BIOCHEMISTRY
SYLLABUS FOR B.Sc.

CHOICE BASED CREDIT SYSTEM (CBCS)

To be commenced from the Academic year 2025-26

KAKATIYA UNIVERSITY
WARANGAL-506009
TELANGANA STATE

KAKATIYA UNIVERSITY

CREDIT DISTRIBUTION FOR THE COURSE

Annexure-I (Credits)

Proposed CBCS Structure from 2025-2026 for Undergraduate Course

Courses		Papers	Total Credits	Credits for each paper/ Semester					
				B.Sc					
				I	II	III	IV	V	VI
Core Courses (DSC)	Major-1	6	30	5	5	5	5	5	5
	Major-2	6	30	5	5	5	5	5	5
	Minor-1	4	20	5	5	5	5	---	----
MIL/AEC (First language)	English	4	20	5	5	5	5	---	----
Second Language (Telugu, Hindi, Urdu etc.,)		4	20	5	5	5	5	---	----
Multi Disciplinary Course	MDC-1	1	4	---	----	---	----	4	----
SEC 1,2		2	4	---	----	---	----	2	2
SEC 3,4		2	4	---	----	---	----	2	2
Value added course (VAC)	VAC 1,2	2	6	---	----	---	----	3	3
Internships	Internship/Project	1	4	---	----	---	----	---	4
Total Credits in each semester		----	142	25	25	25	25	21	21
Total Credits in UG		---	142						

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CURRICULUM FOR BIOCHEMISTRY FOR B.Sc. (UG) 2025-26

YEAR	Semester	Course Title (Theory and Practical)	HPW	Number of Credits	Total Credits	Max. Marks		
						I.A	End Exam	Total
1st Year	I Sem	Paper-1: Chemistry of Biomolecules (Theory)	4	4	5	20	80	100
		Chemistry of Biomolecules (Practical)	2	1		-	25	25
	II Sem	Paper-II: Chemistry of Nucleic Acids (Theory)	4	4	5	20	80	100
		Chemistry of Nucleic Acids (Practical)	2	1		-	25	25
2nd Year	III Sem	Paper-III: Bioenergetics, Biological oxidation and Enzymology Theory	4	4	5	20	80	100
		Bioenergetics, Biological oxidation and Enzymology (Practical)	2	1		-	25	25
	IV Sem	Paper-IV: Intermediary Metabolism (Theory)	4	4	5	20	80	100
		Intermediary Metabolism (Practical)	2	1		-	25	25
3rd Year	V Sem	Paper-V: Physiology and Clinical Biochemistry (Theory)	4	4	5	20	80	100
		Physiology and Clinical Biochemistry (Practical)	2	1			25	25
		MDC-1:	4	4	4	20	80	100
		SEC-1	2	2	2	10	40	50
		SEC-2:	2	2	2	10	40	50
		VAC-1:	3	3	3	15	60	75
	VI Sem	Paper-VI: Nutrition and Immunology (Theory)	4	4	5	20	80	100
		Nutrition and Immunology (Practical)	2	1		-	25	25
		SEC-3	2	2	2	10	40	50
		SEC-4	2	2	2	10	40	50
		VAC-2	3	3	3	15	60	75
		Internship / Project	4	4	4	20	80	100
		TOTAL	**58**	**52**	**52**	**230**	**1070**	**1300**

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Sl.No	Paper	Credits
1	Major - 1	30
2	Major -2	30
3	Minor - 1	20
4	AEC (Ability Enhancement Course) - English	20
5	Second Language	20
6	MDC (Multi-Disciplinary Course) - 1	4
7	SEC (Skill Enhancement Course) – 1,2,3,4	8
8	VAC (Value Added Course) -1,2	6
9	Project	4
	TOTAL	**142**

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DSC -1A
Semester – I: Paper-BS103 (Theory): Chemistry Of Biomolecules
(4 Credits; 4Hr/week)

Credit- I: Introduction

1. Scope of Biochemistry
2. Water as biological solvent
3. Weak acids and bases
4. pH and concept of Buffers
5. Biological buffers and their physiological importance
6. Henderson- Hasselbalch equation (Simple numerical problems)
7. Common functional groups in biomolecules.

