 30 days.
2	Choose your product	Explore different products and finalize what you want to sell online.
3	Find a supplier who will deliver the product for you	Identify suppliers who can send your product directly to the customer and help you launch your E-commerce business.
4	Create your E-commerce store	Make a simple online store using Instamojo and learn how to upload product images and descriptions on the store.
5	Activate payments on your store	Learn how to link your bank account to a payment gateway and integrate it with your Instamojo store to start

		receiving payments.
6	Launch your online store	Connect your domain name to your Instamojo account, create your launch poster, and officially launch your E-commerce store.
7	Get first 100 people to visit your online store	Learn how to write simple and catchy messages to promote your store and send them to 100 people.
8	Make your first sale	Convert one paying customer and learn how to process the order from beginning to delivery.
9	Create and post your first ad	Learn how to design a simple promotional ad and post it to bring in more people and sales.
10	Take feedback from customers	Engage with your paid customers, take product feedback, and upload success stories or reviews on your website.
11	Get a repeat customer or referral	Build trust with your paid customers to get either a repeat order or a referral.
12	Plan your business growth	Make a 1-month plan to promote and grow your E-commerce store and earn more money.

Professional Service

Week/Milestone	Milestone	Description
1	Start your journey in professional services	Learn what is a service and how you can earn money by offering your skill as a service.
2	Choose your service skill	Choose one skill you are good at and turn it into a service that people will pay for.
3	Find your ideal customer	Talk to people directly or through social media apps to understand who is willing to pay for your service and "WHY".
4	Build your online profile and show what you offer	Explore apps or websites such as WhatsApp Business, Upwork, or Urban Company, and learn how to create an online profile.
5	Write your service	Learn how to write your service in a simple and

	description	powerful way that gets people excited to try it.
6	Finalize your pricing and launch your service	Learn how to set the right price that your customers find fair and launch your service.
7	Get first 100 leads for your service	Learn how to write catchy messages to promote your service in the market and get your first 100 leads.
8	Offer a free service and learn from feedback	Give your service for free to real users and use their feedback to make it better.
9	Make your first sale	Get one paying customer for your service and work really hard to get a 5-star rating and a video testimonial.
10	Build trust with customers and get repeat orders	Use your trust and good relationship with existing customers to get your first repeat customer.
11	Earn your first referral	Start offering bonus or other additional services to your existing customers and get your first referral.
12	Plan your business growth	Make a 1-month plan on how to g

Retail Business

Week/Milestone	**Milestone**	**Description**
1	Learn how to start retail business	Understand how retail works, the types of business you can start, and talk to local shops.
2	Choose your product and ideal customer	Look at products in demand in your area and choose what you'll focus on based on your customer needs.
3	Find a supplier for your product	Identify suppliers or wholesalers who can provide quality products/raw materials at good prices.
4	Set up your business	Arrange your shop/home or prepare your products stocked with shopkeepers.
5	Decide product prices and prepare stock	Decide the right selling price, maintain a simple record of sales, and get ready to handle cash or digital payments.
6	Launch your business	Put up posters near your shop and share the announcement with friends, family, and local community groups.
7	Promote your business	Learn simple ways to promote your business locally.

	in your area	
8	Make your first sale	Ensure the buying process is smooth and the customer is happy.
9	Take feedback from customers	Engage with your paid customers and collect product feedback.
10	Discover other platforms to grow your sales	Learn how to set up a free WhatsApp Business account for your shop and collect orders there.
11	Get a repeat customer or referral	Build trust with your paid customers to get either a repeat order or a referral.
12	Plan your business growth	Make a 1-month plan to promote and g

Miscellaneous

Week/Milestone	**Milestone**	**Description**
1	Start your journey as an entrepreneur	Learn what entrepreneurship means and how you can start earning by solving problems around you.
2	Identify and validate a real problem to solve	Look around yourself, talk to people, and pick one real problem that many people face.
3	Define your customer and their pain points	Find out who will buy from you, what difficulties they face, and why they need your solution.
4	Generate business ideas and finalize one idea	Think of different ways to solve the problem, compare options, and choose one idea to move ahead with.
5	Define your product or service	Decide clearly what product or service you will provide and how it will solve the customer's problem.
6	Finalize your pricing and launch your business	Set a fair price for your product or service and take the first step to launch your business.
7	Promote your business and get first 100 leads	Tell people about your business using word of mouth, posters, or social media, and collect interest from 100 people.
8	Make your first sale	Get your first paying customer and deliver your product or service with full effort.

9	Take feedback from customers and improve	Listen to what customers say after using your product/service and make it better step by step.
10	Build trust with customers and get your first repeat order	Keep your promise, give good quality, and motivate your customer to buy from you again.
11	Earn your first referral and expand your sales	Ask happy customers to recommend you to friends and family so that you can grow your sales.
12	Plan your business growth	Make a simple plan for the next month to get more customers, increase sales, and grow your business.

Evaluation Criteria

The evaluation will be conducted by a committee consisting of the Class Mentor, Nodal Officer, and the Principal/HOD or his/her nominee.

Evaluation Component	**Description**	**Weightage**
Weekly Task Completion	Timely submission of weekly tasks, including activities, reflection prompts, graded quizzes, etc.	**60%**
Target Completion	Performance-based evaluation on achieving revenue or profit targets (e.g., generating ₹10,000 revenue).	**20%**
Final Project	A comprehensive project based on the semester theme.	**20%**

Evaluation Mechanism: The score generated by the app will be considered final.

Weekly Component

Each week of the course follows a structured format designed to guide students from learning to doing through simple, practical, and accessible activities.

Component	**Duration**	**Description**
Action Lab	~4 hours	• Hands-on task based on the weekly concept. • Includes step-by-step guidance, templates, and worksheets. • Ends with a submission (e.g., video, reflection, or proof of action).
Learning Resources	Self-paced	• Videos, short readings, real-life stories, and practical tools to deepen understanding at the learner's own pace.
Check-in	Self-paced	• Quizzes and reflection prompts to reinforce learning and monitor progress.

Syllabus Overview for Semester 1–5

Semester	Learning Focus	Learner's Demonstration	Revenue Target
1	Setup & Launch	**Understand. Create. Start.**	₹10,000
2	Marketing Basics	**Engage. Share. Grow.**	₹40,000
3	Operations & Scale	**Earn. Deliver. Expand.**	₹80,000
4	Organic Growth	**Attract. Retain. Build.**	₹160,000
5	AI Automation & Finance Mastery	**Simplify. Track. Sustain.**	₹400,000

Semester 1: Setup & Launch

In Semester 1, students will explore what entrepreneurship means and how it connects to their daily lives. They will learn to identify problems, shape simple business ideas, and test the minimum viable product (MVP). This semester builds the foundation by developing observation skills, value creation, and action-oriented thinking

Semester 2: Marketing Basics

In Semester 2, students will learn how to attract customers and increase business visibility through digital platforms and community-based marketing strategies. They will also begin running paid advertising campaigns and optimize their marketing efforts using basic analytics.

Semester 3: Operations & Scale

This semester focuses on the day-to-day operations of running a business, including order fulfillment, customer service, logistics, and workflow management. Students will also learn strategies to scale their businesses while effectively managing resources and maintaining quality.

Semester 4: Organic Growth

Students will learn how to grow their businesses organically through referrals, partnerships, customer engagement, and community building. The semester emphasizes developing a loyal customer base and leveraging word-of-mouth marketing to increase reach and credibility.

Semester 5: AI Automation & Finance Mastery

Students will explore AI-powered business tools, automation techniques, and financial management practices. They will learn to automate routine tasks, track business performance using key financial metrics, manage cash flow, and develop sustainable strategies for long-term business growth.

Semester 5: AI Automation & Financial Mastery

The final semester prepares students for long-term business sustainability. Students will integrate AI to improve productivity, automate routine tasks, and enhance decision-making. They will also develop skills in financial planning, including setting income goals, tracking expenses, understanding profit

margins, and preparing simple financial forecasts. This semester helps students build a strong entrepreneurial identity while creating systems for financial stability and scalable growth.

Suggested Readings

1. Sinek, Simon. *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Portfolio/Penguin.
2. Ries, Eric. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business.
3. Berger, Jonah. *Contagious: How to Build Word of Mouth in the Digital Age*. Simon & Schuster.
4. Knight, Phil. *Shoe Dog: A Memoir by the Creator of Nike*. Scribner.
5. Fried, Jason, and David Heinemeier Hansson. *Rework: Change the Way You Work Forever*. Crown Business.
6. García, Héctor, and Francesc Miralles. *Ikigai: The Japanese Secret to a Long and Happy Life*. Penguin Books.
7. Ferriss, Tim. *Tools of Titans* (Selected Chapters). Houghton Mifflin Harcourt.
8. Thiel, Peter, and Blake Masters. *Zero to One: Notes on Startups, or How to Build the Future*. Crown Business.
9. Lamba, Anil. *Romancing the Balance Sheet*. Anil Lamba Publications.
10. The Better India / YourStory – Young Entrepreneurs Series (Collection of Articles): Real-life stories of young Indian entrepreneurs and startup journeys that inspire innovation and action.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Value Added Course
Course Code: SECF-I
Course Title: Foundation Course

Course Duration: 30 hours

PURPOSE & AIM

This course has been designed to strengthen the intellectual foundation of all the new entrants in the college. One of the most common factors found in the students seeking admission in college after high school is the lack of an overall view of human history, knowledge of global issues, peaks of human intellect, social/political thinkers and inventors & discoverers who have impacted human life. For a student, the process of transition from school to college is full of apprehension and skepticism regarding adapting themselves to new system. The Foundation Programme intends to bridge the gap between high school and college education and develop an intellectual readiness and base for acquiring higher education.

INSTRUCTIONAL OBJECTIVES

- To enable the students to realise their position in the whole saga of time and space
- To inculcate in the man appreciation of life, cultures and people across the globe
- To promote, in the students, an awareness of human intellectual history
- To make them responsible and humane world citizen so that they can carry forward the rich legacy of humanity

LEARNING OUTCOMES

After the completion of this Audit course, students will be able to

- learn how past societies, systems, ideologies, governments, cultures and technologies were built, how they operated, and how they have changed
- understand how the rich history of the world helps us to paint a detailed picture of where west and to day

- understand the Vedic theism, Upanishads Philosophy and doctrines of Jainism, Buddhism and Sikhism
- acquire knowledge of women rights and courage to face day to day challenges
- acknowledge the changes in society, religion and literature in the renaissance period and the importance of empathy and compassion for humanity
- learn about the prominent Indians (Men and Women) who contributed significantly in freedom struggle, education, economic development and in the formation and evolution of our nation
- understand meaning of race and how that concept has been used to justify exclusion, Inequality, and violence throughout history and the origin of civil right movements to fight for equality, liberty and fraternity
- criticallyevaluatethesocio-politicalandeconomicissuesatgloballevelanditsimplications in the present
- upgrade and enhance learning technological skills and striking a balance between technology and their well being
- take pride in learning the saga of Indian Past Culture and Heritage
- understand the rich legacy of KMV and its progressive endeavours

MODULE	TITLE	CONTACT HOURS
I	Introduction and Initial Assessment	2
II	The Human Story	3
III	*The Vedas* and the Indian Philosophy	2.5
IV	The Journey of Woman The Story and the Dream	2.5
V	Changing Paradigms in Society, Religion & Literature	2.5
VI	Makers of Modern India	2.5
VII	Racism: Story of the West	2.5
VIII	Modern World at a Glance: Political & Economic Perspective	2.5
IX	Technology Visa Vis Human Life	2.5
X	My Nation My Pride	2.5
XI	The KMV Experience	2.5
XII	Final Assessment, Feedback and Closure	2.5

EXAMINATION

- **Total Marks: 50 (Final Exam: 40; Internal Assessment:10)**
- Final Exam: multiple choice quiz**.** Marks–20; Time: 1hour
- Internal Assessment:10 (Assessment: 6; Attendance: 4)

  Comparative assessment questions (medium length) in the beginning and close of the programme. Marks: 3; Time: 0.5hour each at the beginning and end.
- Total marks: 50 converted to grade for final result
- Gradingsystem:90%marks&above: A grade

  80% - 89% marks: B grade70% - 79% marks: C grade60% - 69% marks: D grade50% -

  59% marks: E grade

  Below 50% marks: F grade (Fail-must give the exam again)

SYLLABUS

Module I Being a Human: Introduction & Initial Assessment

- Introduction to the programme
- Initial Assessment of the students through written answers to a couple of questions

Module 2 The Human Story

- Comprehensiveoverviewofhumanintellectualgrowthrightfromthebirthofhumanhistory
- The wisdom of the Ancients
- Dark Middle Ages
- Revolutionary Renaissance
- Progressive modern times
- Most momentous turning points, inventions and discoveries

Module 3 *The Vedas* and the Indian Philosophy

- Origin, teachings and significance of *The Vedas*
- Upnishads and Puranas
- Karma Theory of *The Bhagwad Gita*
- Main tenets of Buddhism & Jainism

- Teachings of Guru Granth Sahib

Module 4 Changing Paradigms in Society, Religion &Literature

- Renaissance: The Age of Rebirth
- Transformation in human thought
- Importance of humanism
- Geocentricism to heliocentricism
- Copernicus, Galileo, Columbus, Darwin and Saint Joan
- Empathy and Compassion

Module 5 Woman: A Journey through the Ages

- Status of women in pre – vedic times
- Women in ancient Greek and Roman civilizations
- Women in vedic and ancient India
- Status of women in the Muslim world
- Womenin the modern world
- Crime saga in st women
- Women labour work force participation
- Women in politics
- Status of women-our dream

Module 6 Makers of Modern India

- Early engagement of foreigners with India
- Education: The first step to modernization
- Railways: The life line of India
- Raja Ram Mohan Roy, Gandhi, Nehru, Vivekanand, Sardar Patel etc.
- Indira Gandhi, Mother Teresa, Homai Vyarawala etc.
- The Way Ahead

Module 7 Racism: Story of the West

- European beginnings of racism

- Racism in the USA -Jim Crow Laws
- Martin Luther King Jr. and the battle against racism
- Apartheid and Nelson Mandela
- Changing face of racism in the modern world

Module 8 Modern World at a Glance: Political & Economic Perspective

- Changing world order
- World War I & II
- UNO and The Common wealth
- Nuclear Powers; Terrorism
- Economic Scenario: IMF, World Bank
- International Regional Economic Integration

Module 9 Technology Visa Vis Human Life

- Impact of technology on modern life
- Technological gadgets and their role in our lives
- Technology and environment
- Consumerism and materialism
- Psychological and emotional consequences of technology
- Harmonizing technology with ethics and humaneness

Module 10 My Nation My Pride

- Indian Past Culture and Heritage
- Major Discoveries (Medicinal and Scientific)
- Vedic Age
- Prominent Achievements
- Art, Architecture and Literature

Module 11 The KMV Experience

- Rich Legacy of KMV
- Pioneering role in women emancipation and empowerment

- KMV Contribution in the Indian Freedom Struggle
- Moral, cultural and intellectual heritage of KMV
- Landmark achievements
- Innovative initiatives; international endeavours
- Vision, mission and focus
- Conduct guidelines for students

Module 12 Final Assessment, Feedback & Closure

- Final multiple-choice quiz
- Assessment through the same questions asked in the beginning
- Feedback about the programme from the students
- Closure of the programme

PRESCRIBED READING

The Human Story published by Dawn Publications

Semester-II

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTL -2421
Course Title: Punjabi (Compulsory)
(Theory)

COURSE OUTCOMES

CO1: ਸਰਵੋਤਮ ਪੰਜਾਬੀ ਕਵਿਤਾ ਤੇ ਕਹਾਣੀ ਪੁਸਤਕ ਦੇ ਕਹਾਣੀ ਭਾਗ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਕਹਾਣੀ ਨੂੰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਕਹਾਣੀ ਜਗਤ ਨਾਲ ਜੋੜਣਾ ਹੈ।

CO2: ਗੱਦ ਪ੍ਰਵਾਹ ਪੁਸਤਕ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਮੁੱਲਵਾਨ ਗਿਆਨ ਦੇਣਾ ਹੈ।

CO3: ਸ਼ਬਦ ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ, ਪਰਿਭਾਸ਼ਾ, ਮੁੱਢਲੇ ਸੰਕਲਪ,ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ -ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

CO4: ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਸਮੇਂ ਅਤੇ ਮਿਹਨਤ ਦੀ ਬੱਚਤ ਕਰਨ ਬਾਰੇ ਦੱਸਣਾ ਹੈ।ਮੁਹਾਵਰੇ / ਅਖਾਣ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ।ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ।

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTL -2421
Course Title: Punjabi (Compulsory)
(Theory)

ਸਮਾਂ ਤਿੰਨ ਘੰਟੇ **Maximum Marks: 100**
L-T-P **Theory:70**
4-0-0 **CA:30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ।ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ।ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

ਯੂਨਿਟ-I

ਸਰਵੋਤਮ ਪੰਜਾਬੀ ਕਵਿਤਾ ਤੇ ਕਹਾਣੀ (ਸੰਪਾ.ਡਾ.ਰਮਿੰਦਰ ਕੌਰ, ਡਾ. ਮੇਘਾ ਸਲਵਾਨ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ। (ਕਹਾਣੀ ਭਾਗ)
ਕਹਾਣੀ ਦਾ ਸਾਰ/ਵਿਸ਼ਾ ਵਸਤੂ

ਯੂਨਿਟ-II

ਗੱਦ ਪ੍ਰਵਾਹ (ਰੇਖਾ ਚਿਤਰ ਤੇ ਹਲਕੇ ਲੇਖ)
(ਸੰਪਾ.ਡਾ.ਬਿਕਰਮ ਸਿੰਘ ਘੁੰਮਣ ਅਤੇ ਜਸਪਾਲ ਸਿੰਘ),
ਗਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
(ਵਿਸ਼ਾ ਵਸਤੂ/ਸਾਰ)

ਯੂਨਿਟ-III

(ੳ) ਸ਼ਬਦ ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ, ਪਰਿਭਾਸ਼ਾ, ਮੁੱਢਲੇ ਸੰਕਲਪ
(ਅ) ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ

ਯੂਨਿਟ-IV

ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ
ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

Bachelor of Science (Bio-Technology) Three Year Degree Programme
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Semester-II
Session: 2026-27
Course Code: BBTL-2031
Course Title: Basic Punjabi
(Theory)

COURSE OUTCOMES:

CO1: ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ (ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ, ਯੋਜਕ ਅਤੇ ਵਿਸਮਿਕ)ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ -ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

CO2: ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ(ਸਾਧਾਰਨ ਵਾਕ, ਸੰਯੁਕਤ ਵਾਕ, ਮਿਸ਼ਰਤ ਵਾਕ, ਬਿਆਨੀਆ ਵਾਕ, ਪ੍ਰਸ਼ਨ ਵਾਚਕ ਵਾਕ ਅਤੇ ਹੁਕਮੀ ਵਾਕ) ਦੀ ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਇਸ ਦੀ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ ਅਤੇ ਉਨ੍ਹਾਂ ਦੀ ਭਾਸ਼ਾ ਤੇ ਪਕੜ ਮਜਬੂਤ ਹੋਵੇਗੀ।

CO3: ਪੈਰ੍ਹਾ ਰਚਨਾ ਅਤੇ ਸੰਖੇਪ ਰਚਨਾ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO4: ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ ਲਿਖਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਇਸ ਕਲਾ ਵਿਚ ਨਿਪੁੰਨ ਕਰਨਾ ਹੈ। ਅਖਾਣ ਅਤੇ ਮੁਹਾਵਰੇ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ। ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ।

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Course Code: BBTL-2031
Course Title: Basic Punjabi
(Theory)

ਸਮਾਂ : 3 ਘੰਟੇ **Maximum Marks: 100**
L-T-P **Theory: 70**
4-0-0 **CA: 30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ। ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।

3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠਕਮ੍ਰ

ਯੂਨਿਟ-I

ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ (ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ, ਯੋਜਕ ਅਤੇ ਵਿਸਮਿਕ)

ਯੂਨਿਟ-II

ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ

(ੳ) ਸਾਧਾਰਨ ਵਾਕ, ਸੰਯੁਕਤ ਵਾਕ ਅਤੇ ਮਿਸ਼ਰਤ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

(ਅ) ਬਿਆਨੀਆ ਵਾਕ, ਪ੍ਰਸ਼ਨ ਵਾਚਕ ਵਾਕ ਅਤੇ ਹੁਕਮੀ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਯੂਨਿਟ-III

ਪੈਰ੍ਹਾ ਰਚਨਾ

ਸੰਖੇਪ ਰਚਨਾ

ਯੂਨਿਟ-IV

ਚਿੱਠੀ ਪੱਤਰ (ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ)

ਅਖਾਣ ਅਤੇ ਮੁਹਾਵਰੇ (ਲਿਸਟ ਨਾਲ ਨੱਥੀ ਹੈ)

