॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

Phone: (02462)215541 **Academic-1 (BOS) Section** website: srtmun.ac.in

E-mail: bos@srtmun.ac.in

शैक्षणिक वर्ष २०२४–२५ पासून राष्ट्रीय शैक्षणिक धोरणानुसार लागू केलेल्या विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी प्रथम वर्षाच्या सुधारित (दुरूस्ती) अभ्यासक्रमा बाबत..

..

प रि प त्र क

संदर्भ:– १. जा.क्र.शै–१/एनईपी/विवत्रंविपदवी/२०२४–२५/१२३ दिनांक २०/०६/२०२४

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, संदर्भीय परिपत्रकान्वये दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीतील विषय क्र. १५/५९–२०२४ अन्वये मान्यता दिल्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरणानुसार पदवी प्रथम वर्षाचे अभ्यासक्रम शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्यात आलेले आहेत. तथापी वरील संदर्भीय परिपत्रका अन्वये प्रकाशित केलेल्या अभ्यासक्रमामध्ये अभ्यासमंडळानी किरकोळ दुरूस्ती करून अभ्यासक्रम सादर केला असून मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा यांच्या मान्यतेने दुरूस्ती केलेले खालील अभ्यासक्रम लागू करण्यात येत आहेत.

01	B. Sc. I year Agrochemical and Fertilizer
02	B. Sc. I year Chemistry (General)
03	B. Sc. I year Biochemistry

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

सहाय्यक.कुलसचिव
शैक्षणिक अभ्यासमंडळ विभाग

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शैक्षणिक–१/परिपत्रक/एनईपीयुजीदुरूस्ती/S&T/
२०२४–२५/284
दिनांक : ०८.१०.२०२४

प्रत माहिती व पुढील कार्यवाहीस्तव.

०१. मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
०२. मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
०३. मा. संचालक, सर्व संबधित संकुले, प्रस्तुत विद्यापीठ.
०४. मा. प्राचार्य, सर्व संबधित महाविद्यालये, प्रस्तुत विद्यापीठ.
०५.सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यानां देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

COURSE STRUCTURE

As Per National Education Policy- 2020

B. Sc. First Year

Subject: Biochemistry

- ❖ Teaching scheme
- ❖ Examination Scheme
- ❖ Syllabus

To be Implemented from

Academic Year 2024-2025

B. Sc. First Year Semester I *(Level 4.5)*

Sub. Code: BCH

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	**SBCHCT1101**	**Biomolecule**	02	--	**04**	02	--
	SBCHCP1102	**Practical Based on SBCHCT1101**	-	02			04
Optional 2	SBCHMT1103	**Organic Chemistry**	02	--	**04**	02	--
	SBCHMP1104	**Practical Based on SBCHMT1103**	-	02			04
Optional 3	SBCHMT1105	**Cell Biology**	02	--	**04**	02	--
	SBCHMP1106	**Practical Based on SBCHMT1105**	-	02			04
Generic Electives *(from other Faculty)*	SBCHGE1101	**Soil Chemistry**	02	--	**02**	02	--
Skill Based Course (related to Major)	SBCHSC1101	**Biochemistry Laboratory Skills- I**	--	02	**02**	--	04
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	AECMIL1101	MAR/HIN/URD/KAN/PAL	02		**02**	02	-
Indian Knowledge System (IKS)	IKSXXX1101	Select from Basket 5	02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester I *(Level 4.5) Sub. Code: BCH*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	**SBCHCT1101**	**Biomolecule**	10	10	10	40	--	--	50
	SBCHCP1102	**Practical Based on SBCHCT1101**	--	--	--	--	20	30	50
Optional 2	SBCHMT1103	**Organic Chemistry**	10	10	10	40	--	--	50
	SBCHMP1104	**Practical Based on SBCHMT1103**	--	--	--	--	20	30	50
Optional 3	SBCHMT1105	**Cell Biology**	10	10	10	40	--	--	50
	SBCHMP1106	**Practical Based on SBCHCT1105**	--	--	--	--	20	30	50
Generic Elective	**SBCHGE1101**	**Soil Chemistry**	10	10	10	40	--	--	50
Skill Based Course	**SBCHSC1101**	**Biochemistry Laboratory Skills- I**	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course	AECMIL1101	MAR/HIN/URD/KAN/PAL	10	10	10	40	-	-	50
Indian Knowledge System	IKSXXX1101	Select from Basket 5	10	10	10	40	--	--	50

B. Sc. First Year Semester II *(Level 4.5)*

Sub. Code: BCH

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	**SBCHCT1151**	Metabolism	02	--	**04**	02	--
	SBCHCP1152	**Practical Based on** SBCHCT **1151**	-	02			04
Optional 2	SBCHMT1153	Plant Physiology	02	--	**04**	02	--
	SBCHMP1154	**Practical Based on** SBCHMT **1153**	-	02			04
Optional 3	SBCHMT1155	Inorganic and Physical Chemistry	02	--	**04**	02	--
	SBCHMP1156	**Practical Based on** SBCHMT **1155**	-	02			04
Generic Electives *(from other Faculty)*	**SBCHGE1151**	**Herbal Technology**	02	--	**02**	02	--
Skill Based Course (related to Major)	**SBCHSC1151**	**Biochemistry Laboratory Skills-II**	--	02	**02**	--	04
Ability Enhancement Course	AECENG1151	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	AECMIL1151	(MAR/HIN/URD /KAN/PAL)	02		**02**	02	
Value Education Course	VECCOI1151	Constitution of India	-	02	**02**	02	-
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester II *(Level 4.5) Sub. Code: BCH*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SBCHCT1151	Metabolism	10	10	10	40	--	--	50
	SBCHCP1152	**Practical Based on** SBCHCT **1151**	--	--	--	--	20	30	50
Optional 2	SBCHMT1153	Plant Physiology	10	10	10	40	--	--	50
	SBCHMP1154	**Practical Based on** SBCHMT **1153**	--	--	--	--	20	30	50
Optional 3	SBCHMT1155	Inorganic and Physical Chemistry	10	10	10	40	--	--	50
	SBCHMP1156	**Practical Based on** SBCHMT **1155**	--	--	--	--	20	30	50
Generic Elective	SBCHGE1151	**Herbal Technology**	10	10	10	40	--	--	50
Skill Based Course	SBCHSC1151	**Biochemistry Laboratory Skills-II**	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1151	L1 – Communication Skill	10	10	10	40	--	--	50
Ability Enhancement Course	AECENG1151	(MAR/HIN/URD /KAN/PAL)	10	10	10	40	--	--	50
Value Education Course	VECCOI1151	Constitution of India	10	10	10	40	--	--	50

Syllabus for B. Sc. First Year

Subject: Biochemistry

Semester – I

As Per National Education Policy- 2020

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Major Core Theory Course

Course Code – SBCHCT1101

Title of the Course: Biomolecule

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course pre-requisite:

Biomolecules are fundamental to life, serving structural, functional, regulatory, and communicative roles within living organisms. Understanding their importance is crucial for comprehending the complexities of biological systems and for developing applications in various scientific and technological fields.

