Shree Warana Vibhag Shikshan Mandal's

WARANA UNIVERSITY,
WARANANAGAR

(A State Public University established under Section 3 (6) of MPUA, 2016)

।। विद्या सर्वस्य भूषणम् ।।

Warana University

Established: 2025

Structure & Syllabus For

Bachelor of Science (B. Sc.) in Biochemistry

UNDER

Faculty of Science & Technology

B. Sc. Part - I (Semester - I and II)

(As Per National Education Policy – 2020)

With Effect from Academic Year 2025-26 Onwards

Abbreviations:

POs	Program Outcomes
PSOs	Program Specific Outcomes
COs	Course Outcomes
DSC	Discipline Specific Core
DSE	Discipline Specific Elective
GE	Generic Elective
OE	Open Elective
VSC	Vocational Skill Course
SEC	Skill Enhancement Course
IKS	Indian Knowledge System
AEC	Ability Enhancement Course
VEC	Value Education Course
OJT	On Job Training (Internship)
FP	Field project
CEP	Community engagement project
CC	Co-curricular Courses
RM	Research Methodology
RP	Research Project
MJ	Major Course
MN	Minor Course

PREAMBLE

The National Education Policy 2020 for higher education aims to transform the existing higher education system in India. This policy emphasizes on promoting interdisciplinary studies, introducing new subjects, and providing flexibility in courses and fresh opportunities for students. It aims to increase the Gross Enrolment Ratio (GER) in higher education, provide multiple entry and exit options, and allow students to choose courses according to their interests and aptitude. The policy envisions setting up of a National Research Foundation, a National Education Technology Forum, and setting up of more Higher Education Institutions in the country. The policy is aimed at creating a holistic and flexible education system that is adaptive to the needs of the 21st century.

The B.Sc. Biochemistry syllabus is framed to give sound knowledge with understanding of biochemistry to undergraduate students at first year of three years of B.Sc. degree course. Students learn biochemistry as a separate subject from B.Sc. I. The goal of the syllabus is to make the study of biochemistry popular, interesting, and encouraging to the students for higher studies including research.

The new and updated syllabus is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

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GENERAL OBJECTIVES OF THE COURSE

Biochemistry is a pervasive subject. All the branches of life science need extensive knowledge of biochemistry. It is an experimental science, and students need to trend in practical to get expertise in doing fine experiments and handle sophisticated instruments. Along with the data obtained its statistical analysis is also required to establish authenticity in the fields like medicine, pharmaceuticals, forensic science and biotechnology. There is an immense potentiality for biochemistry and postgraduates to undertake advanced research or in Industries as skilled biochemists.

PROGRAMME OUTCOMES (POs) – B.Sc.

PO-1: - Students will gain fundamental knowledge of biochemistry which will help them with PG Studies and Research

PO-2: - Students will be able to know good laboratory practices and lab safety.

PO-3: - To make the learner proficient in analytical skill during the course.

PO-4: - Students will be able to apply the fundamental knowledge to address crosscutting issues such as sustainable development

PO-5: - Students will be able to solve various problems by identifying the essential parts of a problem,

formulating a strategy for solving the problem, applying appropriate techniques to arrive at a solution, testing the precision and accuracy of the solution and interpreting the results.

PO-6: - Students will be able to communicate effectively, i.e., articulate, comprehend and write effective reports, make effective presentations and documentation and express the subject through technical writing and oral presentation.

PROGRAMME SPECIFIC OUTCOMES (PSOs) – B.Sc. BIOCHEMISTRY

After successful completion of the B.Sc. BIOCHEMISTRY course, the students will

PSO-1: - Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learnt in the classroom.

PSO-2: - Develop the ability to apply the knowledge acquired in classroom and laboratories to specific problems in theoretical and experimental Biochemistry.

PSO-3: - Identify the area of interest in the academic research and development.

PSO-4: - Perform job in various fields like food, pharmaceutical, agriculture, health care, public services and business etc.

PSO-5: - Be an entrepreneur with precision, analytical mind, innovative thinking, and clarity of thought, expression and systematic approach.