ਅਖਾਣ

ਉਠੇ ਤਾ ਉੱਠ ਨਹੀਂ ਰੇਤੇ ਦੀ ਮੁੱਠ,ਉੱਦਮ ਅੱਗੇ ਲੱਛਮੀ ਪੱਖੇ ਅੱਗੇ ਪੈਣ ,ਉਹ ਦਿਨ ਡੁੱਬਾ ਜਦੋਂ ਘੋੜੀ ਚੜ੍ਹਿਆ ਕੁੱਬਾ ,ਉੱਚੀ ਦੁਕਾਨ ਫਿੱਕਾ ਪਕਵਾਨ ,ਉਲਟੀ ਵਾੜ ਖੇਤ ਨੂੰ ਖਾਏ ,ਉੱਚਾ ਲੰਮਾ ਗੱਭਰੂ ਪੱਲੇ ਠੀਕਰੀਆਂ ,**ਅਸ਼ਰਫ਼ੀਆਂ ਦੀ ਲੁੱਟ ਤੇ ਕੋਲਿਆਂ ਤੇ ਮੁਹਰਾਂ, ਅੱਗੇ ਸੱਪ ਪਿੱਛੇ ਸ਼ੀਂਹ, ਆਦਰ ਤੇਰੀ ਚਾਦਰ ਨੂੰ ਬਹਿਣਾ ਤੇਰੇ ਗਹਿਣੇ ਨੂੰ, ਆਪੇ ਫਾਥੜੀਏ ਤੈਨੂੰ ਕੌਣ ਛੁਡਾਏ, ਆਪਣੇ ਹੱਥੀਂ ਆਪਣਾ ਆਪੇ ਹੀ ਕਾਜ ਸਵਾਰੀਐ, ਆਰੀ ਨੂੰ ਇੱਕ ਪਾਸੇ ਦੰਦੇ ਜਹਾਨ ਨੂੰ ਦੋਹੀਂ ਪਾਸੀਂ,**ਅੱਖੀਂ ਵੇਖ ਕੇ ਮੱਖੀ ਨਹੀਂ ਨਿਗਲੀ ਜਾਂਦੀ ,ਅੰਦਰ ਹੋਵੇ ਸੱਚ ਤਾਂ ਕੋਠੇ ਚੜ੍ਹ ਕੇ ਨੱਚ ,ਆਪੇ ਮੈਂ ਰੱਜੀ ਪੁੱਜੀ ਆਪੇ ਮੇਰੇ ਬੱਚੇ ਜਿਉਣ ,ਆਪ ਕੁਚੱਜੀ ਵਿਹੜੇ ਨੂੰ ਦੋਸ਼ ,ਅੰਨ੍ਹਾ ਵੰਡੇ ਰਿਉੜੀਆਂ ਮੁੜ ਮੁੜ ਆਪਣਿਆਂ ਨੂੰ ,ਅਕਲ ਵੱਡੀ ਕੇ ਮੱਝ ,ਅੰਨ੍ਹਿਆਂ ਵਿੱਚ ਕਾਣਾ ਰਾਜਾ ,ਆਪਣੀ ਪੀੜ੍ਹੀ ਹੇਠ ਸੋਟਾ ਫੇਰਨਾ ,ਇਕ ਅਨਾਰ ਸੌ ਬਿਮਾਰ ,ਇਕ ਹੱਥ ਨਾਲ ਤਾੜੀ ਨਹੀਂ ਵੱਜਦੀ ,ਇੱਕ ਚੁੱਪ ਸੌ ਸੁੱਖ ਝੱਟ ਮੰਗਣੀ ਪੱਟ ਵਿਆਹ ,ਸਹਿਜ ਪੱਕੇ ਸੋ ਮੀਠਾ ਹੋਵੇ ,ਦਾਲ ਵਿੱਚ ਕਾਲਾ ਹੋਣਾ ,**ਸੰਗ ਤਾਰੇ ਕੁਸੰਗ ਡੋਬ,**ਸੱਦੀ ਨਾ ਬੁਲਾਈ ਮੈਂ ਲਾੜੇ ਦੀ ਤਾਈਂ ,ਸਵੈ ਭਰੋਸਾ ਵੱਡਾ ਤੋਸਾ,ਸੌ ਦਿਨ ਚੋਰ ਦੇ ਇਕ ਦਿਨ ਸਾਧਦਾ ,ਸੱਪ ਦਾ ਬੱਚਾ ਸਪੋਲੀਆ ,ਸੱਪ ਮਰ ਜਾਵੇ ਲਾਠੀ ਵੀ ਨਾ ਟੁੱਟੇ ,ਸਾਈਆਂ ਕਿਤੇ ਵਧਾਈਆਂ ਕਿਤੇ ,ਹੰਕਾਰਿਆ ਸੋ ਮਾਰਿਆ ,**ਹੱਥ ਨੂੰ ਹੱਥ ਧੋਂਦਾ ਹੈ,** ਹਾਥੀ ਲੰਘ ਗਿਆ ਪੂਛ ਰਹਿ ਗਈ, **ਕੋਹ ਨਾ ਚੱਲੀ ਬਾਬਾ ਤਿਹਾਈ,**ਕੁੱਛੜ ਕੁੜੀ ਸ਼ਹਿਰ ਢੰਡੋਰਾ ,ਕੋਲਿਆਂ ਦੀ ਦਲਾਲੀ ਵਿੱਚ ਮੂੰਹ ਕਾਲਾ ,ਕਰੇ ਕੋਈ ਭਰੇ ਕੋਈ ,**ਖਿੱਦੋ ਫ਼ਰੋਲਿਆਂ ਲੀਰਾਂ ਹੀ ਨਿਕਲਦੀਆਂ ਹਨ,** ਖ਼ਵਾਜੇ ਦਾ ਗਵਾਹ ਡੱਡੂ ,ਖੇਤੀ ਖਸਮਾਂ ਸੇਤੀ ,**ਖਰਬੂਜ਼ੇ ਨੂੰ ਦੇਖ ਕੇ ਖਰਬੂਜ਼ਾ ਰੰਗ ਬਦਲਦਾ ਹੈ,**ਖੂਹ ਪੁੱਟਦੇ ਨੂੰ ਖਾਤਾ ਤਿਆਰ ,**ਘੜੇ ਨੂੰ ਹੱਥ ਲਾਇਆ ਸਾਰਾ ਟੱਬਰ ਤਿਹਾਇਆ,**ਘਰ ਦਾ ਭੇਤੀ ਲੰਕਾ ਢਾਹੇ ,ਘਰ ਦੀ ਕੁੱਕੜੀ ਦਾਲ ਬਰਾਬਰ ,ਚਿੰਤਾ ਚਿਖਾ ਬਰਾਬਰ , ਛੱਜ ਤਾਂ ਬੋਲੇ ਛਾਣਨੀ ਵੀ ਬੋਲੇ,ਛੋਟੀ ਮੂੰਹ ਵੱਡੀ ਗੱਲ , **ਜੋ ਰਾਤੀਂ ਜਾਗਣ ਕਾਲੀਆਂ ਸੋ ਹੀ ਖਾਣ ਸੁਖਾਲੀਆਂ**,ਜਾਂਦੇ ਚੋਰ ਦੀ ਲੰਗੋਟੀ ਹੀ ਸਹੀ ,ਜਿਸਦੀ ਕੋਠੀ ਦਾਣੇ ਉਹਦੇ ਕਮਲੇ ਵੀ ਸਿਆਣੇ ,ਜਿਹੜੇ ਗੱਜਦੇ ਨੇ ਉਹ ਵਰ੍ਹਦੇ ਨਹੀਂ , ਝੱਟ ਮੰਗਣੀ ਪੱਟ ਵਿਆਹ ,**ਨਵਾਂ ਨੌ ਦਿਨ ਪੁਰਾਣਾ ਸੌ ਦਿਨ, ਪਾਣੀ ਵਿੱਚ ਸੋਟਾ ਮਾਰਿਆਂ ਪਾਣੀ ਦੋ ਨਹੀਂ ਹੋ ਜਾਂਦੇ, ਵਿੱਦਿਆ ਵਿਚਾਰੀ ਤਾਂ ਪਰਉੱਪਕਾਰੀ, ਵੇਲੇ ਦੀ**

ਨਮਾਜ਼ ਕੁਵੇਲੇ ਦੀਆਂ ਟੱਕਰਾਂ, ਇਕ ਦਰ ਬੰਦ ਸੌ ਦਰ ਖੁੱਲ੍ਹਾ, ਬਿੱਲੀ ਦੇ ਸਿਰ੍ਹਾਣੇ ਦੁੱਧ ਨਹੀਂ ਜੰਮਦਾ,ਰੱਸੀ ਸੜ ਗਈ ਵੱਟ ਨ੍ਹੀਂ ਗਿਆ

ਮੁਹਾਵਰੇ

ਉਸਤਾਦੀ ਕਰਨੀ, ਉਂਗਲ ਕਰਨੀ, ਉੱਲੂ ਬਣਾਉਣਾ ,ਉੱਚਾ ਸਾਹ ਨਾ ਕੱਢਣਾ, ਉੱਡਦੇ ਫਿਰਨਾ ,ਉੱਘ ਸੁੱਘ ਮਿਲਣੀ,ਅੱਖਾਂ ਵਿਚ ਰੜਕਣਾ **,ਉਂਗਲਾਂ ਤੇ ਨਚਾਉਣਾ, ਉਧੜ-ਧੁੰਮੀ ਮਚਾਉਣਾ, ਊਠ ਦੇ ਮੂੰਹ ਵਿੱਚ ਜ਼ੀਰਾ ਦੇਣਾ,**ਅੱਗ ਲਾਉਣਾ ,ਆਵਾ ਊਤ ਜਾਣਾ ,ਅਸਮਾਨ ਨੂੰ ਟਾਕੀਆਂ ਲਾਉਣਾ, ਅੱਖਾਂ ਵਿੱਚ ਲਾਲੀ ਉਤਰਨੀ ,ਅਕਲ ਤੇ ਪਰਦਾ ਪੈਣਾ, **ਅੱਖਾਂ ਅੱਗੇ ਖੋਪੇ ਚਾੜ ਦੇਣੇ, ਅੱਖਾਂ ਉੱਤੇ ਬਿਠਾਉਣਾ, ਅੱਲੇ ਫੱਟਾਂ ਤੇ ਲੂਣ ਛਿੜਕਣਾ, ਆਪਣੇ ਅੱਗੇ ਕੰਡੇ ਬੀਜਣਾ, ਆਪਣੇ ਤਰਕਸ਼ ਵਿੱਚ ਤੀਰ ਹੋਣਾ, ਸਿਰ ਚੜ੍ਹਨਾ,**ਈਨ ਮੰਨਣੀ, ਈਦ ਦਾ ਚੰਨ ਹੋਣਾ, ਇੱਟ ਨਾਲ ਇੱਟ ਖੜਕਾਉਣਾ,ਸਿਰ ਫਿਰਨਾ, ਸਿਰ ਤੇ ਚੜ੍ਹਨਾ ,ਸਬਰ ਦਾ ਘੁੱਟ ਭਰਨਾ, ਸਿਰ ਪੈਰ ਨਾ ਹੋਣਾ, **ਸਿਰ ਖੁਰਕਣ ਦੀ ਵੇਹਲ ਨਾ ਹੋਣਾ,ਸੱਠੀ ਦੇ ਚੌਲ ਖੁਆਣੇ,**ਹੱਥ ਧੋ ਕੇ ਪਿੱਛੇ ਪੈਣਾ, ਹੱਥੀਂ ਛਾਂਵਾਂ ਕਰਨੀਆਂ, ਹੱਡ ਭੰਨਣੇ, ਹੱਥ ਤੰਗ ਹੋਣਾ ,ਹੱਥ ਮਲਣਾ,ਹੱਥ ਪੈਰ ਮਾਰਨਾ, **ਹੱਥ ਉੱਤੇ ਹੱਥ ਧਰ ਕੇ ਬੈਠਣਾ, ਹੱਥ ਵਟਾਉਣਾ, ਹਵਾ ਦੇ ਘੋੜੇ ਸਵਾਰ ਹੋਣਾ,**ਕੰਨੀਂ ਕਤਰਾਉਣਾ, ਕੰਨ ਤੇ ਜੂੰ ਨਾ ਸਰਕਣਾ, ਕੰਨ ਘੇਸਲ ਮਾਰਨੀ, **ਕਣਕ ਨਾਲ ਘੁਣ ਵੀ ਪਿਸਣਾ, ਕੱਖ ਭੰਨ ਕੇ ਦੂਹਰਾਂ ਨਾ ਕਰਨਾ, ਕਲਮ ਦੇ ਧਨੀ ਹੋਣਾ, ਕਿਤਾਬੀ ਕੀੜਾ ਹੋਣਾ,** ਖ਼ਾਨਾ ਖ਼ਰਾਬ ਹੋਣਾ, ਖਾਨਿਓ ਜਾਣਾ,**ਖੂਹ ਨਿਖੁੱਟ ਜਾਣਾ,** ਗੁੱਡੀ ਚੜ੍ਹਨੀ, ਗਲ ਪੈਣਾ ,ਗੰਗਾ ਨਹਾਉਣਾ ,ਚੜ੍ਹ ਮੱਚਣੀ, ਚੰਦ ਚਾੜ੍ਹਨਾ, ਚਾਦਰ ਵੇਖ ਕੇ ਪੈਰ ਪਸਾਰਨਾ ,ਚਕਮਾ ਦੇਣਾ ,ਛੱਕੇ ਛੜਾਉਣਾ ,ਛਾਪਾ ਮਾਰਨਾ, ਛਿੱਲ ਲਾਉਣੀ ,ਛਿੱਕੇ ਟੰਗਣਾ

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTL-2431
Course Title: Punjabi History and Culture
(Theory)

COURSE OUTCOMES:

After completing Semester II and course on Ancient History of Punjab students will be able to understand:

CO1: The reasons and impact of Alexander's invasions and to comprehend various factors leading to rise and fall of empires and emergence of new dynasties and their administration specifically of Maurya rule in general and Ashok in particular

CO2: Art and architecture of Gupta period and the Indo-Greek style of architecture under Gandhara School

CO3: To have an insight into the socio-cultural history under Harshvardhan and Punjab under the stated period

CO4: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Greek Art and Architecture in Punjab

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTL-2431
Course Title: Punjabi History and Culture
(Theory)

Examination Time: 3 Hours **Max. Marks: 100**
Credits L-T-P: 4-0-0 **Theory: 70**
Contact Hours: 4 Hrs/ Week **CA: 30**

Instructions for the Paper Setter:

Eight questions of equal marks to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Unit I-IV of the syllabus respectively. Candidates are required to attempt five questions in 800 words selecting at least one question from each section. The fifth question may be attempted from any sections. Each question will carry 14 Marks.

Unit-I

1. Alexander's Invasion's and Impact
2. Administration of Chandragupta Maurya with special reference to reforms introduced by Ashoka

Unit-II

3. The Kushans: Gandhar School of Art
4. Gupta Empire: Golden Period-Social and Cultural life, Art and Architecture)

Unit-III

5. The Punjab under Harshvardhana: Society and Religion during the time of Harshvardhana
6. Socio-cultural History of Punjab from 7^{th} to 1000 A.D.

Unit-IV

7. Development of Languages and Education with Special reference to Taxila
8. Development to Art and Architecture

Suggested Readings

- B.N. Sharma: *Life in Northern India*, Delhi. 1966
- Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Course Code: BBTM-2102
Session: 2026-27
Course Title: Communication Skills in English-II
(Theory)

COURSE OUTCOMES

At the end of this course, the students will develop the following skills:

CO 1: Enhancement of listening skills with the help of listening exercises based on conversation, news and TV reports

CO 2: The ability of Note-Taking to be able to distinguish the main points from the supporting details and the irrelevant information from the relevant one

CO 3: Improvement of speaking skills enabling them to converse in a specific situation

CO 4: Acquisition of knowledge of phonetics which will help them in learning about correct pronunciation as well as effective speaking.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Course Code: BBTM-2102
Session: 2026-27
Course Title: Communication Skills in English-II
(Theory)

Total Marks: 100
Examination Time: 3 Hrs. **Theory: 50**
Practical: 20
CA: 30

L-T-P:3-0-2

Instructions for the paper setter and distribution of marks:
The question paper will consist of four sections. The candidate will have to attempt five questions in all selecting one from each section and the fifth question from any of the four sections. Each question will carry 10 marks. Each question can be sub divided into two parts. (10 x 5 = 50)

Unit I

Listening Skills: Barriers to listening; effective listening skills; feedback skills.

Activities: Listening exercises – Listening to conversation, News and TV reports

Unit II

Attending telephone calls; note taking and note making

Activities: Taking notes on a speech/lecture

Unit III

Speaking and Conversational Skills: Components of a meaningful and easy conversation, understanding the cue and making appropriate responses, forms of polite speech, asking and providing information on general topics

Activities:1) Integration of English Language Learning with AI tools

2) Oral description or explanation of a common object, situation or concept

Unit IV

The study of sounds of English, Stress

Situation based Conversation in English Essentials of Spoken English

Activities: Giving Interviews

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *Business Communication* by Sethi, A and Adhikari, B., McGraw Hill Education 2009.
3. *Communication Skills* by Raman, M. & S. Sharma, OUP, New Delhi, India (2011).
4. *A Course in Phonetics and Spoken English* by J. Sethi and P.V. Dhamija, Phi Learning.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-1102
Course Title: Communication Skills in English-I
PRACTICAL / ORAL TESTING

Time: 3 hours **Marks: 20**

Course Contents:

1. Oral Presentation with/without audio visual aids (10 Marks)
2. Group Discussion/ Mock Interview (05 Marks)
3. Listening to any recorded or live material and asking oral questions for listening comprehension (05 Marks)

Questions:

1. Oral Presentation will be of 5 to 7 minutes duration. (Topic can be given in advance or it can be of student's own choice). Use of audio-visual aids is desirable.
2. Group discussion comprising 8 to 10 students on a familiar topic. Time for each group will be 15 to 20 minutes.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM- 2483
Course Title: Cell Biology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understanding the basic unit of life – cell and broad classification of cell types.

CO2: Understanding the structure and functions of cell organelles.

CO3: Understand Cell Division and Cell Cycle.

CO4: Understanding the biological membranes along with membrane transport mechanism.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM- 2483
Course Title: Cell Biology
(Theory)

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

Max. Marks: 100
Theory: 50
Practical: 20
CA: 30

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.

Unit-I

Cell as a basic unit of living systems. The cell theory Broad Classification of Cell Types: PPLO's, bacteria, eukaryotic microbes, plant and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organizations of otherwise genetically similar cells.

Unit-II

Structure and function of cell organelles, ultrastructure of cell membrane, cytosol, Golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes, cytoskeletal structures (actin, microtubules etc.), Mitochondria, chloroplasts, lysosomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin).

Unit-III

Cell Division and Cell Cycle: mitosis, meiosis, stages of cell cycle, binary fission, amitosis and its regulation. Cell-cell interaction, Cell locomotion (amoeboid, flagellar and ciliar).

Unit-IV

Biological Membranes: Supramolecular architecture of membranes; Solute transport across membranes; Model membranes and Liposomes.

Books Recommended:

1. De-Robertis, F.D.P. and De-Robertis Jr. E.M.F. (2017) Cell and Molecular Biology, Saunders, Philadelphia.
2. Lodish, Berk, Kaiser, Krieger, Scott, Bretscher, Ploegh and Matsudaira (2007) Molecular Cell Biology 6th Edition, W.H.Freemen& Co Ltd.
3. Geoffrey, M. Cooper & Robert E. Hausman (2013) The Cell: A molecular approach 6th Edition, Sinauer Associates.
4. Alberts, Johnson, Lewis, Raff, Roberts and Walter (2008) Molecular Biology of the Cell, 5th Edition, Garland Science.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2483
Course Title: Cell Biology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

- **CO1:** Perform a variety of molecular and cellular biology techniques.
- **CO2**: Describe cellular membrane structure and function, fine structure and function of cell organelles.
- **CO3**: Understand Microtomy, staining and histology of different tissues.
- **CO4**: Study about electron micrographs of different organelles

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2483
Course Title: Cell Biology
(Practical)

Time: 2 Hrs. **Practical: 20**
Credit: 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.

1. Study of Cells:

(a) Prokaryotic cells: Lactobacillus, E. coli. Blue green algae.

(b) Eukaryotic cells: Testicular material (for studies of spermatogenesis)

2. Study of electron micrographs of various cell organelles-plasma membrane, Mitochondria, Golgi complex, Lysosomes, Endoplasmic Reticulum (smooth and granular), Cilia, Centrioles, inclusions like glycogen, lipids, etc.
3. Preparation of Permanent Slides: Principles and procedures- Section cutting of tissues and staining of tissues with Haematoxylin/eosin method.
4. Study of permanent slides of various tissues (gut region, liver, lung, spleen, kidney, pancreas, testis, ovary, tongue, skin etc.).
5. Preparation of Buccal Smear for microscopic examination.
6. Barr body observation in human squamous epithelial cells.
7. Microtomy of Plant Tissue specimens (Stem & Root)

Books Recommended:

1. Shah, V.C., Bhatavdekar, J., Chinoy, N.J. and Murthy, S.K. (1988). Essential techniques in Cell Biology.Anand Book Depot, Ahemadabad.
2. Celis, J.E. (1998) Cell Biology: A Laboratory handbook. Vol. 1-3. Academic Press, UK.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2064
Couse Title: Biochemistry-II
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the fundamental principles of metabolism, bioenergetics, thermodynamics, ATP-mediated energy transfer, and electron transport mechanisms underlying cellular metabolic processes.