Course objectives:

- Explain the structure and function of the four major classes of biomolecules: proteins, nucleic acids, carbohydrates, and lipids.
- Understand the chemical properties and biological roles of amino acids, nucleotides, monosaccharides, and fatty acids.
- Describe the structure and function of nucleic acids (DNA and RNA) and their role in the storage, transmission, and expression of genetic information.

Course outcomes: The student will be able to

1. Gathering basic knowledge of carbohydrate, protein, lipid and nucleic acid.
2. Understand the different structure biomolecule.
3. Know the function of biomolecule.
4. Explaining disease related biomolecule
5. Learn the different type RNA.

CURRICULUM DETAILS: SBCHC1101: BIOMOLECULE

Module No.	Unit No.	Topic	Hrs.
1.0		**Carbohydrate**	**07**
	1.1	Definition, Classification and Function of Carbohydrates	
	1.2	Structure of Glucose, Isomerism, Mutarotation	
	1.3	Chemical Properties of Monosaccharides, Glycoside Formation	
	1.4	Derivatives of Monosaccharide, Disaccharide. Polysaccharide.	
2.0		**Protein**	**08**
	2.1	General Nature of amino acid, and Classification, Properties of amino acid	
	2.2	Biologically important Peptide	
	2.3	Definition, Classification and Function of protein	
	2.4	Structure and properties of Protein.	
3.0		**Lipid**	**07**
	3.1	Definition, Classification and Function of Lipid. Fatty acid and essential fatty acid.	
	3.2	Reaction of lipid, Characterization of fat, Triglyceride, Phospholipid, Glycolipid, Cholesterol	
	3.3	Lipoprotein, Eicosanoid, Micelles, Lipid Bilayer and Liposomes	
	3.4	Definition and Classification of Vitamins	
4.0		**Nucleic Acid**	**08**
	4.1	Nucleic Acid, Nucleotide, Nucleoside	
	4.2	Biologically important Nucleotide, Synthetic analogue of nucleotide	
	4.3	DNA Structure and Function, Organization of DNA	
	4.4	RNA Structure and Function	
		Total	**30**

Text Books and Reference Books:

1. Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox
2. Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Gregory J. Gatto Jr.
3. Biochemistry" by Donald Voet and Judith G. Voet
4. Biochemistry" by Reginald H. Garrett and Charles M. Grisham
5. Fundamentals of Biochemistry: Life at the Molecular Level" by Donald Voet, Judith G. Voet, and Charlotte W. Pratt
6. Marks' Basic Medical Biochemistry: A Clinical Approach" by Michael Lieberman and Alisa Peet
7. Biochemistry: The Molecular Basis of Life" by Trudy McKee and James R. McKee
8. Harper's Illustrated Biochemistry" by Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil
9. Biochemistry: A Short Course" by John L. Tymoczko, Jeremy M. Berg, and Gregory J. Gatto Jr.
10. Introduction to General, Organic, and Biochemistry" by Frederick A. Bettelheim, William H. Brown, Mary K. Campbell, and Shawn O. Farrell
11. Textbook of Biochemistry with Clinical Correlations" by Thomas M. Devlin
12. Principles of Biochemistry" by H. Robert Horton, Laurence A. Moran, Gray Scrimgeour, Marc Perry, and David Rawn
13. Biochemistry: U Satyanarayan
14. Biochemistry: Luber Stryer
15. Fundamental of Biochemistry: A.C Deb
16. Text book of Biochemistry: Jain & Jain

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Major Practical Course

Course Code – SBCHCP1102

Title of the Course: Practical based on SBCHCT1101

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SBCHCP1102: Practical based on SBCHCT1101

Sr. No	Practical Exercises	Hrs.
1.	Preparation of Ninhydrin Reagent.	4
2.	Preparation of Benedicts Reagent.	4
3.	Preparation of Barford's Reagent.	4
4.	Preparation of Biuret Reagent.	4
5.	Perform Ninhydrin test for amino acid.	4
6.	Perform Millions test for amino acid	4
7.	Perform Sakaguchi test for amino acid	4
8.	Perform precipitation test for protein with Organic solvent.	4
9.	Perform precipitation test for protein with TCA	4
10.	Perform precipitation test for protein with Ammonium Sulphate.	4
11.	Perform Molish test for Carbohydrate.	4
12.	Perform Benedicts test for Carbohydrate.	4
13.	Perform Orcinol test for Nucleic acid.	4
14.	Perform Diphenylamine test for Nucleic Acid.	4
15.	Perform Emulsification test for Lipid.	4
	Total	**60**

Text Books and Reference Books:

1. Biochemistry Laboratory: Modern Theory and Techniques" by Rodney F. Boyer
2. Experiments in Biochemistry: A Hands-on Approach" by Shawn O. Farrell and Lynn E. Taylor
3. Biochemical Techniques: Theory and Practice" by John F. Robyt and Bernard J. White
4. Practical Biochemistry: Principles and Techniques" by Keith Wilson and John Walker
5. Laboratory Manual for Principles of Biochemistry" by David K. Jemiolo and William M. Scovell
6. Biochemistry Laboratory Manual for Undergraduates: An Inquiry-Based Approach" by Timea Gerczei Fernandez and Scott Pattison
7. A Biochemistry Laboratory Manual" by John Tansey
8. Biochemistry Laboratory: A Student-Centered Approach" by Benjamin F. Lasseter and Scott A. Ensign
9. Experimental Biochemistry" by Robert L. Switzer and Liam F. Garrit
10. Laboratory Experiments in Biochemistry" by Swapan Kumar Nath
11. In Introduction to Practical Biochemistry: Divid Plummer
12. Laboratory Manual in Biochemistry: J Jayaraman

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Minor Core Theory Course

Course Code – SBCHMT1103

Title of the Course: Organic Chemistry

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course pre-requisite:

Organic compounds are indispensable to life on Earth, contributing to its diversity, complexity, and sustainability. Their study and understanding are essential for advancing fields such as biology, medicine, agriculture, and environmental science.