ELIGIBILITY FOR ADMISSION

As per guidelines obtained from Warana University, Warananagar by following rules and regarding reservations by Govt. of Maharashtra

DURATION

The course shall be a fulltime course. One Year, Semester I and II.

MEDIUM OF INSTRUCTION

The medium of instruction shall be English

MEME Instructions: In alignment with the National Education Policy (NEP) 2020, the Bachelor of Science (B.Sc.) program adopts the Multiple Entry and Multiple Exit (ME-ME) framework. This flexible structure is designed to provide students with academic mobility, skill development, and lifelong learning opportunities. Through ME-ME framework, the program enables students to enter and exit at different stages with appropriate certifications. Information regarding different entry and exit options available to students and respective mandatory number of credits to be earned by the students are provided in the table below.

Year	Stage of exit	Type of Award	Mandatory Credits to be earned	Minimum credits to be earned
1	After successful completion of One Year	Undergraduate Certificate in Science	44	40
2	After successful completion of Two Year	Undergraduate Diploma in Science	88	80
3	After successful completion of Three Year	Bachelor of Science Degree	132	120

Re-entry provision: Students leaving after a undergraduate certificate or undergraduate diploma may re-enter the program within 5 years by earning required credits through Academic Bank of Credits.

SCHEME OF TEACHING AND EXAMINATION: [The scheme of teaching and examination should be given as applicable to the course/paper concerned.]

B.Sc. Program Structure for Level 4.5 of B.Sc.-I Semester I

Sr. No.	Teaching Scheme: Theory (TH) & Practical (P)					Examination Scheme: Semester-end Examination (SEE)			Internal Assessment (IA)			Practical		
	Course Type	No. of Lectures	Pract-ical	Hours	Credits	Paper Hours	Max	Min	Internal	Max	Min	Paper Hours	Max	Min
1.	DSC-I	4	1	4 +4	6	1	30	12	Assignment	20	8	2	50	20
2.	DSC-I	4	1	4 +4	6	1	30	12		20	8	2	50	20
3.	DSC-I	4	1	4 +4	6	1	30	12		20	8	2	50	20
4.	OE -I	-	1	4	2	-	-	-		-	-	2	50	20
5.	VEC	-	-	-	-	-	-	-		-	-	-	-	-
6.	IKS (Generic)	2	-	2	2	2	50	20		-	-	-	-	-
Total					22	[DSC (60 X 3) + IKS 50] Total SEE = 230			DSC (40X3) Total IA = 120			Practical. = 50X4 Total Practical. = 200		
						Total Semester –I = 550								

B.Sc. Program Structure for Level 4.5 of B.Sc.-I Semester II

Sr. No.	Teaching Scheme: Theory (TH) & Practical (P)					Examination Scheme: Semester-end Examination (SEE)			Internal Assessment (IA)			Practical		
	Course Type	No. of Lectures	Pract-ical	Hours	Credits	Paper Hours	Max	Min	Internal	Max	Min	Paper Hours	Max	Min
1.	DSC-II	4	1	4 +4	6	1	30	12	Assignment	20	8	2	50	20
2.	DSC-II	4	1	4 +4	6	1	30	12		20	8	2	50	20
3.	DSC-II	4	1	4 +4	6	1	30	12		20	8	2	50	20
4.	OE -II	-	1	4	2	-	-	-		-	-	2	50	20
5.	VEC -I	2	-	2	2	2	50	20		-	-	-	-	-
6.	IKS (Generic)	-	-	-	-	-	-	-		-	-	-	-	-
Total					22	[DSC (60 X 3) + IKS 50] Total SEE = 230			DSC (40X3) Total IA = 120			Practical. = 50X4 Total Practical. = 200		
						Total Semester –I = 550								

General Guidelines for the selection of subjects

1. In first year, student has to choose three DSC subjects from the basket for faculty of Science. (The DSC Basket for faculty of Science includes Mathematics, Physics, Chemistry, Biochemistry, Zoology, Biochemistry, Industrial Microbiology and Computer Science)

2. At the start of second year, out of these 3 DSC subjects, he/she has to opt one subject as Major subject and one as Minor subject. The remaining DSC subject will be dropped.