CO2: Analyze the structural organization and biochemical properties of nucleic acids and biologically important nucleotides, and examine their functional significance in cellular metabolism.

CO3: Evaluate the structure, classification, catalytic mechanisms, and regulation of enzymes, and assess the biochemical significance of vitamins as enzyme cofactors in maintaining normal physiological functions.

CO4: Assess the principles of enzyme kinetics, enzyme inhibition, and hormonal regulation, and appraise their roles in metabolic regulation and human health.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2064
Couse Title: Biochemistry-II
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1

Theory: 50
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

UNIT-I

Introduction to metabolism, catabolism, anabolism, Laws of Thermodynamics and living system, Free energy change and direction of metabolism, Characteristics of Metabolic pathways, Regulation of metabolic pathways, Compartmentation, and Interorgan metabolism. ATP: Structure, Free energy change, energy coupling with ATP (Creatinine phosphokinase, NDP kinase, Adenylate kinase), metabolic roles of ATP; Energy rich metabolites, biological oxidation – Reduction reactions. Electron transport chain, calculation of ATP during metabolic processes

UNIT-II

Structure of nucleosides and nucleotides, nucleic acid structure – Watson – Crick Model of DNA, structural features of different types of DNA, Nucleic acid chemistry- UV absorption, effect of temperature, acid and alkali on DNA. Structure and functions of biologically important nucleotides as – source of energy, component of coenzymes, second messengers.

UNIT-III

Introduction to Enzymes: Nomenclature, Classification and Characteristics of enzymes, Cofactors, Co-enzyme and Prosthetic group, Mechanism of Enzyme Action: Nature of active site, enzyme substrate complex, Factors responsible for catalytic efficiency of enzymes. Effect of temperature and pH on enzyme activity. Covalent catalysis, Acid base catalysis, Strain and distortion theory, Induced fit hypothesis. Estimation of enzymes such as α-amylase, acid phosphatase, and catalase to demonstrate enzyme function and their response to temperature and pH.

Vitamins: occurrence, biomedical importance, deficiency of fat – soluble vitamins (A, D, E, K) and water-soluble vitamins (Vitamin B complex and Vitamin C), vitamins as cofactors.

UNIT-IV

Enzyme Kinetics: A brief overview of enzyme energetics, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of Km and Vmax values. Enzyme inhibition: Reversible and Irreversible inhibition, Competitive and non-competitive inhibition, Regulation of enzyme activity.

Hormones: Secretory glands, biomedical importance and disorders related with steroid hormones (ovarian, testicular, adrenal cortical and corpus luteal) and peptide hormones (hormones of pancreas, hypophysis, parathyroid, GIT), amino acid hormones (thyroidal, adrenal medullary).

Books Recommended:

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry*. Macmillan.
2. Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.
3. Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins.
4. J L Jain, Sunjay Jain, Nitin Jain (2016) Fundamentals of Biochemistry, 7th Ed, S Chand
5. Satyanarayana (2020) Biochemistry, 5th Ed, Elsevier

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2064
Couse Title: Biochemistry-II
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the principles underlying enzyme assays, enzyme kinetics, and biochemical estimation techniques employed in experimental biochemistry.

CO2: Perform biochemical assays for the estimation of enzyme activities, creatinine, DNA, and RNA using standard laboratory protocols and Good Laboratory Practices (GLP).

CO3: Analyze the effects of pH, temperature, substrate concentration, and inhibitors on enzyme activity by interpreting experimental observations and enzyme kinetic parameters.

CO4: Evaluate experimental data to determine enzyme kinetic parameters and biochemical estimations, and draw scientifically valid conclusions based on the experimental findings.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2064
Couse Title: Biochemistry-II
(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.

Experiment:

1. Estimation of Alpha-amylase activity from saliva.
2. Quantitative estimation of catalase activity in mung beans
3. Effect of pH and temperature on enzyme activity.
4. Determination of Km for amylase
5. Competitive and non-competitive inhibition
6. To estimate creatinine level in a given sample
7. Estimation of DNA by diphenylamine method
8. Estimation of RNA by orcinol method

Books Recommended:

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry*. Macmillan.
2. Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.
3. Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins.
4. J L Jain, Sunjay Jain, Nitin Jain (2016) Fundamentals of Biochemistry, 7th Ed, S Chand
5. Satyanarayana (2020) Biochemistry, 5th Ed, Elsevier.
6. Plummer D (2006) An introduction to Practical Biochemistry. Tata McGraw Hill Publishing Co., New Delhi.
7. Sawhney S.K. and Singh, R. (2001). Introductory Practical Biochemistry, Narosa Publication House, New Delhi.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2065
Course Title: General Microbiology-II
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the principles of microbial growth, growth kinetics, factors influencing microbial growth, and bacterial sporulation in Session and continuous culture systems.

CO2: Analyze the structure, classification, cultivation, and life cycles of plant, animal, and bacterial viruses, including their replication strategies and biological significance.

CO3: Evaluate the interactions between microorganisms and the human host by examining normal microbiota, mechanisms of microbial pathogenicity, host defense systems, and the diagnosis and management of major viral, bacterial, and fungal diseases.

CO4: Assess the role of microorganisms in environmental sustainability through their applications in biomining, bioconversion, bioremediation, and municipal solid waste management.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2065
Course Title: General Microbiology-II
(Theory)

Time: 3 Hours **Max. marks: 100**

L-T-P:3-0-1 **Theory: 50**

Practical: 20

CA: 30

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.

UNIT-I

Introduction to concept of microbial growth in Session and continuous system. Bacterial generation, doubling time, and specific growth rate. Factors affecting microbial growth: temperature, pH, provision of gases. Monoauxic, diauxic and synchronized growth curve. Sporulation and regeneration of bacteria.

UNIT-II

Viruses-Introduction, plant and animal viruses-structure and composition, classification based on differences in their transcription process. Cultivation of plant and animal viruses. Life cycle Tobacco Mosaic Virus, Herpes simplex and bacteriophages – structure and properties (Lysogenic and Lytic cycle), viriods.

UNIT-III

Normal microflora of human body (skin, oral cavity, respiratory tract, urogenetial tract, gastrointestinal tract), Pathogenic microorganisms- Factors contributing towards microbial pathogenicity (adhesion, invasiveness and toxigenicity), Natural resistance and Non-specific defense mechanism against microorganisms.

Introduction, mechanism of action, diagnosis, and treatment for viral diseases – Covid 19, Influenza, AIDS, and hepatitis. Bacterial diseases-Diphtheria, Tuberculosis, Typhoid, Streptococcus, Klebsiella infection. Fungal diseases-Aspergillosis and Candidiasis.

UNIT-IV

Introduction to role of microbes in environment, bio-mining, bioconversion, bioremediation, and municipal solid waste transformations.

Books Recommended:

1. Davis, B.D., Dulbecco. R., Eisen, H.N. and Ginsberg, H.S. (1990). Microbiology: 4th Edition, Harper & Row, Publishers, Singapore.

2. Tortora, G., Tortora, G. J., Funke, B. R., Case, C. L., Weber, D., & Bair, W. B. (2024). *Microbiology: an introduction*.

3. Pelczar, M.J., Chan, E.C.S. & Krieg, N.R. *Microbiology*. **7th Edition**. McGraw-Hill.

4. Sherwood, L., Prescott, L. M., Sherwood, L. M., & Woolverton, C. J. (2017). *Prescott's microbiology*. McGraw-Hill Education.

5. Purohit, S.S. (2006). Microbiology: Fundamentals and Applications, 7th Edition, Agrobios (India).

6. Postgate, J. R. (2000). *Microbes and man*. Cambridge university press.

7. Tortora, G. J., Case, C. L., Weber D., & Funke, B. R. (2024). *Microbiology: an introduction*. 14th edition. San Francisco, CA: Pearson Benjamin Cummings.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: BBTM-2065
Course Title: General Microbiology-II
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Perform microbial enumeration, isolation, and cultivation techniques using standard microbiological methods while adhering to Good Laboratory Practices (GLP) and aseptic techniques.

CO2: Determine microbial growth characteristics by constructing growth curves, calculating generation time, and demonstrating bacterial sporulation using appropriate staining techniques.

CO3: Identify clinically and agriculturally important microorganisms and viral infections through standard diagnostic procedures, including the Germ Tube Test for *Candida albicans* and symptom-based identification of Tobacco Mosaic Virus (TMV).

CO4: Analyze the microbiological quality of environmental samples by performing Standard Plate Count (SPC) and interpreting experimental results for microbial assessment.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Course Code: BBTM-2065
Course Title: General Microbiology-II
(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. Enumeration of microorganism by Total count and viable count methods.
2. Isolation and Study of Normal Microflora from Hands, Oral Cavity (Tooth-Scum), and Other Body Surfaces.
3. Determination of Growth curve of micro-organisms and Calculation of Generation Time.
4. Study of Sporulation in Bacteria by Endospore Staining
5. Identification of *Candida albicans* by Germ Tube Test.
6. Study of Symptoms of Tobacco Mosaic Virus (TMV) Using Infected Plant Specimens/Charts.
7. Microbiological Analysis of Water by Standard Plate Count (SPC) Method.

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Books Recommended:

1. Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10th Edition, Harlow, Addition-Wesley.
2. Sambrook, J. and Russel, D.W. (2012). Molecular Cloning: A laboratory manual 4th Edition, Cold Spring Harbor Laboratory Press, New York.
3. Dubey, R. C., & Maheshwari, D. K. (2023). *A textbook of microbiology*. S. Chand Publishing.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: USEP-0002
Course Title: Business Class
(Practical)

COURSE OUTCOMES:

CO1: Launch and manage a business within their chosen entrepreneurial track by applying fundamental business concepts and strategies.

CO2: Identify profitable business opportunities, develop innovative solutions, and implement effective marketing and sales strategies using digital and traditional methods.

CO3: Apply financial management techniques to monitor business performance, analyze financial metrics, and make informed business decisions.

CO4: Scale and sustain a business by leveraging operational systems, automation tools, and AI-driven solutions for improved productivity and long-term growth.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-I
Session: 2026-27
Course Code: USEP-0002
Course Title: Business Class
(Practical)

Time: 3 Hours **Max. Marks: 50**

L-T-P: 0-0-2

INTRODUCTION

This semester helps learners understand marketing as a practical life skill- not just "advertising." It teaches them how to communicate value, attract the right customers, and grow something small into something sustainable. Learners explore the basics of customer psychology, messaging, content creation, and simple sales strategies. Through hands-on activities, they will practice real marketing techniques for their micro-hustle or a simulated business idea, learning how to get attention, build trust, and generate sales.

Learners Objective

→Understand the core concepts of marketing using simple, relatable real-world examples.
→Learn how customers think, choose, and buy—and how businesses influence decisions ethically.
→Identify and define a target customer clearly instead of "selling to everyone."
→Create clear messaging: what they sell, who it helps, and why it matters.
→Use basic marketing channels (offline + online) to attract customers.
→Run a simple marketing campaign and measure what worked.
→Build confidence in selling, promoting, and talking about their product/service.

Outcome

By the end of this semester, learners will be able to market a product/service using basic strategies, attract real customers, and improve their results through feedback and experimentation.

Guiding Principles/Approach

This syllabus is built on action-based learning, clarity-first communication, and customer first thinking. Learners don't just study marketing- they practice it in real situations through small experiments and repeated improvement. The course is designed to feel approachable and practical: learners create simple content, test messaging, talk to real people, and observe what influences decisions.
Instead of heavy theory, students build marketing skills through doing: customer discovery, storytelling, channel experiments, and reflection. The curriculum emphasizes confidence building, ethical marketing, and communication as a leadership skill. By helping learners see results quickly (even small wins like one customer or one inquiry), the program builds
motivation, creativity, and real-world business readiness.

Recap Milestone

The recap milestone focuses on revising all the 12 milestones of semester 1 and also helps students understand the upcoming 12 milestones journey of semester 2.

Milestone #	**Milestone Name**	**Milestone Description**	**Task #**	**Task Title**	**Activity Title**
Recap	**Recap and Introduction**	Revise what you learned in Semester 1 and plan what you will do in Semester 2.	**1**	Revise first 12 milestones of Semester 1	• Watch a video on **"Semester 1 Summary"** .• Download the 12 summary cards of Semester 1 milestones. • Write 3 key learnings from Semester 1.• Write 3 things you will improve in Semester 2 .• Attempt the Semester 1 Recap Quiz.
		Revise what you learned in Semester 1 and plan what you will do in Semester 2.	**2**	Set your goals for Semester 2	• Learn how to 4X your revenue in Semester 2 using marketing .• Read how famous brands use marketing to increase revenue .• Set your marketing goals .• Attempt the Semester 2 Readiness Quiz.

Milestone 13:

Marketing Fundamentals Marketing Fundamentals milestone focuses on helping students understand the basics of marketing and how they can use marketing to scale their businesses and generate revenue.

Milestone #	**Milestone Name**	**Milestone Description**	**Task #**	**Task Title**	**Activity Title**
13	Learn marketing	Learn how you can	**1**	**Understand**	• Watch a video on

	fundamentals to scale your business	use multiple types of marketing to scale your business and grow your revenue.		**what is marketing**	marketing fundamentals. • Read examples of famous marketing campaigns in India .• Explain what you learned about marketing .• Attempt Task 01 Quiz.
			2	**Learn different types of digital marketing**	• Watch a video on what is digital marketing. • Read a document on types of digital marketing. • Write what kind of digital marketing works best for your business and why .• Attempt Task 02 Quiz.
			3	**Write 3 marketing ideas for your business**	• Read a document on how businesses like yours are using marketing to generate revenue .• Write three marketing ideas to scale your business .• Validate your ideas with 3–5 people .• Shortlist the best idea and explain how it will generate revenue .• Share your experience of completing this milestone .• Attempt Task 03 Quiz.

Milestone 14: WhatsApp/ Community Marketing

WhatsApp/Community Marketing milestone focuses on helping students learn how to build a WhatsApp community for their users and use it to generate trust, engagement, and sales.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
14	**Build and activate your WhatsApp community**	Build a WhatsApp community for your users and use it to generate trust, engagement, and sales.	**1**	**Create your WhatsApp community**	• Watch a video on why you should build a WhatsApp community. • Read a document on how to create a WhatsApp community .• Enter the name of your community. • Upload your WhatsApp community link .• Attempt Task 01 Quiz.
			2	**Invite people to join your WhatsApp community**	• Read a few sample invite and welcome messages .• Draft an invite message to invite 50 people to join your community .• Draft a welcome message for your community members .• Upload a screenshot of your welcome message. • Attempt Task 02 Quiz.
			3	**Engage your community users and start building trust**	• Learn how to engage people in your community .• Read the top 10 community engagement ideas for your business .• Write 5 types of content to post weekly in your community .• Create and upload your weekly content calendar. • Attempt Task 03 Quiz.
			4	**Get 3 sales from your WhatsApp Community**	• Learn how to do soft-selling in your community .• Create a community-only offer .• Learn how to convert interested people into paid customers. • Write a simple plan to generate 3 sales per month from the community

					.• Share your experience of completing this milestone. • Attempt Task 04 Quiz.

Milestone 15: Generating Content for Marketing usingAI

AI-led Content creation and marketing milestone focuses on helping students learn how to use AI tools to generate creative ideas and create professional videos, posters, and blogs.

Milestone #	**Milestone Name**	**Milestone Description**	**Task #**	**Task Title**	**Activity Title**
15	**Use AI to generate content for marketing**	**Learn how to use AI tools to generate creative ideas and create professional videos, posters, and blogs.**	**1**	**Learn what is content marketing**	• Watch a video on *What is Content Marketing*. • Learn which content works for brand awareness or revenue generation .• Write three types of content you believe your customers like .• Attempt Task 01 Quiz.
			2	**Generate content ideas to attract customer**	• Learn how to use AI to generate content marketing ideas for your business. • Generate 10 small content ideas to attract your customers .• Discuss the ideas with your users and take feedback .• Shortlist the three best content ideas to attract customers. • Attempt Task 02 Quiz.
			3	**Create your first brand video using AI**	• Watch a video on *How to Use AI Tools to Create Simple Short Videos* .• Read a guide on how to ask AI to write a video script .• Generate five ideas for your AI videos and write them here .• Upload your AI-generated video link. • Attempt Task 03 Quiz.
			4	**Create a brand poster using AI**	• Learn how to create a poster using AI .• Write a prompt for the poster you will create using AI .• Upload the AI poster you have

					created .• Post the poster in your WhatsApp community .• Attempt Task 04 Quiz.
			5	**Write a blog using AI**	• Learn how to use prompt engineering to write content for your business .• Read a list of topics on which you can write a blog .• Write the topic on which you will write a short blog .• Write the first version of your blog. • Share your blog with your friends and faculty .• Share your experience of completing this milestone .• Attempt Task 05 Quiz.

Milestone 16: Social Media Marketing

Social Media Marketing milestone focuses on helping students learn what social media marketing is and how to create a social media weekly plan that engages users and improves brand visibility.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
16	**Plan your social media marketing strategy**	**Learn what social media marketing is and how you can use it to scale your business.**	**1**	**Learn what is social media marketing**	• Watch a video on *Introduction to Social Media Marketing*. • Learn different types of social media marketing .• Read a document on how to use social media marketing to generate revenue .• Write your understanding of social media marketing .• Write one social media marketing idea for your business .• Attempt Task 01 Quiz.
			2	**Research your competitors**	• Learn how to research your competitors .• Find your competitors .• Write the three things your competitors are posting .• Find one unique gap that you can capture .• Attempt Task 02 Quiz.
			3	**Finalize**	• Watch a video on *What are*

				your content pillars	*Content Pillars?* .• Read examples of content pillars .• Write five content pillars for your social media strategy .• Attempt Task 03 Quiz.
			4	**Create your weekly social media plan**	• Watch a video on *How to Create a Weekly Social Media Plan*. • Look at examples of social media calendars .• Create and upload your weekly calendar .• Upload the link to your Instagram Channel .• Share your experience of completing this milestone. • Attempt Task 04 Quiz.

Milestone 17: Trust-led Marketing

Trust-ledMarketingmilestonefocusesonhelpingstudentsbuildtrustthroughsocialmedia proofs, testimonials, or basic engagement and later converting them into leads and sales.

Milestone #	**Milestone Name**	**Milestone Description**	**Task #**	**Task Title**	**Activity Title**
17	**Generate leads and turn them into sales**	**Use testimonials, conversations, and daily posts to generate leads and close sales.**	**1**	**Use social proof to build trust**	• Identify 2 happy customers .• Create a testimonial post with a call-to-action (CTA) .• Post the testimonial on social media.• Post the testimonial in the community .• Attempt Task 01 Quiz.
			2	**Make people share their problem**	• Learn how to ask open-ended questions .• List 5 customer problems .• Post these problems in the community and on social media. • Evaluate the top 2 problems customers face .• Encourage people to share their problems .• Attempt Task 02 Quiz.

			3	**Help your users with a 3–5 days content sprint and generate leads**	• Brainstorm or use AI to create a solution document for each problem .• Post one solution daily for 3–5 days .• Send direct messages (DMs) to check if your solution is helping them. • Write how many leads you generated .• Attempt Task 03 Quiz.
			4	**Convert leads into sales**	• Learn how to convert leads into sales .• Soft-sell your offering in the community and on social media .• DM people explaining how your product can help them better. • Follow up after 24–48 hours. • Write how many leads you converted into sales .• Share your experience of completing this milestone .• Attempt Task 04 Quiz.

Milestone 18: Viral/Trend Marketing

Viral Marketing milestone focuses on helping students learn how to launch viral campaigns for their businesses using the latest trends and make their brand go viral without spending any money.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
18	**Make your brand go viral**	**Design viral marketing campaigns to reach 5X users without spending any money.**	**1**	**Learn viral marketing**	• Understand what virality is and how it works .• Read about the top 10 viral marketing campaigns in India .• Write three reasons why people share content .• Attempt Task 01 Quiz.
			2	**Design 2 viral campaigns for your business**	• Learn five types of common viral marketing strategies .• Read 10 viral marketing ideas for your business

					.• Design two viral campaigns for your business .• Take feedback from people and finalize one campaign. • Set your campaign targets .• Attempt Task 02 Quiz.
			3	**Launch one viral campaign to increase customer reach**	• Create your campaign launch video or poster .• Create your campaign launch message .• Launch your campaign on your social media platform .• Launch your campaign in your WhatsApp community .• Attempt Task 03 Quiz.
			4	**Promote your campaign to make it viral**	• Share your campaign in other groups and forums. • Measure your campaign performance .• Learn how to improve your campaign .• Analyze your campaign and record final metrics .• Enter the summary of your campaign.• Share your experience of completing this milestone. • Attempt Task 04 Quiz.

