

M. G. Science Institute, Ahmedabad

Autonomous | Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Biotechnology

Bachelor of Science (Hons.) in Biotechnology

B.S. (Hons.) Biotechnology

(Effective from Academic Year 2024-25)



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1.0 Preamble

Welcome to the Bachelor of Science (B.S) in Biotechnology program, an interdisciplinary field at the forefront of scientific innovation and technological advancement. This program is designed to provide students with a comprehensive understanding of the principles, applications, and ethical considerations of biotechnology, preparing them for dynamic careers in research, industry, healthcare, and beyond.

2.0 Definitions

Bachelor Degree

Bachelor Degree is designed to offer the undergoing students a broad foundation necessary for a science-based career with a special focus on multidisciplinary learning.

Bachelor Degree of Science (B.S)

Bachelor of science degree (B.S) aims at providing advanced and specialized theoretical and research skills in the chosen science subject, along with the overall knowledge in the sciences, to provide the students a strong platform for an advanced academic or professional career.

Choice Based Credit System

The Choice Based Credit System (CBCS) provides an opportunity for the students to choose courses from the prescribed courses comprising Core, minor, multi-disciplinary, or skill-based courses.

Credit

Credits means the value assigned to a course which indicates the level of instruction:

1 hour lecture per week equals 1 credit

2 hours practical per week equals 1 credit

Credit for a practical could be proposed as part of a course or as a separate practical course.

SGPA

SGPA means Semester Grade Point Average calculated for individual semesters.

CGPA

CGPA means Cumulative Grade Point Average calculated for all courses completed by the students at any point of time. CGPA is calculated for each year for both semesters clubbed together.

Course

A course is a specific subject in the academic programme taught in a particular semester for the specifically assigned number of credits.

Course Announcement

The college shall announce the elective courses it proposes to offer to the students out of the wider course basket. It is not mandatory to offer all the electives. The decision of the principal shall be final in this case. However, in the spirit of Choice Based Credit System, the college should offer choices to the students for the elective courses and not offer only the minimum number of electives.

Course Registration

It is mandatory for every student, to register every semester, for the elective courses opted for that semester. Each student, on admission shall be assigned to a Faculty Advisor who shall advise him/her about the academic programs and counsel on the choice of courses considering the student's profile, career goals and courses taken in the earlier semesters. With the advice and consent of the Faculty Advisor, the student shall register for a set of courses he/she plans to take up for the Semester. Students

shall have to register for the courses for the semester within first week of Semester I and immediately after conclusion of the preceding term for subsequent Semesters II, III, IV, V, VI, VII and VIII.

Course Outcomes

Course outcomes are the specific and measurable attributes defining the knowledge, skill and attitude of the learners are expected to demonstrate by the completion of the course.

Grading System

The Grading System is the 10-point standard scale system defined by the UGC comprising of the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

Graduate Attributes

The Graduate Attributes are the generic abilities, attitudes and approaches expected to be demonstrated by the learner in the world around him/her in a longer period of the life time.

Learning Outcomes

Learning outcomes describe the measurable skills, abilities, knowledge, or values that students should be able to demonstrate as a result of completing a course.

Outcome Based Education (OBE) Approach

OBE is the approach focusing on the performance outcome comprising of the following:

- The performer – the student (learner), not only the teacher.
- The performable (thus demonstrable or assessable) to perform
- The performance outcome, not the activity or task to be performed.

Outcome-Based Assessment

An assessment system that asks course teachers to first identify what it is that we expect students to be able to do once they have completed a course or program. It then asks course teachers to provide evidence that they are able to do so. In other words, how will each learning outcome be assessed? What **evidence of student learning** is most **relevant for each learning outcome** and **what standard or criteria** will be used to evaluate that evidence? Assessment is therefore a key part of outcome-based education and used to determine whether or not a qualification has been achieved.

Programme Educational Objectives

Programme Educational Objectives are a set of **broad future-focused student performance outcomes** that explicitly identify what students will be **able to do with what they have learned**, and what **they will be like** after they leave school and are **living full and productive lives**. Thus, PEOs are what the programme is preparing graduates for in their **career and professional life** (to attain within a **few years** after graduation).

Programme Outcomes

Programme Outcomes are a set of **narrow statements** that describe what learners of the programme are expected to know and be able to perform or attain by the time of graduation.

Programme Specific Outcomes

The PSOs are a set of narrow statements that describe what the learners of a particular specialization of the programme are expected to know and be able to perform or attain by the time of graduation. PSOs are also a function of the various course combinations offered by the college.

Semester

The Semester means the one half of the academic year comprising of the teaching days and examination & evaluation days as per the UGC/ University norms.

Teaching and Learning Activities

The set of **pedagogical tools and techniques** or the teaching and learning activities that aim to **help students to attain** the intended learning outcomes and engage them in these learning activities through the teaching process.

3.0 B.S. In Biotechnology Programme Focus

Programme Educational Objectives (PEOs)

- a) Built strong foundations in core areas of data science with a focus on Data Science and Analytics so that learners can contribute significantly in the area of data analytics, research and innovation.
- b) Develop professionals with high competency in recent tools and techniques related to Data Science and Analytics.
- c) Inculcate strong human values and social, interpersonal and leadership skills required for professional success in evolving global professional environments

Programme outcomes (POs)

- a) The B.S in Biotechnology program offers a rigorous curriculum that integrates foundational knowledge in biology, chemistry, mathematics, and engineering with specialized courses in biotechnology.
- b) Students will explore the diverse applications of biotechnology, including genetic engineering, medical biotechnology, agricultural biotechnology, environmental biotechnology, and industrial biotechnology.
- c) Through hands-on laboratory experiences, research projects, and industry internships, students will develop practical skills and critical thinking abilities essential for success in the field.

Graduate Attributes (GAs)

These attributes reflect the core competencies necessary for graduates to succeed in the field. The common graduate attributes for B.S. in Biotechnology courses are:

Technical Competence:

Proficiency in molecular biology, genetics, biochemistry, microbiology, and bioinformatics. Skilled in laboratory techniques including DNA manipulation, protein expression, and cell culture.

Critical Thinking and Problem Solving:

Analytical skills to address complex biological problems. Ability to evaluate scientific literature and propose innovative solutions.

Ethical Awareness:

Understanding of ethical implications in biotechnological research and applications. Commitment to responsible conduct in research and adherence to ethical principles.

Communication Skills:

Clear and persuasive communication of scientific findings to diverse audiences. Ability to engage in constructive dialogue on biotechnological issues.

Teamwork and Collaboration:

Collaborative skills to work effectively in multidisciplinary teams. Leadership abilities and contribution to group projects.

Professionalism:

Demonstration of professionalism, integrity, and adherence to ethical guidelines. Commitment to lifelong learning and staying updated with advancements in biotechnology.