3. Student cannot select a subject as major or minor other than the subjects taken in first year.

4. OE is to be chosen compulsorily from faculty other than that of the major. (B.Sc. students needs to select OE from faculty of Arts or Faculty of Commerce)

5. VSC is to be selected from the basket of Skill courses approved by the university.

6. IKS (Generic) will be provided by the university separately.

Credit Distribution Structure for B.Sc.-I in Biochemistry with Multiple Entry and Multiple Exit Options:

COURSE CATEGORY	**ABBREVIATION (Only2 Letters)**	**DESCRIPTION**	**Sem.-I Credit**	**Sem.-II Credit**
DSC	DSC (DS)	Discipline Specific Course	6x3=18	6x3=18
OE	OE(OE)	Open Elective	2x1=02	2x1=02
SEC	SEC (SE)	Skill Enhancement Course	-	-
AEC/IKS/VEC	AEC(AE)	Ability Enhancement Course	-	-
	IKS(IK)	Indian Knowledge System (Generic)	2x1=02	-
	VEC(VE)	Value Education Course	-	2x1=02
CC/CEP	CC (CC)	Co-curricular Course	-	-
	CEP(CE)	Community Engagement Project	-	-
			22	22
			Total 44	

Bachelor of Science in BIOCHEMISTRY
Credit Framework
First-Year (B. Sc. I- BIOCHEMISTRY)

Level	Sem.	Subject-1 (Chemistry)	Subject-2	Subject-3	IDC/MDC/OE/GE	SEC	AEC, VEC, IKS			OJT, FP, CEP, CC, RP			Tot Cre
		DSC	DSC	DSC	OE	SEC	AEC	VEC	IKS	CC	FP/OJT	RP/ Dissert.	
4.5	I	MoL-101 Paper-I Molecule of Life-1 (2 Cr)	DSC-I (2 Cr)	DSC-I (2 Cr)	CHOEPR-101 Practical Paper-I Infectious Disease-I (2 Cr)	--	--	--	IKS-I (2 Cr) Introduction on to IKS	--	--	--	
		MoL-102 Paper-II Molecule of Life-2 (2 Cr)	DSC-II (2 Cr)	DSC-II (2 Cr)									
		PRCH-103 Practical Paper-I (2 Cr)	DSC-P-I (2 Cr)	DSC-P-I (2 Cr)									
	Credits	**4(T)+2(P) =6**	**4(T)+2(P) =6**	**4(T)+2(P) =6**	**2 (P) =2**	**--**	**--**	**--**	**2(T)**	**--**	**--**	**--**	**2**
	II	MoL -201 Paper-III Molecule of Life-3 (2 Cr)	DSC-III (2 Cr)	DSC-I (2 Cr)	CHOEPR-201 Practical Paper-II Infectious Disease-II (2 Cr)	--	--	VEC-I (2 Cr) Democracy, Election and Constitution	--	--	--	--	
		BCT-202 Paper-IV Biochemical Technique (2 Cr)	DSC-IV (2 Cr)	DSC-II (2 Cr)									
		PRCH-203 Practical Paper-II (2 Cr)	DSC-P-II (2 Cr)	DSC-P-II (2 Cr)									
	Credits	**4(T)+2(P)=6**	**4(T)+2(P) =6**	**4(T)+2(P) =6**	**2 (P)=2**	**--**	**--**	**2(T)**	**--**	**--**	**--**	**--**	**2**
Total Credits		**12**	**12**	**12**	**4**	**--**	**--**	**2**	**2**	**--**	**--**	**--**	**4**
		Exit Option: Award of UG Certificate in Major with 44 Credits and an additional 4 credits core NSQF course/ Internship/Skill Courses OR Continue											

Course Code Table

B.Sc.-I: SEMESTER-I (TOTALCREDITS-22): *(Note: Put '—' wherever 'Not Applicable')*

COURSE CATEGORY		COURSE NAME	COURSE CODE	CREDITS
DSC	DS-I	Phycology and Microbiology	2502USBOMJ101	2