Course objectives:

- Comprehend the hybridization, bonding, and molecular geometry of organic molecules.
- Recognize and classify various functional groups and their significance.
- Analyze and predict the mechanisms of organic reactions, including substitution, elimination, addition, and rearrangement reactions.
- Understand the role of reaction intermediates like carbocations, carbanions, and free radicals.

Course outcomes: The student will be able to

1. Gathering basic knowledge of chemical bonding
2. Understand the mechanism of organic reaction
3. Know the different states of compounds
4. Explaining mechanism electrophile and nucleophile
5. Learn the different type of reaction.

CURRICULUM DETAILS: SBCHMT1103: ORGANIC CHEMISTRY

Module No.	Unit No.	Topic	Hrs.
1.0		**Chemical Bonding**	**07**
	1.1	Definition, types of chemical bonding Ionic bond, covalent bond, co-ordinate bond, Metallic bond, Vander walls bonds, Hydrogen bond.	
	1.2	Theories of bonding- Valence bond Theory, Molecular orbital Theory.	
	1.3	Concept of Hybridization, Types of Hybridization – SP, SP2 SP^3, dSP3, d2SP3	
	1.4	Hybridization with suitable examples.	
2.0		**Organic Compound**	**08**
	2.1	Empirical, structural & Molecular formula of Organic Compound	
	2.2	Nomenclature & classification of Organic compounds,	
	2.3	Determination of C,H,N& Halogens.	
	2.4	Estimation of C,H,N& Halogens.	
3.0		**Mechanism of Organic Reaction**	**07**
	3.1	Types of reagents- Electrophiles, Nucleophiles.	
	3.2	Electron Mobility: Inductive effect, Resonance, Hyper conjuction(With one example each)	
	3.3	Reactive intermediates- carbocation, carbanion, free radicals, carbenes, Arynes & nitrenes.	
	3.4	Aromaticity & Huckel Rule. Types of Reactions: Substitution, Addition, Elimination, Rearrangement, Redox Reaction.	
4.0		**Solid State**	**08**
	4.1	Defination of unit cells, space lattice	
	4.2	Laws of crystallography- Laws of constancy of interfacial angles, Law of Rational indices, Law of symmetry.	
	4.3	Symmetry elements in crystal, Determination of miller indices study of crystal structure- NaCl, KCl, CsCl.	
	4.4	X-ray crystalloghphy, Derivation of Bragg's equation.	
		Total	**30**

Text Books and Reference Books:

1. "Organic Chemistry" by Jonathan Clayden, Nick Greeves, and Stuart Warren
2. "Organic Chemistry" by Paula Yurkanis Bruice
3. "Organic Chemistry" by Leroy G. Wade Jr. and Jan W. Simek
4. "Organic Chemistry" by T.W. Graham Solomons, Craig B. Fryhle, and Scott A. Snyder
5. "Organic Chemistry: Structure and Function" by Peter Vollhardt and Neil Schore
6. "Organic Chemistry" by David R. Klein
7. "Organic Chemistry" by Francis A. Carey and Robert M. Giuliano
8. "Organic Chemistry as a Second Language: First Semester Topics" by David R. Klein
9. "Organic Chemistry" by L.G. Wade Jr.
10. "Advanced Organic Chemistry: Part A: Structure and Mechanisms" by Francis A. Carey and Richard J. Sundberg
11. "Organic Chemistry" by Robert T. Morrison and Robert N. Boyd
12. "March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure" by Michael B. Smith and Jerry March
13. "Organic Chemistry: A Brief Course" by Robert C. Atkins and Francis A. Carey
14. Advanced Organic chemistry - Bhal & Bhal
15. Advanced Organic Chemistry- P.L. Soni
16. Fundamentals Of Chemistry - Farooquim, Kuberkar &Wangikar

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Minor Core Theory Course

Course Code – SBCHMP1104

Title of the Course: Practical based on SBCHMT1103

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SBCHMP1104: Practical based on SBCHMT1103

Sr. No	Practical Exercises	Hrs.
1.	Preparation of standard solutions(% Molar, and Normal) of acids and alkali, Stock and working solution.	4
2.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: Salicylic acid	4
3.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: pthalic acid	4
4.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: aniline	4
5.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: Nitrobenzene	4
6.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: 1-Napthol	4
7.	Qualitative Analysis of organic compound, Preliminary tests, Nature, detection of elements, functional groups, M.P. and their derivatives: Napthalene	4
8.	Estimation of Protein.	4
9.	Estimation of Fatty Acid.	4
10.	Estimate of glycine.	4
11.	Estimate of unsaturation.	4
12.	Estimate phenol.	4
13.	Estimate of Amine.	4
14.	Estimate of Acid.	4
15.	Estimation of Ascorbic Acid.	4
	Total	**60**

Text Books and Reference Books:

1. Organic Chemistry" by Jonathan Clayden, Nick Greeves, and Stuart Warren

2. Organic Chemistry" by Paula Yurkanis Bruice
3. Organic Chemistry" by Leroy G. Wade Jr. and Jan W. Simek
4. Organic Chemistry" by T.W. Graham Solomons, Craig B. Fryhle, and Scott A. Snyder
5. Organic Chemistry: Structure and Function" by Peter Vollhardt and Neil Schore
6. Organic Chemistry" by David R. Klein
7. Organic Chemistry" by Francis A. Carey and Robert M. Giuliano
8. Organic Chemistry as a Second Language: First Semester Topics" by David R. Klein
9. Organic Chemistry" by L.G. Wade Jr.
10. Advanced Organic Chemistry: Part A: Structure and Mechanisms" by Francis A. Carey and Richard J. Sundberg
11. Organic Chemistry" by Robert T. Morrison and Robert N. Boyd
12. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure" by Michael B. Smith and Jerry March
13. Organic Chemistry: A Brief Course" by Robert C. Atkins and Francis A. Carey
14. Advanced Organic chemistry - Bhal & Bhal
15. Advanced Organic Chemistry- P.L. Soni
16. Fundamentals Of Chemistry - Farooquim, Kuberkar &Wangikar

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Minor Core Theory Course

Course Code – SBCHMT1105

Title of the Course: Cell Biology

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course pre-requisite:

Microbiology is integral to human health, industry, agriculture, and the environment. Its contributions are essential for addressing global challenges such as infectious diseases, food security, environmental sustainability, and biotechnological innovation.