Credit – II: Amino acids & proteins

1. Classification, structures, stereochemistry and chemical reactions of amino acids.
2. Titration curve of glycine &pK value.
3. Essential, nonessential amino acids and non-protein amino acids.
4. Peptide bond formation, Naturally occurring peptides: Glutathione and Enkephalin
5. Outline of protein classification, structural organization of proteins: primary, secondary, tertiary and quaternary structures (ex. hemoglobin & myoglobin)
6. General properties of proteins, denaturation and renaturation of proteins.
7. Determination of amino acid composition of proteins, Sequencing of amino acids.

Credit - III: Carbohydrates

1. Classification of carbohydrates
2. Monosaccharides : Structures, Fisher and Haworth projections
3. Reactions of monosaccharides, Mutarotation
4. Derivatives of monosaccharides: Amino sugars and Glycosides
5. Glycosidic bond formation, Disaccharides, Oligosaccharides
6. Polysaccharides, Storage and Structural Polysaccharides
7. Bacterial cell wall polysaccharides.

Credit – IV: Lipids

1. Classification of lipids, Reactions & properties of lipids
2. Saturated, Unsaturated and Essential fatty acids
3. Structure and functions of Neutral fats, waxes, phospholipids, sphingolipids,
4. Structure and functions of cholesterol and glycolipids.
5. Prostaglandins and lipoproteins.
6. Bio membranes, behavior of amphipathic lipids in water, formation of micelles, bilayers, vesicles, Liposomes
7. Membrane composition and fluid mosaic model.

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References:

1. Lehninger's Principles of Biochemistry – Nelson.D.L. and Cox.M.M., Freeman & Co.
2. Biochemistry – Berg.J.M.,Tymoczko.J.L. andStryer.L., Freeman & Co.
3. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons .
4. Textbook of Biochemistry – West.E.S.,Todd.W.R,Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
5. Outlines of Biochemistry – Conn.E.E.,Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
6. Harper's Illustrated Biochemistry – Murray, R.K., Granner.D.K. &Rodwell,V.W., McGraw-Hill
7. Bichemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R. A. Lippincott
8. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
9. Biochemistry – Satyanarayana.U and Chakrapani.U, Books & Allied Pvt. Ltd.
10. Biochemistry for B.Sc., First Year - B. SashidharRao, K. Valipasha, KarunaRupula and S. Ravi Kiran, Vol. 1, Telugu Akademi Publishers, Hyderabad, 2018

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DSC – 1A
Semester – I: BS 103; Practical: Qualitative Analysis of Biomolecules
(1 Credits; 2Hr/week)

1. Laboratory general safety procedures
2. Preparation of standard solutions (Molar, Normal and percent solutions)
3. Determination of pKa values of amino acids by titration (Glycine)
4. Preparation of buffers (Acetate and Phosphate buffers)
5. Qualitative identification of Carbohydrates
6. Qualitative identification of Amino acids
7. Qualitative identification of Lipids

References

1. Experimental Biochemistry-A student companion-BeeduSashidharRao and VijayDeshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

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DSC – 1B
Semester – II: Paper-BS203 (Theory) Chemistry Of Nucleic Acids And Biochemical Techniques
(4 Credits; 4Hr/week)

Credit - I: Composition of Nucleic acids

1. Organization of DNA in the cell, Mitochondria and Chloroplasts.
2. Composition of nucleic acids (DNA & RNA)
3. Structure of purines and pyrimidines.
4. Nucleosides and Nucleotides
5. Stability and formation of phosphodiester linkages
6. Effect of acids, alkali and nucleases on phosphodiester linkages
7. Photochemical and Spectral characteristics of Nucleic acids.

Credit - II: Structure of Nucleic acids

1. Watson& Crick DNA double helix structure.
2. Introduction to circular DNA, supercoiling, helix to random coil transition,
3. Denaturation of nucleic acids.
4. Hyperchromic effect
5. Tm values and their significance.
6. Reassociation kinetics, Cot curves and their significance.
7. Different types of RNA and their biological functions.