DSC	DS-I	Biomolecules and Cell Biology	2502USBOMJ102	2
DSC	DS-I	Practical-I	2502USBOMJ103	2
OE	OE-I	□□□□□ □ □□□□□□□□ □□□□□□ □□□□□	2502USBOOE101	2
SEC	SE-I	-	-	-
AEC	AE-I	-	-	-
IKS (Generic)	IK	Introduction to Indian Knowledge System	2502USBOIK101	2
CC	CC	-	-	-
			CREDITS FOR B.Sc.-I, SEM-I	10

B.Sc.-I: SEMESTER-II (TOTALCREDITS-22): *(Note: Put '—' wherever 'Not Applicable')*

COURSE CATEGORY		COURSE NAME	COURSE CODE	CREDITS
DSC	DS-I	Mycology and Phytopathology	2502USBOMJ201	2
DSC	DS-I	Archegoniate	2502USBOMJ202	2
DSC	DS-I	Practical-II	2502USBOMJ203	2
OE	OE-II	□□□□□□ □□□□□□□□□□	2502USBOOE201	2
SEC	SE-I	-	-	-
AEC	AE-I	-	-	-
VEC (Generic)	VE-I	Democracy, Election and Constitution	2502USBOVE201	2
CC	CC	-	-	-
			CREDITS FOR B.Sc.-I, SEM-I	10

NOTE REGARDING OPEN ELECTIVE:

The OE courses offered by the Department of Biochemistry are available for the first-year students of the faculty of Arts and Humanities or faculty of Commerce and Management. The students of science should select the open elective subject from the OE basket provided by the faculty of Arts and Humanities or the faculty of Commerce and Management. The details of OE courses available are provided in the prospectus and posted on Institutional Website.

Semester- I

Note on OE courses: - The students of science should select the open elective subject from the OE basket provided by faculty of Arts and Humanities or faculty of Commerce and Management. The details of OE courses available are provided in the prospectus and posted on Institutional Website.

B. Sc. I (NEP-2.0) Semester I, PAPER-I

MoL-1-101- Molecules of Life-1

(Theory Credits-02, 30 hours. Marks- 50)

Expected Course outcomes
To learn and understand What is Biochemistry.
To learn and understand about biochemistry and its importance in life.
To learn Different areas in biochemistry.
To Understand Fundamentals of Carbohydrates, water, and vitamins.

Module	Sub-module	Syllabus Content	Hrs.
I	Foundations of biochemistry	Definition of biochemistry and its importance. Overview of biomolecules and their significance.	3
	Water	Molecular structure of water (H2O), Polarity of water molecules and hydrogen bonding, Unique properties, weak interactions in aqueous systems, ionization of water, water as a reactant and fitness of the aqueous environment. Transport of nutrients, gases, and waste products in aqueous solutions.	6
	Vitamins	Structure and active forms of water-soluble vitamins, deficiency diseases and symptoms, hypervitaminosis viz. Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic acid.	6

II	Carbohydrates	Definition, classification, and brief account of monosaccharides (aldoses and ketoses): Trioses – Glyceraldehyde, Dihydroxyacetone Tetroses – Erythrose, Erythrulose Pentoses – Ribose, Xylose, Ribulose, Xylulose Hexoses – Glucose, Fructose Conformations of glucose: alpha & beta Disaccharides: Glycosidic bond, Maltose, Isomaltose, Lactose, Sucrose and Cellobiose Polysaccharides: Structure and biological role of Starch, Glycogen, Cellulose Mucopolysaccharides: Hyaluronic acid, Heparin.	30

Reference Books:

1. Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry.
2. Biochemistry - Lubert stryer.
3. Textbook of Biochemistry and Human Physiology - G .P. Talwar.
4. Harper’s Review of Physiological Chemistry - H. A. Harper.
5. Fundamentals of Biochemistry - J. L.Jain.
6. Biochemistry - U. Satyanarayan.

B.Sc. Part I (NEP-2.0) SEMESTER-I, PAPER-II

MoL-2-102- Molecules of Life-2

(Theory Credits: 02, 30 hours, Marks- 50)

Expected Course outcomes
This course introduces foundation of biochemistry.
Fundamentals of Biochemistry i.e., proteins.
Classification, structure, and function of amino acids.
To understand Structure, function, and types of amino acids.

