

Dr. N.G.P.ARTS AND SCIENCE COLLEGE
REGULATIONS 2026-27 for Under Graduate Programme
(Outcome Based Education model with Choice Based Credit System)

B.Sc. Biochemistry Degree
(For the students admitted during the academic year 2026-27)

Eligibility

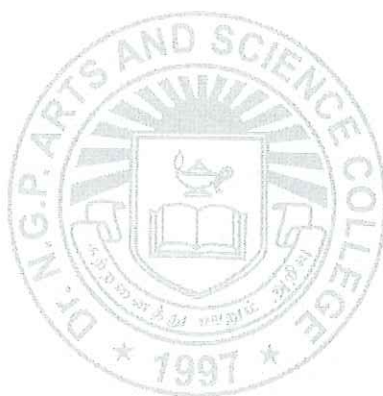
A pass in Higher Secondary Examination conducted by the Government of Tamil Nadu with Physics/ Biology/ Chemistry /Biochemistry/ Microbiology/Home science as one of the paper are only eligible for Examinations accepted as equivalent there by Academic Council, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Bachelor of Science in Biochemistry Degree Examination** of this College after the programme of study of three academic years.

Programme Educational Objectives

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. Offer students a thorough understanding on basic principles of biochemistry at the molecular and cellular levels.
2. Empower students to comprehend the occurrence of varied bio- molecular types with unique chemical characteristics that make them indispensable for life.

3. Provide students a detailed understanding on basic energy requirement of living cells, and how cells meet this prerequisite adequately through varied metabolic processes.
4. Capacitate students to grasp intricate influence of DNA and RNA structures in preserving and transferring information of cell function for generations.
5. Enable students to understand how multiple biological reactions with differing kinetics are performed in a small cell volume at a given time.
6. Entitle students to appreciate the prominence of Biochemistry in basic and applied research in varied branches of industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc.



PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	Graduates are cognizant of basic principles and concepts in diverse branches of biological and allied sciences that govern mechanisms of bio-molecular unity in varied life existences. Alumni are expressive of assimilated wisdom to peers and public at ease with language of their choice through discussion and debate.
PO2	Graduates are comprehensive of intricacies in biological organization, and they have acquired and developed primary and secondary experimental competencies and technical skills to address, investigate, design, develop and demonstrate solutions to life's important issues.
PO3	Graduates are advantaged to the pivotal and functional importance of major and allied subjects, and combine it with modern tools to investigate both basic and applied research questions in areas of industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc. Alumni are valuable performers as an individual or in a team.
PO4	Graduates are competent to enroll in higher education programs, and successful in placements of vast career options in core and allied areas of the study (scholars, managers, counselors, writers, technical experts, field experts, teachers, entrepreneur and a responsible citizen). Alumni have acquired and developed skills to manage projects and finances. While discharging duties at varied capacities, graduates are inculcated to keep sustainable environment as a goal, and follow ethics of professional stature.
PO5	Graduates are infused with metamorphic qualities of education, and inspired to develop scientific temperament and lead a scientific way of life in facing socio-economical challenges that will benefit the society. Alumni are adept at connecting their learning's to worldwide events. Thereby, they continue the learning's lifelong.

TOTAL CREDIT DISTRIBUTION

Part	Subjects	No.of Papers	Credit	SemesterNo.
I	Tamil/Hindi/French/Malayalam	4	4x3=12	I,II,III&IV
II	English	4	4x3=12	I,II,III&IV
III	Core Credits (5)	3	5X 3=15	I-VI
	Core Credits (4)	9	4X 9=36	I-VI
	Core Credits (3)	1	3X1=03	I-VI
	Core Practical (2)	7	2X7=14	I-VI
	Core Project (2)	1	2X1=2	VI
	Inter Departmental Course(IDC)	2	3X2=6	I-II
	Inter Departmental Course(IDC)	2	4X2=8	III & IV
	Inter Departmental Course Practical (IDC)	1	2X1=2	I
	Discipline Specific Elective(DSE)	3	4X3=12	V & VI
	Skill Enhancement Course(SEC)	4	2X4=8	III -VI
	Industrial Training	1	2X1=2	V
IV	Environmental Studies(AECC)	1	2X1=2	I
	Basic Tamil/ Advanced Tamil/ Human Rights and Womens rights	1	2X1=2	II
	Generic Elective (GE)	1	2X1=2	V
	Innovation, IPR and Entrepreneurship	1	2X1=2	VI
V.	NSS/NCC/YRC/RRC/Yoga/ Sports/Clubs/Health and Wellness	1	2X1=2	II
Total credits			142	