Milestone 19: BTL/Offline Marketing

BTL/Offline Marketing milestone focuses on helping users learn about BTL(below the line) or offline marketing and use it to reach out to local customers and generate revenue.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
18	**Make your brand go viral**	**Design viral marketing campaigns to reach 5X users without**	**1**	**Learn viral marketing**	• Understand what virality is and how it works. • Read about the top 10 viral marketing campaigns in India .• Write three reasons why people

		spending any money.			share content.• Attempt Task 01 Quiz.
			2	**Design 2 viral campaigns for your business**	• Learn five types of common viral marketing strategies .• Read 10 viral marketing ideas for your business .• Design two viral campaigns for your business .• Take feedback from people and finalize one campaign .• Set your campaign targets .• Attempt Task 02 Quiz.
			3	**Launch one viral campaign to increase customer reach**	• Create your campaign launch video or poster .• Create your campaign launch message .• Launch your campaign on your social media platform .• Launch your campaign in your WhatsApp community .• Attempt Task 03 Quiz.
			4	**Promote your campaign to make it viral**	• Share your campaign in other groups and forums .• Measure your campaign performance .• Learn how to improve your campaign .• Analyze your campaign and record final metrics .• Enter the summary of your campaign .• Share your experience of completing this milestone .• Attempt Task 04 Quiz.

Milestone 20: Collaboration and Affiliate Marketing

Collaboration and Affiliate Marketing milestone focuses on helping users learn about affiliate marketing and how to collaborate with individuals/businesses to reach more customers and generate revenue.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
20	**Grow through collaboration and affiliation**	**Use partners and affiliates to reach new**	**1**	**Understand affiliate marketing and**	• Watch a video on what affiliate marketing is.

	marketing	**audiences and generate sales.**		**collaboration**	• Read about top collaboration or affiliate marketing campaigns .• Learn 10 common types of collaboration or affiliate marketing for your business .• Pick three types that can work for your business .• Attempt Task 01 Quiz.
			2	**Design your affiliation model**	• Learn how to start an affiliation program. • Decide your commission structure. • Write a pitch for partnership .• Attempt Task 03 Quiz.
			3	**Finalize one person or business for collaboration**	• Learn how to find the right partner for collaboration .• Create a list of 5–10 people or businesses for collaboration. • Send your partnership pitch to potential partners .• Write the name of one final partner .• Attempt Task 03 Quiz.
			4	**Execute the collaboration**	• Explain how the partner will market your brand. • Post the link or screenshot of successful collaboration. • Respond to new leads within 24 hours

					.• Close at least one sale .• Attempt Task 04 Quiz.
			5	**Measure your collaboration**	• Write the number of leads generated .• Write the number of sales closed and revenue generated .• Write what worked and how to improve the collaboration .• Share your experience of completing this milestone .• Attempt Task 05 Quiz.

Milestone 21: Advertising Marketing (Meta)

Advertising Marketing milestone focuses on helping users learn how to post a paid ad on Meta (Instagram and Facebook) promoting their business and reach to more users or generate revenue.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
21	**Run your first ad on Instagram**	**Learn how to boost posts or run simple video ads to reach new viewers.**	**1**	**Setup your Meta Business Suite**	• Watch a video on why to run ads on Meta. • Learn different types of ads.• Read the guide on Meta Ad Account setup .• Set up your Meta Ad Account. • Attempt Task 01 Quiz.
			2	**Design your first paid ad**	• Watch samples of good ad designs for your business .• Finalize your ad objective .• Upload the final draft of your ad with final copy and creatives .• Attempt Task 02 Quiz.
			3	**Define your target audience**	• Watch a video on how to target the right people for

				and budget	your ad. • Define your target audience .• Learn how to decide the right budget for your ad .• Decide your final budget .• Attempt Task 03 Quiz.
			4	**Launch your ad**	• Learn how to create and launch your ad. • Create your ad and review the preview .• Upload the screenshot of the launched ad. • Attempt Task 04 Quiz.
			5	**Manage incoming leads from ad**	• Draft a message for incoming leads .• Send draft messages to leads within 24 hours. • Pitch your offer to leads and follow up. • Close at least one sale .• Attempt Task 05 Quiz.
			6	**Measure your ad performance**	• Learn metrics to measure ad performance. • Write the money spent and the number of leads or impressions .• Mention CPL or CPM .• Write the revenue generated and the number of sales closed .• Write what worked and how to improve future ads .• Share your experience of completing this milestone. • Attempt Task 06 Quiz.

Milestone 22: Psychological Marketing

Psychological Marketing milestone focuses on helping users identify psychological triggers like urgency, pricing, and offers, and use them to increase conversions and revenue.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
22	**Use**	**Learn how to**	**1**	**Understand**	• Learn why people buy

	Psychological Triggers to Increase Sales	**use urgency, pricing, and offers to increase conversions and revenue.**		**the psychological triggers**	products .• Share a story of one product you purchased because of a trigger .• Identify buying triggers for your business.• Attempt Task 01 Quiz.
			2	**Execute FOMO or urgency marketing**	• Learn how to create a FOMO or urgency marketing campaign .• Write how you will create FOMO or urgency for your customers .• Create one FOMO/urgency marketing campaign .• Launch your campaign on social media and in your community. • Attempt Task 02 Quiz.
			3	**Execute one offer or discount marketing campaign**	• Learn how to create offer or discount marketing campaigns .• Write how you will create an offer/discount campaign. • Create one offer/discount campaign for your customers .• Launch your campaign on social media and in your community .• Share your experience of completing this milestone .• Attempt Task 03 Quiz.

Milestone 23: Data-Driven Marketing

Data-Driven Marketing milestone focuses on helping users analyze the data of the last 10 milestones and run specific campaigns or ideas that resulted in lead generation or revenue.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
23	**Use Data-Driven Marketing to Grow Faster**	Analyze data of the last 10 milestones to identify top campaigns or ideas and decide what to continue, improve, or stop.	**1**	**Analyze your marketing data**	Learn how businesses make decisions using data
			2	**Re-execute top performing campaign**	List 3 things that worked well and why
					List 3 things that didn't work well and why
					Attempt task 01 quiz
					Re-execute top 1–2

					campaigns for 1 week
					Write how it helped generate leads or revenue
					Attempt task 02 quiz
			3	**Improve one low-performing campaign and relaunch it**	Pick one low-performing campaign and write how to improve it
					Improve the campaign and relaunch it
					Measure its performance and see if it was better
					Share your experience of doing this milestone
					Attempt task 03 quiz

Milestone 24: Closure and Next Step

The final milestone focuses on helping users reflect on their learnings and also create an action plan for the next few months to continue to scale and grow their business.

Milestone #	Milestone Name	Milestone Description	Task #	Task Title	Activity Title
24	**Plan your next growth phase**	Document your 12 weeks of learning and create a 1 month plan to scale and grow your business.	**1**	**Review your progress**	List all the ideas you executed
					Write which milestone helped you the most and how
					Write which milestone helped you the least and why
					Write your key learnings from this semester
					Create a not-to-do list for your business
					Attempt task 01 quiz
			2	**Create your 1 month marketing plan**	Learn how to create a 1 month marketing plan
					Set your marketing goal
					Create and upload your 1 month plan to achieve this goal

					Share your experience of doing this milestone
					Attempt final semester quiz

Evaluation Criteria

The evaluation will be conducted by a committee consisting of the class mentor, nodal officer, and the principal HOD or his/her nominee.

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks, including activities, reflection prompts, graded quizzes, etc.	**60%**
Target Completion	Performance-based evaluation on hitting revenue or profit targets (e.g., generating ₹10,000 revenue).	**20%**
Final Project	A comprehensive project depending on the theme of the semester.	**20%**

Evaluation Mechanism

The score generated by the app will be final.

Weekly Component

Each week of the course follows a structured format designed to guide students from learning to doing, using simple, mobile-accessible components:

Component	Duration	Description
Action Lab	~4 hrs	- Hands-on task on the weekly concept. - Includes step-by-step guidance, templates, and worksheets. - Ends with a submission (e.g., video, reflection, or proof of action).
Learning Resources	Self-paced	- Videos, short readings, real-life stories, and tools to deepen understanding at their own pace.
Check-in	Self-paced	- Quizzes & Reflection prompts

Syllabus Overview for Semester 1–5

Semester	Learning Focus	Learner's Demonstration	Revenue Target
1	Setup & Launch	Understand. Create. Start.	₹10,000/-

2	Marketing Basics	Engage. Share. Grow.	₹40,000/-
3	Operations & Scale	Earn. Deliver. Expand.	₹80,000/-
4	Organic Growth	Attract. Retain. Build.	₹160,000/-
5	AI Automation & Finance Mastery	Simplify. Track. Sustain.	₹400,000/-

Semester 1: Setup & Launch

In Term 1, students will explore what entrepreneurship means and how it connects to their daily lives. They will learn to identify problems, shape simple business ideas, and test the mineral settings. This semester builds the foundation—mindset, observation, value creation, and action.

Semester 2: Marketing Basics

In Term 2, students will learn how to attract customers and grow their visibility using digital platforms and community-based marketing strategies. Students will also begin to run paid advertising campaigns and learn how to optimize their marketing efforts.

Semester 3: Operations & Scale

This semester focuses on the day-to-day operations of running a business, including order fulfillment, customer service, and logistics. Students will also focus on scaling operations as demand grows, with an emphasis on managing resources effectively.

Semester 4: Organic Growth

Students will learn how to grow their businesses organically, using referrals, partnerships, and community engagement. This semester focuses on building a loyal customer base and using word-of-mouth marketing to increase reach and credibility.

Semester 5: AI Automation & Financial Mastery

The final semester prepares students for long-term sustainability. Students integrate AI to improve productivity, automate routine tasks, and enhance decision-making. They also dive deep into financial planning, learning to set income goals, track expenses, understand profit margins, and create simple financial forecasts. This semester helps students solidify their entrepreneurial identity design systems for financial stability and scalability.

Books recommended:

1. Simon Sinek, *Start with Why: How Great Leaders Inspire Everyone to Take Action*, Portfolio/Penguin
2. Eric Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business
3. Jonah Berger, *Contagious: How to Build Word of Mouth in the Digital Age*, Simon & Schuster
4. Phil Knight, *Shoe Dog: A Memoir by the Creator of Nike*, Scribner

5. Jason Fried and David Heinemeier Hansson, *Rework: Change the Way You Work Forever*, Crown Business
6. Héctor García and Francesc Miralles, *Ikigai: The Japanese Secret to a Long and Happy Life*, Penguin Books
7. Tim Ferriss, *Tools of Titans (Selected Chapters)*, Houghton Mifflin Harcourt
8. Peter Thiel and Blake Masters, *Zero to One: Notes on Startups, or How to Build the Future*, Crown Business
9. Anil Lamba, *Romancing the Balance Sheet*, Anil Lamba Publications
10. The Better India/Your Story, *Young Entrepreneurs Series* (Collection of Articles) – Real Indian stories of youth starting businesses, snackable reads that show what's possible.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-II
Session: 2026-27
Value Added Course
Course Code: VACD-2161
Course Title: Drug Abuse and Ethical Education

Course Duration: 30 hours
Course Credits: 4

Course Description:-

Drug Abuse and Ethical Education Programme has been introduced as part of the curriculum of second Semester of all streams of undergraduate degree programs. It has been added as a compulsory subject, the awards of which will not be incorporated in the total marks but will earn the student 4 credits.

Expectations:-

This academic input has been taken up to sensitize the students to the need of a morally upright character in the present times when youth is being mislead into consumption/ abuse of drugs, thereby ruining their present and future.

By studying Drug Abuse the students will have a better understanding of the concept. They will be able to analyze the physical, psychological and social consequences on individuals and develop strategy for prevention and management to promote healthy life style and community well being

EXAMINATION

- **Total Marks: 100 (Final Exam: 70; Internal Assessment: 30)**
- Final Exam: multiple choice Questions Marks-70; Time: 3 hours
- Internal Assessment: 30
- Total marks: 100 converted to grade for final result
- Grading system for Audit Course

Letter Grade	Percentage Score
O	90.1-100 %
A+	80.1-90 %
A	70.1-80 %
B+	60.1-70 %
B	50.1- 60 %

C	45-50 %
P	35-44.9 %
F	Below 35
Ab	Absent

Syllabus:

Module I: Challenges before youth:

- Drug Abuse: Meaning; Nature and Types and Extent of Drug Abuse in India and Punjab
- Consequences of Drug Abuse: Individual; Education; Employment; Income Family; Violence; Society; Crime and Social Disorganization

Module II: Solving the problem:

- Prevention of Drug abuse: Role of family and Educational Institutions; Parent child relationship; Family support and Supervision; Counseling and Teacher as role-model.

- Management of Drug Abuse: Medical and Psychiatric management; Medication and withdrawal effects; Counseling; Behavioral and Cognitive therapy; Legislation: NDPs act; Statutory warnings and strict enforcement of laws

Module III: Understanding the Self:

- Character building: Self-awareness; Self growth; Self Control; Self Discipline; Character and Destiny

- Generation gap: Relation with peer group; siblings and elders

Module IV: Social Responsibility:

- Opposite Sex Relations

- Globalization and IT Boom- Advantages and Disadvantages

Semester-III

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3061
Couse Title: Gene Structure and Function
(Theory)

COURSE OUTCOMES:

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

CO1: Describe the molecular organization of DNA and RNA, gene architecture, regulatory elements, mechanisms of DNA replication, and the concepts of genome size and genome complexity in prokaryotic and eukaryotic organisms.

CO2: Analyze the molecular mechanisms of transcription and the structure–function relationship of different RNA molecules, and examine the classification, characteristics, and applications of transposable elements in prokaryotic and eukaryotic genomes

CO3: Evaluate the regulatory mechanisms governing gene expression in prokaryotic and eukaryotic systems, with special emphasis on operon models and molecular control of transcription.

CO4: Assess the molecular basis of oncogenesis, tumour suppressor genes, DNA repair mechanisms, and the scientific significance of the Human Genome Project in advancing genomics, precision medicine, and biotechnology research.

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Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3061
Couse Title: Gene Structure and Function
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks**.**

UNIT-I

Molecular basis of life: DNA and RNA. ultra structure of prokaryotic and Eukaryotic gene and their regulatory elements (promoter, operator, silencer, enhancer, 5' and 3' UTR's), DNA replication; types of replication (conservative, semiconservative and dispersive), Meselson and Stahl experiment of replication, overview of components and mechanism of replication in prokaryotes and eukaryotes, Genome size and Genome complexity: C value and C value paradox, pseudogenes, intergenic sequences, satellite and repetitive, DNA.

UNIT-II

Structure of different types of RNA and their function, transcription process in prokaryotes and eukaryotes (transcription factors, RNA polymerases, formation of initiation, complex, elongation and termination),

Transposable elements (TEs): characteristic of transposable elements, Types of transposable elements: Insertion sequences and transposons- Class I- retrotransposons, LINE and SINE and Class II-DNA Transposons, Autonomous and non-autonomous transposons, Bacterial transposons- composite and non-composite mobile genetic elements, applications of transposable elements.

UNIT-III

Regulation of gene expression in prokaryotes: Lac operon, Repressible model- Negative regulation of lac operon by lactose, Inducible- positive regulation of lac operon: Induction and catabolite activator, mechanism and control of Tryptophan and Histidine operon, levels of gene regulation in eukaryotes

UNIT-IV

Genes playing role in cancer development: protooncogenes, activation of oncogenes, inactivation of tumor suppressor genes (function and mechanism of action of p53) and DNA repair genes, Human Genome Project (HGP): Phases, Principle and goals of Human Genome project, and outcome of HGP

Books recommended:

1. Lodish, H. F., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H. L., Martin, K.C., Yaffe, M.B. and Amon, A. (2021). *Molecular cell biology* (Vol. 1). New York: WH Freeman.

2. Krebs, J. E., Lewin, B., Goldstein, E. S., & Kilpatrick, S. T. (2013). *Lewin's essential genes*. Jones & Bartlett Publishers.

3. Nelson, D.L. & Cox, M.M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman.

4.Freifelder, D. (2013). Microbial Genetics, Narosa Publishing House.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3061
Couse Title: Gene Structure and Function
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Perform the isolation of plant genomic DNA and evaluate its quality and purity using UV–Visible spectrophotometric analysis.

CO2: Operate UV–Visible spectrophotometric techniques to determine the concentration, absorption characteristics, and purity of nucleic acid samples.

CO3: Demonstrate the principles and applications of Native PAGE and SDS-PAGE for the separation and analysis of proteins.

CO4: Analyze genomic sequences using bioinformatics tools to identify open reading frames (ORFs) and exon–intron organization for gene structure annotation and interpretation.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3061
Couse Title: Gene Structure and Function
(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.

Experiment:

1. Extraction of plant Genomic DNA

2. Determination of absorption spectra of DNA and RNA using UV-Vis Spectrophotometer and determine purity of DNA and RNA sample.

3. To study proteins by Native PAGE

4. To study proteins by SDS PAGE

5. a. To deduce ORF from genomic DNA using different ORF Finder Tools, PlasMappe 3.0.

b. To determine intron exon boundaries using Gene Structure Display Server.

(https://gsds.gao-lab.org/)

Books recommended:

1.Lodish, H. F., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H. L., Martin, K.C., Yaffe, M.B. and Amon, A. (2021). *Molecular cell biology* (Vol. 1). New York: WH Freeman.
2.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., Lewin, B., Goldstein, E. S., & Kilpatrick, S. T. (2013). *Lewin's essential genes*. Jones &

Bartlett Publishers.
4.Nelson, D.L. & Cox, M.M. (2021). *Lehninger Principles of Biochemistry*. 8th Edition. W.H. Freeman.
5.Freifelder, D. (2013). Microbial Genetics, Narosa Publishing House.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session 2026-27
Course Title: Biomathematics and Biostatistics
Course Code: BBTM-3332

COURSE OUTCOMES:

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

CO1: Calculate Significant digits, differentiation and integration and to understand the concept of population and samples, Random sampling.

CO2: Calculate summary statistics (mean, median, mode, range, standard deviation and variance) from the data.

CO3: Familiar with the graphical representation of data and concepts of correlation and regression.

CO4: State the null hypothesis and alternative hypothesis (both one way and two ways) for the application of t-test, F test, Chi Square test and ANOVA.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session 2026-27
Course Title: Biomathematics and Biostatistics
Course Code: BBTM-3332

Examination Time: (3+3) Hours **Max. Marks: 100**
L-T-P **Theory: 50**
3-0-1 **Practical: 20**
CA: 30

Instructions for the paper setters: Eight questions of equal marks (10 marks each) 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.

Unit-I

Scientific notation, Significant digits, Rounding off, Scientific notations, Sampling, Problem identification, Concept of population and samples, Random sampling, Data collection, Log, Indices, Design of experiments, differentiation and integration of trigonometric functions, inverse trigonometric functions, logarithmic functions and exponential functions, logarithmic differentiation & integration, results relating to the sum, difference, product and quotient of functions (without proofs).

Unit-II

Measurement of central tendency, mean, geometric mean, harmonic mean, Median, Mode, Quartile mean, decile, percentile, Dispersion, Mean deviation, Standard deviation, Standard error, Coefficient of variation , Variance, Coefficient of determinant, moments, skewness and kurtosis

Unit-III

Graphical representation of data, scattered diagram, Straight line, Least square test, Correlation coefficient, Regression coefficient, Correction of experimental data and model development

Unit-IV

Testing of hypothesis, null and alternate hypothesis, type-I, TYPE II errors, level of significance, Normal distribution, Binomial distribution, Student ‘t’-test, ‘F’-test, chi- square test, analysis of variance (One-way and Two way ANOVA)

Text Books:

1. Kothari, C.R. (2004) Research Methodology Methods and Techniques, New Age International Publications, New Delhi
2. Arora, P.N. & Malhan, P.K. : Biostatistics (Himalaya Publication House)
3. Robert R. Sokal and F. James Rohlf Introduction to Biostatistics

Practical:

1. Graphical representation of data (bar charts, line graphs)
2. Introduction to Statistical Computing
3. Computation of Descriptive Statistics
4. Paired samples t test, and One Way ANOVA,
5. Repeated Measures ANOVA
6. Fisher exact test
7. Computation of Correlation coefficient (Pearson, Spearman) and Linear Regression model
8. Performs unpaired t test, Weldh's t test (doesn't assume equal variances) and paired t test

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM -3063
Couse Title: Immunology-I
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the fundamental concepts of innate and adaptive immunity, including immunological memory, specificity, self–non-self recognition, and the terminology associated with the immune system.

CO2: Interpret the organization and functions of lymphoid cells, lymphoid organs, and the lymphatic system, and explain their coordinated roles in the generation and regulation of immune responses.

CO3: Analyze the structural and functional characteristics of antigens, immunoglobulins, and the complement system, and examine their roles in humoral immune responses.

CO4: Evaluate the role of Major Histocompatibility Complex (MHC) molecules and antigen receptors of T and B lymphocytes in antigen recognition, antigen presentation, and adaptive immune responses.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3063
Couse Title: Immunology-I
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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.