Module	Sub-module	Syllabus Content	Hrs.
I	Chemistry of Amino Acids	Definition, Nomenclature, Structure, and classification of amino acids: Neutral amino acids: - Glycine, Alanine, Valine, Leucine, Isoleucine Hydroxy amino acids - Serine, Threonine Sulphur containing amino acids - Cysteine, Methionine Aromatic amino acids - Phenylalanine, Tyrosine, Tryptophan Heterocyclic amino acids – Proline Acidic amino acids and its amides: Aspartic acid, Glutamic acid, Asparagine, Glutamine Basic amino acids: Lysine, Arginine, Histidine Stereochemistry of amino acids, Zwitterion and isoelectric pH	15

		Amino acid titration curve (Glycine and aspartic acid)	
II	Chemistry of Proteins	Definition, Classification (based on structure) Peptide bond and its nature. Structural studies of proteins – i) Primary structure ii) Secondary structure iii) Tertiary structure iv) Quaternary structure Forces involved in maintaining different structural levels of proteins. Structure and function of oxytocin and myoglobin Techniques to isolate proteins- i) salt fractionation and ii) solvent fractionation, Sequencing techniques– i) Sanger, ii) Edman methods	15

Reference Books:

1. Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry.
2. Biochemistry - Lubert stryer.
3. Textbook of Biochemistry and Human Physiology - G .P. Talwar.
4. Harper's Review of Physiological Chemistry - H. A. Harper.
5. Fundamentals of Biochemistry - J. L.Jain.
6. Biochemistry - U. Satyanarayan.

B. Sc. I Semester I, Practical Course

PRBC-103-PRACTICAL PAPER-I

(Credits-02, 60 hours)

Biochemistry Practical Course-I

Expected Course outcomes
Students will get detailed and comprehensive knowledge on the various practical aspects of biochemical techniques.
The students will be able to analyze biochemically different biological samples.
The students will get practical knowledge regarding preparation of biochemically important buffers,
To understand estimating the biomolecules in each sample by using standard analytical techniques.

Sr No	Name of The Experiment
1	Fundamentals of Biochemical analysis
2	Demonstration of some lab equipment: - Colorimeter, Hot air oven, Incubator, Centrifuge, Water bath, Water distillation unit.
	Separation methods:
3	Paper chromatographic separation & identification of amino acids from binary mixture.
	Isolations:
4	Isolation and characterization of starch from potatoes.
	Colorimetric estimations:
5.	Verification of Beer Lambert's law and estimation of copper sulphate.
6.	Estimation of protein by Biuret method.
7.	Estimation of glucose from DNSA method.
8.	Estimation of carbohydrates by Phenol-H_2SO_4 method

Books recommended for Practicals

1. Stains and Staining procedures by Desai and Desai.
2. Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
3. Bacteriological techniques by F. J.Baker.
4. Introduction to Microbial techniques by Gunasekaran.
5. Biochemical methods by Sadashivan and D.Manickam.
6. Laboratory methods in Biochemistry by J.Jayaraman.
7. Experimental Microbiology – Patel &Patel

B. Sc. I Semester I OPEN ELECTIVE COURSE
BCOEPR-101 INFECTIOUS Disease-I
(Credits-02, 60 hours, Marks-50)

Expected Course Outcomes
Develop a comprehensive understanding of various infectious agents, including bacteria, viruses, fungi, and parasites.
Understand the principles of infectious disease epidemiology, including the spread, transmission routes, and risk factors associated with different pathogens.
Gain proficiency in the laboratory and clinical methods used for the diagnosis of infectious diseases.
Able to make informed decisions about infectious disease prevention strategies, including vaccination, vector control, and public health measures

Module	Sub-module	Syllabus Content	Hrs.
I	Classification of infectious agents	Bacteria, Viruses, protozoa and fungi. Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis. Infection and evasion.	30
II	Overview of diseases caused by bacteria	Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, Diagnostics, Therapeutics, inhibitors, and vaccines. Drug resistance and implications on public health. Other bacterial diseases include Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.	30

Recommended Books.

