

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
NATIONALLY ACCREDITED (III CYCLE) WITH “A” GRADE BY NAAC
TIRUCHIRAPPALLI – 620 018

DEPARTMENT OF BIOTECHNOLOGY



B.Sc., BIOTECHNOLOGY
SYLLABUS
2026 – 2027 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
DEPARTMENT OF BIOTECHNOLOGY

VISION

- To educate a broad range of basic lab skills applicable to biology and biotechnology.
- Make the students know and understand broad range of basic biological concepts and can apply and analyse these in at least one specialty area.
- Make the students generate a hypothesis, design approaches to test them and interpret the data from those tests to reach valid conclusions.
- To develop the ability to place their own works in a broader scientific context.

MISSION

- To produce ambitious, creative graduates who are interested in continuing their education in biosciences.
- Make the students to read and critically evaluate the original scientific literature.
- To produce responsible biotechnology professionals to fulfill the employment and research needs in the biotechnology industry.
- Enhance the student's ability to integrate their acquired computer and biosciences knowledge and skills to investigate and solve the biological problems.
- To create opportunities for placement in leading industries through Internships.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO 1	LEARNING ENVIRONMENT To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO 2	ACADEMIC EXCELLENCE To provide a conducive environment to unleash students hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO 3	EMPLOYABILITY To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO 4	PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO 5	GREENSUSTAINABILITY To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc., BIOTECHNOLOGY PROGRAMMES

PO NO	On completion of B.Sc., Biotechnology Programme, the students will be able to
PO 1	Academic Excellence and Competence: Elicit firm fundamental knowledge in theory as well as practical for coherent understanding of academic field to pursue multi and interdisciplinary science careers in the future.
PO 2	Holistic and Social approach: Create novel ideas related to the scientific research concepts through advanced technology and sensitivity towards sustainable environmental practices as well as social issues.
PO 3	Professional ethics and Teamwork: Explore professional responsibility through projects, internships, field trips/industrial visits and mentorship programmes to transmit communication skills.
PO 4	Critical and Scientific thinking: Equip training skills in Internships, Research Projects to do higher studies in multidisciplinary paths with a higher level of specialization to become professionals of high - quality standards.
PO 5	Social Responsibility with ethical values: Ensure ethical, social and holistic values in the minds of learners and attain gender parity for building a healthy nation.

PROGRAMMESPECIFIC OUTCOMES FOR B.Sc., BIOTECHNOLOGY

PSO NO	The students of B.Sc., Biotechnology will be able to	POs Addressed
PSO 1	Acquire knowledge of biological sciences with the implementation of technology on different living systems like plants, animals and microbes.	PO1 PO 2
PSO 2	Explain the fundamental concepts and develop skills in Immunology, Developmental biology, Nanobiotechnology, Genomics, Proteomics, Bioinformatics, Agriculture and Medicine	PO 1 PO 2
PSO 3	Apply the technical aspects related to the improvement of microbes, plants and live-stocks for the welfare of human and environment.	PO 2 PO 4
PSO 4	Impart hands-on techniques in various thrust areas of biotechnology to meet the emerging demands in industry, academia and research.	PO 2 PO 4
PSO 5	Gaining knowledge to transform theoretical concepts to practical products/process to move ahead in entrepreneurship and apply the laws concerning to IPR and bioethics	PO 2 PO 3 PO 5



CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
DEPARTMENT OF BIOTECHNOLOGY
BSc BIOTECHNOLOGY
CHOICE BASED CREDIT SYSTEM-LEARNING OUTCOME BASED
CURRICULUM FRAMEWORK (CBCS - LOCF)