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

Antigen, Epitope (B cell and T Cell epitope), Immunogen, Factors influencing immunogenicity, Immunoglobulins, classes and structure; affinity and avidity; Complement fixing antibodies and complement cascade.

UNIT-IV

MHC class I and class II molecules, structure T and B Cells and function of class I and class II MHC molecules, structure of T-cell antigen receptors.

Books Recommended:

1.Murphy, K., & Weaver, C. (2017). *Janeway's immunobiology*. 9th edition. Garland science.
2.Owen, J., Stranford S.A., Jones P.P., Owen J.A. (2018). *Kuby immunology*. New York: W.H. Freeman, Macmillan Learning.
3.Abbas, A. K., Lichtman, A. H., Pillai, S., Henrickson S. (2025). *Cellular and molecular immunology* (11th ed.). Elsevier.
4.Flajnik, M. (2022). *Paul's fundamental immunology*. Lippincott Williams & Wilkins.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3063
Couse Title: Immunology-I
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Perform safe blood collection, plasma separation, and hematological investigations using standard laboratory procedures and aseptic techniques.

CO2: Determine total and differential blood cell counts and interpret hematological parameters for the assessment of immune and physiological status.

CO3: Isolate peripheral blood mononuclear cells (PBMCs) and evaluate cell viability using standard dye exclusion techniques.

CO4: Demonstrate antigen–antibody interactions by performing different immunological techniques and analyze the experimental outcomes.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3063
Couse Title: Immunology-I
(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.

Experiment:

1. Collection of blood sample by different method.

2. Separation of Plasma from blood

3. Differential leucocytes count

4. Total Leucocytes count

5. Total RBC count

6. Isolation of mononuclear cells from peripheral blood and to check their viability by dye exclusion method.

7. Ouchterlony Double Immunodiffusion Test.

8. Haemagglutination assay.

9. Haemagglutination Inhibition assay.

Books Recommended:

1.Miller, L. E., & Stevens, C. D. (2023). Clinical immunology and serology.
2.Celis, J.E. (2021). Cell Biology: A laboratory handbook Amsterdam; Boston: Elsevier Academic
3.Hay, F.C. Westwood O.M.R. (2002). Practical Immunology, 4th Ed., Blackwell Science, U.K.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3484
Course Title: Zoology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain foundational knowledge of animal diversity and evolution

CO2: Understand human physiological systems (digestive, respiratory and circulatory) and their regulation.

CO3: Understand human physiological systems (excretory, musculoskeletal, nervous and endocrine) and their regulation.

CO4: Analyze host–parasite interactions and vector biology with medical relevance and **t**o develop integrative skills linking zoology with health, disease and environment.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3484
Course Title: Zoology
(Theory)

Time: 3 Hrs. **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

Instructions for the paper setters: Eight questions of equal marks (10 marks each) 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.

Unit -I

Animal Diversity & Evolutionary Concepts

- Overview and general classification of Kingdom Animalia up to class level (with examples).
- Origin of Life: primitive earth, Oparin–Haldane theory, Miller–Urey experiment.
- Evolution of unicellular to multicellular organisms.
- Theories of Evolution: Lamarckism, Darwinism, Hugo de Vries, Modern Synthesis.
- Geological Time Scale (brief overview).

Unit -II

Animal Physiology – Systems I

- **Digestive system**: Structure of human alimentary canal & glands, digestion, absorption, enzymatic & symbiotic digestion.
- **Respiratory system**: Human respiratory system, transport of gases, oxygen dissociation curve, Bohr effect, chloride shift, Haldane effect, regulation of breathing.
- **Circulatory system**: Human heart (structure, heartbeat regulation, ECG), cardiac output & blood pressure, blood composition & functions, blood groups, Rh factor, blood clotting.

Unit -III

Animal Physiology – Systems II

- **Excretory system:** Kidney & nephron, urine formation, osmoregulation.
- **Musculoskeletal system**: Structure of skeletal muscle, chemical & physical basis of muscle contraction.
- **Neural integration:** Structure & function of neuron, resting membrane potential,

nerve impulse conduction, synapse & neuromuscular junction, basic brain structure & functions.

- **Endocrine system:** Physiology of thyroid, parathyroid, adrenal, pituitary, hypothalamus, pancreas, and gonads.

Unit -IV

Parasitology & Public Health Zoology

- Introduction to parasitology and terminologies.
- Life history, infection mode, pathogenicity, prophylaxis & treatment of:
    - **Protozoans:** Entamoeba, Giardia, Trypanosoma, Plasmodium.
    - **Helminths**: Tapeworm, Ascaris, Ancylostoma.
- Arthropod vectors & associated diseases: Malaria, Dengue, Yellow Fever, Filariasis, Plague, Epidemic Typhus – distribution, prevention & control.

Books Recommended:

1. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Saunders.
2. Martini, F.H. & Nath, J.L. Fundamentals of Anatomy & Physiology, Pearson.
3. Hill, R.W., Wyse, G.K. & Anderson, N. Animal Physiology, Sinauer Associates.
4. Ganong, W.F. Review of Medical Physiology, McGraw Hill.
5. Panikar, C.K. & Ghosh, S. Textbook of Medical Parasitology, Jaypee Publishers.
6. Loker, E.S. &Hofkin, B.V. Parasitology: A Conceptual Approach, Garland Science.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3484
Course Title: Zoology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Develop practical skills in basic human physiology and microscopy.

CO2: Identify and interpret prepared slides of tissues, parasites, and vectors of medical importance.

CO3: Understand evolutionary phenomena through comparative observations.

CO4: Apply knowledge of laboratory tests to link structure, function, and disease.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3484
Course Title: Zoology
(Practical)

Time: 3 Hrs. **Practical: 20**

Credit: 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.

1. **Human Systems (Charts/Models/Videos):**
   o Digestive, Circulatory (Arterial & Venous), and Urinogenital systems.
2. **Basic Physiological Tests:**
   o Analysis of foodstuffs for starch, proteins, and fats.
   o Determination of human blood groups.
   o Recording of blood pressure.
   o Estimation of haemoglobin.
3. **Microscopy & Preparations:**
   o Preparation of mammalian blood smear.
   o Study of prepared slides: compound tissues (epithelial, connective, muscular, nervous).
4. **Evolutionary & Comparative Zoology (Charts/Models):**
   o Homology, Analogy, Mimicry.
   o Study of human skeleton (representative bones).
5. **Parasitology & Vector Biology**:
   o Study of prepared slides/specimens of Protozoan parasites: *Entamoeba, Giardia, Trypanosoma, Plasmodium.*
   o Helminths: *Taenia, Ascaris, Ancylostoma.*
   o Arthropod vectors: *Anopheles, Culex, Aedes mosquitoes*, Rat flea.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTI-3065
Couse Title: Internship

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

CO1: Apply disciplinary knowledge, technical competencies, and standard professional practices to perform assigned tasks effectively in industrial, research, healthcare, or other professional settings.

CO2: Analyze workplace processes and real-world challenges to identify problems and recommend appropriate scientific or technical solutions.

CO3: Demonstrate professional ethics, effective communication, teamwork, leadership, and responsible workplace behavior while functioning in multidisciplinary professional environments.

CO4: Evaluate professional experiences and learning outcomes by preparing, presenting, and defending a comprehensive internship report that demonstrates reflective learning and professional competence.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTI 3065
Couse Title: Internship

Time: 3 Hours **Max. Marks:50**
L-T-P: 0-0-2

Practical:50

Evaluation of report based on above themes will be evaluated by board of three internal examiners. Award list will be submitted thereafter.

It is a course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution. A key aspect of the internship/apprenticeship is induction into actual work situations. It involves working with local industry, government or private organizations, business organizations, artists, craft persons, and similar entities to provide opportunities for students to actively engage in onsite experiential learning.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3060
Couse Title: Skill Development in Biotechnology
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the principles, production processes, quality standards, and agricultural applications of biofertilizers, including the molecular basis of biological nitrogen fixation.

CO2: Analyze the therapeutic significance of medicinal plants, phytochemicals, and essential oils, together with their extraction methods and industrial applications.

CO3: Evaluate the scientific basis and health-promoting potential of nutraceuticals and functional foods, including nutritional genomics, quality control, and quality assurance practices.

CO4: Assess the applications of biofuels, bioenergy, bioremediation, and bioentrepreneurship in promoting sustainable development and biotechnology-driven innovation.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3060
Couse Title: Skill Development in Biotechnology
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

UNIT-I

Biofertilizers: Introduction and types and importance of biofertilizers, Microorganisms used in biofertilizers production, Biological Nitrogen fixation VIZ: Rhizobium: Process of nodule formation, Role of Nif and Nod gene in, Enzyme nitrogenase and its component, Different methods of application of biofertilizers, Strategies of Mass production and packing, Registration of biofertilizers.

UNIT-II

Herbal Biotechnology: Introduction to medicinal plants and their medicinal value, Phytochemicals, Essential oil: definition, extraction and applications in domestic life, industry and other purposes (Eucalyptus, Lavender, Rosa grass, Tulsi)

UNIT-III

Nutraceuticals and Functional Foods: Introduction to Nutraceuticals as Science, Properties, structure and functions of various Nutraceuticals, Food as remedies, Anti-nutritional Factors present in Foods, Nutraceuticals and Functional, Functional Foods, Nutritional Genomics, Quality Control, Quality Assurance

UNIT-IV

Biofuels, bioenergy, bioremediation and Bioentrepreneurship
Introduction to biofuels and green bioenergy sources, plant and microbe as alternating sources of bioenergy production, biofuels from waste products, bioremediation-types, biodegradation of herbicides, antibiotics, plastic menace and oil spills.

Overview of bioindustries, public/private funding opportunities; Innovation-focused thinking. Preparation of a business plan: socio-economic cost benefit analysis; Statutory and legal aspects. Business and market strategy: pricing, financing, market linkages, branding

Books Recommended:

1. Oladiji, A. T., Ajayi, E. I., Temidayo, A., Oladiji, O., & Olaley, J. (2024). *Nutrition and Diet in Health*.
2. Rakshit, A., Meena, V. S., Fraceto, L. F., Parihar, M., Benavides-Mendonza, A., & Singh, H. B. (Eds.). (2024). *Bio-inoculants in Horticultural Crops: Advances in Bio-inoculant, Volume 3*. Elsevier.
3. Singh, S., Datta, R., Johri, P., & Trivedi, M. (Eds.). (2022). *Phytopharmaceuticals and biotechnology of herbal plants*. CRC Press.
4. Kommu, S., Thirumurugan, R., Madupoju, B. (Eds.) (2024). *Text book of Nutraceuticals and Functional Foods: Theory and Applications*. Notion Press.
5. Gurunathan, B., Sahadevan, R., Zakaria, Z.A. (2021) *Biofuels and Bioenergy: Opportunities and Challenges*. Elsevier.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM-3060
Couse Title: Skill Development in Biotechnology
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Perform the isolation, cultivation, and production of *Rhizobium*-based biofertilizers using standard microbiological techniques.

CO2: Demonstrate the extraction of essential oils from plant materials using appropriate distillation techniques.

CO3: Analyze the phytochemical composition of essential oils by determining their total polyphenolic and flavonoid contents using standard analytical methods.

CO4: Evaluate the antioxidant and antimicrobial potential of essential oils using DPPH and antimicrobial assays, and interpret the experimental findings for their potential biotechnological applications.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: BBTM 3060
Couse Title: Skill Development in 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.

Experiment:

1. Isolation of Rhizobium from root nodules
2. Production of commercial biofertilizers using Rhizobium.
3. Extraction of essential oils through oil distillation apparatus.
4. To measure total polyphenolic content of the essential oil.
5. Total flavonoid content of the essential oil.
6. Investigating the antioxidant potential of the oils by DPPH assay.
7. Antimicrobial activity of essential oils.

Books Recommended:

1. Oladiji, Adenike Temidayo, et al. *Nutrition and Diet in Health*. 2024.
2. Waste, F. P. (2025). *Emerging methods for oil extraction from food processing waste*. CRC Press: Boca Raton, FL, USA.
3. Nayik, G. A., & Ansari, M. J. (Eds.). (2023). *Essential oils: extraction, characterization and applications*. Academic Press.
4. Al-Harrasi, A., Al-Rawahi, A., Al Hatmi, S. A., & Bhatia, S. (2025). *Medicinal and Aromatic Plants of Oman: Phytochemistry and Ethno-Pharmacological Aspects, Volume 1*. CRC Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: VACE-3221
Course Title: Environmental Studies
(Theory)

COURSE OUTCOMES:

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

CO1: Understand the concept and need of environmental education and role of an individual in conservation of natural resources.

CO2: Learn about role of major Eco system and their conservation and Develop desirable attitude, value and respect for protection of Biodiversity.

CO3: Learn about the control measure of pollution and solid waste management and climate change and global warming.

CO4: Knowledge regarding welfare programmes and Human rights and understand the role of different agencies in the protection of environment

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-III
Session: 2026-27
Course Code: VACE-3221
Course Title: Environmental Studies
(Theory)

Time: 3 Hrs. **Max. Marks: 50**
Credit: 2-0-0 **Theory: 35**
CA: 15

Instructions for the Paper Setter:

Eight questions of equal marks (7 marks) are to be set, two in each out 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.

Unit I

1. The multidisciplinary nature of environmental studies

- Definition, scope and importance, Need for public awareness

2. Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit II

3. Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

4. Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity

Unit III

5. Environmental Pollution

- Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

6. Social Issues and the Environment

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Public awareness

Unit IV

7. Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Artificial Intelligence in Environment and Human Health

8. Introduction to Environmental Laws, Environmental Audit and Impact Assessment

- Constitutional provisions- Article 48A
- Article 51A(g) and other derived environmental rights
- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act

- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Environmental risk assessment Pollution control and management
- Waste Management- Concept of 3R (Reduce, Recycle and Reuse)
- Ecolabeling /Ecomark scheme

References:

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

Semester-IV

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4061
Couse Title: Molecular Biology
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the molecular organization of DNA, experimental evidence establishing DNA as the genetic material, and the structural organization of genomes and chromosomes in prokaryotes, eukaryotes, organelles, and viruses.

CO2: Analyze the mechanisms of DNA damage and the major DNA repair pathways involved in maintaining genome integrity and cellular stability.

CO3: Evaluate the molecular mechanisms of genetic information flow by interpreting the processes of genetic coding, protein synthesis, post-translational modifications, and translational regulation.

CO4: Assess the principles of genetic linkage, DNA recombination, and mutation, and appraise their significance in genome evolution, genetic diversity, and biotechnological applications.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4061
Couse Title: Molecular Biology
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

UNIT-I

DNA as genetic material, structure of DNA, experimental evidence for DNA as genetic material (Griffith's transformation experiment, Avery and Macleod experiment and Hershey and Chase experiment), DNA to chromosome: genomes of bacteria, eukaryotes, organelles and viruses, Linear and Circular chromosomes, single stranded and doubles stranded DNA/RNA viral genome, organization DNA into chromosomes: Heterochromatin and euchromatin, brief idea of chloroplast DNA and mitochondrial DNA.

UNIT-II

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: photoreactivation, bases excision repair, nucleotide excision repair, mismatch repair, SOS repair recombinational repair,

UNIT-III

Genetic code, Protein synthesis and processing: Ribosome, initiation factors aminoacylation of tRNA, aminoacyl tRNA synthetase, formation of initiation complex, elongation and elongation factors, termination and termination factors, and post translational modifications, inhibitors of translation.

UNIT-IV

DNA linkage, DNA recombination: general overview of types of DNA recombination- homologous, non-homologous, site specific and replicative recombination), linkage and recombination of gene in a chromosome crossing-over, cytological basis of crossing over, molecular mechanism of crossing over, Holliday model of recombination. Mutation: Spontaneous versus induced mutations, types of mutations (misssense mutation, non-sense mutation, silent mutation, point mutation, frameshift mutation), mutations rate and frequency, Mutagens: Physical and Chemical, the molecular basis of mutations. Significance and Practical applications of Mutation.

Books Recommended:

1.George M Malacinski (2015) Freifelders Essentials of Molecular Biology, 4Th/Ed, Jones & Bartlett
2.Clark, D. P., Pazdernik, N. J., McGehee, M. R., & Rader, B. A. (2025). *Biotechnology: The Technological Applications of Genetics and Genomics*. Elsevier.
3.Pk Gupta (2018) Molecular biology, 2nd Edition, Rastogi Publications
4.James D. Watson, A. Baker Tania, P. Bell Stephen, Gann Alexander, Levine Michael, Losick Richard (2017) Molecular Biology of the Gene, 7th Ed, Pearson Education

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4061
Couse Title: Molecular Biology
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Prepare laboratory reagents and stock solutions by following Good Laboratory Practices (GLP) and standard laboratory protocols.

CO2: Isolate genomic DNA from human samples and RNA from plant tissues using standard molecular biology techniques.

CO3: Estimate the concentration and purity of nucleic acids using fluorometric analysis and analyze the experimental data.

CO4: Perform agarose gel preparation and electrophoresis for the separation and visualization of nucleic acids.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4061
Couse Title: Molecular Biology
(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.

Experiment:

1. Preparation of stock solutions.
2. Isolation of human genomic DNA.
3. RNA isolation from plants.
4. Quantification of DNA by fluorometric (Ethidium bromide) analysis
5. Preparation of Agarose gel for agarose gel electrophoresis

Books Recommended:

1. S.B. Primrose and R.M. Twyman; Principles of Gene Manipulation. 2006.
2. J. Sambrook and Michael R. Green; Molecular Cloning: A Laboratory Manual, (Fourth Edition), CSHL, 2012.
3.Brown, T. A. (2023). *Genomes 5*. CRC Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4062
Couse Title: Biochemical and Biophysical Techniques
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the principles, instrumentation, and applications of centrifugation techniques, including sedimentation theory, centrifuge types, rotor selection, and factors influencing sedimentation.

CO2: Analyze the principles and applications of chromatographic techniques for the separation, purification, and characterization of biomolecules.

CO3: Evaluate the principles, instrumentation, and analytical applications of advanced chromatographic techniques.

CO4: Assess the principles, instrumentation, and applications of spectroscopic techniques for qualitative and quantitative biomolecular analysis.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4062
Couse Title: Biochemical and Biophysical Techniques
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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.

Section-C

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

Section-D

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. (2022) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2.Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
3.Freifelder, D. (1999). Physical Biochemistry - Application of Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman, and Co.
4.Plummer D (2006) An Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Co.,

New Delhi.
5.Wilson K and Walker J (2010) Principles and Techniques of Practical Biochemistry, Cambridge University Press, UK
6.Sawhney, S.K. and Singh, R. (2001). Introductory Practical Biochemistry. Narosa Publication House, New Delhi.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4062
Couse Title: Biochemical and Biophysical Techniques
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Demonstrate the operation of different centrifugation techniques, including swing-out rotor, angle rotor, and differential centrifugation, for the separation of biological samples.

CO2: Perform the separation of biomolecules using paper chromatography and thin-layer chromatography by following standard laboratory procedures.

CO3: Analyze the separation and purification of proteins using ion-exchange and affinity chromatography based on their physicochemical properties.

CO4: Interpret the experimental results obtained from centrifugation and chromatographic techniques for the qualitative analysis and purification of biomolecules.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4062
Couse Title: Biochemical and Biophysical Techniques
(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.

Experiment:

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

Books Recommended:

1. Upadhyay, A., Upadhyay, K. and Nath N. (2022) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
3. Friefelder, D. (1999). Physical Biochemistry - Application of Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman and Co.
4. Plummer D (2006) An Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Co., New Delhi.
5. Wilson K and Walker J (2010) Principles and Techniques of Practical Biochemistry, Cambridge University Press, UK
6. Sawhney, S.K. and Singh, R. (2001). Introductory Practical Biochemistry. Narosa Pub. House, New Delhi.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4063
Couse Title: Biochemistry-II
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the fundamental principles of metabolism, bioenergetics, thermodynamics, ATP-mediated energy transfer, and electron transport mechanisms underlying cellular metabolic processes.

CO2: Analyze the structural organization and biochemical properties of nucleic acids and biologically important nucleotides, and examine their functional significance in cellular metabolism.

CO3: Evaluate the structure, classification, catalytic mechanisms, and regulation of enzymes, and assess the biochemical significance of vitamins as enzyme cofactors in maintaining normal physiological functions.

CO4: Assess the principles of enzyme kinetics, enzyme inhibition, and hormonal regulation, and appraise their roles in metabolic regulation and human health.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4063
Couse Title: Biochemistry-II
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1

Theory: 50
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

UNIT-I

Introduction to metabolism, catabolism, anabolism, Laws of Thermodynamics and living system, Free energy change and direction of metabolism, Characteristics of Metabolic pathways, Regulation of metabolic pathways, Compartmentation, and Interorgan metabolism. ATP: Structure, Free energy change, energy coupling with ATP (Creatinine phosphokinase, NDP kinase, Adenylate kinase), metabolic roles of ATP; Energy rich metabolites, biological oxidation – Reduction reactions. Electron transport chain, calculation of ATP during metabolic processes

UNIT-II

Structure of nucleosides and nucleotides, nucleic acid structure – Watson – Crick Model of DNA, structural features of different types of DNA, Nucleic acid chemistry- UV absorption, effect of temperature, acid and alkali on DNA. Structure and functions of biologically important nucleotides as – source of energy, component of coenzymes, second messengers.

