Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/349 **Date: 24/06/2024**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/877/ Date: 26/12/2023 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change syllabi, nature of question paper B.Sc. Part-I (Sem. I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Food Science and Technology (Entire)	6.	Biochemistry
2.	Food Science	7.	Biotechnology (Optional/Vocational)
3.	Food Science and Quality Control	8.	Biotechnology (Entire)
4.	Food Technology & Management (Entire)	9.	Pollution
5.	Computer Science (Opt)	10.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	B.Sc. Exam/ Appointment Section
2	Director, Board of Examinations and Evaluation	5	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	6	Affiliation Section (U.G.) (P.G.)

Shivaji University, Kolhapur

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Accredited By NAAC with 'A' Grade

Syllabus for Bachelor

of Science Part – I

(Sem I & II)

BIOCHEMISTRY

[NEP-2.0]

(To be implemented from August, 2024-25 onwards as per NEP 2020)

Shivaji University, Kolhapur

NEP-2020 (2.0): Credit Framework for UG(B. Sc.I) Programme under Faculty of Science and Technology

B. Sc. I Biochemistry

Level	**Sem**	**COURSES**			**OE**	**VSC/SEC**	**AEC/VEC/IKS**	**OJT/FP/CEP/CC/RP**	**Total Credit**
		Course-I	Course-II	Course-III					
4.5		DSC-I(2) DSC-II(2) DSC-Pract.-I(2)	DSC-I(2) DSC-II(2) DSC-Pract.-I(2)	DSC-I(2) DSC-II(2) DSC-Pract.-I(2)	OE -I (T/P) (2)		IKS-I (2) Introduction to IKS		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
		DSC-III(2) DSC-IV(2) DSC-Pract.-II(2)	DSC-III(2) DSC-IV(2) DSC-Pract.-II(2)	DSC-III(2) DSC-IV(2) DSC-Pract.-II(2)	OE-II(T/P) (2)		VEC -I (2) (Democracy, Election and constitution)		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
1st Year Cum. Credits		8(T) + 4(P) = 12	8(T) + 4(P) = 12	8(T) + 4(P) = 12	2 + 2 = 4		2 + 2 = 4		44
Exit option: Award of UG Certificate with 44 Credits									

Shivaji University, Kolhapur

Revised Syllabus for Bachelor of Science Part – I: Biochemistry

1. TITLE: Biochemistry

2. YEAR OF IMPLEMENTATION: - Revised Syllabus will be implemented from June, 2024 onwards.

3. PREAMBLE:

This 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.

4. GENERAL OBJECTIVES OF THE COURSE/ PAPER:

1) To make the students knowledgeable with respect to the subject and its practicable applicability.
2) To promote understanding of basic and advanced concepts in Biochemistry.
3) To expose the students to various emerging areas of Biochemistry.
4) To prepare students for further studies, helping in their bright career in the subject.
5) To expose the students to different processes used in industries and in research field.
6) To prepare the students to accept the challenges in life sciences.
7) To develop skills required in various industries, research labs and in the field of human health.

5. Program Specific Outcomes:

- Understand basics of Biochemistry.
- Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learnt in the classroom.
- Develop the ability to apply the knowledge acquired in classroom and laboratories to specific problems in theoretical and experimental Biochemistry.
- Identify the area of interest in the academic research and development.
- Perform job in various fields like food, pharmaceutical, agriculture, health care, public services and business etc.
- Be an entrepreneur with precision, analytical mind, innovative thinking, and clarity of thought, expression and systematic approach.