(For the candidates admitted from the academic year 2026-2027 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. /	Credits	Exam			Total	
							Hrs.	Marks			
								Int	Ext		
I	I	Ability Enhancement Course – I (AEC - I)	Podhu Tamil -I	26ULT1	6	3	3	30	70	100	
			Hindi Language and Literature-I	26ULH1							
			Basic French - I	26ULF1							
			Sanskrit Prose and Vocabulary	26ULS1							
	II	Ability Enhancement Course – II (AEC - II)	General English-I	26UE1	6	3	3	30	70	100	
	III	Core Course – I(CC-I)	Cell Biology	26UBT1CC1	5	5	3	30	70	100	
			Core Practical - I (CP-I)	Cell Biology(P)	26UBT1CP1	3	3	3	40	60	100
			Allied Course- I (AC-I)	Biochemistry	26UBT1AC1	3	3	3	30	70	100
			Allied Course Practical- I (ACP-I)	Biochemistry(P)	26UBT1ACP1	3	3	3	40	60	100
	IV	Ability Enhancement Compulsory Course-I (AECC-I)	Value Education	26UGVE	2	2	-	100	-	100	
Ability Enhancement Compulsory Course-II (AECC-II)			Cyber Security	26UGCS	2	2	-	100	-	100	
Total					30	24				800	
II	I	Ability Enhancement Course – III (AEC - III)	Podhu Tamil -II	26ULT2	6	3	3	30	70	100	
			Hindi Language and Literature-II	26ULH2							
			Basic French - II	26ULF2							
			Sanskrit Poetry and Grammar - I	26ULS2							
	II	Ability Enhancement Course – IV (AEC - IV)	General English-II	26UE2	6	3	3	30	70	100	
	III	Core Course – II (CC-II)	Molecular Biology	26UBT2CC2	5	5	3	30	70	100	
			Core Practical - II (CP-II)	Molecular Biology(P)	26UBT2CP2	3	3	3	40	60	100
			Allied Course- II (AC-II)	General Microbiology	26UBT2AC2	3	3	3	30	70	100
			Allied Course Practical-II (ACP-II)	General Microbiology(P)	26UBT2ACP2	3	3	3	40	60	100
	IV	Ability Enhancement Compulsory Course-III (AECC-III)	Environmental Science	26UGEVS	2	2	-	100	-	100	
			Ability Enhancement Compulsory Course-IV (AECC-IV)	Innovation and Entrepreneurship	26UGIE	2	2	-	100	-	100
	Extra Credit Course #		SWAYAM	As per UGC Recommendation							
	Total					30	24				800
III	I	Ability Enhancement Course – V (AEC - V)	Podhu Tamil -III	26ULT3	6	3	3	30	70	100	
			Hindi Language and Literature-III	26ULH3							
			Intermediate French – I	26ULF3							
			Sanskrit Didactics, Alankara and Grammar - II	26ULS3							
	II	Ability Enhancement Course – VI (AEC - VI)	Learning Grammar Through Literature-I	26UE3	6	3	3	30	70	100	
	III	Core Course–III (CC-III)	rDNA Technology	26UBT3CC3	6	5	3	30	70	100	
			Core Practical -III(CP-III)	rDNA Technology (P)	26UBT3CP3	3	3	3	40	60	100
			Allied Course - III (AC-III)	Bioinformatics & Biostatistics	26UBT3AC3	4	3	3	30	70	100
Allied Course Practical-III (ACP-III)			Bioinformatics & Biostatistics (P)	26UBT3ACP3	3	3	3	40	60	100	

IV	Interdisciplinary Course- I (IDC-I)	Introduction to NCC@	26UNC3IDC1	2	2	2	-	100	100
		Biochemical Techniques for Chemists (P)	26UBT4IDC1P			3	30	70	
		Basic Tamil – I	26ULC3BT1						
		Special Tamil – I	26ULC3ST1						
	Ability Enhancement Compulsory Course-V (AECC-V)	Health and Wellness *	26UGHW	2*	1	-	100	-	100
Extra Credit Course #		SWAYAM		As per UGC Recommendation					
Total				30	23				800