Entrepreneurial Skills:

Understanding of business aspects including intellectual property rights and commercialization strategies. Ability to identify market opportunities and develop business plans.

Global Awareness:

Awareness of the global impact of biotechnology on society, environment, and health. Engagement in cross-cultural dialogue and collaboration.

4.0 B.S. In Biotechnology Programme Course Types and Evaluation Pattern

Sr. No.	Course Type	Credits	Nature	CCE Marks	ECE Marks	Total Marks
1	Major Course	4	Compulsory	50	50	100
2	Minor Course	4	Compulsory	50	50	100
3	Multidisciplinary Course	4	Elective	50	50	100
4	Skill Enhancement Course	2	Elective	25	25	50
5	Ability Enhancement Course	2	Elective	25	25	50
6	Indian Knowledge System/ Value Added Courses	2	Elective	25	25	50

Courses Types Definitions:

1. Major Course (BT-C)

Discipline-specific course core is a course that a student admitted to a particular programme must successfully complete receiving the degree and which cannot be substituted by any other course.

2. Minor Course (BT-M)

A discipline Specific Minor Course refers to a set of academic courses that form a focused and specialized area of study within a particular discipline. Students have the option to pursue a minor alongside their major allowing them to gain additional expertise in a specific subject.

3. Multidisciplinary Course (IDC)

A multidisciplinary course is a course chosen generally from a related discipline/subject, intending to seek exposure in the discipline relating to the core domain of the student.

4. Skill Enhancement Course

Skill Enhancement Course is designed to provide students with specific skills or knowledge in addition to their primary academic pursuits. The main purpose of the SEC is to provide students with practical skills, life skills, soft skills, hands-on training, etc. to increase their employability.

5. Ability Enhancement Course

The ability enhancement course is designed to improve students' communication, language, and personality development skills. The main purpose of the AEC is to introduce students to the theory,

fundamentals, and tools of communication and to develop in them vital communication skills that should be integral to personal, social, and professional interactions.

6. Indian Knowledge System

Indian Knowledge System refers to the rich and diverse heritage of knowledge, wisdom, and traditions that have evolved over millennia within the Indian subcontinent.

5.0 B.S. Programme Structure

B.S. in Biotechnology is a four-year programme divided into eight semesters. A student is required to complete 176 credits for the completion of the programme and the award of B.S in Biotechnology degree. The B.S. in Biotechnology programme is aligned with the NEP-2020 structure as given in below Table.

Courses	No. of Papers	Credits Each	Total Credits
1. DSC-Major	22	4	88
2. DSC-Minor	8	4	32
3. IDC-Multi	3	4	12
4. AEC	5	2	10
5. SEC	5	2	10
Internship	1	4	4
6. IKS/VAC	4	2	8
OJT/RP	2	6	12
		Total	176

Details of Programme

Year	Semester	Course Type (Credits)						
		Major-1 (4)	Major-2 (4)	Minor-1 (4)	MDC-1 (4)	AEC-1 (2)	SEC-1 (2)	IKS-1 (2)
1 st Year	Sem-I	Major-3 (4)	Major-4 (4)	Minor-2 (4)	MDC-2 (4)	AEC-2 (2)	SEC-2 (2)	VAC-1 (2)
	Sem-II	Major-5 (4)	Major-6 (4)	Major-7 (4)	MDC-3 (4)	AEC-3 (2)	SEC-3 (2)	IKS-2 (2)
2 nd Year	Sem-III	Major-8 (4)	Major-9 (4)	Major-10 (4)	Minor-3 (4)	AEC-4 (2)	SEC-4 (2)	VAC-2 (2)
	Sem-IV	Major-11 (4)	Major-12 (4)	Major-13 (4)	Minor-4 (4)	Minor-5 (4)	SEC-5 (2)	-
3 rd Year	Sem-V	Major-14 (4)	Major-15 (4)	Major-16 (4)	Minor-6 (4)	AEC-5 (2)	Internship (4)	-
	Sem-VI	Major-17 (4)	Major-18 (4)	Major-19 (4)	Minor-7 (4)	-	OJT/RP-1 (6)	-
4 th Year	Sem-VII	Major-20 (4)	Major-21 (4)	Major-22 (4)	Minor-8 (4)	-	OJT/RP-2 (6)	-
	Sem-VIII							

6.0 Multiple Entry-Exit Option

The B.S. in Biotechnology programme is fully compliant with the Curriculum and Credit Framework for Undergraduate Programmes issued by the UGC. Accordingly, the programme provides the exit option to the learners at the end of the first year with UG Certificate awarded, at the end of the second year with UG Diploma awarded, at the end of the third year with UG Degree awarded and at the end of the fourth year with UG Honors Degree awarded. The learners choosing to exit the programme at the end of the first year or at the end of the second year will be allowed to, subject to successful completion of the relevant

portion of the curriculum, shall be allowed to re-enter within a period of three years and complete the degree programme within a period of maximum seven years from the year of the first admission. All the other details are as provided in Sec.3.2.3 of the Curriculum and Credit Framework for Undergraduate Programmes issued by the UGC in December 2022.

7.0 Internship Project

Every learner must undergo and complete the internships/apprenticeships in a firm/ industry/organization or training in labs with faculty or researchers in their own or other college/institute/research institution during the summer term. Completion of the Summer Internship shall be mandatory for every learner choosing to exit at the end of the first year with a UG Certificate or at the end of the second year with a UG Diploma. The Internship Project shall carry the weightage of 4 credits. Since the internship is categorized as Practice, every learner will have to actually produce the work for 120 hours during the internship.

Evaluation of the Internship Project:

It is mandatory for the student to seek advance written approval from the faculty guide and the HOD for the internship and organization before commencing the internship.

- a. It is mandatory for the student to seek advance written approval from the faculty guide and the Director of the Institute about the topic and organization before commencing the SIP.
- b. Students shall also seek a formal evaluation of their Internship Project from the external guide. The formal evaluation by the external guide shall be done for 50 marks and comment on the nature and quantum of work undertaken by the student, the effectiveness and overall professionalism. The learning outcomes of the Internship Project and utility of the project to the host organization must be specifically highlighted in the formal evaluation by the external guide. The Internship Project evaluation sheet duly signed and stamped by the external guide shall be included in the final Internship report.
- c. The completion of the SIP shall be certified by the respective Faculty Guide & approved by the Director of the Institute.
- d. The college level evaluation shall be for 50 marks through the Viva-Voce conducted by the faculty guide and HOD of the respective department.
- e. Copies of SIP report and records of evaluation shall be maintained by the college for a period of 5 academic years.