UNIT-III

Introduction to Enzymes: Nomenclature, Classification and Characteristics of enzymes, Cofactors, Co-enzyme and Prosthetic group, Mechanism of Enzyme Action: Nature of active site, enzyme substrate complex, Factors responsible for catalytic efficiency of enzymes. Effect of temperature and pH on enzyme activity. Covalent catalysis, Acid base catalysis, Strain and distortion theory, Induced fit hypothesis. Estimation of enzymes such as α-amylase, acid phosphatase, and catalase to demonstrate enzyme function and their response to temperature and pH.
Vitamins: occurrence, biomedical importance, deficiency of fat – soluble vitamins (A, D, E, K) and water-soluble vitamins (Vitamin B complex and Vitamin C), vitamins as cofactors.

UNIT-IV

Enzyme Kinetics: A brief overview of enzyme energetics, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of Km and Vmax values. Enzyme inhibition: Reversible and Irreversible inhibition, Competitive and non-competitive inhibition, Regulation of enzyme activity.
Hormones: Secretory glands, biomedical importance and disorders related with steroid hormones (ovarian, testicular, adrenal cortical and corpus luteal) and peptide hormones (hormones of pancreas, hypophysis, parathyroid, GIT), amino acid hormones (thyroidal, adrenal medullary).

Books Recommended:

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry*. Macmillan.
2. Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.
3. Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins.
4. J L Jain, Sunjay Jain, Nitin Jain (2016) Fundamentals of Biochemistry, 7th Ed, S Chand
5. Satyanarayana (2020) Biochemistry, 5th Ed, Elsevier

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4063
Couse Title: Biochemistry-II
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the principles underlying enzyme assays, enzyme kinetics, and biochemical estimation techniques employed in experimental biochemistry.

CO2: Perform biochemical assays for the estimation of enzyme activities, creatinine, DNA, and RNA using standard laboratory protocols and Good Laboratory Practices (GLP).

CO3: Analyze the effects of pH, temperature, substrate concentration, and inhibitors on enzyme activity by interpreting experimental observations and enzyme kinetic parameters.

CO4: Evaluate experimental data to determine enzyme kinetic parameters and biochemical estimations, and draw scientifically valid conclusions based on the experimental findings.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4063
Couse Title: Biochemistry-II
(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.

Experiment:

1. Estimation of Alpha-amylase activity from saliva.
2. Quantitative estimation of catalase activity in mung beans
3. Effect of pH and temperature on enzyme activity.
4. Determination of Km for amylase
5. Competitive and non-competitive inhibition
6. To estimate creatinine level in a given sample
7. Estimation of DNA by diphenylamine method
8. Estimation of RNA by orcinol method

Books Recommended:

1.Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry*. Macmillan.
2.Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.
3.Abali, E. E., Cline, S. D., Franklin, D. S., & Viselli, S. M. (2025). *Lippincott® illustrated reviews: biochemistry*. Lippincott Williams & Wilkins.
4.J L Jain, Sunjay Jain, Nitin Jain (2016) Fundamentals of Biochemistry, 7th Ed, S Chand
5.Satyanarayana (2020) Biochemistry, 5th Ed, Elsevier.
6.Plummer D (2006) An introduction to Practical Biochemistry. Tata McGraw Hill Publishing Co., New Delhi.
7.Sawhney S.K. and Singh, R. (2001). Introductory Practical Biochemistry, Narosa Publication House, New Delhi.

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-IV
Course Code: BBTM-4084
Course Title: Chemistry

COURSE OUTCOMES:

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

CO1: Explain the basic concepts of bio-organic chemistry, including functional groups of biomolecules, stereochemistry, chemical bonding, and reactive intermediates involved in biological systems.

CO2: Describe the structure, properties, and biological significance of amino acids, peptides, and proteins, including protein folding, denaturation, and the role of important proteins in living organisms.

CO3: Explain the chemistry of lipids and biomembranes and apply the principles of chemical equilibrium to chemical and biological processes.

CO4: Apply the principles of chemical kinetics, catalysis, and nucleic acid chemistry to understand reaction mechanisms, enzyme action, and the structure and functions of DNA and related biomolecules.

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-IV
Course Code: BBTM-4084
Course Title: Chemistry

Exam Time: 3Hrs. **Max. Marks: 100**
Credit (L-T-P): 3-0-1 **Theory: 50**
Practical: 20
CA: 30

Instructions for the Paper Setters: Eight questions of equal marks (ten marks each) 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.

Unit I

Bio Organic Chemistry: Functional groups of Biomolecules, Geometry of C bonding, chirality and 3D structure- configuration, confirmations, steric hinderance. Stereo isomers and geometric isomers. Stereo specific interactions. Factors affecting co-ordination numbers and stereo-chemistry, Isomerism incoordination compounds.

Reactive intermediates

Carbocations, carbanions, free radicals, carbenes, arenes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species, Stereochemistry of chemical reactions that produce chiral centers, chemical reactions that produce stereoisomers, Resolution of enantiomers, chiral centers other than carbon, prochirality

Bonding

Chemical bonding and intramolecular forces, Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions, resonance, hyperconjugation, hydrogen bonding and Inductive and electrometric effects.

Unit II

Chemistry of Amino acids & Proteins: Ramachandran plot for amino acids. Peptide bond formation - Planar structure, stabilization & peptide conformation (φ & ψ). Peptide hormones (glucagon) and antimicrobial peptides. Forces stabilizing the 3D structure of proteins, Protein denaturation and folding. Molecular chaperons, Protein misfolding. Oxygen binding proteins (Haemoglobin & Myoglobin) and Histones. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio.

Unit III

Chemistry of Lipids: Bio-membrane: Behavior of amphipathic lipids in water- formation of micelles, bilayers, vesicles, liposomes. Membrane composition and organization – Fluid mosaic model.

SOLUTIONS: Chemical Equilibrium: General characteristics of chemical equilibrium, thermodynamic derivation of the law of chemical equilibrium, Van't Hoff reaction isotherm.

Relation between Kp, Kc and Kx. Temperature dependence of equilibrium constant Van't Hoff equation, homogeneous & heterogeneous equilibria, Le Chetalier's principle

Unit IV

CHEMICAL KINETICS AND CATALYSIS: Scope, rate of reaction, influencing factors such as concentration, temperature, pressure, solvent etc. theories of chemical kinetics. Arrhenius equation, concept of activation energy. Rates of reactions, rate constant, order and molecularity of reactions. Chemical Kinetics: Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-life time of a reaction. Methods for determining order of reaction. Effect of temperature on reaction rate and the concept of activation energy. Catalysis: Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis.

Chemistry of Nucleic acids: Nucleotides as energy carrier, cofactors & regulatory molecules (cyclic AMP). Unusual structures in DNA (Palindrome, mirror repeats, hairpins and cruciform), Structural polymorphism in DNA, DNA stability, DNA hybridization.

Books Recommended:

1. G.L. Eichorn, Inorganic Biochemistry, Vol. I Elsevier,
2. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th ed. Pearson Education, Singapore, 1999.
3. D.F.C Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS Oxford, 1991.
4. Cowan, J.A. (1997) – Inorganic Biochemistry – An Introduction, Wiley- VCH

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester IV
Course Code: BBTM-4084
Course Title: Chemistry
Practical

COURSE OUTCOMES:

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

CO1: Perform basic laboratory techniques for the extraction, precipitation, and qualitative analysis of biomolecules such as carbohydrates, proteins, amino acids, and starch.

CO2: Apply chromatographic and spectroscopic methods for the separation, identification, and characterization of biological and chemical compounds.

CO3: Determine and interpret physicochemical properties of solutions, including pH, buffer action, optical activity, and concentration-dependent absorbance using Beer–Lambert law.

CO4: Demonstrate safe laboratory practices, accurate experimental observations, data recording, and analysis of results related to biochemical and analytical experiments

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-IV
Course Code: BBTM-4084
Course Title: Chemistry
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.

1. Extraction and Characterization of Starch
2. Qualitative test for Carbohydrates, Amides- phenols. Aldehydes
3. Isoelectric precipitation of proteins
4. Intracellular total protein precipitation by TCA/ Acetone method
5. Qualitative analysis of proteins
6. Separation of Amino acids by chromatography
7. Verification of Lambert beer's law for solution of $CoCl_2.H_2O$ (in water) and $K_2Cr_2O_7$ (in water)
8. pH of buffer solution
9. Determine the %age composition of an optically active solution

Books Recommended:

1) Nelson and Cox, Lehninger. Principles of Biochemistry (7th Edition), W.H Freeman Publishers (2010).
2) Dubey R.C, A Textbook of Biotechnology (6th Edition), S. Chand Publishing, reprint, 2014.
3) Zubey G. Principles of Biochemistry, Oscar Publication (2000).
4) Devlin T. M. Text Book of Biochemistry with Clinical Correlations (4th Edition) Wiley & Sons Publication (2005).
5) Roy Tasker, Carl Rhodes. Stryer's Biochemistry (7th Edition) W. H. Freeman
6) publishers (2012).
7) R.T. Morison and R.N. Boyd, Organic chemistry
8) L. Finar, Organic Chemistry, Vol.I, IV ed. J. March, Advanced Organic Chemistry, Reactions Mechanisms and Structure.
9) Physical Chemistry by Peter Atkin 10th edition.
10) Thermodynamics for chemists by Samuel Glasstone 2009

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4065
Course Title: Ecology and Evolution
(Theory)

COURSE OUTCOME:

After successful completion of this course, the learners will be able to:

CO1: Explain the fundamental concepts of ecology, environmental components, habitat, niche, trophic interactions, nutrient cycling, and species interactions.
CO2: Analyze ecological succession, ecosystem structure and function, energy flow, biogeochemical cycles, and biodiversity conservation strategies for sustainable ecosystem management.
CO3: Interpret the principles of organic evolution, origin of life, natural selection, and speciation using classical and modern evolutionary theories.
CO4: Apply the principles of population genetics, molecular evolution, phylogenetic reconstruction, and biogeography to explain genetic variation, evolutionary relationships, and species diversification.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4065
Course Title: Ecology and Evolution
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1

Theory: 50
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

Unit-I

The Environment: Physical environment; biotic environment; biotic and abiotic interactions: trophic levels and their interactions; nutrient cycles; primary and secondary levels. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized Species. Interactions: Types of interactions (mutualism, symbiosis, commensalism, competition, parasitism, predation, etc.), interspecific competition (physiological adaptations to abiotic environment); prey- predator interactions (Lotka-Volterra equation etc.), prey predator interactions (mimicry, crypsis, etc.).

Unit-II

Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax. **Ecosystem Ecology**: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of ecosystems: terrestrial (forest, grassland) and aquatic (freshwater, marine, estuarine). *in situ* conservation (endemism, biodiversity hotspots, protected areas); *ex-situ* conservation; conservation genetics (genetic diversity, inbreeding depression).

Unit-III

Organic evolution: Evidences of evolution (palaeontological, comparative anatomy, embryological, biogeographical and molecular evidences); natural selection and types of selection (stabilizing, directional, disruptive), industrial melanism and polymorphism.

Origin of life: Origin of micro-molecules, macromolecules, viruses, prokaryotes and eukaryotes speciation: isolation and its types.

Unit-IV

Population and Quantitative genetics: Origins of genetic variation; Mendelian genetics; Hardy-Weinberg equilibrium; drift; selection population genetics polygenic traits.

Molecular evolution Neutral theory; molecular clocks; rates of evolution; phylogenetic reconstruction; molecular systematics. Species concepts and speciation; adaptive radiation; convergence; biogeography.

Books Recommended:

1. Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill.
2. Jansma, R. (2016). *Global philosophical and ecological concepts*. Motilal Banarsidass Publishers.
3. Rastogi, V. B. (2022). *Organic evolution: Evolutionary Biology*. MedTech Science Press.
4. Sigmund, K. (2017). *Games of life: Explorations in ecology, evolution, and behavior*. Dover Publications.
5. Odum, E. P., and Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Cengage Learning India Private Limited
6. Smith, T. M., & Smith, R. L. (2015). *Elements of ecology*, Global Edition. Pearson Education.
7. Maynard Smith, J. (1993). *The theory of evolution*. Cambridge University Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4065
Course Title: Ecology and Evolution
(Practical)

COURSE OUTCOME:

After completion of this practical course, the learners will be to:

CO1: Identify ecological sampling methods, homologous and analogous structures, mimicry, and fossils related to ecology and evolution.

CO2: Explain the principles of quadrat analysis and water quality assessment using dissolved oxygen (DO) and total dissolved solids (TDS).

CO3: Perform ecological sampling and water quality analysis using standard laboratory techniques.

CO4: Analyze experimental observations and evolutionary evidence to interpret ecological patterns, adaptations, and evolutionary relationships.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: BBTM-4065
Course Title: Ecology and Evolution
(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.

Experiment:
1. To determine the minimum size of the quadrat by species area-curve method.
2. To measure amount of dissolved oxygen in pond water.
3. To determine the total dissolved solids (TDS) in water
4. Comparison of homologous and analogous structures
5. Demonstration of kinds of mimicry in various group of animals,
6. Study of fossils

Books Recommended:

1. Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill.
2. Kardong, K.V. (2018). *Vertebrates: Comparative anatomy, function, evolution* (8th ed.). McGraw-Hill Education.
3. Rastogi, V. B. (2022). *Organic evolution* (Evolutionary Biology). MedTech Science Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-IV
Session: 2026-27
Course Code: VACP-4511
Course Title: Personality Development and Gender Sensitization
Value Added Audit Course (VAAC)

Course Duration: 30 hours

Course intended for: Semester IV students of the undergraduate degree program.

Course Objectives :

1. To create awareness about gender equality, gender roles, stereotypes, diversity, and inclusion, and promote respect for individuals irrespective of gender.
2. To develop empathetic, respectful, and non-discriminatory attitudes and behaviours that enable students to build healthy relationships and contribute to a safe and inclusive society.
3. To develop self-awareness, self-confidence, emotional intelligence, and positive attitudes among undergraduate students for effective personal growth.
4. To enhance communication, interpersonal, leadership, decision-making, and professional skills to prepare students for academic, social, and workplace environments.

Learning Outcomes:

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

1. Explain and critically analyse concepts of sex, gender, gender roles, stereotypes, and cultural norms, and evaluate their influence on social, economic, and political participation.
2. Demonstrate awareness of gender equality, gender justice, constitutional provisions, legal rights, and access to comprehensive healthcare, and develop strategies to promote equality, inclusion, and non-discrimination.
3. Apply self-defence techniques and engage in critical self-reflection to respond to potential threats and adversities, challenge gender-based discrimination, and contribute towards social transformation and a safe, equitable society.
4. Demonstrate self-awareness and personal effectiveness by identifying their strengths and areas for improvement, developing self-confidence, emotional intelligence, positive attitudes, and effective stress-management skills.
5. Apply effective communication and interpersonal skills through active listening, verbal and non-verbal communication, teamwork, leadership, problem-solving, decision-making, and conflict-resolution strategies.

6. Adopt healthy and professional lifestyle practices by demonstrating appropriate personal grooming, professional etiquette, physical fitness, balanced diet and nutrition, time management, and behaviors that support overall personal and professional well-being.

CURRICULUM

Course Code: VACP-4511 **Total contact hours: 30**

MODULE	TITLE	HOURS
1	**Introduction to Personality Development and Gender Sensitization**	**2 Hrs.**
2	**Workshop in Self-Defense Techniques**	**8 Hrs.**
3	**a) Cultural Roles and Gender Sensitivity**	**1 Hrs.**
	b) Gender Dimensions in Economic Participation and Wage Gap	**1 Hrs.**
	c) Gender Rights: Constitutional Rights & Legal Rights	**1 Hrs.**
	d) Gender Issues and the Health Care System	**1 Hrs.**
	e) Gender and Political Participation	**1 Hrs.**
4	**Self-Awareness and Self-Management**	**4 Hrs.**
5	**Communication and Interpersonal Skills**	**4 Hrs.**
6	**Professional Personality and Leadership Development**	**5 Hrs.**
7	**Final Assessment Feedback and Closure**	**2 Hrs.**
	Total	**30 Hrs.**

B.Sc. Bio-Technology Semester-V

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5061
Couse Title: r-DNA Technology-I
(Theory)

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

CO1: Explain the properties, mechanisms of action, and applications of DNA-modifying enzymes employed in recombinant DNA technology and molecular cloning.

CO2: Analyze the characteristics, selection strategies, and applications of cloning vectors used for gene cloning and recombinant DNA technology in *Escherichia coli*.

CO3: Evaluate the principles and applications of nucleic acid hybridization, blotting techniques, and gene transfer methods used in molecular biology and genetic engineering.

CO4: Assess the principles, methodologies, and detection strategies of radioactive and non-radioactive nucleic acid labelling for molecular diagnostics and biotechnology research.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5061
Couse Title: r-DNA Technology-I
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 4-0-1 **Practical:20**
Theory: 50

CA:30

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 in all, 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 Modifying enzymes: Ligases for blunt and sticky end ligation, DNA Polymerases, Klenow fragment, Phosphatases, Polynucleotide kinase, Terminal deoxynucleotidyl transferase, Restriction enzymes, reverse transcriptase. RNase-H, DNase-I, Nuclease S-I

Unit-II

Cloning Vectors for *E coli*: features of plasmids and development of plasmids as vector (α complementation), lytic and lysogenic cycle in Lambda: bacteriophages as vector, Genetic selection (Hfl, Spi) and histochemical selection, M13 as cloning vector, Cosmids

Unit-III

Southern and Northern blotting, Hybridization, Merits and demerits of nitrocellulose and nylon membranes (N and N+). Methods of Transformation: $CaCl_2$, electroporation, transfection, microprojectile.

Unit-IV

Labelling of DNA and RNA- Radioactive labeling (Nick Translation, Random Priming, End Labelling), Non-Radioactive labelling (Direct and Indirect non isotopic labeling), Detection systems of labeled probes

Books Recommended:

1.Primrose, S. B., & Twyman, R. M. (2014). *Principles of gene manipulation and genomics*. Wiley-Blackwell

2.Watson, J. D., Myers, R. M., Caudy, A. A., & Witkowski, J. A. (2017). *Recombinant DNA: Genes and genomes—A short course*. W. H. Freeman.
3.Brown, T. A. (2025). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
4. Sharma, A. D. (2017). *rDNA technology* (2nd ed.). Himalaya Publishing House.
5.Reece, R. J. (2008). *Analysis of genes and genomes*. Wiley-Blackwell.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5061
Couse Title: r-DNA Technology-I
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the principles underlying bacterial culture, genomic DNA isolation, restriction digestion, agarose gel electrophoresis, and Southern blotting.
CO2: Perform bacterial culture, genomic DNA isolation, spectrophotometric quantification, and agarose gel electrophoresis using standard molecular biology protocols.
CO3: Analyze DNA quality, restriction enzyme digestion patterns, and electrophoretic profiles to assess the integrity and characteristics of nucleic acid samples.
CO4: Evaluate the results of restriction digestion and Southern blotting for the detection and characterization of specific DNA sequences in molecular biology investigations.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5061
Couse Title: r-DNA Technology-I
(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. Isolation of genomic DNA from bacteria.
2. Spectrophotometric quantification of DNA and determination of purity.
3.Restriction enzyme digestion of the isolated DNA with 6, 5 and 4 cutters.
4.Southern Blotting.

Books Recommended:

1.S.B. Primrose and R.M. Twyman; Principles of Gene Manipulation. 2006.
2.J. Sambrook and Michael R. Green; Molecular Cloning: A Laboratory Manual, (Fourth Edition), CSHL, 2012.
3.Brown, T. A. (2023). *Genomes 5*. CRC Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5062
Couse Title: Animal Biotechnology-I
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the principles, laboratory design, aseptic techniques, cryopreservation methods, and characteristics of normal and transformed cells in animal tissue culture.

CO2: Analyze the sources, types, prevention, and control of contamination, laboratory biosafety practices, and cleanroom facilities required for safe and effective animal tissue culture.

CO3: Evaluate the composition, physicochemical properties, and applications of culture media and reagents, including serum-supplemented, serum-free, and conditioned media, for the cultivation of animal cells.

CO4: Assess the methodologies for primary and established cell culture, cell isolation, cultivation, growth kinetics, and cell proliferation analysis for applications in animal tissue culture research.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5062
Couse Title: Animal Biotechnology-I
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 4-0-1 **Theory: 50**
Practical:20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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 facility and their applications.

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 and 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.Freshney, R. I. and Davis A.C. (2021). *Culture of animal cells: A manual of basic technique and specialized applications* (8th ed.). John Wiley & Sons.

2.Davis, J. M. (Ed.). (2011). *Animal cell culture: Essential methods*. John Wiley & Sons.

3.Celis, J. E. (Ed.), Carter, N., Simons, K., Small, J. V., Hunter, T., & Shotton, D. (Eds.). (2006). *Cell biology: A laboratory handbook*. Elsevier Academic Press.

4.Butler, M. (2005). *Animal cell culture and technology*. Taylor & Francis.