IV	I	Ability Enhancement Course – VII (AEC - VII)	Podhu Tamil -IV	26ULT4	6	3	3	30	70	100
			Hindi Language and Literature-IV	26ULH4						
			Intermediate French - II	26ULF4						
			Sanskrit Drama and Grammar - III	26ULS4						
	II	Ability Enhancement Course – VIII (AEC - VIII)	Learning Grammar Through Literature-II	26UE4	6	3	3	30	70	100
	III	Core Course – IV(CC-IV)	Immunology	26UBT4CC4	5	5	3	30	70	100
		Core Practical - IV(CP-IV)	Immunology (P)	26UBT4CP4	3	3	3	40	60	100
		Allied Course - IV (AC-IV)	Bioanalytical Techniques	26UBT4AC4	3	3	3	30	70	100
		Allied Course Practical-IV (ACP-IV)	Bioanalytical Techniques (P)	26UBT4ACP4	3	3	3	40	60	100
	IV	Interdisciplinary Course- II (IDC-II)	Specialisation in Army@	26UNC4IDC2	2	2	2	-	100	100
Molecular Techniques for Chemists (P)			26UBT4IDC2P							
Basic Tamil – II			26ULC4BT2							
Special Tamil - II			26ULC4ST2							
	Skill Enhancement Course – I (SEC-I)	Medical Lab Technology (P)	26UBT5SEC1P	2	2	3	40	60	100	
	Extra Credit Course #	SWAYAM	As per UGC Recommendation							
Total				30	24				800	
30 Days INTERNSHIP during Semester Holidays										
V	III	Core Course – V(CC-V)	Plant & Animal Biotechnology	26UBT5CC5	6	5	3	30	70	100
		Core Course – VI(CC-VI)	Microbial Biotechnology	26UBT5CC6	6	5	3	30	70	100
		Core Practical- V(CP-V)	Plant & Animal Biotechnology (P)	26UBT5CP5	3	3	3	40	60	100
		Core Practical – VI(CP-VI)	Microbial Biotechnology (P)	26UBT5CP6	3	3	3	40	60	100
		Internship *	Internship	26UBT5INT	-	2	-	20	80	100
		Discipline Centric Elective Course– I (DCEC-I)	A. Nanobiotechnology & AI	26UBT5DCE1A	5	4	3	30	70	100
			B. Developmental Biology	26UBT5DCE1B						
			C. Food Microbiology	26UBT5DCE1C						
		Discipline Centric Elective Course– II (DCEC-II)	A. Nanobiotechnology & AI (P)	26UBT5DCE2A	5	4	3	40	60	100
			B. Developmental Biology (P)	26UBT5DCE2B						
C. Food Microbiology (P)	26UBT5DCE2C									
Ability Enhancement Compulsory Course-VI(AECC-VI)	Introduction to Disaster Management	26UGDM	2	2	-	100	-	100		
	Extra Credit Course #	SWAYAM	As per UGC Recommendation							
Total				30	28				800	
VI	III	Core Course – VII(CC-VII)	Bioprocess Technology	26UBT6CC7	6	5	3	30	70	100
		Core Course – VIII(CC-VIII)	Environmental Biotechnology	26UBT6CC8	5	5	3	30	70	100
		Core Practical –VII(CP-VII)	Bioprocess Technology (P)	26UBT6CP7	3	3	3	40	60	100
		Core Practical –VIII(CP-VIII)	Environmental Biotechnology (P)	26UBT6CP8	3	3	3	40	60	100
		Discipline Centric Elective Course– III (DCEC-III)	A. Cancer Biology	26UBT6DCE3A	5	4	3	30	70	100
			B. Human Anatomy and Physiology	26UBT6DCE3B						
			C. Pharmacognosy	26UBT6DCE3C						
	Project	Project Work	26UBT6PW	5	3	-	20	80	100	
	IV	Skill Enhancement Course – II (SEC-II)	Professional Competency-General Studies for Competitive Examinations	26UBT6SEC2	2	2	2	-	100	100
		Ability Enhancement Compulsory Course-VII	Gender Studies	26UGGS	1	1	-	100	-	100

	(AECC-VII)								
V	Extension Activity *		26UGEA	-	1	-	-	-	-
			Total	30	27				800
			Grand Total	180	150				4800

- @ NCC is one of the choices in GEC. Only the NCC cadets are eligible to choose this course. However, NCC Course is a Compulsory Course for the NCC Cadets. If the Cadet has not studied Tamil in the school level, she has to take Basic Tamil Course.
- *Shall be outside instruction hours
- # Should complete a minimum of one Extra Credit Course from Semester II onwards

DEPARTMENT OF B.Sc BIOTECHNOLOGY
CHOICE BASED CREDIT SYSTEM-LEARNING OUTCOME BASED
CURRICULUM FRAMEWORK (CBCS - LOCF)
(For the Candidates admitted from the Academic year 2026-2027 and onwards)
Curriculum Structure
Courses & Credits for UG Science Programmes