8.0 Comprehensive Internal Evaluation (CIE)/Comprehensive Concurrent Evaluation (CCE)

1. The course teacher shall prepare the scheme of Comprehensive Concurrent Evaluation (Formative Assessment) before commencement of the term. The scheme of Comprehensive Concurrent Evaluation shall explicitly state the linkages of each CCE with the Course Outcomes and define the targeted attainment levels for each CO.
2. The Head of the Department shall approve the scheme of Comprehensive Concurrent Evaluation with or without modifications.
3. The course teacher shall display, on the notice board/ ERP, the approved CCE scheme of the course and the same shall also be hosted on the website, not later than the first week of the term.
4. Each CCE item shall be of minimum 25 marks.
5. For a 4 Credit Course there shall be a MINIMUM of three CCE items. The final scores shall be converted to 50, using an average or best two out of three formulae.

6. For 2 Credit Course there shall be a MINIMUM of two CCE items. The final scores shall be converted to 50.
7. CCE shall be spread through the duration of course and shall be conceptualized, executed, assessed and documented by the course teacher along with student-wise and class-wise attainment levels of the COs and the attainment levels of the course.
8. The assessment outcome of each CCE shall be duly signed by the course teacher & the programme coordinator / HOD of the college.
9. A copy of the duly signed CCE outcome shall be displayed on the notice boards/ ERP, within a week of the assessment and course teachers shall guide the students on a need basis.
10. The college may conduct additional make up / remedial CCE items at its discretion.
11. At the end of the term aggregate CCE scores/grades shall be calculated and the CO attainment levels shall be calculated by the course teacher. The same shall be displayed on the notice board/ ERP.
12. Records of CCE shall be retained for 5 years from the completion of the Academic Year. i.e. Current Academic Year (CAY) + 4 years.

The comprehensive internal evaluation shall be conducted by the college once a semester. The maximum marks for 4 credit courses shall be 50 and for 2 credit courses shall be 25 marks.

9.0 End-Semester Evaluation

1. The End Semester Evaluation (Summative Evaluation) for all the courses shall be conducted by the Examination Department/Committee of the college headed by a full-time regular faculty member nominated by the Principal as Controller of the Examination.
2. The ESE for each course shall have the weightage as follows:
 - For a 4 Credit Course: 50 marks
 - For a 2 Credit Course: 25 marks
3. The ESE for each course shall have 5 questions each of 10 marks. In case of 2 Credit courses the aggregate marks out of 50 shall be converted to the level proportionate to 25 marks.
4. All questions shall be compulsory with internal choice within the questions.
5. The broad structure of the ESE question paper shall be as follows:

Question Number	COGNITIVE ABILITIES EVALUATED	Nature
Q.1	REMEMBERING	Answer any 5 out of 8 (2 marks each)
Q.2	UNDERSTANDING	Answer any 2 out of 3 (5 marks each)
Q.3	APPLYING	Answer 3 (a) or 3 (b) (10 marks)
Q.4	ANALYSING	Answer 4 (a) or 4 (b) (10 marks)
Q.5	EVALUATING	Answer 5 (a) or 5 (b) (10 marks)
	CREATING	

10.0 Passing Standard

A learner shall be said to have earned the credits for a course if he/she earns minimum 36% marks. Formative Evaluation and Summative Evaluation shall be separate head of passing.

Grading System

The Indirect and Absolute Grading System shall be used, i.e. the assessment of individual Courses in the concerned examinations will be on the basis of marks. However, the marks shall later be converted into

Grades by a defined mechanism wherein the overall performance of the learners can be reflected after considering the Credit Points for any given course. The overall evaluation shall be designated in terms of Grade. The 10-point standard scale mandated by UGC shall be used.

The performance of a student will be evaluated in terms of two indices, viz.

- Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester
- Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point in time

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

Grade Point (Gi) (10 points scale) = Marks of each paper out of 100 / 10

Marks out of 100	Grade Point Range (Gi)	Letter Grade	Classification
96.0-100	10	O	Outstanding
86.0-95.9	9	A+	Excellent
76.0-85.9	8	A	Very Good
66.0-75.9	7	B+	Good
56.0-65.9	6	B	Above Average
46.0-55.9	5	C	Average
36.0-45.9	4	P	Pass
Below 36.0	0	F	Fail
Absent	0	Ab	Absent

The Semester Grade Point Average (SGPA) is the ratio of the sum of the product of the number of credits with the grade point scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA (S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

The cumulative grade point average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that i^{th} semester.

The SGPA and CGPA shall be rounded off to 2 decimal points.

Scaling Down of the CIE Score

The marks obtained by the student for the CCE shall be scaled down, to the required extent, if percentage of the marks of CCE exceeds the percentage of marks scored in the ESE (End Semester University Examination) by 25% for the respective course.

Degree Requirements

The degree requirements for the B.S. in Biotechnology programme are completion of minimum 136 credits and 180 credits in case of Honours degree.

Maximum Duration for Completion of the Programme

The program of the study is four years of eight semesters. A candidate shall complete his/her degree within **seven (7)** academic years from the date of his/her admission to the first semester.

Grade Improvement

There shall be a provision for candidates to reappear for the examination for the concerned course of theory papers only (subject) in which the candidate wishes for improvement of his/ her grade point of SGPA in general and CGPA in a total of the program subject to the condition that:

- a) The candidate shall be eligible to reappear for improvement of grade points only after successfully passing the program.
- b) The candidate may opt for the examination for any number of courses (subject/paper) of the programme for improvement of grade points but not more than three times for each course (subject/paper) as per the prevailing syllabus of the examination conducted in the regular schedule of University examinations.
- c) All such provisions are there within 04 years from successful completion of the programme, but not exceeding the period of 08 years of the duration of completion of the programme.
- d) In all such cases grade points are considered if there is a progress in such improvements, otherwise, original grade points shall be retained.
- e) No such candidates shall be eligible for the award of Rank, Gold Medal, Cash Prize, etc.
- f) The validity of credits earned will be for a maximum period of seven years or as specified by the Academic Bank of Credits (ABC).

11.0 Attendance

The student must meet the requirement of 75% attendance per semester per course for grant of the term. The college may condone the shortage in attendance in exceptional circumstances, up to a maximum of 10%. The college shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled.

12.0 Medium of Instruction

The medium of instruction and evaluation shall be English.