Department of Biochemistry

Teaching and Evaluation scheme

Three/ Four- Years UG Program Department/ Subject Specific Core or Major (DSC)

First Year Semester-I&II

Level	Sem	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP/CC/RP	Total Credit
		Course-I	Course-II	Course-III					
4.5		DSC-I (2) Molecules of Life 1 DSC-II (2) Molecules of Life 2 DSC-Pract.-I(2) Biochemistry Practical Course-I	DSC-I(2) DSC-II(2) DSC-Pract.-I(2)	DSC-I(2) DSC-II(2) DSC-Pract.-I(2)	OE -I (T/P) (2) Infectious diseases-I		IKS-I (2) Introduction to IKS		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
		DSC-III(2) Molecules of Life 3 DSC-IV(2) Biochemical Techniques 1 DSC-Pract.-II(2) Biochemistry Practical Course-II	DSC-III(2) DSC-IV(2) DSC-Pract.-II(2)	DSC-III(2) DSC-IV(2) DSC-Pract.-II(2)	OE-II(T/P) (2) Infectious diseases-II		VEC -I (2) (Democracy, Election and constitution)		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
1st Year Cum. Credits		8(T) + 4(P) = 12	8(T) + 4(P) = 12	8(T) + 4(P) = 12	2 + 2 = 4		2 + 2 = 4		44
Exit option: Award of UG Certificate with 44 Credits									

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-I

Paper- I- DSC-I Molecules of Life 1

Objectives-

- To make students aware of fundamentals of Biochemistry.
- To make Students aware of biomolecules of living organism
- To introduce vide areas in Biochemistry

	Paper- I: -DSC-I MOLECULES OF LIFE 1	
	Credit – I	
	The foundations of biochemistry Definition of biochemistry and its importance. Overview of biomolecules and their significance. **Water** Molecular structure of water (H_2O), 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. **Vitamins** Structure and active forms of water-soluble vitamins, deficiency diseases and symptoms, hypervitaminosis viz. Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic acid	15
	Credit- 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	15

Learning Outcomes-

Students should be able to understand

- What is Biochemistry?
- About the biochemistry and its importance in life.
- Different areas in biochemistry
- Fundamentals of Carbohydrates, water, and vitamins.

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-I

Paper-II-DSC-II Molecules of Life 2

Objectives-

- This course introduces foundation of biochemistry
- Student will learn chemistry of water, amino acids, and Carbohydrates.

Paper-II: -DSC-II MOLECULES OF LIFE 2		
	Credit—I	
	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 Amino acid titration curve (Glycine and aspartic acid)	15
	Credit—II	
	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

Learning Outcomes-

Students should be able to understand

- Fundamentals of Biochemistry i.e., proteins.
- Structure, function, and types of amino acids.
- Classification, structure, and function of amino acids.

Reference Books: -

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

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-I

Practical syllabus

Biochemistry Practical Course-I

(Credit : 02)

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

Practical outcome-

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

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

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-II

PAPER III DSC-III: - Molecules of Life 3

Objectives-

- This course introduces chemistry of lipids and nucleic acids.
- Student will learn identification and classification of biomolecules

Paper-III DSC-III: - MOLECULES OF LIFE 3		
	Credit-I	
	Nucleic acids 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 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
	Credit- II	15
	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… I) Simple lipids: triglyceride and fatty acids II)Compound lipids: Phospholipids, viz. lecithin, cephalin, phosphatidylserine, sphingomyelin, glycolipids (cerebrosides & gangliosides) Derived lipids: steroids (cholesterol). Lipid bilayer and Fluid mosaic model of membrane.	

Learning outcomes-

Students should gain knowledge about

- Basic concepts of foundation of biochemistry
- Chemistry of Biomolecules such as lipids and nucleic acid.

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-II

PAPER IV DSC-IV – Biochemical Techniques 1

Objectives-

- 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.

PAPER IV DSC-IV– BIOCHEMICAL TECHNIQUES-1

	Credit-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. **Electrophoresis:** Definition of the terms: electrophoresis, electrophoretic mobility Factors affecting electrophoretic mobility Principle, technique and applications of Paper, PAGE and SDS –PAGE (The discussion should include preparation of mechanism of separation, important applications, and advantages of the method.)	15
	Credit- 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) **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+	15

Learning Outcomes-

Students should gain knowledge about

- Buffer, preparations, and its mechanism
- Basic components of biochemical techniques.
- Methods of chromatography and electrophoresis.

Reference books: -

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

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-II

Biochemistry Practical Course-II

(Credit : 02)

	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.