Course objectives:

- Comprehend the basic structure and function of prokaryotic and eukaryotic cells.
- Identify and describe the roles of cellular organelles and structures
- Explain mechanisms of membrane transport
- Understand the regulation of the cell cycle and the role of checkpoints.

Course outcomes: The student will be able to

1. Comprehensive Knowledge of Cell Structure and Function
2. Understanding of Membrane Dynamic
3. Proficiency in Cell Cycle and Division
4. Understanding of Cell Differentiation and Development

CURRICULUM DETAILS: SBCHMT1105: CELL BIOLOGY

Module No.	Unit No.	Topic	Hrs.
1.0		**Introduction to Cell Biology**	**07**
	1.1	Historical aspects: cell theory, protoplasm theory and organizational theory.	
	1.2	Broad classification of cell types: prokaryotic cell and eukaryotic cells	
	1.3	Compartments and division of labour within organelles and their characteristics.	
	1.4	Ultrastructure of virus, bacterial, plant and animal cells.	
2.0		**Cell Wall and Cell Membrane**	**08**
	2.1	Structure and functions of the bacterial cell wall and the plant cell wall. Plasma membrane: membrane models and composition.	
	2.2	Types of junctions: tight junction, gap junction and adherens junction. Transport mechanisms: simple diffusion, osmosis,	
	2.3	Cytoskeleton structure: microtubules and microfilaments.	
	2.4	Basic aspects of intercellular communication: autocrine, paracrine, endocrine and neuronal signaling.	
3.0		**Cell Organelle**	**07**
	3.1	Structure and functions of: endoplasmic reticulum (rough endoplasmic reticulum and smooth endoplasmic reticulum)	
	3.2	Golgi apparatus, lysosomes, centrioles, basal bodies, vacuoles, ribosomes and microbodies (peroxisomes and glyoxisomes).	
	3.3	Mitochondria: structure, function and organization of the respiratory chain. Structure of Nucleus and cell Cycle	
	3.4	Chloroplasts: structure, function and photophosphorylation.	
4.0		**Microscopy**	**08**
	4.1	Principles and applications: refraction, magnification, resolution, resolution limit and Ernst Abbe's equation.	
	4.2	Types of microscopy, with principles and application: light microscopy, dark field microscopy, phase contrast microscopy, differential interference contrast microscopy, fluorescence micros,	
	4.3	Electron microscopy (transmission electron microscopy, scanning electron microscopy, scanning tunneling microscopy) and atomic force microscope	
	4.4	Cell Cycle and its regulation	
		Total	**30**

Text Books and Reference Books:

1 In "Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter

2 Essential Cell Biology" by Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter

3 The Cell: A Molecular Approach" by Geoffrey M. Cooper and Robert E. Hausman

4 Cell and Molecular Biology: Concepts and Experiments" by Gerald Karp

5 Molecular Cell Biology" by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Angelika Amon, and Kelsey C. Martin

6 Lewin's CELLS" by George Plopper, David Sharp, and Eric Sikorski

7 Cell Biology" by Thomas D. Pollard, William C. Earnshaw, and Jennifer Lippincott-Schwartz

8 Molecular and Cell Biology For Dummies" by Rene Fester Kratz

9 Introduction to the Cell: Molecular Biology of Cells in Health and Disease" by Stephen R. Bolsover, Elizabeth A. Shephard, Hugh A. White, and Jeremy S. Hyams

10 Molecular Biology: Principles and Practice" by Michael M. Cox, Jennifer Doudna, and Michael O'Donnell

11 Cell Biology by the Numbers" by Ron Milo and Rob Phillips

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Minor Core Theory Course

Course Code – SBCHMP1106

Title of the Course: Cell Biology

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SBCHMP1106: Practical based on SBCHMT1105

Sr. No	Practical Exercises	Hrs.
1.	Observe and sketch the cells, noting visible structures such as the nucleus, cytoplasm, and cell wall (in plant cells).	4
2.	Prepare wet mounts of plant (e.g., onion epidermis)	4
3.	Prepare wet mounts of plant animal cells (e.g., cheek cell)	4
4.	Prepare bacterial smear on a slide	4
5.	Perform Gram staining procedure (crystal violet, iodine, alcohol, safranin).	4
6.	Observe under a microscope to differentiate Gram-positive (purple) and Gram-negative (pink) bacteria.	4
7.	Perform cell counting using a hemocytometer.	4
8.	Extract DNA from cells.	4
9.	Precipitate DNA using ethanol or isopropanol.	4
10.	Prepare agarose gel	4
11.	Cell Viability Assay (MTT or Trypan Blue Exclusion):	4
12.	Perform Gram staining procedure by iodine.	4
13.	Perform Gram staining procedure by alcohol.	4
14.	Perform Gram staining procedure by safranin.	4
15.	Extract protein from cell	4
	Total	**60**

Text Books and Reference Books:

12 In "Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter

13 "Essential Cell Biology" by Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter

14 "The Cell: A Molecular Approach" by Geoffrey M. Cooper and Robert E. Hausman

15 "Cell and Molecular Biology: Concepts and Experiments" by Gerald Karp

16 "Molecular Cell Biology" by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Angelika Amon, and Kelsey C. Martin

17 "Lewin's CELLS" by George Plopper, David Sharp, and Eric Sikorski

18 "Cell Biology" by Thomas D. Pollard, William C. Earnshaw, and Jennifer Lippincott-Schwartz

19 "Molecular and Cell Biology For Dummies" by Rene Fester Kratz

20 "Introduction to the Cell: Molecular Biology of Cells in Health and Disease" by Stephen R. Bolsover, Elizabeth A. Shephard, Hugh A. White, and Jeremy S. Hyams

21 "Molecular Biology: Principles and Practice" by Michael M. Cox, Jennifer Doudna, and Michael O'Donnell

22 "Cell Biology by the Numbers" by Ron Milo and Rob Phillips

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - I)

Generic Elective Course

Course Code – SBCHGE 1101

Title of the Course: Soil Chemistry

[No. of Credits: 2 Credit] **[Total: 30 Hours]**

CURRICULUM DETAILS: SBCHGE 1101: Soil Chemistry

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Soil Chemistry**	**08**
	1.1	Definition and scope of soil chemistry	
	1.2	Importance of soil chemistry in agriculture and the environment	
	1.3	Soil formation and development	
	1.4	Primary and secondary minerals, Clay minerals: types and properties, Soil texture and structure	
2.0		**Soil Organic Matter**	**07**
	2.1	Composition and properties of soil organic matter	
	2.2	Humus formation and its role in soil fertility	
	2.3	Decomposition processes and microbial activity	
	2.4	Definition and measurement of soil pH, Factors affecting soil pH Soil acidity and alkalinity	
3.0		**Soil Nutrient Cycles**	**07**
	3.1	Nitrogen cycle: processes and transformations	
	3.2	Phosphorus cycle: availability and fixation	
	3.3	Potassium and other essential nutrients	
	3.4	Fertilizers and their environmental impact	
4.0		**Soil Contamination and Remediation**	**08**
	4.1	Sources and types of soil contaminants	
	4.2	Heavy metals and their behavior in soils	
	4.3	Soil remediation techniques: physical, chemical, and biological methods	
	4.4	Role of soil chemistry in ecosystem services	