13.0 Detailed Course List (Annexure-1)

Detailed course list is available in Annexure-1

14.0 Detailed Syllabus for Each Course (Annexure-2)

Detailed syllabus for each course is available in Annexure-2

Annexure 1 Detailed Course List for B.S. Biotechnology

Detailed Course List for B.S. in Biotechnology

Year	Sem	Course Type	Course Code	Course Title	Credits		Total
					T	P	
1	Sem-I	BT-Core	BT-111	Introduction of Biotechnology	4	0	4
		BT-Core	BT-112	Practical	0	4	4
		BT-M	MIC-113	History & Development of Microbiology	2	2	4
		IDC/Multi	CHE-114	Chemical Bases of Life	2	2	4
		AEC	AEC-115	Communicative English-I	2	-	2
		SEC	SEC-116	Fundamentals & Concept of Biotechnology	1	1	2
		VAC/IKS	IKS-117	Ethics and Human Values	2	-	2
	Sem-II	BT-Core	BT-121	Cell Biology	4	0	4
		BT-Core	BT-122	Practical	0	4	4
		BT-M	MIC-123	Cultivation & Isolation of Bacteria	2	2	4
		IDC/Multi	CHE-124	Chemistry in Physical science	2	2	4
		AEC	AEC-125	Communicative English-II	2	-	2
		SEC	SEC-126	Biotechnology skills & Analytical Techniques	1	1	2
		VAC/IKS	IKS-127	Introduction to Science and Technology	2	-	2

Exit Option: Students exiting the programme after securing **44** credits will be awarded an **Advanced UG Certificate in Biotechnology** provided they secure **4** credits in work-based vocational courses offered by the institute during the summer term.

Annexure 2 Detailed Syllabus for BS Biotechnology Sem I and Sem II

Detailed Syllabus for Sem-I and Sem-II

PROGRAMME OUTCOMES (POs)

- **PO1** Understand the concepts of Biotechnology and demonstrate interdisciplinary skills acquired.
- **PO2** Demonstrate the laboratory skills in Cell Biology, Biochemistry, Microbiology, and Environmental Biotechnology with an emphasis on technological aspects.
- **PO3** Acquire knowledge and apply good laboratory and good manufacturing practices in Biotech industries.
- **PO4** Demonstrate communication skills, scientific writing, and data collection and interpretation abilities through Biotechnology experiments in laboratory.
- **PO5** Instilling knowledge and awareness on professional ethics, bioethical and health issues, intellectual property rights and life-long learning through career- oriented courses such as IPR, biosafety and bioethics.

PROGRAMME SPECIFIC OUTCOME (PSOs)

At the end of the B.S. program in Biotechnology, the students will be able to:

- **PSO1** Show academic competence by understanding the basic concepts of major areas of Biotechnology and diverse phenomena observed in nature and in daily life.
- **PSO2** Gain thorough knowledge and develop interdisciplinary skills by detailed study on applications of Biotechnology in various fields for the benefit of society.
- **PSO3** Exhibit Personal and professional competence by applying appropriate tools and techniques in biotechnology, to design and perform experiments proficiently by end of the programme and become competent to pursue higher studies or join the industry sector after completion of B.S.
- **PSO4** Develop Research competence by acquiring ability to identify, formulate, analyze and solve scientific problems during practical sessions and learn to carry out experiments in areas of biotechnology such as Plant tissue culture biotechnology, Animal biotechnology, Enzyme Technology and Bioinformatics.
- **PSO5** Develop Entrepreneurial attitude by viewing biotechnology as a tool to develop mind and critical attitude and logical reasoning that is prepared to serve in diverse field.

BTM111 (T): Introduction to Biotechnology and Molecules of Life

Semester: I	Course Title: Introduction to Biotechnology and Molecules of Life	Credit: 4
Course Code: BTM111 (T)		4 hours/week

COURSE OUTCOMES (COS)

By the end of the course student should be able to:

- **CO1** Understand the potential for vertical career growth in biotech-oriented industries, service sectors and related avenues and study of basis of life

- **CO2** Be cognizant about structure, functions, and significance of amino acids and proteins
- **CO3** Interpret the diversified structure and functions of Carbohydrates
- **CO4** Differentiate the different classes and forms of lipids

Unit 1: Introduction to Biotechnology and Basis of Life**Teaching Hours: 10**

- Historical development, major areas/divisions of biotechnology, application and scope of Biotechnology
- Nucleic Acids: Nucleoside and Nucleotides, Nitrogen bases (purines and pyrimidines),
- Structure and Function of Nucleic Acid
- Types of Nucleic Acid (A-DNA, B-DNA, Z- DNA)
- Structure and Function of RNA (mRNA, rRNA, tRNA)

Unit 2: Amino Acids and Proteins**Teaching Hours: 10**

- Properties of amino acids (Stereoisomerism, zwitterion)
- Biological importance of amino acids
- Classification of amino acids based on "R" group
- Structure and organization of Proteins- Primary, Secondary (alpha helix-eggalbumin, beta sheet-keratin, triple helix-collagen, Tertiary (myoglobin) and Quaternary (haemoglobin)
- Biological functions of proteins

Unit 3: Carbohydrates**Teaching Hours: 10**

- Physical properties of Carbohydrates (Optical rotation),
- Chemical Properties of Carbohydrates (reducing and nonreducing, aldose and ketose)
- Classification, Structures and Functions of Monosaccharides (glucose, fructose, galactose, ribose, deoxy ribose)
- Classification, Structures and Functions of Disaccharides (lactose, sucrose, maltose)
- Classification, Structures and Functions of Polysaccharides (starch, glycogen, cellulose)

Unit 4: Lipids**Teaching Hours: 10**

- Properties of lipids and biological function of Lipids
- Classification of lipids (Simple, derived and complex)
- Saturated and Unsaturated Fatty Acids (MUFA, PUFA)
- Structures and Functions of - Triacylglycerols, Phospholipids, Glycolipids, Lipoproteins, Steroids (Cholesterol)

REFERENCES

No.	Name	Author
1.	Biochemistry	Berg JM, and Tymoczko TJ Stryer L

2.	A textbook of Biochemistry	Rama Rao AV
3.	Biochemistry	Donald Voet and Voet J
4.	Lehninger's Principles of Biochemistry	Nelson DL and Cox MM
5.	Fundamentals of Biochemistry	Deb AC
6.	"Biochemistry", Fifth edition, W.H. Freeman and Company, New York, 2002	Jeremy M. Berg, John L. Tymozko and Lubert Stryer
7.	"Harper's Illustrated Biochemistry". McGraw Hill Education (Asia), 2006	Robert K. Murray, Daryl K. Granner and Victor W. Rodwell

BTM112 (P): PRACTICALS

Semester: I	Course Title: Introduction to Biotechnology and Molecules of Life (P)	Credit: 4
Course Code: BTM112 (P)		8 hours/week

1. Introduction to Biotechnology Lab and basic equipments used in it.
2. General practice and maintenance of a Biotechnology laboratory.
3. Basic calculations- Normality, Molarity, Molality percent solutions (v/v, w/v).
4. Calibration of pH meter.
5. Preparation of standard solutions: Normal, Molar and Percent (w/v and v/v) solutions.
6. Introduction to Qualitative analysis of Carbohydrates.
7. Qualitative test of Monosaccharide –Glucose.
8. Qualitative test of Monosaccharide –Fructose.
9. Qualitative test of Disaccharide –Maltose.
10. Qualitative test of Disaccharide –Lactose.
11. Qualitative test of Disaccharide –Sucrose.
12. Precipitation and denaturation test of Proteins.