Part	Course	No. of Courses	Hours	Credits	Total Credits
I	Ability Enhancement Course	4	6	12	12
II	Ability Enhancement Course	4	6	12	12
III	Core (Theory)	8	5/6	8*5=40	105
	Core (Practical)	8	3	8*3=24	
	Project Work	1	5	3	
	Internship	1	-	2	
	Allied Courses	8	4/3	8*3=24	
	DCEC	3	5	3*4=12	
IV	IDC	2	2	2*2=4	20
	SEC	2	2	2*2=4	
	AECC-I - Value Education	1	2	2	
	AECC-II Cyber Security	1	2	2	
	AECC-III- Environmental Science	1	2	2	
	AECC-IV-Innovation and Entrepreneurship	1	2	2	
	AECC-V- Health and Wellness	1	-	1	
	AECC-VI - Introduction to Disaster Management	1	2	2	
AECC-VII Gender Studies	1	1	1		
V	Extension Activities		-	1	01
		48		150	150

Semester – I	Internal Marks: 30			External Marks: 70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS	
26UBT1CC1	CELL BIOLOGY	CORE	5	5	

Course Objectives:

- To provide a comprehensive understanding of cell biology fundamentals, including cell theory, structure, diversity, and comparison of prokaryotic and eukaryotic cells.
- To impart knowledge on cellular organization, including membranes, organelles, cytoskeleton, and their functional significance.
- To explain and evaluate cell cycle, cell division, cell signaling mechanisms, and the structural and functional specialization of cells in multicellular organisms.

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1	Course emphasis on Employability / Entrepreneurship / Skill Development	Skill Development
2	Course integrates cross-cutting issues relevant to Professional Ethics / Gender Sensitization / Environment & Sustainability / Human Values	Professional Ethics, Environment & Sustainability
3	Course relevant to Local / Regional / National / Global needs	Local, National, and Global Need
4	Course focus on Sustainable Development Goals (SDGs)	SDG 3, SDG 9, SDG 12, SDG 15

Course Outcome and Cognitive Level Mapping

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Explain the fundamental principles of cell biology, including cell theory, structure, and diversity of cell types	K1, K2
CO2	Compare and analyze prokaryotic and eukaryotic cellular organization and ultrastructure	K2, K3
CO3	Interpret the structure and functional significance of cellular membranes, organelles, and cytoskeletal components.	K3
CO4	Examine the mechanisms of cell division, cell cycle regulation, and cell signaling pathways.	K3, K4
CO5	Evaluate the structure and functional specialization of different cell types in multicellular organisms.	K4, K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	1	1	3	2	1	1	1
CO2	3	3	2	2	1	3	2	2	2	2
CO3	3	2	2	2	1	3	3	2	2	1
CO4	3	2	3	2	1	3	3	2	3	1
CO5	3	3	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Fundamentals of cell structure: Cell as the basic unit of life, Cell theory and evolution of cell concept, Basic properties of cells, Ultrastructure of prokaryotic and eukaryotic cells. Differences between prokaryotic and eukaryotic cells	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Cellular membranes and matrices: Plasma membrane: Fluid Mosaic Model, Chemical composition and membrane dynamics. Transport mechanisms: Diffusion, facilitated diffusion, osmosis, active transport. Cell wall: structure and function. Cytoskeleton: Microtubules, microfilaments, intermediate filaments. Cell motility: flagella	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Endomembrane System: Ultrastructure and functions: Nucleus, Endoplasmic reticulum (RER & SER), Golgi apparatus, Ribosomes (70S and 80S), Mitochondria, Chloroplast, Lysosomes and microbodies (peroxisomes, glyoxysomes).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Cell Division and Signaling: Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, Chromosomal crossing over; Apoptosis (programmed cell death); Signal transduction - Cell to cell recognition.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Specialized cells: Motile cells (amoeboid and Sperm cells), nerve cells and nerve impulse conduction, muscle cells and muscle contraction and Egg cells.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not included for End Semester Examination) Discovery of Cells, Emerging Trends in Cell Biology - Single-cell analysis and organoids - Cytoskeleton in mechanobiology- Molecular regulation of cell adhesion, Advanced research in red blood cells	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