Credit - III: Spectrophotometric and Centrifugation Techniques

1. Concept of absorbance, Electromagnetic spectrum.
2. Beer-Lamberts law and its limitations.
3. Principle of Colorimetry and spectrophotometry
4. UV and Visible spectra, Molar extinction coefficient.
5. Principle of Fluorimetry and applications
6. Principle of Centrifugation, Sedimentation coefficient
7. Types of Centrifugation and their applications

Credit – IV: Chromatography and Electrophoresis techniques

1. Introduction and principles of chromatographic techniques
2. Paper chromatography and applications
3. Thin layer chromatography and applications
4. Gel filtration (molecular sieve) chromatography
5. Ion exchange Chromatography
6. Affinity chromatography
7. Electrophoresis:Principle and applications - Native, SDS-PAGE and Agarose gel electrophoresis

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3. Outlines of Biochemistry – Conn.E.E.,Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
4. Principles and Techniques of Practical Biochemistry- Wilson, K. and Walker, J. Cambridge Press.
5. The Tools of Biochemistry- Cooper, T. G.John Wiley & Sons Press.
6. Physical Biochemistry- Friefelder, D.W.H. Freeman Press.
7. Analytical Biochemistry – Holme.D.J. and Peck.H., Longman.
8. Biophysical Chemistry: Principle and techniques- Upadhyay A, Upadhyay K and Nath. N. Himalaya Publishing House.
9. Experimental Biochemistry- Clark Jr. J.M and Switzer, R. L. Freeman &Co.
10. Biochemistry for B.Sc., First Year - B. SashidharRao, K. Valipasha, KarunaRupula and S. Ravi Kiran, Vol. I, Telugu Akademi Publishers, Hyderabad, 2018

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DSC – 1B

Semester – II: Paper-BS203; Practical's: Quantitative Analysis of Biomolecules

(1 Credit; 2Hr/week)

1. Amino acid Estimation by Ninhydrin method
2. Protein Estimation by Biuret method
3. Protein estimation by Folin`s Method
4. Estimation of Total Sugars by Anthrone Method
5. Estimation of Reducing Sugars by Dinitrosalicylate method
6. Estimation of Keto sugar by Roe`s resorcinol Method
7. Estimation of total sugars by Phenol-sulphuric acid method

References

1. Experimental Biochemistry-A student companion-BeeduSashidharRao and VijayDeshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

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Annexure – I (Credits)
Proposed CBCS Structure from 2025-26 for Under Graduate Courses

Courses		Papers	Total Credits	Credits for each paper / Semester						Credits for each paper / Semester						Credits for each paper / Semester					
				BA						B.Com.						B.Sc.					
				I	II	III	IV	V	VI	I	II	III	IV	V	VI	I	II	III	IV	V	VI
Core Courses DSC	Major-1	6	30	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Major -2	6	30	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Minor-1	4	20	5	5	5	5	-	-	5	5	5	5	-	-	5	5	5	5	-	-
MIL/AEC (First Language)	English	4	20	5	5	5	5	-	-	5	5	5	5	-	-	5	5	5	5	-	-
Second Language (Telugu, Hindi, Urdu, etc.)		4	20	5	5	5	5	-	-	5	5	5	5	-	-	5	5	5	5	-	-
Multi-Disciplinary Course	MDC 1	1	4	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-
Sec 1, 2		2	4					2	2					2	2					2	2
Sec 3, 4		2	4					2	2					2	2					2	2
Value added course (VAC)	VAC 1, 2	2	6	-	-	-	-	3	3	-	-	-	-	3	3	-	-	-	-	3	3
Internships	Internship / Project	1	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4
Total Credits in each semester			142	25	25	25	25	21	21	25	25	25	25	21	21	25	25	25	25	21	21
Total Credits in UG				142						142						142					
Credits under Non-CGPA (Community engagement and service)		NSS /NCC /sports / Extra curricular	6	Upto 6 (2 in each year)						Upto 6 (2 in each year)						Upto 6 (2 in each year)					
		IKS	4	Upto 4 (2 in each, after I & II years)						Upto 4 (2 in each, after I & II years)						Upto 4 (2 in each, after I & II years)					