MIE113 (T): [Microbiology Saga: Discovery and Introduction](#)

Semester: I	Course Title: Microbiology Saga: Discovery and Introduction	Credit: 2
Course Code: MIE113 (T)		Hours: 2/week

See the file: MIE113 T+P.pdf

MIE113 (P): [Microbiology Saga: Discovery and Introduction](#)

Semester: I	Course Title: Microbiology Saga: Discovery and Introduction	Credit: 2
Course Code: MIE113 (P)		Hours: 4/week

See the file: MIE113 T+P.pdf

CHMDC114 (T): [Biomolecules](#)

Semester: I	Course Title: Biomolecules	Credit: 2
Course Code: CHMDC114 (T)		Hours: 2/week

See the file: CHMDC114 T+P.pdf

CHMDC114 (P): [Biomolecules](#)

Semester: I	Course Title: Biomolecules	Credit: 2
Course Code: CHMDC114 (P)		Hours: 4/week

See the file: CHMDC114 T+P.pdf

AEC115 [Language Through Literature-I](#)

Semester: I	Course Title: Language Through Literature-I	Credit: 2
Course Code: AEC115		Hours: 2/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	
CO 2	UNDERSTANDING	Students will develop an appreciation for diverse literary forms, demonstrating an ability to analyze and interpret stories and poems in English.
CO 3	APPLYING	Students will exhibit improved grammatical competence, applying correct grammar and syntax in written and spoken communication.
CO 4	ANALYSING	Students will acquire the ability to understand and critically evaluate scientific articles, research papers, and lab reports, demonstrating improved scientific literacy.
CO 5	EVALUATING	Students will showcase overall language proficiency, enabling effective communication in various contexts.
CO 6	CREATING	

Unit	Content	Teaching Hours
I	Text: <i>Sparkles</i> (Macmillan Publication) Section – I	10
II	Text: <i>Sparkles</i> (Macmillan Publication) Section – II	10
III	Grammar A) BE, HAVE and DO as Lexical Verbs B) Tenses: <ul style="list-style-type: none"> • Simple Present Tense • Simple Past Tense • Simple Future Tense • Present Continuous Tense • Past Continuous Tense • Present Perfect Tense • Past Perfect Tense • Present Perfect Continuous Tense 	5
IV	A) Comprehension of Scientific articles, scientific texts <ul style="list-style-type: none"> • The passage should be of 200-300 words. • The questions should measure the student's ability to comprehend the main ideas, relevant facts and arguments, and the logical relationship between various ideas and facts presented in the passage. • A total of four questions will be asked from the passage. B) Vocabulary(Textual Glossary)	5
V	PRACTICAL Speaking: To enable the students to <ul style="list-style-type: none"> • Greeting and formulae of everyday conversation • Introduce themselves • Making a request, saying no politely 	10

References Books:

- *Oxford Practice Grammar (Advanced)* - George Yule – OUP.
- *Advanced Grammar in Use* - Martin Hewings - Cambridge University Press.
- *English Grammar for Students* - Anne Seaton and Y H Mew - Learner's Publishing.
- *A Practical English Grammar* - A J Thomson and A V Martinet – OUP.
- *Better English* - Betty Kirkpatrick - Geddes and Grosset.
- *Contemporary English Grammar Structures and Composition* – David Green - Trinity Press.

BTSEC116 (A): Fundamentals of Computers in Biotechnology

Semester: I	Course Title: Fundamentals of Computers in Biotechnology	Credit: 2
Course Code: BTSEC116 (A)		Hours: 2/week

Course Objectives:

1. Introduction of computers to biology students.
2. Create spreadsheets, charts and presentations.
3. Understanding basic tools used in handling of data
4. Acquire knowledge on primary biological database storage and retrieval

Course Outcomes:

On the completion of the course students will be able to:

1. Know the fundamental terms associated with computers and basics of primary Biological databases.
2. Know different types of MS office applications and their use in Biology.
3. Understand the basic uses and applications of computer in handling Biological data.

Assessment Methods:

- Class participation and engagement
- Quizzes and exams
- Written assignments, such as research papers or case studies
- Group projects or presentations
- Final exam or project

Unit 1: Fundamentals of Computing and Biological Data Management

- Introduction to Computers: Definition of Hardware and software
- Computer Hardware: Input devices, Output devices, Central Processing Unit (CPU), Storage devices
- Computer software: System software (Operating systems: Windows and Linux), basics of Application Software
- Biological data: Primary Biological database storage and retrieval (e.g. NCBI)
- Presentation of Biological data using various approaches (Scientific Papers, Presentations and Posters)

UNIT 2: Use of Word Processing and Spreadsheets in Biotechnology

- Introduction to different word processing software
- Exploration of features in Word processing software
- Concept of document building and types of documents in Biotechnology.
- Applications in Biotechnology: Review of Literature and preparation of research report of any disease.
- Introduction to the use of Electronic Spread Sheet
- Formulas and Function- Using basic Formulas (Autofill, AutoSum functions and absolute reference)
- Charts and Tables of biological data- Tables, Column Chart, Line Chart, Pie Chart (Create data sheet containing 50 patients visiting hospital (blood pressure, heart beat, weight, height, haemoglobin levels, sex, age and disease). Draw relevant chart and analyse the data).

REFERENCE

No.	Name	Author
1.	World wide web Design with HTML(First Edition-2010)	Tata McGraw Hill By C Xavier
2.	Web Enabled commercial application development using HTML, Javascript, DHTML and php	Ivan Bayross
3.	The Complete Reference HTML and CSS (Fifth Edition)	Thomas A Powell
	https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0717-34582004000300001	

WEB SOURCES

1. <http://www.tutorialspoint.com/ht...>
2. <https://www.udemy.com/learn-html...>
3. HTML 5 Cheat Sheet (PDF) - Smashing Magazine
4. <http://html5please.com/>

BTSEC116 (B): Overview on thrust areas of Biotechnology

Semester: I	Course Title: Overview on thrust areas of Biotechnology	Credit: 2
Course Code: BTSEC116 (B)		Hours: 2/week

Course Objectives:

- To educate students about the diverse applications of biotechnology in healthcare, agriculture, environment, and industry.
- To deepen understanding of various techniques and technologies used in biotechnology.
- To instill an awareness of the ethical, legal, and societal implications related to the field of biotechnology.
- To equip students with the ability to apply biotechnological knowledge in problem-solving and decision-making within real-world scenarios.