S. No.	Author Name	Title of the Book	Publisher's Name	Year of Publication
1	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P.	Essential Cell Biology (5th Edition)	Garland Science	2019
2	Rastogi, S. C.	Cell and Molecular Biology	New Age International	2020
3	Veer Bala, R.	Cell Biology	MedTech Publishers	2021

Reference Books

S. No.	Author Name	Title of the Book	Publisher's Name	Year of Publication
1	Alberts, B., Heald, R., Johnson, A., Morgan, D., Raff, M., Roberts, K., & Walter, P.	Molecular Biology of the Cell (Latest Edition)	W. W. Norton & Company	2022
2	Alberts, B. et al.	Essential Cell Biology (6th Edition)	Garland Science	2023
3	Bergtrom, G.	Cell and Molecular Biology: What We Know & How We Found Out	University of Wisconsin (Open Textbook)	2023
4	Sharma, P.	The Concept Book of Cell Biology	Independent Publication	2025
5	Becker, W. M., Kleinsmith, L. J., Hardin, J., & Bertoni, G.	Becker's World of the Cell	Pearson	2021

Web References

1. <https://www.infobooks.org/free-pdf-books/biology/cell-biology/>
2. <http://www.freebookcentre.net/Biology/Cell-Biology-Books.html>;
3. https://tripurauniv.ac.in/Page/SubjectWiseOnline_EBooks_Cell_Molecular_Biology
4. <https://ocw.mit.edu/courses/7-06-cell-biology-spring-2007/>
5. <https://archive.nptel.ac.in/content/storage2/courses/102103045/download/mod2.pdf>

Pedagogy

Chalk and Talk, PPT, Videos and Animations

Course Designers

Dr.P.Bhuvaneswari

Semester– I	Internal Marks: 30		External Marks:70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26UBT1AC1	BIOCHEMISTRY	ALLIED	03	03

Course Objectives

- To understand the structure, classification, chemistry and biological roles of carbohydrates, lipids, amino acids, proteins and nucleic acids.
- To understand the biosynthesis of carbohydrates, lipids, amino acids and nucleotides, emphasizing key enzymes, precursors, regulation and biological significance.
- To analyze bioenergetics, carbohydrate metabolism, glycolysis, pyruvate fate, hexose catabolism, and regulatory mechanisms.
- To describe the TCA cycle, its regulation, energy yield. Metabolic oxidation and integration of bio molecules under different physiological states.
- To understand the role of vitamins and minerals and its role in biological systems.

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1	Course emphasis on Employability / Entrepreneurship / Skill Development	Skill Development
2	Course integrates cross-cutting issues relevant to Professional Ethics / Gender Sensitization / Environment & Sustainability / Human Values	Professional Ethics, Environment & Sustainability
3	Course relevant to Local / Regional / National / Global needs	Local, National, and Global Need
4	Course focus on Sustainable Development Goals (SDGs)	SDG 3, SDG 4, SDG 9 and SDG 12

Course Outcome and Cognitive Level Mapping

Upon successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Understand the structure, classification, chemistry and biological significance of carbohydrates, lipids, amino acids, proteins and nucleic acids.	K1,K2
CO2	Explain the biosynthesis of carbohydrates, lipids, amino acids and nucleotides, including key enzymes, precursors, regulation and physiological roles.	K2
CO3	Analyze bioenergetics and carbohydrate metabolism, including glycolysis, fate of pyruvate, hexose catabolism and regulatory mechanisms.	K3
CO4	Describe central metabolic pathways such as TCA cycle, their regulation, energy yield, amphibolic roles, oxidation and metabolic Integration of fatty acids & amino acid. (β - oxidation & urea cycle).	K4
CO5	To understand the Chemistry, classification and Properties of vitamins and Minerals.	K5

Mapping of CO with PO and PSOs

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	1	3	3	2	2	1
CO2	3	3	3	2	2	3	3	3	2	2
CO3	3	3	3	2	1	3	3	3	2	1
CO4	3	3	3	3	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	3	3	3