Text Books and Reference Books:

1. Soil Chemistry" by Daniel G. Strawn, Hinrich L. Bohn, and George A. O'Connor
2. The Chemistry of Soils" by Garrison Sposito
3. Soil Chemistry and its Applications" by Malcolm Cresser, Ken Killham, and Tony Edwards
4. Environmental Soil Chemistry" by Donald L. Sparks
5. Soil Chemistry" by Hinrich L. Bohn, Brian L. McNeal, and George A. O'Connor
6. Soil and Environmental Chemistry" by William F. Bleam
7. Handbook of Soil Sciences: Properties and Processes" edited by Pan Ming Huang, Yuncong Li, and Malcolm E. Sumner
8. Principles of Soil Chemistry" by Kim H. Tan
9. Soil Chemistry, 4th Edition" by William L. Lindsay
10. Soil Chemical Methods - Australasia" edited by George E. Rayment and David J. Lyons
11. Soil Fertility and Fertilizers: An Introduction to Nutrient Management" by John L. Havlin, Samuel L. Tisdale, Werner L. Nelson, and James D. Beaton
12. Soil Microbiology, Ecology, and Biochemistry" by Eldor A. Paul

National Education Policy 2020

B.Sc. Biochemistry I Year (Semester - I)

Skill Enhancement Course

Course Code – SBCHSC1101

Title of the Course: Biochemistry Laboratory Skill-I

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SBCHSC 1101: Biochemistry Laboratory Skill-I

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Cleaning of Glassware.	4
2	Calibration of glassware.	4
3	Calibration of volumetric apparatus.	4
4	Calibration of Weighing balance.	4
5	Calibration of Autoclave.	4
6	Calibration of Centrifuges.	4
7	Calibration of Incubator.	4
8	Calibration of Hot air oven.	4
9	Calibration of Colorimeter.	4
10	Calibration of Spectrophotometer, Water distillation plant, pH meter.	4
11	Calibration of Water distillation Unit,	4
12	Calibration of pH meter.	4
13	Calibration of Microscope	4
14	Calibration of Stethoscope	4
15	Preparation of Normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution.	4
	Total	**60**

Text Books and Reference Books:

13. Biochemistry Laboratory: Modern Theory and Techniques" by Rodney F. Boyer
14. Experiments in Biochemistry: A Hands-on Approach" by Shawn O. Farrell and Lynn E. Taylor
15. Biochemical Techniques: Theory and Practice" by John F. Robyt and Bernard J. White
16. Practical Biochemistry: Principles and Techniques" by Keith Wilson and John Walker
17. Laboratory Manual for Principles of Biochemistry" by David K. Jemiolo and William M. Scovell
18. Biochemistry Laboratory Manual for Undergraduates: An Inquiry-Based Approach" by Timea Gerczei Fernandez and Scott Pattison
19. A Biochemistry Laboratory Manual" by John Tansey
20. Biochemistry Laboratory: A Student-Centered Approach" by Benjamin F. Lasseter and Scott A. Ensign
21. Experimental Biochemistry" by Robert L. Switzer and Liam F. Garrit
22. Laboratory Experiments in Biochemistry" by Swapan Kumar Nat

Syllabus for B. Sc. Biochemistry,

First Year

Semester – II

As Per National Education Policy- 2020

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - II)

Major Core Theory Course

Course Code – SBCHCT 1151

Title of the Course: METABOLISM

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course objectives:

- Understand the fundamental principles of metabolic pathways.
- Analyze the mechanisms of metabolic control and regulation.
- Explore the integration of metabolic pathways in different physiological states.
- Investigate metabolic disorders and their biochemical bases.

Course outcomes:

- Outline the steps and regulation of glycolysis, gluconeogenesis, glycogen metabolism, and the pentose phosphate pathway.
- Explain the processes of fatty acid synthesis and degradation.
- Understand ketogenesis, ketone body utilization, and cholesterol metabolism.
- Outline the pathways of amino acid degradation and the urea cycle.

CURRICULUM DETAILS: SBCHCT 1151: METABOLISM

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Carbohydrate Metabolism**	**07**
	1.1	Glycolysis: steps, regulation, and energetics, Gluconeogenesis	
	1.2	The citric acid cycle: steps and regulation, Electron transport chain Oxidative phosphorylation.	
	1.3	Glycogen metabolism: synthesis and degradation.	
	1.4	Pentose phosphate pathway, ATP synthesis and mitochondrial function	
2.0		**Lipid Metabolism**	**08**
	2.1	Fatty acid synthesis and degradation and its regulation	
	2.2	Ketogenesis and ketone bodies and its regulation	
	2.3	Cholesterol metabolism, Synthesis and degradation, and its regulation	
	2.4	Lipoproteins and lipid transport.	
3.0		**Amino acid Metabolism**	**08**
	3.1	Amino acid degradation and the urea cycle	
	3.2	Biosynthesis of non-essential amino acids	
	3.3	Metabolism of one-carbon units	
	3.4	Disorders of amino acid metabolism	
4.0		**Nucleotide Metabolism**	**07**
	4.1	Purine and pyrimidine biosynthesis and degradation	
	4.2	Regulation of nucleotide metabolism	
	4.3	Salvage pathways	
	4.4	Disorders of nucleotide metabolism	
		Total	**30**

Text Books and Reference Books:

1. Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox
2. Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Gregory J. Gatto Jr.
3. Biochemistry" by Donald Voet and Judith G. Voet
4. Biochemistry" by Reginald H. Garrett and Charles M. Grisham
5. Fundamentals of Biochemistry: Life at the Molecular Level" by Donald Voet, Judith G. Voet, and Charlotte W. Pratt
6. Marks' Basic Medical Biochemistry: A Clinical Approach" by Michael Lieberman and Alisa Peet
7. Biochemistry: The Molecular Basis of Life" by Trudy McKee and James R. McKee
8. Harper's Illustrated Biochemistry" by Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil
9. Biochemistry: A Short Course" by John L. Tymoczko, Jeremy M. Berg, and Gregory J. Gatto Jr.
10. Introduction to General, Organic, and Biochemistry" by Frederick A. Bettelheim, William H. Brown, Mary K. Campbell, and Shawn O. Farrell
11. Textbook of Biochemistry with Clinical Correlations" by Thomas M. Devlin
12. Principles of Biochemistry" by H. Robert Horton, Laurence A. Moran, Gray Scrimgeour, Marc Perry, and David Rawn
13. Biochemistry: U Satyanarayan
14. Biochemistry: Luber Stryer
15. Fundamental of Biochemistry: A.C Deb
16. Text book of Biochemistry: Jain & Jain

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester -II)

Major Practical Course

Course Code – SBCHCP 1152

Title of the Course: Practical based on SBCHCT 1151

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SBCHCP 1152: Practical based on SBCHCT 1151

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	To measure the activity of a specific enzyme, such as catalase.	4
2	To measure the activity of a specific enzyme, such as amylase.	4
3	To study the process of glycolysis and fermentation in yeast cells.	4
4	To study the metabolism of lipids in liver cells.	4
5	To measure blood glucose levels in response to carbohydrate intake.	4
6	To detect and quantify metabolic intermediates in a specific pathway, such as the citric acid cycle.	4
7	To study the impact of specific inhibitors on metabolic pathways.	4
8	To measure the activity of the urea cycle in liver tissue.	4
9	To study the catabolism of amino acids.	4
10	Measure basal metabolic rate (BMR) in humans or animals.	4
11	Measure the activity of the pentose phosphate pathway.	4
12	Analyze cholesterol synthesis and degradation.	4
13	Measure photosynthetic activity.	4
14	Measure the production of NADPH.	4
15	Identify intermediates of the citric acid cycle by chromatography.	4
	Total	**60**

Text Books and Reference Books:

1. Biochemistry Laboratory: Modern Theory and Techniques" by Rodney F. Boyer
2. Experiments in Biochemistry: A Hands-on Approach" by Shawn O. Farrell and Lynn E. Taylor
3. Biochemical Techniques: Theory and Practice" by John F. Robyt and Bernard J. White
4. Practical Biochemistry: Principles and Techniques" by Keith Wilson and John Walker
5. Laboratory Manual for Principles of Biochemistry" by David K. Jemiolo and William M. Scovell
6. Biochemistry Laboratory Manual for Undergraduates: An Inquiry-Based Approach" by Timea Gerczei Fernandez and Scott Pattison
7. A Biochemistry Laboratory Manual" by John Tansey
8. Biochemistry Laboratory: A Student-Centered Approach" by Benjamin F. Lasseter and Scott A. Ensign
9. Experimental Biochemistry" by Robert L. Switzer and Liam F. Garrit
10. Laboratory Experiments in Biochemistry" by Swapan Kumar Nath
11. In Introduction to Practical Biochemistry: Divid Plummer
12. Laboratory Manual in Biochemistry: J Jayaraman

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - II)

Minor Core Theory Course

Course Code – SBCHMT 1153

Title of the Course: PLANT AND ANIMAL PHYSIOLOGY

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course objectives:

- To understand the fundamental physiological processes in plants.
- To explore the mechanisms of photosynthesis, respiration, and other metabolic processes.
- To study water and nutrient uptake, transport, and assimilation in plants.
- To examine the role of plant hormones in growth and development.
- To understand how plants respond to environmental stresses.

Course outcomes:

1. Understand Plant Cell Structure and Function:
2. Analyze Water Relations in Plants:
3. Comprehend Mineral Nutrition:
4. Explain Photosynthesis and Respiration:
5. Understand Plant Hormones and Growth Regulators:
6. Investigate Growth and Development Processes:
7. Explore Plant Responses to Light:
8. Analyze Plant Stress Physiology:
9. Study Secondary Metabolites:
10. Evaluate Plant-Environment Interactions:

CURRICULUM DETAILS: SBCHMT 1153: PLANT &ANIMAL PHYSIOLOGY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Plant Physiology**	**07**
	1.1	Overview of plant physiology, Plant cell structure and function Water potential and movement Transpiration and water uptake	
	1.2	Water and nutrient uptake in plants, Xylem and phloem transport Transpiration and water potential.	
	1.3	Essential nutrients and their functions, Soil-plant interactions, Light absorption and photophosphorylation,	
	1.4	Photosynthetic pigments, Light absorption and photophosphorylation Photosynthetic pigments	
2.0		**Plant Metabolism and Hormone**	**08**
	2.1	Calvin cycle and carbon fixation, Photorespiration	
	2.2	Glycolysis, TCA cycle, and oxidative phosphorylation Mitochondrial function	
	2.3	Auxins, gibberellins, and cytokinins, Hormonal regulation of growth	
	2.4	Ethylene, abscisic acid, and brassinosteroids, Stress hormones and signaling	
3.0		**Stress Physiology**	**08**
	3.1	Cell division and differentiation, Meristems and organogenesis	
	3.2	Light perception and signal transduction, Circadian rhythms	
	3.3	Abiotic stress (drought, salinity, temperature).,	
	3.4	Biotic stress (pathogens and herbivores)	
4.0		**Plant Secondary Metabolite**	**07**
	4.1	Types and functions of secondary metabolites	
	4.2	Role in plant defense	
	4.3	Symbiosis (mycorrhizae, nitrogen-fixing bacteria)	
	4.4	Allelopathy and competition	
		Total	**30**

Text Books and Reference Books:

1. Plant Physiology and Development" by Lincoln Taiz, Eduardo Zeiger, Ian Max Møller, and Angus Murphy
2. Introduction to Plant Physiology" by William G. Hopkins and Norman P. A. Hüner
3. Plant Physiology" by Frank B. Salisbury and Cleon W. Ross
4. Biochemistry & Molecular Biology of Plants" by Bob B. Buchanan, Wilhelm Gruissem, and Russell L. Jones
5. Fundamentals of Plant Physiology" by Lincoln Taiz, Ian Max Møller, Angus Murphy, and Eduardo Zeiger

Animal Physiology Textbooks:

1. Animal Physiology" by Richard W. Hill, Gordon A. Wyse, and Margaret Anderson
2. Principles of Animal Physiology" by Christopher D. Moyes and Patricia M. Schulte
3. Eckert Animal Physiology: Mechanisms and Adaptations" by David Randall, Warren Burggren, Kathleen French, Roger Eckert
4. Comparative Animal Physiology" by Philip C. Withers
5. Animal Physiology: From Genes to Organisms" by Lauralee Sherwood, Hillar Klandorf, Paul Yancey