Course Outcomes:

- Comprehend the varied applications and impacts of biotechnology across multiple domains.
- Evaluate different biotechnological techniques and applications.
- Understand the ethical, societal, and legal facets of biotechnology.
- Apply biotechnology concepts to real-world scenarios and problem-solving.

Unit 1: Biotechnological Techniques and Applications

- Red Segment: Overview of health, medical, and diagnostics in biotechnology
- Yellow Segment: Food Biotechnology and Nutrition Science
- Blue Segment: Aquaculture, Coastal and Marine Biotech

- Green Segment: Agricultural, Environmental Biotechnology
- Brown Segment: Arid Zone and Desert Biotechnology
- Grey Segment: Classical Fermentation and Bioprocess Technology

Unit 2: Ethical, Legal, and Societal Implications of Biotechnology

- Dark Segment: Bioterrorism, Biowarfare, Biocrimes, Anticrop warfare
- Purple Segment: Overview on Patents, Publications, Inventions, Intellectual Property Rights (IPRs)
- White Segment: Concepts on Gene-based Bioindustries
- Gold Segment: Bioinformatics and Nanobiotechnology

REFERENCE

No.	Name	Author
1.	The Colours of Biotechnology: Science, Development and Humankind https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0717-34582004000300001	Edgar J. DaSilva
2.	Basic Biotechnology (Cambridge University Press) ISBN: 9780511802409	Colin Ratledge
3.	Biotechnology and Society (The University of Chicago Press)	Hallam Stevens

IKS117 Indian Knowledge Systems

Semester: I	Course Title: Indian Knowledge Systems	Credit: 2
Course Code: IKS117		Hours: 2/week

Unit	Topic	Teaching Hours
I	Introduction to IKS <ul style="list-style-type: none"> ○ Introduction to IKS & Its importance <ul style="list-style-type: none"> ▪ Introduction & importance of IKS ▪ Various IKS Systems ○ Shashtra – Foundational Literature of Bharatvarsha <ul style="list-style-type: none"> ▪ What is Shashtra? ▪ Importance of Shashtra ▪ Classification of Shashtra – Vaidic & Avidic (with examples of imp. Literature) ○ Base of IKS proliferation <ul style="list-style-type: none"> ▪ Bhartiya Education System and its philosophy ▪ History of BES from Ancient to Modern ▪ Domains of Education: Gurukul, Pathshala, Vidyalay, Vishva vidyalay 	15

II	<p>Contribution of IKS to the World</p> <ul style="list-style-type: none"> ▪ Mathematics & Astronomy ▪ Number System ▪ Algebra & Arithmetic ▪ Geometry ○ Life sciences <ul style="list-style-type: none"> ▪ Physics ▪ Chemistry ▪ Botany ○ Town planning & Temple Architecture <ul style="list-style-type: none"> ▪ Indigenous tools & technologies for town planning & Temple Architecture ▪ Science of Architecture ▪ Lothal, MohanJoDaro, Dholavira ○ Angkorvat, Lepakshi Temple, Jagannath Puri Temple, Thanjavur Temple, Modhera and Konark Sun Temple, Hampi Temple Etc. ○ Ayurveda <ul style="list-style-type: none"> ▪ Introduction of Ayurveda- Definition, Branches of Ayurveda, Books and Pioneers ▪ Concept of Tri Dosh and the importance of its Balance in the body ▪ Indic Medical Science Achievement: Tools & Technology ○ Art & Traditions <ul style="list-style-type: none"> ▪ History and Origin ▪ Skill Enhancement with 64 Kala ▪ Science behind our traditions and rituals 	15
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Reference Books:

- Introduction to Indian Knowledge System-Concept and Application by B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavan R.N.
- R.M.Pujari, Pradeep Kolhe, N.R. Kumar, 'Pride of India: A Glimpse into India's Scientific Heritage', Samskrita Bharati Publication.
- 'Indian Contribution to science', compiled by Vijnana Bharati.
- 'Knowledge Traditions and Practices of India', Kapil Kapoor, Michel Danino, CBSE, India.
- Dr. Subhash Kak, Computation in Ancient India, Mount, Meru Publishing (2016)
- Dharampal, Indian Science and Technology in the Eighteenth Century, Academy of Gandhian Studies, Hyderabad, 1971, republ. Other India Bookstore, Goa, 2000
- Robert Kanigel, The Man Who Knew Infinity: A Life of the Genius Ramanujan, Abacus, London, 1999
- Alok Kumar, Sciences of the Ancient Hindus: Unlocking Nature in the Pursuit of Salvation, CreateSpace Independent Publishing, 2014
- B.V. Subbarayappa, Science in India: A Historical Perspective, Rupa, New Delhi, 2013
- S. Balachandra Rao, Indian Mathematics and Astronomy: Some Landmarks, Jnana Deep Publications, Bangalore, 3rd ed., 2004.

BTM121 (T): Cell Biology

Semester: II	Course Title: Cell Biology	Credit: 4
Course Code: BTM121 (T)		4 hours/week

COURSE OUTCOMES (COs)

The students should be able to know:

- **CO1** Cell as a structural and functional unit of life, cellular composition, and different life forms viz. prokaryotes, eukaryotes, and archaea.
- **CO2** Comparing the cellular morphologies and, structure and functions of cell wall and cell membrane.
- **CO3** The structure and chemistry of cell and its sub-cellular components.
- **CO4** Cellular processes linked to its growth, division, metabolism, and expression of traits.

Unit 1: Introduction to Cell biology**Teaching Hours: 10**

- Overview on Origin of life and Last Universal ancestor
- History of Cell biology, Cell as basic unit of life, Cell theory, Protoplasm theory
- Evolution of Prokaryotic and Eukaryotic cell (Endosymbiont theory)
- Broad classification of cell types: Bacteria, Archaea (prokaryotic) and eukaryotic cells and their similarities and differences.

Unit 2: Cell wall and Cell membrane**Teaching Hours: 10**

- Structure and functions of cell wall: Bacterial cell wall, Plant cell wall and Fungal cell wall.
- Structure and functions of plasma membrane: Fluid mosaic model, exocytosis, endocytosis, phagocytosis – vesicles and their importance in transport.
- Cytoskeleton structure and function – microtubules, microfilaments and intermediate filament.