**“1” – Slight (Low) Correlation, “2” – Moderate (Medium) Correlation,
“3” – Substantial (High) Correlation, “-” indicates there is no Correlation.**

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Bio molecules Classification and Properties Structure, Chemistry, Properties and Biological Significance of Bio molecules: Carbohydrates (Starch), Lipids, Proteins, amino acids, & Nucleic acids (DNA); Lipids: Simple (triglycerides), Compound (phospholipids), Derived (Terpenes). Amino acids: nonpolar, polar, Proteins: fibrous (keratin), Globular (Hemoglobin). Configuration of Proteins by Linderstorm-Lang.	09	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4,K5
II	Biosynthesis of Biomolecules Carbohydrates: Gluconeogenesis, Glycogenesis, Lipids: Fatty acid - triglyceride, and steroid biosynthesis; Amino acids: Shikimate pathway. Nucleotides: Purine and Pyrimidine synthesis.	09	CO1 CO2 CO3, CO4, CO5	K1,K2,K3, K4,K5
III	Bioenergetics and Carbohydrate Metabolism Principles: Laws of Thermodynamics, Gibbs free energy, high-energy compounds (ATP, GTP, PEP); Glycolysis: pathway, key enzymes (hexokinase, PFK, pyruvate kinase), net ATP; Fate of pyruvate: aerobic (acetyl-CoA), anaerobic (lactic acid); Catabolism of hexoses: fructose.	09	CO1 CO2 CO3, CO4, CO5	K1,K2,K3, K4,K5
IV	Central Metabolic Pathways , Oxidation & Integration: TCA Cycle - Steps, regulation (ATP/ADP, NADH, Ca ²⁺), energy yield (NADH, FADH ₂ , GTP); Amphibolic role & Metabolic integration Fatty acids: β-oxidation, Amino acids: Urea cycle.	09	CO1, CO2 , CO3 , CO4, CO5	K1,K2,K3, K4,K5
V	Vitamins and Minerals : Vitamins: Definition, Classification, Fat soluble & Water soluble vitamins -Sources, Structure and Physiological functions, Vitamin, deficiency diseases-Macro and Micro minerals-Sources and Functions.	09	CO1, CO2 CO3 CO4 CO5	K1,K2,K3, K4,K5

	<p>* Self Study for Enrichment (Not included for End Semester Examination) Weak interactions in aqueous systems, water as a reactant and fitness of the aqueous environment. Lipids as signals , Cofactors and Pigments</p>	-	CO1, CO2, CO3, CO4 CO5	K1,K2,K3, K4,K5
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Textbooks

S.No	Author Name	Title of the book	Publishers name	Year of Publication
1	Gupta, S.N	Concepts of Biochemistry	Rastogi Publications	(2020)
2	Sathyanarayana, U.,Chakrapani,U	Biochemistry,	5 th Edition. Elsevier Publishers.	(2020)
3	Singh, S.P., Singh, A.N	Textbook of Biochemistry	CBS Publishers	(2021)

Reference books

S.No	Author Name	Title of the book	Publishers name	Year of Publication
1	Dean Appling, R., Spencer Anthony,J., Cohill,C., Christopher Mathews, K	Pearson Education.	Biochemistry Concepts and Connections	(2017)
2	Jeremy Berg,M., Stryer ,L., Tymoczko, J., Gatto, G	Biochemistry	Freeman and Company	(2019)
3	Brailsford Robertson , T	Principles of Biochemistry	MJP Publishers	(2020)
4	Manzoor Malik, M	Fundamentals of Biochemistry	LAP Lambert Academic Publishing	(2021)
5	Vikrant,V	Biochemistry	Discovery Publishing House Pvt Ltd	(2021)

Web References

1. <http://ecoursesonline.iasri.res.in/course/view.php?id=422>
2. <https://nptel.ac.in/courses/102105034/>
3. <https://youtu.be/DhwAp6yQHQI>
4. <https://agrimoon.com/fundamentals-of-biochemistry-pdf-book/>
5. <http://courseware.cutm.ac.in/courses/fundamentals-of-biochemistry/>

Pedagogy

Chalk and Talk, PPT, Animation and Videos

Course Designer

Ms. S.ARTHI

Semester– I	Internal Marks: 40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26UBT1CP1	CELL BIOLOGY (P)	CORE PRACTICAL – I (CP – I)	03	03

Course Objectives

- To provide hands-on training in basic cell biology laboratory techniques.
- To develop skills in microscopy, sectioning, staining, and cellular observation.
- To introduce modern analytical tools such as ImageJ and digital microscopy.
- To strengthen understanding of cell structure, division, and membrane physiology.