Practical outcome-

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

Books recommended for Practicals

8) Stains and Staining procedures by Desai and Desai.
9) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
10) Bacteriological techniques by F. J.Baker.
11) Introduction to Microbial techniques by Gunasekaran.
12) Biochemical methods by Sadashivan and D.Manickam.
13) Laboratory methods in Biochemistry by J.Jayaraman.
14) Experimental Microbiology – Patel &Patel

List of the Laboratory equipment:

1. Colorimeter
2. pH meter
3. Electrophoresis apparatus
4. Computer with printer.
5. Water bath / Incubator
6. Mixer
7. Oven
8. Chemical balance / Single pan balance
9. Suction pump
12. Centrifuge machine
13. Heating mantle with magnetic stirrer
14. Soxhlet extraction apparatus.
15. Micropipettes
16. Glassware

- **OTHER FEATURES:**

(A) LIBRARY:

References and Text Books, Journals and Periodicals, Reference Books. – List Attached

(B) LABORATORY SAFETY EQUIPMENTS:

1) Fire extinguisher
2) First aid kit
3) Fumigation chamber
4) Stabilized power supply
5) Insulated wiring for electric supply.
6) Good valves & regulators for gas supply.
7) Operational manuals for instruments.
8) Emergency exits

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-I

OE-I (T) Infectious diseases-I

Objectives-

- 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.

OE-I (T) Infectious diseases-I		
	Credit-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.	15
	Credit- 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 including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.	15

Learning Outcomes-

Students should gain knowledge about

- able to make informed decisions about infectious disease prevention strategies, including vaccination, vector control, and public health measures
- Demonstrate the ability to critically analyze and communicate information about emerging infectious threats.

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - I NEP Syllabus with effect from June, 2024

B. Sc. Part – I Semester-II

OE-II (T) Infectious diseases-II

Objectives-

- Understand the principles of infectious disease epidemiology, including the spread, transmission routes, and risk factors associated with different pathogens.
- Analyze the impact of social, environmental, and behavioral factors on the transmission and prevalence of infectious diseases.
- Explore the principles of diseased caused by Viruses and bacteria viz AIDS and Malaria.

OE-II (T) Infectious diseases-II		
	Credit-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.	15
	Credit- 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.	15

Learning Outcomes-

Students should gain knowledge about

- able to make informed decisions about infectious disease prevention strategies, including vaccination, vector control, and public health measures
- Demonstrate the ability to critically analyze and communicate information about emerging infectious threats.

Nature of Question Paper
for B.Sc. Part – I, II & III (40 + 10 Pattern) according to Revised Structure
as Per NEP – 2020 to be implemented from academic year 2023-24

Maximum Marks: 40 **Duration: 2 hrs.**

Q. 1 Select the most correct alternate from the following **[8]**

i) to viii) MCQ one mark each with four options

A) B) C) D)

Q.2 Attempt any TWO of the following **[16]**

A)

B)

C)

Q. 3 Attempt any FOUR of the following **[16]**

a)

b)

c)

d)

e)

f)

---xxx---

B.Sc. I Syllabus (NEP-2020)
To be implemented from June 2024 onwards
Nature of Practical Examination
Total Marks 50

1. Practical examination will be conducted semester wise.
2. Practical examination will be conducted for one day per batch.
3. The examination will be conducted in two sessions per day and each session will be of three hours duration.
4. Every candidate should perform one experiment each from Group I and Group II.
5. At least eighty percent practical should be completed by the student.
6. The marks distribution for practical is as below
   Note:- At least 80% Practical should be covered in practical examination.

For Semester I

Sr.No.	Experiments	Marks
1	Colorimetric estimation	15
2	Isolation of biological samples	10
3	Paper chromatography/Separation method	15
4	Journal	10
	Marks	**50**

For Semester II

Sr.No.	Experiments	Marks
1	Volumetric estimation	15
2	Qualitative analysis of a) Carbohydrate b) Enzyme detection	20
3	Genetic problems	05
4	Journal	10
	Marks	**50**