Unit 3: Structure, composition, and functions of cell organelles**Teaching Hours: 10**

- Structure and function of Nucleus and nuclear transport by NPC
- Mitochondria as powerhouse of cell,
- Structure and function of Chloroplast,
- Types, structure and functions of Endoplasmic reticulum,
- Golgi apparatus and vesicular transport,
- Function and types of Ribosomes as exceptional organelle
- Lysosomes and Peroxisomes

Unit 4: Cell division**Teaching Hours: 10**

- Phases of Mitosis and Meiosis & its Significance
- Cell cycle phases, checkpoints and regulation

- Tumor: types, molecular basis, and developmental stages
- Types of Cell death: Apoptosis and Necrosis
- Cell senescence: Theories and significance

REFERENCE

No.	Name	Author
1.	Becker's World of the Cell. 9 th Edn (Global Edition). Pearson Education Ltd.	Hardin J. and Bertoni G. (2017)
2.	Karp's Cell and Molecular Biology – Concepts and Experiments. 8 th Edn. John Wiley and Sons	Karp G., Iwasa J. and Masall W. (2015)
3.	The Cell – A Molecular Approach, 8 th Edn., Sinauer Associates Inc., Oxford University Press	Cooper G.M. (2019)
4.	Campbell Biology in Focus. Pearson Education	Urry L.A. Cain M.L., Wasserman S.A., Minorsky P.V., Jackson R.B. and Reece J.B. (2014)
5.	Essential Cell Biology. W.W. Norton & Company	Albert B., Hopkin K., Johnson A.D., Morgan D., Raff M., Roberts K. and Walter P. (2018)
6.	Raven and Johnson's Biology. 9 th Edn. Mc Graw Hill publications	Mason K.A., Losos J.B. and Singer S.R. (2011)
7.	Molecular biology of cell, 6 th edn., Garland Science, Taylor and Francis	Alberts B., Johnson B., Lewis J., Morgan D., Raff M., Roberts K. and Walter P. (2015)
8.	The Cell: A visual tour of the building block of life, The University of Chicago Press and Ivy Press Ltd.	Challoner J. (2015)
9.	Cell and Molecular Biology, 4 th edition, Rastogi Publications	Gupta, P. K. (2015)
10.	Cell and Molecular Biology. John Wiley and Sons	Sheeler P., Bianchi D.E.
11.	Cell and Molecular Biology	De Roberties

BTM122 (P): PRACTICALS

Semester: II	Course Title: Cell Biology	Credit: 4
Course Code: BTM122 (P)		8 hours/week

- 1) Demonstration of advance laboratory instruments (UV-Vis Spectrophotometer, Centrifuge, Electrophoretic apparatus, and PCR).
- 2) Sterilization techniques and aseptic handling of microbial cultures.
- 3) Monochrome staining of yeast.
- 4) Study of bacteria using differential staining method (Gram staining).
- 5) Differential staining of Nucleus from human WBCs.
- 6) Study of different phases of Mitosis using Onion root tip.
- 7) Observation of cell motility using hanging drop method.
- 8) Microscopic observation of wet mount preparation from Fungi.
- 9) Estimation of total sugar using Cole's method.
- 10) Estimation of protein using Biuret method.

MIE123 (T): Foundation and fundamentals of Bacteriology

Semester: II	Course Title: Foundation and fundamentals of Bacteriology	Credit: 2
Course Code: MIE123 (T)		2 hours/week

See the file: MIE123 T + E.pdf

MIE123 (P): Practical Component

Semester: II	Course Title: Foundation and fundamentals of Bacteriology	Credit: 2
Course Code: MIE123 (P)		4 hours/week

See the file: MIE123 T + E.pdf

CHMDC124 (T): Industrial Chemistry

Semester: II	Course Title: Industrial Chemistry	Credit: 2
Course Code: CHMDC124 (T)		Hours: 2/week

See the file: MIE123 T + E.pdf

CHMDC124 (P): Chemistry Lab-III

Semester: II	Course Title: Chemistry Lab-III	Credit: 2
Course Code: CHMDC124 (P)		Hours: 4/week

See the file: MIE123 T + E.pdf

AEC125 Language Through Literature-II

Semester: II	Course Title: Language Through Literature-II	Credit: 2
Course Code: AEC125		Hours: 2/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	
CO 2	UNDERSTANDING	Students will demonstrate an increased interest in reading stories and poems in English, developing a habit of literary exploration.
CO 3	APPLYING	Students will exhibit proficiency in identifying and using different sentence types, articles, and question tags in written and spoken English
CO 4	ANALYSING	Students will apply learned grammatical concepts effectively in communication, showcasing improved language precision
CO 5	EVALUATING	Students will be adept at constructing grammatically correct sentences in English, and understanding and implementing English syntax principles.
CO 6	CREATING	Students will demonstrate the ability to choose and use appropriate words and expressions in various contexts, enhancing their communication skills in English

Unit	Content	Teaching Hours
I	Text: <i>Sparkles</i> (Macmillan Publication) Section – III	10
II	Text: <i>Sparkles</i> (Macmillan Publication) Section– IV	10
III	Grammar A) Articles B) Types of Sentences <ul style="list-style-type: none"> • Question Tags 	10
IV	Practical A) Jumbled Sentences B) Cloze Test <ul style="list-style-type: none"> • The passage for the Cloze Test will contain a total of four blanks (one mark each) and for each blank three options will be given. Describing scientific processes/ experiments	10

References Books:

- Oxford Practice Grammar (Advanced) - George Yule – OUP.
- Advanced Grammar in Use - Martin Hewings - Cambridge University Press.
- English Grammar for Students - Anne Seaton and Y H Mew - Learner's Publishing.

- A Practical English Grammar - A J Thomson and A V Martinet – OUP.
- Better English - Betty Kirkpatrick - Geddes and Grosset.
- Contemporary English Grammar Structures and Composition – David Green - Trinity Press.

BTSEC126 (A) - Biotechnological Skills and Analytical Techniques

Semester: II	Course Title: Biotechnology Skills & Analytical Techniques	Credit: 2
Course Code: BTSEC126 (A)		Hours: 2/week

Course Objectives

- Impart understanding of biotechnology industry structure globally and in India.
- Develop key industry professional skills such as decision-making, problem-solving, and team management.
- Enhance interpersonal and data interpretation skills essential for research and industrial environments.
- Cultivate strong laboratory skills, emphasizing safe solution preparation and handling.

Course Outcomes

- Skill enhancement as per National Occupational Standards (NOS) of “Lab Technician/ Assistant” Qualification Pack issued by Life Sciences Sector Skill Development Council - LFS/Q0509, Level 3.
- Knowledge about major activities of biotech industry, regulations, and compliance, environment, health, and safety (EHS), good laboratory practices (GLP), standard operating procedures (SOP) and GMP as per the industry standards.
- Demonstrate soft skills, such as decision making, planning, organizing, problem solving, analytical thinking, critical thinking, and documentation.

Unit: 1 Introduction to Biotechnology Industry and Professional Skills

- Insights into biotechnology industry:
 - Biotechnology Industry in Indian and Global context - organization in context of large/medium/ small enterprises, their structure and benefits.
- Industry professional skills to be acquired:
 - Planning and organizing skills, decision-making, problem-solving skills, analytical thinking, critical thinking, team management, risk assessment.