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1	Course emphasis on Employability / Entrepreneurship / Skill Development	Employability
2	Course integrates cross-cutting issues relevant to Professional Ethics / Gender Sensitization / Environment & Sustainability / Human Values	Professional Ethics
3	Course relevant to Local / Regional / National / Global needs	National needs
4	Course focus on Sustainable Development Goals (SDGs)	SDG 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO 1	Demonstrate laboratory safety, GLP practices, and biosafety understanding.	K1, K2
CO 2	Operate light microscopes and apply digital imaging techniques.	K2
CO 3	Prepare sections and stains for plant, microbial, and animal cells. Identify mitotic, meiotic, prokaryotic, and eukaryotic cell structures.	K3
CO 4	Perform cell enumeration, membrane permeability, and viability assays.	K4
CO 5	Illustrate and conclude cell viability and counting.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	2	3	3	1
CO2	3	3	3	3	2	3	2	3	3	1
CO3	3	2	3	3	2	3	2	3	3	1
CO4	3	2	3	3	1	3	2	2	3	1
CO5	3	3	3	3	1	3	2	2	3	2

“1” – Slight (Low) Correlation, “2” – Moderate (Medium) Correlation,
“3” – Substantial (High) Correlation, “-” indicates there is no correlation.

Syllabus

1. Laboratory rules, regulations, Good Laboratory Practices (GLP) & Biosafety Level-I.
2. Principles and working mechanism of Light Microscope with Digital Imaging demonstration.
3. Observation of Prokaryotic Cells – *Escherichia coli*
4. Observation of Eukaryotic Cells – Yeast & Onion epidermis (stained).
5. Morphological characterization of plant tissue cells by hand sectioning and temporary staining using leaf, stem, and root of selected plants (*Tradescantia* leaf / *Allium cepa* root / *Helianthus annuus* stem)
6. Blood Smear Preparation and Differential Staining (Leishman/Giemsa).
7. Cell Division – Mitotic stages (Onion root tip squash) by Acetocarmine stain.
8. Cell Division – Meiotic stages (Permanent slide observation).
9. Cell Division – Binary fission/Budding stages in Yeast.
10. Barr Body identification from buccal smear.
11. Electron micrograph of Cytoplasmic Organelles.

Reference Books

S. No.	Author name	Title of the book	Publishers name	Year of Publication
1.	Tyagi, E., Singh, D., & B. S., M. K.	<i>Laboratory manual of cell biology, cytogenetics, physiological and biochemistry.</i>	Taneesha Publishers	2024
2.	Saxena, K.	<i>Practical guide of cell biology & molecular genetics.</i>	Amazon India.	2023
3.	K. V. Chaitanya	Cell and Molecular Biology: A Lab	Manual Kindle Edition	2013
4.	Safadi-Chamberlain, F.	<i>Cell biology laboratory manual</i> (6th ed.).	Kendall Hunt Publishing.	2024
5.	Srivastav, R. K.	<i>Lab Manual Biology.</i>	Saraswati Books House.	2024

E- Books

1. https://www.bjcancer.org/Sites_OldFiles/_Library/UserFiles/pdf/Cell_Biology_Laboratory_Manual.pdf
2. http://www.ihcworld.com/_protocols/lab_protocols/cell-biology-lab-manual-heidcamp.htm
3. https://www.deanza.edu/faculty/heyerbruce/b6b_pdf/Bio6B-Manual_W19.pdf
4. https://www.researchgate.net/publication/330654692_Cell_Biology_Practical_Manual
5. <https://www.pdfdrive.com/cell-biology-protocols-d13735633.html>

Pedagogy

Practical Observation and Demo

Course Designer

Dr. R. Rameshwari

Semester - I	Internal Marks: 40	External Marks: 60		
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/ WEEK	CREDITS
26UBT1ACPI	BIOCHEMISTRY (P)	ALLIED COURSE PRACTICAL – I (ACP – I)	3	3

Course Objectives

- To develop skills in preparing and standardizing chemical solutions using molarity and normality concepts.
- To train students in accurate measurement and interpretation of pH using indicators and digital instruments.
- To enable identification of biomolecules such as carbohydrates, proteins and lipids through qualitative biochemical tests.
- To provide hands-on experience in quantitative estimation of biomolecules and basic analytical techniques like chromatography.