1. Mandell, Douglas, and Bennett's Principles and practice infectious Diseases, ed. 10.
2. Essentials of Clinical Infectious Diseases, Second Edition. by William F. Wright.
3. Hunter's Tropical Medicine and Emerging Infectious Diseases, ed. 10 by Timothy P. Endy.
4. Introduction to Clinical Infectious Diseases, ed. 2 by Joseph Domachowske.

B.Sc. Part I (NEP-2.0) SEMESTER-I, PAPER-II

MoL-3-201- Molecules of Life-3

(Theory Credits: 02, 30 hours, Marks- 50)

Expected Course Outcomes
This course introduces chemistry of lipids and nucleic acids.
Students will learn identification and classification of biomolecules
Basic concepts of foundation of biochemistry
Chemistry of Biomolecules such as lipids and nucleic acid.

Module	Sub-module	Syllabus Content	Hrs.
		DNA as the carrier of genetic information Nitrogen bases, purines, pyrimidines, sugars (ribose and deoxyribos) phosphate Structure of nucleosides, nucleotides, and polynucleotide formation. Nucleic acid structure – Watson-Crick model of DNA. Types of genetic material, denaturation and	

I	Chemistry of Nucleic Acids	renaturation, cot curves. Structure of major species of RNA -mRNA, tRNA and rRNA. Organelle DNA -- mitochondria and chloroplast DNA. Definition of a gene, organization of genes in viruses, bacteria, animals, and plants	15
	Chemistry of Lipids	Definition and classification of lipids with two examples of each class Fatty acids – Properties, Classification, Essential & non-essential fatty acids. A brief account of structure and functions of… Simple lipids: triglyceride and fatty acids Compound lipids: Phospholipids, viz. lecithin, cephalin, phosphatidylserine, sphingomyelin, glycolipids (cerebrosides & gangliosides) Derived lipids: steroids (cholesterol). Lipid bilayer and Fluid mosaic model of membrane.	15

Reference Books:

1) Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry.
2) Biochemistry - Lubert stryer.
3) Textbook of Biochemistry and Human Physiology - G .P. Talwar.
4) Harper’s Review of Physiological Chemistry - H. A. Harper.
5) Fundamentals of Biochemistry - J. L.Jain.
6) Biochemistry - U. Satyanarayan.

B. Sc. I Semester II, Paper IV

BCT-202- BIOCHEMICAL TECHNIQUE

(Theory Credits:02, Lectures-30 hours)

Expected Course Outcomes
Students will acquire the skills necessary for accurate and precise measurements, sample preparation, and data analysis in a biochemical laboratory setting.
Develop an understanding of fundamental laboratory techniques used in biochemistry, including spectrophotometry, chromatography, and electrophoresis.
Buffer, preparations, and its mechanism
Basic components of biochemical techniques.

Module	Sub-module	Syllabus Content	Hrs.
I	Buffers:	pH and buffer: Hydrogen ion concentration, Handerson – Hasselbalch equation, Buffer- definition, Types & its preparation, Buffers of biological importance such as carbonate-bicarbonate, phosphate, acetate, etc., Haemoglobin buffering capacity, Mechanism of action of buffers in biological system, pH meter – instrumentation and application.	7
	Electrophoresis:	Definition of the terms: electrophoresis, electrophoretic mobility Factors affecting electrophoretic mobility Principle, technique and	8

Biochemical Technique and Electrophoresis		applications of Paper, PAGE and SDS –PAGE (The discussion should include preparation of mechanism of separation, important applications, and advantages of the method.)	
II	Chromatography	Definition Principle, technique, and applications of i) Paper ii) Thin layer, iii) Ion exchange, iv) Gel permeation chromatography (The discussion should include selection of matrix, preparation of plates, column packing, sample application, mechanism of separation, important applications, and advantages of each one of the methods)	8
CHROMATOGRAPHY AND SPECTROSCOPY	Absorption spectroscopy	Beer Lambert's law, Limitations of Beer Lambert's law Meaning of the term's transmittance, absorbance, molar, and specific absorbance Construction, working and applications of i) colorimeter ii) uv spectrophotometer Advantages of spectrophotometer over colorimeter Absorption spectra of proteins, nucleic acids, cytochrome, and NAD+	7