Unit-2: Interpersonal and Analytical Skills for Biotechnological Applications

- Interpersonal skills:
 - Writing skills, reading skills, oral communication, conflict-resolution techniques, interpretation of research data, trouble shooting in workplace
- Analytical Skills in laboratory:
 - Solutions: Molarity, Molality, Normality, Mass percent % (w/w), Percent by volume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions. Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions

REFERENCE

No.	Name	Author
1.	Basic skills in Interpreting Laboratory Data (4thed)	Marry Lee
2.	Basic Laboratory methods of Biotechnology	Lisa A. Sideman & Cynthia J. Moore
3.	Biotechnology & Laboratory of science.	Lisa A. Sideman & Marry Ellen Kraus.

BTSEC126 (B)- Understanding Health and Hygiene through Microbial Biotechnology

Semester: II	Course Title: Understanding Health and Hygiene through Microbial Biotechnology	Credit: 2
Course Code: BTSEC126 (B)		2 T

Course Objectives

- Cultivate proficiency in analyzing public health data and understanding health parameters and disease risks.
- Provide insights into the operations of India's healthcare system and the roles of key global health organizations.
- Encourage understanding of both foundational and advanced community health practices.
- Educate on family planning, epidemiology, prevention measures, and vaccine types.

Course Outcomes

- Ability to critically analyze and interpret public health data and understand the implications of health parameters and disease risk factors.
- Understanding of India's healthcare infrastructure, and familiarity with the objectives and roles of major global health organizations.
- Proficiency in practical applications of community health practices, from basic hygiene to managing hospital-acquired immunity.
- Capability to implement knowledge on family planning, epidemiology, and preventive measures, including a comprehensive understanding of different types of vaccines.

Unit 1: Understanding Health Metrics

- Exploration of Public Health Data: Its Sources and Significance
- Unveiling Health Parameters and Determinants
- An Examination of Disease Risk Factors
- A Comprehensive Look at the Healthcare System in India
- Delving into WHO (World Health Organization) and CDC (Centre for Disease Control and Prevention): Aims and Contributions
- Anticipating Future Challenges in Public Health

Unit 2: Insights Into Hygiene and Community Health Practices

- Foundational Healthcare: The Importance of Hand-Washing, Indian Immunization Schedule
- Intermediate Healthcare: Approaches to Wastewater Treatment
- Advanced Healthcare: Understanding Hospital-acquired Immunity and Interventions.
- Family Planning Perspectives: Sexuality Education for Safe Sex, Contraceptives, and Pregnancy Risks.
- An Introduction to Epidemiology: Preventive Measures and Outbreak Control Strategies.
- A Study on Various Types of Vaccines and role of biotechnology in its development.

REFERENCE

No.	Name	Author
1.	Health & Wellness (10th ed)	Gordon Edlin & Eric Golanty
2.	Introduction to Public Health (4th ed)	Mary-Jane Schneider
3.	Global Health 101 (2nd ed, Riegelman Richard edition)	Skolnik Richard
4.	Prescott, Harley, and Klein's MICROBIOLOGY (9th ed)	Joanne M. Willey, Linda M. Sherwood & Christopher J. Woolverton

VAC127 Interpersonal Skills

Semester: II	Course Title: Interpersonal Skills	Credit: 2
Course Code: VAC127		Hours: 2/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	Identify and analyze different communication styles and understand their strengths and weaknesses
CO 2	UNDERSTANDING	Demonstrate active listening skills and questioning styles to explore issues and enhance understanding
CO 3	APPLYING	Identify conflict response styles; approach and effectively mediate workplace conflicts.
CO 4	ANALYSING	Determine ways to build and maintain trust and increase your influence and eminence in the workplace
CO 5	EVALUATING	
CO 6	CREATING	

Unit	Topics	Teaching Hours
I	<ul style="list-style-type: none"> ➤ Effective Communication <ol style="list-style-type: none"> 1. Art Of Listening <ul style="list-style-type: none"> • Introduction • What is listening? • Benefits of active listening • Factors that hamper listening • Common poor listening habits. 2. Art Of Speaking <ul style="list-style-type: none"> • Art of public speaking • Importance of public speaking • Public speaking tips • Overcoming fear of public speaking 3. Art Of Writing E -mail <ul style="list-style-type: none"> • Introduction • The mail magic • Use appropriate salutations • Make the subject matter significant • Reread before pressing the “send” button – Be polite, and reciprocate good deeds 	15
II	<ul style="list-style-type: none"> ➤ Team Building and Conflict Management <ol style="list-style-type: none"> 1. Body Language 2. Body language in building interpersonal relations –Body language in building industrial relations 3. Interpreting body language Developing confidence with correct body language. ➤ Skill needed for teamwork 	15

Reference

1. Soft Skills Know Yourself And Know The World, Author: Dr. K. ALEX, Publication: S.CHAND, First Edition: 2009, Reprint: 2023
2. Barnlund, Dean C. “A Transactional Model of Communication,” in Foundations of Communication Theory, eds. Kenneth K. Sereno and C. David Mortensen (New York, NY: Harper and Row, 1970), 83–92.
3. Burleson, Brant R. Sandra Metts, and Michael W. Kirch, “Communication in Close Relationships,” in Close Relationships: A Sourcebook, eds. Clyde Hendrick and Susan S. Hendrick (Thousand Oaks, CA: Sage, 2000).
4. Dance, F. E. X. (1972). Speech Communication; Concepts and Behavior. New York: Holt, Rinehart, and Winston.
5. Frank E. X. Dance and Carl E. Larson, The Functions of Human Communication: A Theoretical Approach (New York, NY: Holt, Reinhart, and Winston, 1976)
6. Ellis, Richard and Ann McClintock, You Take My Meaning: Theory into Practice in Human Communication (London: Edward Arnold, 1990).
7. Robert H. Gass and John S. Seiter, Persuasion, Social Influence and Compliance

- Gaining (Boston, MA: Allyn and Bacon, 1999)
8. Erving Goffman, *The Presentation of Self in Everyday Life* (New York, NY: Anchor Books, 1959)
 9. Greene, Kathryn, Valerian J. Derlega, and Alicia Mathews, "Self-Disclosure in Personal Relationships," in *The Cambridge Handbook of Personal Relationships*, eds. Anita L. Vangelisti and Daniel Perlman (Cambridge: Cambridge University Press, 2006).
 10. Hargie, Owen. *Skilled Interpersonal Interaction: Research, Theory, and Practice* (London: Routledge, 2011).
 11. National Association of Colleges and Employers, *Job Outlook 2011* (2010): 25.