Comparative Physiology Textbooks:

1. Comparative Physiology of Animals: An Environmental Approach" by Richard W. Hill
2. Environmental Physiology of Animals" by Pat Willmer, Graham Stone, and Ian Johnston

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester -II)

Minor Practical Course

Course Code – SBCHMP 1154

Title of the Course: Practical based on SBCHMT 1153

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SBCHCP 1152: Practical based on SBCHCT 1151

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Measure the rate of photosynthesis in plant leaves.	4
2	Determine the rate of water loss through transpiration.	4
3	Count the number of stomata on leaf surfaces.	4
4	Investigate how light affects seed germination.	4
5	Study the effects of plant hormones (auxins, gibberellins) on growth.	4
6	Determine the effect of soil pH on plant growth.	4
7	Extract and quantify chlorophyll from plant leaves.	4
8	Study the directional growth response of plants to light.	4
9	Measure the effect of exercise on heart rate.	4
10	Measure basal metabolic rate (BMR) in humans or animals.	4
11	Investigate how temperature affects enzyme activity.	4
12	Study the effect of osmotic pressure on animal cells.	4
13	Determine the BMR in humans.	4
14	Measure systolic and diastolic blood pressure.	4
15	Study the activity of digestive enzymes like pepsin and amylase.	4
	Total	**60**

Text Books and Reference Books:

1. Experiments in Plant Physiology" by Carol Reiss
2. Practical Plant Physiology" by S.K. Verma and Mohit Verma
3. Laboratory Manual for Plant Physiology" by Robert B. Witham, David F. Blaydes, and Robert M. Devlin
4. Practical Plant Biology" by W. Dennis Clark and Norman W. Pirie
5. Plant Physiology Laboratory Manual" by P. Vijaya Lakshmi

Practical Books on Animal Physiology:

1. Animal Physiology: Laboratory Manual" by Nelson L. V. Nascimento
2. Biology 352: Animal Physiology Lab Manual" by J. Grabowski, R. Gonzales, and J. Collier
3. Physiology Laboratory Manual" by Gregory R. Maloof and Charles Welsh
4. Experimental Physiology: A Manual of Laboratory Practical" by N. Kumar and J. P. Singh
5. Practical Workbook of Human Physiology" by Ranajit Kumar Haldar

General Practical Books Covering Both Plant and Animal Physiology:

1. Practical Physiology" by C.C. Chatterjee
2. Practical Zoology and Plant Physiology" by S.C. Santra
3. Laboratory Manual for Human Biology" by Sylvia Mader and Michael Windelspecht
4. Biological Science: Lab Experiments" by Thomas G. Rust
5. Laboratory Exercises in Plant and Microbial Physiology" by Ronald N. Weinstein

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - II)

Minor Core Theory Course

Course Code – SBCHMT 1155

Title of the Course: INORGANIC AND PHYSICAL CHEMISTRY

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

Course objectives:

- Understand the principles of atomic structure and chemical bonding in inorganic compounds.
- Describe the properties and reactions of main group and transition metal compounds.
- Apply the laws and theories of physical chemistry to understand chemical thermodynamics, kinetics, and equilibrium.
- Perform quantitative analysis and calculations related to physical chemical phenomena.
- Develop problem-solving skills through laboratory experiments and theoretical exercises.

Course outcomes:

- Outline the steps and regulation of glycolysis, gluconeogenesis, glycogen metabolism, and the pentose phosphate pathway.
- Explain the processes of fatty acid synthesis and degradation.
- Understand ketogenesis, ketone body utilization, and cholesterol metabolism.
- Outline the pathways of amino acid degradation and the urea cycle.

CURRICULUM DETAILS: SBCHCT 1155: INORGANIC &PHYSICAL CHEMISTRY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Atomic Structure and Chemical Bonding**	**07**
	1.1	Atomic structure: electron configuration, quantum numbers.	
	1.2	Chemical bonding: ionic, covalent, metallic bonding.	
	1.3	Molecular shapes and hybridization.	
	1.4	Intermolecular forces and properties of liquids and solids.	
2.0		**Chemical Thermodynamics**	**08**
	2.1	Laws of thermodynamics: first law, second law, third law.	
	2.2	Thermodynamic functions: enthalpy, entropy, free energy.	
	2.3	Heat capacity, calorimetry, and heat transfer.	
	2.4	Spontaneity, equilibrium, and Gibbs free energy	
3.0		**Chemical Kinetics**	**08**
	3.1	Rate laws and rate constants.	
	3.2	Reaction mechanisms and elementary steps.	
	3.3	Activation energy, reaction orders, and reaction rate theories.	
	3.4	Catalysis and enzyme kinetics	
4.0		**Chemical Equilibrium**	**07**
	4.1	Equilibrium constants and expressions.	
	4.2	Le Chatelier's principle and reaction direction.	
	4.3	Factors affecting equilibrium: temperature, pressure, concentration.	
	4.4	Acid-base equilibria and buffer solutions.	
		Total	**30**

Text Books and Reference Books:

1. Inorganic Chemistry" by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr
2. Inorganic Chemistry: Principles of Structure and Reactivity" by James E. Huheey, Ellen A. Keiter, and Richard L. Keiter
3. Descriptive Inorganic Chemistry" by Geoff Rayner-Canham and Tina Overton
4. Inorganic Chemistry" by Catherine Housecroft and Alan G. Sharpe
5. Inorganic Chemistry" by D.F. Shriver, P.W. Atkins, and T.L. Overton

Physical Chemistry Textbooks:

1. Physical Chemistry" by Peter Atkins and Julio de Paula
2. Physical Chemistry: Thermodynamics, Structure, and Change" by Peter Atkins and Julio de Paula
3. Physical Chemistry" by Ira N. Levine
4. Physical Chemistry for the Chemical Sciences" by Raymond Chang and Jr. Thoman John W.
5. Physical Chemistry: A Molecular Approach" by Donald A. McQuarrie and John D. Simon
6. Physical Chemistry" by Thomas Engel and Philip Reid

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester -II)

Minor Practical Course

Course Code – SBCHMP 1156

Title of the Course: Practical based on SBCHMT 1155

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SBCHCP 1156: Practical based on SBCHCT 1155