References

1. Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry
2. Biochemistry - Lubert Stryer.
3. Introduction to Chromatography theory and practice - Shrivastava.
4. Chromatography - B.K. Sharma.
5. Biophysical and biochemical technique: Nath and Upadhya
6. Fundamental of Biochemistry: A.C. Deb.
7. Textbook of Biochemistry: Jain & Jain

B. Sc. I Semester II Practical Course

PRBC-203 Practical Paper-II

(Credits-02, 60 hours, Marks - 50)

Volumetric Estimations	
1.	Estimation of glycine by formal titration.
Immobilization	
2.	Immobilization of baker's yeast cells by gel entrapment for invertase activity.
3.	Problems on DNA - RNA sequence, Genetic code
Qualitative Analysis	
4.	Detection of Carbohydrates -Glucose, Starch
5.	Detection of Carbohydrates -Starch
6.	Detection of enzymes (any two) Urease, Amylase, Invertase, Phenol oxidase, Alkaline- Phosphatase.
	Isolations
7.	Paper chromatographic separation & identification of sugars from binary mixture.
8.	Demonstration Experiments Extraction of lecithin from egg yolk.

Books recommended for Practical

1. Stains and Staining procedures by Desai and Desai.

2. Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons. Bacteriological techniques by F. J.Baker.
3. Introduction to Microbial techniques by Gunasekaran.
4. Biochemical methods by Sadashivan and D.Manickam.
5. Laboratory methods in Biochemistry by J.Jayaraman.
6. Experimental Microbiology – Patel &Patel

B. Sc. I Semester II OPEN ELECTIVE COURSE

BCOEPR-101 NON-INFECTIOUS Disease-

(Credits-02, 60 hours, Marks-50)

Expected Course Outcomes
Understand the principles of infectious disease epidemiology, including the spread, transmission routes, and risk factors associated with different pathogens.
Analyses the impact of social, environmental, and behavioural factors on the transmission and prevalence of infectious diseases.
Explore the principles of diseased caused by Viruses and bacteria viz AIDS and Malaria.
Demonstrate the ability to critically analyze and communicate information about emerging infectious threats.

Module	Sub-module	Syllabus Content	Hrs.
I	Overview of diseases caused by Viruses	Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugs and inhibitors. Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio.	30
II	Overview of diseases caused by bacteria	Detailed study of Malaria, history, causative agents, Vectors, life cycle, Host parasite interactions, Diagnostics, Drugs and Inhibitors, Resistance, Vaccine development. Other diseases including leishmaniasis, amoebiasis.	30

Recommended Books.

5. Mandell, Douglas, and Bennett's Principles and practice infectious Diseases, ed. 10.
6. Essentials of Clinical Infectious Diseases, Second Edition. by William F. Wright.
7. Hunter's Tropical Medicine and Emerging Infectious Diseases, ed. 10 by Timothy P. Endy.
8. Introduction to Clinical Infectious Diseases, ed. 2 by Joseph Domachowsk

SCHEME OF EXAMINATION:

- The examination shall be conducted at the end of each term for semester pattern.
- The theory paper shall carry 30 marks.
- The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of 30 marks.

- The internal evaluation for each paper shall carry 10 marks. (Semester I and II: Home assignment, class assignment, unit test a and midterm test)
- Question paper will be set in the view of the /in accordance with the entire syllabus and preferably covering each unit of syllabi.

STANDARD OF PASSING: As prescribed under rules and regulation for each degree.

SPECIAL INSTRUCTIONS, IF ANY

Determination of CZPA, Grading and Declaration of result

University has adopted 10-point Grading System as follows: **In each semester, marks obtained in each course (Paper) are converted to grade points:** If the total marks of course are 100 and passing criteria is 40%, then use the following Table for the conversion.