5.Basic Cell Culture: A Practical Approach, 2nd ed. Edited by John Davis Oxford University Press, Oxford and New York. 2002 Davis, J. M. (2004). Basic cell culture: a practical approach. In *Basic cell culture: a practical approach*.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5062
Couse Title: Animal Biotechnology-I
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the sources of contamination and the decontamination measures essential for maintaining aseptic conditions in an animal tissue culture laboratory.

CO2: Prepare balanced salt solutions, culture media, and serum by following standard protocols.

CO3: Perform the isolation and culture of lymphocytes from peripheral blood using aseptic techniques and appropriate cell culture procedures.

CO4: Analyze the quality of prepared media, serum, and cultured cells by interpreting laboratory observations and assessing their suitability for animal tissue culture applications.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5062
Couse Title: Animal Biotechnology-I
(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.Sources of contamination and decontamination measures.
2. Preparation of Hanks Balanced salt solution.
3. Preparation of Minimal Essential Growth medium.
4. Separation of Serum from blood.
5.Isolation and Culture of Lymphocytes from Peripheral Blood

Book Recommended:

1. Freshney, R. I. and Davis A.C. (2021). *Culture of animal cells: A manual of basic technique and specialized applications* (8th ed.). John Wiley & Sons.
2. Davis, J. M. (Ed.). (2011). *Animal cell culture: Essential methods*. John Wiley & Sons.
3. Celis, J. E. (Ed.), Carter, N., Simons, K., Small, J. V., Hunter, T., & Shotton, D. (Eds.). (2006). *Cell biology: A laboratory handbook*. Elsevier Academic Press.
4. Butler, M. (2005). *Animal cell culture and technology*. Taylor & Francis.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5063
Couse Title: Bioprocess Engineering-I
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the fundamental principles of biochemical engineering, including heat and mass transfer, diffusion phenomena, oxygen transfer mechanisms, and microbial culture systems used in bioprocesses.
CO2: Analyze microbial growth kinetics and evaluate the influence of kinetic parameters, substrate utilization, product formation, and biomass productivity on bioprocess performance.
CO3: Evaluate the regulatory mechanisms governing microbial metabolism and product formation, including feedback regulation and the effects of environmental factors on bioprocess efficiency.
CO4: Assess the principles, methods, and process design of sterilization systems employed in bioprocessing for ensuring aseptic operation and product quality.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5063
Couse Title: Bioprocess Engineering-I
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 4-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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: Session, Fed Session 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

Internal and external feed back systems, effector molecules and its kinetics, Effect of temperature, pH and inducer on product synthesis.

Unit-IV

Sterilization: Introduction, air and media sterilizations, design of Session sterilization process, Del factor, sterilization cycle, continuous sterilization process, sterilization of fermenters.

Books Recommended:

1.Stanbury, P. F., Whitaker, A., & Hall, S. J. (2026). *Principles of fermentation technology* (3rd ed.). Elsevier Science.
2.Moo-Young, M. (2019). *Comprehensive biotechnology*. Elsevier.
3.Moo-Young, M., Anderson, W. A., & Chakrabarty, A. M. (Eds.). (2014). *Environmental biotechnology: principles and applications*. Springer Science & Business Media.
4. Bailey, J. E., & Ollis, D. F. (2018). *Biochemical engineering fundamentals*. McGraw-Hill.
5. Pirt, S. J. (1975). *Principles of microbe and cell cultivation* (pp. 274-pp)

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5063
Couse Title: Bioprocess Engineering-I
(Practical)

COURSE OUTCOMES:

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the principles of microbial growth, fermentation processes, and sterilization techniques employed in bioprocess engineering.

CO2: Perform microbial cultivation, determine growth kinetics, and evaluate specific growth rate and generation time using standard fermentation techniques.

CO3: Analyze the influence of process parameters, including temperature, pH, and aeration, on microbial growth and bioprocess performance.

CO4: Evaluate enzyme production and activity in bioreactor or shaking flask systems and interpret the experimental outcomes for process optimization.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5063
Couse Title: Bioprocess Engineering-I
(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. 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.

Book Recommended:

1.Cappuccino J.G., Sherman N. (2007). Microbiology: A laboratory (Pearson Benjamin Cummings). Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10th Edition, Harlow, Addition-Wesley.
2.Plummer D.T. (2006). An introduction to practical biochemistry (Tata McGraw Hill Publishers Co. Ltd., New Delhi).
3.Bansal, D.D. (1985). Practical biochemistry (Standard Publication Chandigarh).

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5064
Couse Title: Environmental Biotechnology
(Theory)

COURSE OUTCOMES:

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

CO1: Explain the causes and impacts of environmental pollution and the principles of biotechnological approaches employed for pollution monitoring, wastewater treatment, solid waste management, and environmental protection.

CO2: Analyze the sources, production technologies, and applications of biomass and biofuels, and examine their potential for sustainable energy generation and environmental sustainability.

CO3: Evaluate the molecular mechanisms of biological nitrogen fixation and the role of biofertilizers in enhancing agricultural productivity and promoting sustainable farming practices.

CO4: Assess the applications of bioremediation technologies and microbial processes for the remediation of environmental pollutants and the development of sustainable environmental management strategies.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5064
Couse Title: Environmental Biotechnology
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 4-0-1 **Theory: 50**
Practical:20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

Unit-I

Environmental Pollution and Management: Types of pollution, sources, methods for the measurement of pollution and their control through Biotechnology; waste water treatments (physical, chemical and Biological). Microbiology of waste water treatments, aerobic and anaerobic process. Thin film techniques for waste water treatment using aquatic plants. Role of nanotechnology in environmental pollution control. Solid Waste Management with Vermicomposting, overall benefits, economics and marketing.

Unit-II

Biomass Production and Biofuels: Introduction, plant biomass, sources of biomass forest biomass, crop residues (cereals, leguminous crops, sugar cane etc.) aquatic biomass, wastes as a source of energy, composition of plant biomass (cellulose, hemicellulose and lignins), biomass conversion, biological and non- biological processes, useful products biomass (ethyl alcohol, methanol, methane), Application and future prospects, Recent trends in biofuel research.

Unit-III

Biological Nitrogen Fixation and Biofertilizer: The range of nitrogen fixing organisms, biochemistry of nitrogenase, genetics of nitrogen fixation, regulation of nif gene expression, symbiotic nitrogen fixation, genetic analysis of Rhizobium bacteria, regulation of nod gene expression, transfer of nif genes from Klebsiella pneumoniae to other organisms, application and future prospects. green manuring, the blue green algae, algalization, Azolla, present status and improvements.

Unit-IV

Bioremediation: Types of bioremediation, use of fungi, algae and bacteria in biosorption, ecological considerations, biodegradation of oil spills, surfactants, TNT wastes, dye stuff wastes, insecticides, herbicides, antibiotics. plastic menace, biodegradable plastics, volatile toxic gases and biofiltration.

Books Recommended:

1. Manahan, S. E. (2022). *Environmental chemistry*. CRC press.

2. Anderson, D., & Conning, D. M. (1993). *Experimental toxicology*. Royal Society of Chemistry.
3. Abbasi, S.A., and Ramasami, E. (1999). Biotechnological Methods of Pollution Control. Universities Press, Hyderabad.
4. Alexander, M. (1999). Biodegradation and Bioremediation. Academic Press, San Diego.
5. Young, L. Y., & Cerniglia, C. E. (Eds.). (1995). *Microbial transformation and degradation of toxic organic chemicals* (pp. xii+-654).
6. Omenn, G. S. (2013). *Environmental biotechnology: reducing risks from environmental chemicals through biotechnology*. Springer Science & Business Media.
7. Rittmann, D.E., McCarty, P.L. (2001). Environmental Biotechnology: Principles and Applications. McGraw Hill, New York

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5064
Couse Title: Environmental Biotechnology
(Practical)

Upon successful completion of this practical course, the learners will be able to:

CO1: Explain the principles and significance of environmental quality assessment, biofertilizer production, vermicomposting, and bioremediation in sustainable environmental management.
CO2: Perform physicochemical and microbiological analyses of environmental samples, including drinking water quality assessment, determination of BOD and COD, and isolation and cultivation of environmentally significant microorganisms.
CO3: Analyze the efficiency of cellulolytic microorganisms, *Rhizobium*, vermicomposting, and fungal strains in waste degradation, biofertilizer production, and dye bioremediation.
CO4: Evaluate experimental findings to assess the effectiveness of biotechnological approaches for pollution control, waste management, and environmental sustainability.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTM-5064
Couse Title: Environmental 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.Determination of drinking water quality
2.Determination of BOD and COD Sewerage samples
3.Isolation of Cellulolytic waste degrading microorganism
4.Isolation of Rhizobium from root nodule and mass cultivation
5.Study the technique of vermicomposting
6.Bioremediation of dyes using different fungal strain from soil

Book Recommended:

1. Manahan, S. E. (1997), Environmental Science and Technology, Lewis Publishers, New York
2. Anderson, D., & Conning, D. M. (1993). *Experimental toxicology*. Royal Society of Chemistry.
3. Abbasi, S.A., and Ramasami, E. (1999). Biotechnological Methods of Pollution Control. Universities Press, Hyderabad.
4. Alexander, M. (1999). Biodegradation and Bioremediation. Acadamic Press, San Diego.
5. Young, L. Y., & Cerniglia, C. E. (Eds.). (1995). *Microbial transformation and degradation of toxic organic chemicals* (pp. xii+-654).

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-V
Course Code: BBTM-5085
Course Title: Chemistry-III

COURSE OUTCOMES:

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

CO1: Understand and apply the laws of thermodynamics to evaluate energy changes, spontaneity, and equilibrium in chemical systems, including simple mixtures.

CO2: Analyze solution behavior and equilibrium systems using thermodynamic principles, including colligative properties and Le Chatelier's principle.

CO3: Determine reaction rates and mechanisms by applying kinetic theories and rate laws, and explain the role of catalysts in various chemical processes.

CO4: Interpret electrochemical behavior of electrolytes through conductance, ionic equilibria, and buffer systems, and apply this understanding to conductometric titrations and pH analysis.

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-V
Course Code: BBTM-5085
Course Title: Chemistry-III

Exam Time: 3Hrs. **Max. Marks: 100**
Credit (L-T-P): 3-0-1 **Theory: 50**
Practical:20
CA:30

Instructions for the Paper Setters: Eight questions of equal marks (ten marks each) 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.

Unit I

CHEMICAL THERMODYNAMICS:

Objectives and limitations of Chemical Thermodynamics, State functions, thermodynamic equilibrium, work, heat, internal energy, enthalpy. First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion. Enthalpy change and its measurement, standard heats of formation and absolute enthalpies. Kirchoff's equation. Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle). Entropy. Entropy changes of an ideal gas with changes in P, V, and T. Free energy and work functions. Gibbs-Helmholtz Equation. Criteria of spontaneity in terms of changes in free energy. Third law of thermodynamics: Absolute entropies. Thermodynamics of Simple Mixtures: Partial molar quantities and their significance. Chemical potential and its variation with T and P. Fugacity function and its physical significance. Concept of activity and activity coefficient.

Unit II

SOLUTIONS:

Ideal and non- ideal solutions, method of expression concentrations of solution, activity and activity coefficients, dilute solution, Osmotic pressure, its law and measurements, Elevation of boiling point and depression of freezing points. Chemical Equilibrium: General characteristics of chemical equilibrium, thermodynamic derivation of the law of chemical equilibrium, Van't Hoff reaction isotherm. Relation between Kp, Kc and Kx. Temperature dependence of equilibrium constant Van't Hoff equation, homogeneous & heterogreneous equilibria, Le Chetalier's principle.

Unit III

CHEMICAL KINETICS AND CATALYSIS: Scope, rate of reaction, influencing factors such as concentration, temperature, pressure, solvent etc. theories of chemical kinetics. Arrhenius equation, concept of activation energy. Rates of reactions, rate constant, order and molecularity of reactions. Chemical Kinetics: Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-life time of a reaction. Methods for determining order of reaction. Effect of temperature on reaction rate and the concept of activation energy. Reaction mechanism. Steady state hypothesis. Catalysis: Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis. Unimolecular surface reactions.

Unit IV

ELECTRO-CHEMISTRY: Specific conductance, molar conductance and their dependence on electrolyte concentration. Ionic Equilibria and conductance, Essential postulates of the Debye- Huckel theory of strong electrolytes. Mean ionic activity coefficient and ionic strength. Transport number and its relation to ionic conductance and ionic mobility. Conductometric titrations. pH scale. Buffer solutions, salt hydrolysis. Acid-base indicators.

Books Recommended:

1. Physical Chemistry by Peter Atkius 10th edition.
2. Thermodynamics for chemists by Samuel Glasstone 2009
3. Chemical Kinetics by Keith J. Laidler 10th edition.
4. Modern Electrochemistry by John O'M Backris and K.N. Reddy 10th edition.

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-V
Course Code: BBTM-5085
Course Title: Chemistry-III

COURS OUTCOMES:

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

CO1: Apply principles of calorimetry to determine thermodynamic parameters such as heat of neutralization and heat of solution for various substances.

CO2: Utilize conductometric methods to determine cell constant, specific/equivalent conductance, and perform titrations for precipitation and acid-base reactions.

CO3: Analyze concentration and absorbance relationships using photometric techniques and validate Lambert-Beer's law.

CO4: Measure and interpret pH values to study buffer solutions, determine ionization constants, and analyze acid-base mixtures using pH meter and polarimetry.

Bachelor of Science (Biotechnology) Three Year Degree Programme
Bachelor of Science (Honours) (Biotechnology) Four Year Degree Programme
Session: 2026-27
Semester-V
Course Code: BBTM-5085
Course Title: Chemistry-III
Practical

Time: 3 Hrs

Practical: 20

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

1. Calorimetry:
a) Determination of Heat of neutralization
(i) Strong acid-strong base
(ii) Weak acid-strong base.
b) Determination of Heat of solution of KCl, NH_4Cl, KNO_3
2. Conductometry:
a) Determination of cell constant.
b) Determination of specific and equivalent conductance of electrolyte (NaCl and HCl).
c) Precipitation titration of Na_2SO_4 vs. $BaCl_2$.
d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH.
3. Photometry.
Verification of Lambert beer's law for solution of $CoCl_2.H_2O$ (in water) and $K_2Cr_2O_7$ (in water)
4. a) pH of buffer solution
b) Acid base titration HCl vs. NaOH.
c) Determination of ionization constant of a weak acid (CH_3COOH)
5. Determine composition of HCl and CH_3COOH in the given solution pH metrically.
6. Polarimetry: Determine the % age composition of an optically active solution.

Books Recommended:
1. Findlay's Practical Physical Chemistry, 9th Edition, Revised by B.P. Levitt.
2. Experimental Physical Chemistry by RC DAS and B. Behera 9th Edition.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTI-5066
Course Title: Internship

After passing this course the student will be able to:

CO1: Apply theoretical knowledge in real-life professional and community settings through experiential learning.
CO2: Develop practical skills, communication abilities, and professional ethics while working with industries and organizations.
CO3: Understand workplace culture, teamwork, and problem-solving approaches in different professional environments.
CO4: Prepare and present internship/community outreach reports effectively based on their field experiences.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Course Code: BBTI-5066
Course Title: Internship

Time: 3 Hours **Max. Marks:50**
L-T-P: 0-0-2

Evaluation of report based on above themes will be evaluated by board of three internal examiners. Students will be evaluated as satisfactory or unsatisfactory. Award list will be submitted

Course Outcomes:

1. It is a course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity.
2. A key aspect of the internship/ apprenticeship is induction into actual work situations.
3. It involves working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in onsite experiential learning

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-V
Session: 2026-27
Value Added Course
Course Code: VACJ-5551
Course Title: Job Readiness

Course Duration: 30 hours
Course Credits: 2

Objectives of the Course:

It is a specialised programme structured to prepare the students ready and adaptable for their professional career. The students will be able to set goals for themselves with the exposure provided to them during the course. The main purpose of the course is to enhance their life skills, increase their capacities for adapting to professional environment and teaming up. They will learn the importance and art of synergising with others and working in teams. It will help them to realize their potential and set high but realistic goals.

Learning Outcomes:

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

- Build confidence and have positive attitude
- Have an overview and exposure of job markets to realize their potential
- Get inputs on critical thinking and leadership qualities
- Comprehend how speaking skills can help them excelling in job interviews
- Acquire knowledge of team work
- Share their ideas in the group and improve their listening skills
- Learn skills of self-introduction to represent themselves and to write a well drafted resume

CURRICULUM

Course Code: VACJ-5551 Course Credits: 02 Contact Hours: 30

MODULE	TITLE	HOURS
I	Goal Setting and Ambition	2 Hours
II	Positive Attitude and Self Confidence	2 Hours
III	Career Options and Job Markets	2 Hours
IV	Resume Building	4 Hours
V	Presentation Skills	4 Hours
VI	Public Speaking	4 Hours
VII	E-Mail Etiquette and Telephonic Conversation	2 Hours
VIII	Organizational Structure and Corporate Jargons	2 Hours
IX	Personal Interviews	4 Hours
X	Final Assessment, Feedback and Closure	4 Hours

B.Sc. Bio-Technology Semester-VI

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6061
Couse Title: Fundamental of Bioinformatics
(Theory)

COURSE OUTCOME:

After successful completion of this course, the learners will be able to:

CO1: Explain the fundamental concepts of computers, computer organization, hardware, software, storage devices, and input/output devices and their relevance in bioinformatics.

CO2: Apply the principles of bioinformatics, including pairwise sequence alignment algorithms, scoring matrices (PAM and BLOSUM), and multiple sequence alignment methods for biological sequence analysis.

CO3: Analyze biological sequence data using BLAST and interpret sequence alignment results for comparative analysis of nucleotide and protein sequences.

CO4: Utilize major biological databases and bioinformatics resources, for retrieval, annotation, and interpretation of biological information.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6061
Couse Title: Fundamental of Bioinformatics
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 15

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 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 Penalities, 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 about: NCBI, EBI, DDBJ, Expasy, PUBMED, PDB, UNIPROT, Pfam, Prosite.

Books Recommended:

1. Norton, P. (2002). *Introduction to Computing Fundamentals*. McGraw-Hill Education, New Delhi.
2. Pradeep, K., & Priti, S. (2004). Computer Fundamentals. BPB Publications.

3. Xiong, J. (2006). *Essential bioinformatics*. Cambridge University Press.
4. Baxevanis A.D. and Ouellette B.F.F. (2011). Bioinformatics a Practical Guide to the Analysis of Genes and Proteins.(3rd Edition) Wiley-Interscience

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6061
Couse Title: Fundamental of Bioinformatics
(Practical)

COURSE OUTCOME:

After successful completion of this course, the learners will be able to:

CO1: Explain the applications of MS Office tools, biological databases, and standard biological sequence formats used in bioinformatics.

CO2: Retrieve biological information from online databases, including NCBI, EMBL, UniProt, and PubMed, using appropriate search strategies.

CO3: Perform biological sequence analysis using BLAST, Clustal Omega, and standard sequence formats (FASTA and GenBank).

CO4: Analyze protein sequences to identify conserved domains and functional motifs using PFAM and PROSITE.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6061
Couse Title: Fundamental of Bioinformatics
(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. 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

Books Recommended:

1. Norton, P. (2002). *Introduction to Computing Fundamentals*. McGraw-Hill Education, New Delhi.
2. Pradeep, K., & Priti, S. (2004). Computer Fundamentals. BPB Publications.
3. Xiong, J. (2006). *Essential bioinformatics*. Cambridge University Press.
4. Baxevanis A.D. and Ouellette B.F.F. (2011). Bioinformatics a Practical Guide to the Analysis of Genes and Proteins. (3rd Edition) Wiley-Interscience

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6062
Course Title: Plant Biotechnology-I
(Theory)

COURSE OUTCOMES:

After successful completion of this course, the learners will be able to:

CO1: Describe the fundamental concepts of plant tissue culture, cellular totipotency, tissue competency, laboratory organization, and sterilization techniques.

CO2: Explain the composition of culture media and the roles of plant growth regulators in the growth and development of plant tissues under in vitro conditions.

CO3: Apply the principles of organogenesis, somatic embryogenesis, micropropagation, and acclimatization for in vitro plant regeneration and multiplication.

CO4: Analyze the applications of haploid and triploid production, embryo, ovule and ovary culture, and somaclonal variation in plant improvement and crop biotechnology.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6062
Course Title: Plant Biotechnology-I
(Theory)

Time: 3 Hours **Max. Marks: 100**

Theory: 50
Practical:20
CA: 30

L-T-P: 3-0-0

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

Unit-I

Cellular totipotency; differentiation, dedifferentiation and redifferentiation of cells; tissue competency; plant-explant-plant concept.

Plant tissue culture lab: Layout and organization, infrastructure, equipments and instruments.

Sterilization methods for lab, glassware, tools, culture media and plant materials.

Unit-II

Culture Media: Nutritional requirements for plant tissue culture; types of media and role of different components; preparation of culture media.