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1	Course emphasis on Laboratory Skills / Analytical Techniques / Experimental Accuracy	Skill Development, Employability
2	Course integrates cross-cutting issues relevant to Professional Ethics, Laboratory Safety, Environmental Awareness and Quality Control	Professional Ethics, Laboratory Safety, Environment & Sustainability
3	Course relevant to Local / Regional / National / Global healthcare, food and research laboratories	National & Global Need
4	Course focus on Sustainable Development Goals	SDG 3, SDG 4, SDG 12

Course Outcome and Cognitive Level Mapping

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Use laboratory safety rules and Good Laboratory Practices while performing biochemical experiments.	K1
CO2	Prepare and standardize solutions accurately using molarity and normality calculations and measure pH using appropriate techniques.	K1, K2
CO3	Perform qualitative tests to identify carbohydrates, proteins, and lipids in given samples.	K3
CO4	Carry out quantitative estimation of biomolecules such as glucose, proteins, and DNA using standard biochemical methods.	K4
CO5	Demonstrate analytical skills through separation techniques like paper chromatography and interpret experimental results effectively.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	2	3	3	1
CO2	3	3	3	3	2	3	2	3	3	1
CO3	3	2	3	3	2	3	2	3	3	1
CO4	3	2	3	3	1	3	2	2	3	1
CO5	3	3	3	3	1	3	2	2	3	2

“1” indicates Slight (Low) Correlation, “2” indicates Moderate (Medium) Correlation, “3” indicates Substantial (High) Correlation, “-” indicates there is no Correlation.

Syllabus

1. Laboratory Rules, Regulations and Good Laboratory Practices.
2. Preparation of Standard solutions (normality and molarity calculations).
3. Measurement of pH using pH paper and pH meter.
4. Preparation of Buffer solutions (Acid and Base).
5. Qualitative tests for Carbohydrates: Molisch’s test, Benedict’s test and Iodine test.
6. Qualitative tests for Proteins: Biuret test and Xanthoproteic test.
7. Qualitative tests for Lipids: Sudan III or Sudan Black test and Grease spot test.
8. Estimation of Glucose by DNS.
9. Estimation of Protein by Lowry’s method.
10. Qualitative estimation of DNA by Diphenyl amine method.
11. Separation of plant pigments using Paper Chromatography.

Reference Books

S. No.	Authors	Year	Title	Publisher
1.	Singh, S. P.	2025	<i>Practical Manual of Biochemistry</i> (8th ed.)	CBS Publishers & Distributors
2.	Rafi, M. D.	2023	<i>Manual of Practical Biochemistry</i> (4th ed.)	Universities Press
3.	Palanivelu, P.	2017	<i>Analytical Biochemistry and Separation techniques: A laboratory manual</i> (5th ed.)	Twenty-First Century Publications
4.	Jayaraman, J.	2011	<i>Laboratory Manual in Biochemistry</i> (2nd ed.)	New Age International
5.	Shankara, Y. M., Shivaraja, & Ganesh, M.	2008	<i>Laboratory Manual for Practical Biochemistry</i>	Jaypee Brothers Medical Publishers

E-Books

1. <https://www.overdrive.com/media/4254532/practical-manual-of-biochemistry>
2. <https://www.overdrive.com/media/11110387/practical-biochemistry>
3. <https://www.overdrive.com/media/8887973/biochemistry-a-practical-manual>
4. <https://skyfox.co/books/practical-manual-of-biochemistry>
5. <https://en.pdfdrive.to/dl/practical-biochemistry-with-clinical-correlation-for-mbbs-students>

Pedagogy

Practical Observation

Course Designer

Dr. G. Gomathi