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Prepare various inorganic compounds using synthetic methods.	4
2	Identify and separate cations and anions present in a given sample.	4
3	Determine the concentration of metal ions in a solution using complexometric titrations.	4
4	Prepare metal complexes and characterize them using spectroscopic methods.	4
5	Study redox reactions involving transition metal ions.	4
6	Measure reaction rates and determine rate constants for chemical reactions.	4
7	Determine thermodynamic properties such as enthalpy, entropy, and Gibbs free energy for chemical reactions.	4
8	Study the behavior of gases and verify gas laws experimentally.	4
9	Determine the pH of solution.	4
10	Analyze the electronic spectra of transition metal complexes.	4
11	Conduct acid-base titrations	4
12	Determine thermodynamic properties such as enthalpy for chemical reactions.	4
13	Determine thermodynamic properties such as entropy for chemical reactions.	4
14	Determine thermodynamic properties such as enthalpy, Gibbs free energy for chemical reactions.	4
15	Determine thermodynamic properties such as enthalpy, entropy, and Gibbs free energy for chemical reactions.	4
	Total	**60**

Text Books and Reference Books:

1. Experimental Physical Chemistry" by Arthur W. Adamson and Alice P. Gast
2. Experiments in Physical Chemistry" by Carl W. Garland, Joseph W. Nibler, and David P. Shoemaker
3. Practical Inorganic Chemistry" by Geoffrey Pass and Haydn Sutcliffe
4. Experimental Inorganic Chemistry: A Laboratory Manual" by Gary L. Miessler and Donald A. Tarr
5. Experiments in Inorganic Chemistry" by H. David H. Stow and Dudley H. Williams
6. Physical Chemistry Laboratory Manual" by Charles W. Garland
7. Experiments in Physical Chemistry" by David P. Shoemaker, Carl W. Garland, and Joseph W. Nibler
8. Experimental Physical Chemistry: A Laboratory Textbook" by George C. Pimentel and Arthur L. H. Lam
9. Laboratory Experiments in Physical Chemistry" by Wilson C. Bair and Michael A. Quackenbush

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - II)

Generic Elective Course

Course Code – SBCHGE 1151

Title of the Course: Herbal Technology

[No. of Credits: 2 Credit] **[Total: 30 Hours]**

CURRICULUM DETAILS: SBCHGE 1151: Herbal Technology

Module No.	Unit No.	Topic	Hrs.
1.0		**Introduction to Herbal Technology**	**08**
	1.1	Definition and scope of herbal technology	
	1.2	Historical background and traditional use of medicinal plants	
	1.3	Importance of herbal technology in modern healthcare	
2.0		**Cultivation of Medicinal Plants**	**07**
	2.1	Selection of medicinal plants and their classification	
	2.2	Soil and climatic requirements	
	2.3	Propagation techniques: seed, vegetative, and tissue culture	
	2.4	Good Agricultural Practices (GAP) for medicinal plants	
3.0		**Harvesting and Post-Harvest Processing**	**08**
	3.1	Optimal harvesting time and methods	
	3.2	Drying, storage, and preservation techniques	
	3.3	Processing of raw materials for extraction	
4.0		**Phytochemistry**	**07**
	4.1	Chemical constituents of medicinal plants	
	4.2	Methods of extraction: maceration, percolation, and distillation	
	4.3	Isolation and purification of bioactive compounds	
		Total	**30**

Text Books and Reference Books:

1. Herbal Medicine: Biomolecular and Clinical Aspects" edited by Iris F.F. Benzie and Sissi Wachtel-Galor
2. Pharmacognosy and Phytochemistry" by Vinod D. Rangari
3. Textbook of Pharmacognosy and Phytochemistry" by Biren Shah and Avinash Seth
4. Herbal Drugs and Phytopharmaceuticals" edited by Max Wichtl
5. Indian Herbal Pharmacopoeia" by Indian Drug Manufacturers' Association (IDMA)
6. Trease and Evans' Pharmacognosy" by William Charles Evans
7. Medicinal Plants: Chemistry and Properties" by Kurt Hostettmann, Andrew Marston, Maryse Hostettmann, and Marston Andrew
8. Handbook of Medicinal Herbs" by James A. Duke
9. Principles and Practice of Phytotherapy: Modern Herbal Medicine" by Kerry Bone and Simon Mills
10. Herbal Medicine: Trends and Traditions" by Charles W. Fetrow and Juan R. Avila
11. Natural Products from Plants" by Leland J. Cseke, Ara Kirakosyan, Peter B. Kaufman, Sara Warber, James A. Duke, and Harry L. Brielmann
12. Medicinal Plants: Utilisation and Conservation" edited by N. K. Dubey

National Education Policy 2020

B.Sc. Biochemistry, I Year (Semester - II)

Skill Enhancement Course

Course Code – SBCHSC 1151

Title of the Course: Biochemistry Laboratory Skill-II

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SBCHSC 1151: Biochemistry Laboratory-II

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	To calibration and Maintance of Ph. Meter.	4
2.	To calibration and Maintance of Analytical Balance.	4
3.	To calibration and Maintance of Compound microscope.	4
4.	To calibration and Maintance of Centrifuge.	4
5.	To calibration and Maintance of Autoclave.	4
6.	To calibration and Maintance of Incubator.	4
7.	To calibration and Maintance of Hot air Oven.	4
8.	To calibration and Maintance of Laminar air flow.	4
9.	To calibration and Maintance of Colony Counter.	4
10.	To calibration and Maintance of Column chromatography.	4
11.	To calibration and Maintance of Electrophoresis.	4
12.	To calibration and Maintance of Colorimeter.	4
13.	To calibration and Maintance of Spectrophotometer.	4
14.	To calibration and Maintance of Glucometer.	4
15.	To calibration and Maintance of Autoanalyzer.	4
	Total	**60**

Text Books and Reference Books:

1) Instrumental Methods in Biochemical Analysis" by H. Holzer and H. Scherz
2) Biochemical Techniques" by Keith Wilson and John Walker
3) Practical Skills in Biomolecular Sciences" by Rob Reed and David Holmes
4) Bioanalytical Chemistry" by Andreas Manz and Nicolaas A. M. E. Schultes
5) Principles and Techniques of Biochemistry and Molecular Biology" by Keith Wilson and John Walker
6) Biochemical Methods" by Sadasivam and Manickam
7) Biochemical Instrumentation" by David Holme and Hazel Peck
8) Basic Laboratory Methods in Medical Parasitology" by World Health Organization
9) Laboratory Techniques in Biochemistry and Molecular Biology" by Raphael L. Levine and Miles D. Houslay
10) Experimental Biochemistry: A Student Companion" by Nikolaus Pfanner and Wilhelm G. Höhne