Gradation Chart:

Table

Marks Obtained	**Numerical Grade (Grade Point)**		**CGPA**	**Letter Grade**
Absent	0 (zero)		-	Ab: Absent
0–39	0 to 4		0.0– 4.99	F: Fail
40– 49	5		5.00–5.49	C: Average
50– 54	6		5.50–6.49	B: Above Average
55– 64	7		6.50–7.49	B+: Good
65– 74	8		7.50–8.49	A: VeryGood
75– 84	9		8.50–9.49	A+: Excellent
85– 100	10		9.50–10.0	O: Outstanding

Note:

1. Marks obtained >=0.5shall be rounded off to next higher digit.
2. The SGPA & CGPA shall be rounded offto2decimal points.
3. Marks obtained in 50 marks or 200 marks paper shall be converted to 100 marks.

Calculation of SGPA & CGPA

1. Semester Grade Point Average **(SGPA)**

$$\text{SGPA} = \frac{\sum (\text{Course credits} \times \text{Grade points obtained}) \text{ of a semester}}{\sum (\text{Course credits}) \text{ of respective semester}}$$

2. Cumulative Grade Point Average **(CGPA)**

$$\text{CGPA} = \frac{\sum (\text{Total credits of a semester} \times \text{SGPA of respective semester}) \text{ of all semesters}}{\sum (\text{Total course credits}) \text{ of all semesters}}$$

NATURE OF THEORY QUESTION PAPER AND SCHEME OF MARKING:

Duration of question paper: As per University rule:

i. Duration of Examination for 60 marks- 2 Hours
ii. Duration of Examination for 30 marks- 1 Hours
iii. Duration of Practical Examination for 50 marks- 2 Hours

Assessment pattern

For 4 Credits 60:40 (SSE : CIE)
For 2 Credits 30:20 (SSE : CIE)

ESE Question paper pattern for theory

(Biochemistry Paper-I, II, III and IV)

Duration: 1 Hr **Total Marks: 30**

Q. 1. Multiple choices questions (6-questions) 6 Marks

(*It may include Wh que., match the pairs, true/false, multiple correct options MCQ etc.*)

i)

ii)

iii)

iv)

v)

vi)

Q. 2. Attempt any two of the following 12 Marks

A. or B.

C. or D.

Q. 3. Short answer questions (any three) (out of five). 12 Marks

(*It may include short notes, label the diagram, compare between, distinguish between etc.)*

a.

b.

c.

d.

e.

SSE Question paper pattern for Practical

(Biochemistry Practical I and II)

Duration: 2 Hr **Total Marks: 30**

Semester-I Practical Paper-I

Q. 1 Biological Isolation- 10 Marks

Q. 2 Biological Separation Methods-10 Marks

Q. 3 Colorimetric Estimation- 10 Marks

Semester-II Practical Paper-II **(30 Marks)**

Q. 1 Volumetric Estimation/ Immobilization- 10 Marks

Q. 2 Biological Separation Methods-15 Marks

Q. 3 Qualitative detection anyone - 05 Marks

Semester II OPEN ELECTIVE COURSE

Nature of Practical Exam for OE for both Semester

Q.1. Major Experiment.	15 Marks.
Q.2. Minor Experiment.	10 Marks.
Q.3. Spotting (5 Spots)	05 Marks.

Internal Evaluation **(20)**

Journal	5
Practical Note Book	5
Oral based on practical	5
Tour report / Project/ Model etc.	5

Nature of Question Paper
Programme: B.Sc. (Part I) (Level 4.5) (Semester – I) (NEP-2020)
Course Title: Interdisciplinary course in Generic IKS
Course Code: 2502USBOIK101

SSE 30 Marks
Question paper pattern

Q. 1. Multiple choices questions (6-questions) 6 Marks

(*It may include Wh que., match the pairs, true/false, multiple correct options MCQ etc.*)

i)

ii)

iii)

iv)

v)

vi)

Q. 2. Write short notes on (Any three) 12 Marks

A.

B.

C.

D.

E.

Q. 3. Answer the following (any two) 12 Marks

a.

b.

c.

Internal Assessment 20 Marks

Nature of Question Paper

Course Title: Democracy, Election and Constitution

Course Code: 2502USBOVE201

SSE 50 Marks

Question paper pattern

Q. 1. Multiple choices questions (25questions) 50 Marks

25 MCQ questions each with 4 options

A) B) C) D)