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

Unit-III

Modes of regeneration: Organogenesis and somatic embryogenesis; types and applications of somatic embryogenesis. Micropropagation methods (axillary bud, shoot-tip and meristem culture); stages of micropropagation, factors affecting micropropagation and technical problems; acclimatization of tissue culture raised plants; applications of micropropagation; a brief account of synthetic seeds.

Unit IV

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

Books Recommended:

1.Bhojwani, S. S., & Dantu, P. K. (2013). *Plant tissue culture: an introductory text* (Vol. 318). India: Springer.
2.Razdan, M. K. (2019). *Introduction to Plant Tissue Culture* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd.
3.Davey, M. R., & Anthony, P. (2010). *Plant cell culture: essential methods*. John Wiley & Sons.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6062
Course Title: Plant Biotechnology-I
(Practical)

COURSE OUTCOMES:

After successful completion of this practical course, the learners will be able to:

CO1: Identify the laboratory infrastructure, essential instruments, culture vessels, and sterilization methods used in plant tissue culture.

CO2: Explain the principles of laboratory organization, aseptic techniques, culture media preparation, and sterilization procedures employed in plant tissue culture.

CO3: Perform the preparation of stock solutions, Murashige and Skoog (MS) medium, sterilization of culture materials, and aseptic inoculation of explants for in vitro culture establishment.

CO4: Analyze the suitability of explants, culture media, and sterilization procedures for the successful establishment of contamination-free plant tissue cultures.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6062
Course Title: Plant Biotechnology-I
(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. 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. Preparation of cotton plugs.
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.Bhojwani, S. S., & Dantu, P. K. (2013). *Plant tissue culture: an introductory text* (Vol. 318). India: Springer.
2.Razdan, M. K. (2019). *Introduction to Plant Tissue Culture* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd.
3.Davey, M. R., & Anthony, P. (2010). *Plant cell culture: essential methods*. John Wiley & Sons.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6063
Course Title: rDNA Technology-II
(Theory)

COURSE OUTCOMES:

After successful completion of this course, the learners will be able to:

CO1: Describe the structure, characteristics, and applications of cloning and expression vectors used in recombinant DNA technology.

CO2: Explain the principles and methodologies of genomic cloning, cDNA cloning, PCR, microarray technology, and DNA sequencing.

CO3: Apply the concepts of recombinant DNA technology to the selection of appropriate cloning strategies, vectors, and molecular techniques for gene manipulation and analysis.

CO4: Analyze gene modification approaches for their applications in biotechnology and genetic engineering.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6063
Course Title: rDNA Technology-II
(Theory)

Time: 3 Hours **Max. Marks: 100**
L -T-P: 4-0-1

Theory: 50
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

UNIT-I

Phagemids, Fosmids, Cloning vectors for Eukaryotes (TAC, YAC, BAC, Ti plasmids), Expression Vectors pET280, pGEX, role of promoter, cassettes and gene fusion, important components of shuttle vectors.

UNIT-II

Overview of cloning, genomic cloning in (Lambda) vector, cDNA cloning: Linker, Adapters, Different strategies for cDNA cloning- self priming and adaptor linker methods.

UNIT-III

Principles and applications of PCR, Fundamental concepts and applications of microarray. DNA Sequencing: Sanger-Coulson method (chain terminating nucleotides), Maxam Gilbert method (chemical degradation of DNA),

UNIT-IV

Changing genes: site directed mutagenesis, cassette mutagenesis, single primer method, PCR methods of site directed mutagenesis, phage display: selection of mutant peptides

Books Recommended:

1. Primrose, S. B., & Twyman, R. M. (2014). *Principles of gene manipulation and genomics*. Wiley-Blackwell
2. Watson, J. D., Myers, R. M., Caudy, A. A., & Witkowski, J. A. (2017). *Recombinant DNA: Genes and genomes—A short course*. W. H. Freeman.
3. Brown, T. A. (2025). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
4. Sharma, A. D. (2017). *rDNA technology* (2nd ed.). Himalaya Publishing House.
5. Reece, R. J. (2008). *Analysis of genes and genomes*. Wiley-Blackwell.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6063

Course Title: r-DNA Technology-II

(Practical)

COURSE OUTCOMES:

After successful completion of this practical course, the learners will be able to:

CO1: Identify the principles and laboratory requirements for plasmid isolation, ligation, transformation, and PCR techniques.

CO2: Explain the principles underlying plasmid isolation, preparation of competent cells, transformation, and polymerase chain reaction (PCR).

CO3: Perform plasmid DNA isolation, ligation, competent cell preparation, bacterial transformation, and PCR using standard molecular biology protocols.

CO4: Analyze the outcomes of transformation and PCR experiments to verify successful gene transfer and amplification.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6063
Course Title: r-DNA Technology-II
(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. Isolation of plasmid DNA
2.To perform ligation reaction
3. Preparation of competent cells
4. Transformation of competent cells by $CaCl_2$ method.
5. Confirmation of the transformants for the presence of plasmid.
6. PCR

Books Recommended:

1. Primrose, S. B., & Twyman, R. M. (2014). *Principles of gene manipulation and genomics*. Wiley-Blackwell
2. Watson, J. D., Myers, R. M., Caudy, A. A., & Witkowski, J. A. (2017). *Recombinant DNA: Genes and genomes—A short course*. W. H. Freeman.
3. Brown, T. A. (2025). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
4. Sharma, A. D. (2017). *rDNA technology* (2nd ed.). Himalaya Publishing House.
5. Reece, R. J. (2008). *Analysis of genes and genomes*. Wiley-Blackwell.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6064
Course Title: Ecology and Evolution
(Theory)

COURSE OUTCOMES:

After successful completion of this course, the learners will be able to:

CO1: Explain the fundamental concepts of ecology, environmental components, habitat, niche, trophic interactions, nutrient cycling, and species interactions.
CO2: Analyze ecological succession, ecosystem structure and function, energy flow, biogeochemical cycles, and biodiversity conservation strategies for sustainable ecosystem management.
CO3: Interpret the principles of organic evolution, origin of life, natural selection, and speciation using classical and modern evolutionary theories.
CO4: Apply the principles of population genetics, molecular evolution, phylogenetic reconstruction, and biogeography to explain genetic variation, evolutionary relationships, and species diversification.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6064
Course Title: Ecology and Evolution
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 4-0-1

Theory: 50
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

Unit-I

The Environment: Physical environment; biotic environment; biotic and abiotic interactions: trophic levels and their interactions; nutrient cycles; primary and secondary levels. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized Species. Interactions: Types of interactions (mutualism, symbiosis, commensalism, competition, parasitism, predation, etc.), interspecific competition (physiological adaptations to abiotic environment); prey- predator interactions (Lotka-Volterra equation etc.), prey predator interactions (mimicry, crypsis, etc.).

Unit-II

Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax. **Ecosystem Ecology**: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of ecosystems: terrestrial (forest, grassland) and aquatic (freshwater, marine, estuarine). *in situ* conservation (endemism, biodiversity hotspots, protected areas); *ex-situ* conservation; conservation genetics (genetic diversity, inbreeding depression).

Unit-III

Organic evolution: Evidences of evolution (palaeontological, comparative anatomy, embryological, biogeographical and molecular evidences); natural selection and types of selection (stabilizing, directional, disruptive), industrial melanism and polymorphism.

Origin of life: Origin of micro-molecules, macromolecules, viruses, prokaryotes and eukaryotes speciation: isolation and its types.

Unit-IV

Population and Quantitative genetics: Origins of genetic variation; Mendelian genetics; Hardy-Weinberg equilibrium; drift; selection population genetics polygenic traits.

Molecular evolution Neutral theory; molecular clocks; rates of evolution; phylogenetic reconstruction; molecular systematics. Species concepts and speciation; adaptive radiation; convergence; biogeography.

Books Recommended:

1. Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill.
2. Jansma, R. (2016). *Global philosophical and ecological concepts*. Motilal Banarsidass Publishers.
3. Rastogi, V. B. (2022). *Organic evolution: Evolutionary Biology*. MedTech Science Press.
4. Sigmund, K. (2017). *Games of life: Explorations in ecology, evolution, and behavior*. Dover Publications.
5. Odum, E. P., and Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Cengage Learning India Private Limited
6. Smith, T. M., & Smith, R. L. (2015). *Elements of ecology*, Global Edition. Pearson Education.
7. Maynard Smith, J. (1993). *The theory of evolution*. Cambridge University Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6064
Course Title: Ecology and Evolution
(Practical)

COURSE OUTCOME:

After completion of this practical course, the learners will be to:

CO1: Identify ecological sampling methods, homologous and analogous structures, mimicry, and fossils related to ecology and evolution.

CO2: Explain the principles of quadrat analysis and water quality assessment using dissolved oxygen (DO) and total dissolved solids (TDS).

CO3: Perform ecological sampling and water quality analysis using standard laboratory techniques.

CO4: Analyze experimental observations and evolutionary evidence to interpret ecological patterns, adaptations, and evolutionary relationships.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6064
Course Title: Ecology and Evolution
(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.

Experiment:
1. To determine the minimum size of the quadrat by species area-curve method.
2. To measure amount of dissolved oxygen in pond water.
3. To determine the total dissolved solids (TDS) in water
4. Comparison of homologous and analogous structures
5. Demonstration of kinds of mimicry in various group of animals,
6. Study of fossils

Books Recommended:

1. Drickamer, L. C., Vessey, S. H., & Jakob, E. (2002). *Animal behavior: Mechanisms, ecology, evolution* (5th ed.). McGraw-Hill.
2. Kardong, K.V. (2018). *Vertebrates: Comparative anatomy, function, evolution* (8th ed.). McGraw-Hill Education.
3. Rastogi, V. B. (2022). *Organic evolution* (Evolutionary Biology). MedTech Science Press.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6065
Course Title: Zoology-II
(Theory)

COURSE OUTCOMES:

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

CO1: Students gain knowledge and skill in the fundamentals of animal sciences. understands the complex interactions among various living organisms.

CO2: Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.

CO3: Understanding of Life history, mode of infection and pathogenicity of the following pathogens with reference to man, prophylaxis and treatment.

CO4: Knowledge of Arthropod vectors of human diseases.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6065
Course Title: Zoology-II
(Theory)

Time: 3 Hrs. **Max. Marks: 100**
Credit: 3-0-0 **Theory: 50**
Practical: 20
CA: 30

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.

Unit-I

Origin of Life on Earth: Origin of earth and primitive earth conditions, Theories of origin of life (Theory of Extraterrestrial contact- Import of life through meteorites, Special creation theory, Oparin Haldane Theory, Abiogenesis, Evidences against theory of spontaneous generation of life, Biogenesis, Theory of chemical evolution, Miller & Urey Experiment). Evolution of Prokaryotes and Eukaryotes (unicellularity to multicellularity).

Unit-II

Evolution: Definition, Scope and History, Theories of Evolution (Lamarckism, Darwinism, Hugo deVries and Modern theory of Evolution). Geological time scale.

Unit -III

Introduction to Parasitology: pertaining to various terminologies in use.
Brief account of Life history, mode of infection and pathogenicity of the following pathogens with reference to man, prophylaxis and treatment.
Pathogenic Protozoans: Entamoeba, Trypanosoma, Giardia and Plasmodium.
Pathogenic Helminths: Tape Worm, Ascaris and Ancylostoma

Unit -IV

Arthropod vectors of human diseases: Malaria, Yellow fever, Dengue haemorragic fever, Filariasis, Plague and Epidemic typhus. Distribution and control of the above mentioned vectors.

Suggested Readings:

1. Garcia, L.S. (2001), Diagnostic Medical Parasitology, (4th ed), ASM Press Washington.

2. Panikar, C. K. and Ghosh Sougata. (2018). Textbook of Medical Parasitology (8th Edition), Jaypee Brothers Medical Publishers (Pl Ltd.), New Delhi.
3. Harrison A. (2000). Principles of Medicine. Loker, Eric S. and Bruce V. Hofkin (2015). Parasitology: A Conceptual Approach, Garland Science, Taylor & Francis Group, New York and London.
4. Zimmer, C. 2000. Parasite Rex: Inside the Bizarre World of Nature's Most Dangerous Creatures, The Free Press, New York.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6065
Course Title: Zoology-II
(Practical)

COURSE OUTCOMES:

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

CO1: Understand Homology, Analogy and Mimicry

CO2: Familiarize with Human skeleton.

CO3: The students will be able to understand human histology.

CO4: Able to prepare slides of pathogenic protozoans.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6065
Course Title: Zoology-II

Time: 2 Hrs. **Practical: 20**
Credit: 0-0-1
Note. The question paper will be set by the examiner based on the syllabus.

1. Study of Evolutionary phenomenon with the help of charts / models /videos: Homology, Analogy and Mimicry.
2. Study of the skeleton of human.
3. Study of the following prepared slides: histology of man (compound tissues).
4. Study of following prepared slides/specimen: Pathogenic Protozoans: Entamoeba, Trypanosoma, Giardia and Plasmodium. Pathogenic Helminths: Tape Worm, Ascaris and Ancylostoma. Arthropod vectors of human diseases: Anopheles, Culex, Aedes Mosquitoes, Rat flea.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6060
Course Title: Skill Development in Bio-Technology-II
(Theory)

After successful completion of this course, learners will be able to:

CO1: Explain the principles of phlebotomy, hematological investigations, and diagnostic techniques used in clinical laboratory practice.

CO2: Apply appropriate laboratory and diagnostic procedures for the analysis of hematological parameters and the diagnosis of human diseases.

CO3: Analyze the role of tumor markers, molecular diagnostic techniques, and PCR-based methods in the detection and diagnosis of infectious diseases and cancer.

CO4: Evaluate biomedical waste management practices and biorisk management strategies for infection prevention, laboratory safety, and regulatory compliance.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6060
Course Title: Skill Development in Bio-Technology-II
(Theory)

Time: 3 Hours **Max. Marks: 100**
L-T-P: 3-0-1 **Theory: 50**
Practical: 20
CA: 30

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 in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

Unit-I

Phlebotomy: Collection of blood samples, preparation and use of different anticoagulants, estimation of CBC, TLC, DLC, bleeding count, clotting time, Platelet count, Reticulocyte count, Morphology of red cells, ESR, PCV

Unit-II

Diagnostic tests: Principles of X-ray, MRI, ultrasonography, CT scan, PET Scan, ECG, ECHO, Biopsy, colonoscopy, Gastroscopy, Eye test, Hearing test

Unit-III

Cancer, Tumor & Cancer Markers: Carcinogens, Oncogene, Clinical applications of tumor markers, Overview of vector borne diseases: Dengue, Chikungunya, PCR based diagnosis of Bacterial, viral & fungal diseases (covid-19, Swine flu, Tuberculosis, Candidiasis)

Unit-IV

Bio-medical Waste and Biorisk Management: Sources and transmission of biomedical infections, investigation, prevention and control of biomedical infections, principles of biorisk management**,** risk assessment and risk mitigation**,** decontamination methods (physical and chemical), sterilization and disinfection, segregation and disposal of non-infectious waste**,** infectious sharp waste**, and** infectious non-sharp waste**,** handling and disposal of ethidium bromide (EtBr) waste**,** biological spill management, and biomedical waste management guidelines.

Books Recommended:

1. McPherson, R. A., & Pincus, M. R. (2021). *Henry's clinical diagnosis and management by laboratory methods E-book*. Elsevier Health Sciences.
2. Kumar, V., Abbas, A. K., & Aster, J. C. (2024). Robbins & Cotran Pathologic Basis of Disease. 11th, editor.

3. World Health Organization. (2025). *Water, sanitation, hygiene, environmental cleaning and waste management in health care facilities: 2023 data update and special focus on primary health care*. World Health Organization.
4. Turgeon, M. L. (2005). *Clinical hematology: theory and procedures*. Lippincott Williams & Wilkins.
5. Tille, P. M. (2013). *Bailey & Scott's Diagnostic Microbiology-E-Book: Bailey & Scott's Diagnostic Microbiology-E-Book*. Elsevier Health Sciences.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6060
Course Title: Skill Development in Bio-Technology-II
(Practical)

COURSE OUTCOMES:

After successful completion of this practical course, learners will be able to:

CO1: Explain the principles of blood collection, peripheral blood smear preparation, and hematological investigations used in clinical diagnostics.
CO2: Perform hematological procedures using standard laboratory techniques.
CO3: Analyze clinical diagnostic reports for disease interpretation.
CO4: Evaluate biomedical waste segregation and disposal practices in accordance with Biomedical Waste Management Guidelines to ensure laboratory safety and infection control.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Course Code: BBTM-6060
Course Title: Skill Development in Bio-Technology-II
(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.

Experiment:

1. Collection of Blood Sample and Preparation of Peripheral Blood Smear.
2. Determination of bleeding time and clotting time
3. Determination of ESR and Packed Cell Volume (PCV).
4. Interpretation of Diagnostic Reports (CBC, X-ray, ECG, CT/MRI Images).
5. Segregation and Disposal of Biomedical Waste according to Biomedical Waste Management Guidelines.

Books Recommended:

1. Turgeon, M. L. (2005). *Clinical hematology: theory and procedures*. Lippincott Williams & Wilkins.
2. McPherson, R. A., & Pincus, M. R. (2021). *Henry's clinical diagnosis and management by laboratory methods E-book*. Elsevier Health Sciences.
3. Tille, P. M. (2013). *Bailey & Scott's Diagnostic Microbiology-E-Book: Bailey & Scott's Diagnostic Microbiology-E-Book*. Elsevier Health Sciences.
4. Cappuccino, J. G., & Welsh, C. T. (2020). Microbiology: A Laboratory Manual. Edn. 12th.
5. Naeem, M. (2026). *Clinical Scores: A Quick Reference Guide*. Cambridge Scholars Publishing.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Value Added Course
Course Code: VACH-6401
Course Title: Human Rights and Constitutional Duties

COURSE OUTCOMES:

After completion of Semester VI, the students will be able to understand the concept of Human Rights and Constitutional Duties, which will enable:

CO1: The students will learn about the basic characteristics and classification of Rights and Duties.

CO2: The students will inculcate the knowledge about the international framework of Human Rights in the context of Universal Declaration of Human Rights as well as the national initiatives.

CO3: This course will guide the students about the relationship between Human Rights and Constitutional Duties as well as the provisions under chapter III and IV of the Indian Constitution.

CO4: The students will also learn about the relationship between Human Rights and Psychology, Human Rights Education and Human Duties for Psychologists and Their Social Responsibility in the society.

This course outcome will help the students in their further higher education programs and competitive exams.

Bachelor of Science (Bio-Technology) Three Year Degree Programme
Bachelor of Science (Honours) Bio-Technology Four Year Degree Programme
Semester-VI
Session: 2026-27
Value Added Course
Course Code: VACH-6401
Course Title: Human Rights and Constitutional Duties

Examination Time: 1 Hrs. **Total Marks: 50**
L-T-P: 2-0-0 **Theory Marks: 35**
CA: 15

Instructions for the Examiner:
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 will carry seven marks.

Unit I
Introduction to Human Rights

Foundational Aspects: Meaning, Nature, Characteristic, Classification.
International Framework: Constituents of the Universal Declaration of Human Rights (UDHR).

Unit II

Constitutional Realisation in India: Fundamental Rights (Part III, Constitution of India).
Protective Mechanism in India: The composition, Powers and Functions of the National Human Rights Commission of India (NHRC).

Unit III
Introduction to Human Duties

Conceptual Perspective: Meaning, Nature & Characteristics of Human Duties.
Intellectual discourses: Classification of Human Duties; Relevance of Human Duties.

Unit IV

Constitutional Recognition in India: Fundamental Duties in Indian Constitution, Part IV A.
Human Rights Education: An Ethical Perspective

Recommended Books:

1. United Nations. The *United Nations and Human Rights 1945-1995*. Geneva: United Nations Blue Books Series, Vol. VII, 1996.

2. Sastry, S. N. *Introduction to Human Rights and Duties*. Pune: University of Pune Press, 2011.
3. Mertus, Julie. *The United Nations and Human Rights-A Guide for a New Era*. London: Routledge, 2009.
4. Donnelly, Jack. *Universal Human Rights in Theory and Practice*. New York: Cornell University Press, 2013.
5. Hammarberg, Thomas. *Taking Duties Seriously- Individual Duties in International Humanitarian Law*. Versoix: International Council on Human Policy, 1999.
6. Miller P. Frederic, *et al. Fundamental Rights, Directive Principles and Fundamental Duties in India*. New York: VDM Publishing, 2009.
7. Cinganelli, Davis Louis. *Human Rights- Theory and Measurements*. London: Macmillan Press, 1988.
8. Ishay, M. R. *The History of Human Rights*. New Delhi: Orient Longman, 2004.
9. Mohapatra, Arun Ray. *National Human Rights Commission of India: Formation, Functioning and Future Perspectives*. New Delhi: Atlantic, 2004.
10. Deol, Satnam Singh. *Human Rights in India-Theory and Practice*. New Delhi: Serials Publications, 2011.
11. Rubin, Neal S. and Flores, Roseanne L. (eds.), *The Cambridge Handbook of Psychology and Human Rights (Cambridge Handbooks in Psychology)*, Cambridge University Press, 2020.