CURRICULUM

B.Sc BIOCHEMISTRY
PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
First Semester												
Part-I												
26TLU1TA	Language-I	Tamil-I	4	1	-	5	60	3	25	75	100	3
26TLU1HA		Hindi-I				5	60					
26TLU1MA		Malayalam-I				5	60					
26TLU1FA		French-I				5	60					
Part-II												
26ELU1EA	Language-II	English I	4	-	1	5	60	3	25	75	100	3
Part-III												
26BCU1CA	Core-I	Biomolecules	4	-	-	4	48	3	25	75	100	4
26BCU1CB	Core-II	Cell biology	3	-	-	3	36	3	25	75	100	3
26BCU1CP	Core Practical-I	Biomolecules and Cell Biology	-	-	4	4	48	6	40	60	100	2
26CEU1IA	IDC-I	Chemistry	3	-	-	3	36	3	25	75	100	3
26CEU1IP	IDC Practical-I	Chemistry	-	-	4	4	48	3	40	60	100	2
Part-IV												
26CEU1AA	AECC-I	Environmental studies	2	-	-	2	24	-	50	-	50	2
Part-V												
26BCU1XA	Extension Activity	NSS/NCC/YRC/ RRC/Yoga/ Sports/ Club	-	-	-	-	-	-	50	-	50	1
Total			20	1	9	30	360				800	23

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Second Semester												
Part-I												
26TLU2TA	Language-I	Tamil - II	4	1	-	5	60	3	25	75	100	3
26TLU2HA		Hindi-II				5	60					
26TLU2MA		Malayalam-II				5	60					
26TLU2FA		French-II				5	60					
Part-II												
26ELU2EA	Language-II	English - II	4	-	1	5	60	3	25	75	100	3
Part-III												
26BCU2CA	Core-III	Enzymology	5	-	-	5	60	3	25	75	100	4
26BCU2CB	Core-IV	Microbiology	4	-	-	4	48	3	25	75	100	4
26BCU2CP	Core Practical-II	Enzymology and Microbiology	-	-	4	4	48	6	40	60	100	2
26PYU2IB	IDC-II	Physics	3	-	2	5	60	3	25	75	100	3
Part-IV												
26TLU2AA/ 26TLU2AB/ 26CMU2AA	AECC-II	Basic Tamil/ Advanced Tamil /Human Rights and Women's Rights	2	-	-	2	24	-	50	-	50	2
Part V												
26BCU2XA	Extension Activity	NSS/NCC/ YRC/RRC/ Yoga/Sports/ Club/Health and Wellness	-	-	-	-	-		50	-	50	1
Total			22	1	7	30	360				700	22

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Third Semester												
Part-I												
26TLU3TA	Language-I	Tamil-III	3	1	-	4	48	3	25	75	100	3
26TLU3HA		Hindi-III				4	48					
26TLU3MA		Malayalam-III				4	48					
26TLU3FA		French-III				4	48					
Part-II												
26ELU3EA	Language-II	English-III	3	1	-	4	48	3	25	75	100	3
Part-III												
26BCU3CA	Core-V	Human Physiology	5	-	-	5	60	3	25	75	100	5
26BCU3CB	Core-VI	Developmental Biology	5	-	-	5	60	3	25	75	100	4
26BCU3CP	Core Practical-III	Human Physiology and Developmental Biology	-	-	4	4	48	6	40	60	100	2
26MTU3IF	IDC-III	Principles of Biostatistics	4	-	-	4	48	3	25	75	100	4
26BCU3SA	SEC-I	Analytical Biochemistry	2	-	2	4	48	3	25	75	100	2
Total			22	2	6	30	360				700	23

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Fourth Semester												
Part-I												
26TLU4TA	Language - I	Tamil-IV	3	1	-	4	48	3	25	75	100	3
26TLU4HA		Hindi-IV				4	48					
26TLU4MA		Malayalam-IV				4	48					
26TLU4FA		French-IV				4	48					
Part-II												
26ELU4EA	Language - II	English-IV	3	1	-	4	48	3	25	75	100	3
Part-III												
26BCU4CA	Core- VII	Intermediary Metabolism	5	-	-	5	60	3	25	75	100	5
26BCU4CB	Core- VIII	Nutritional Biochemistry	4	-	-	4	48	3	25	75	100	4
26BCU4CP	Core Practical-IV	Metabolism and Nutritional Biochemistry	-	-	4	4	48	6	40	60	100	2
26CSU4IM	IDC-IV	Python for Biologists	3	-	2	5	60	3	40	60	100	4
26BCU4SM	SEC-II	Bioinformatics	2	-	2	4	48	6	40	60	100	2
Total			20	2	8	30	360				700	23

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Fifth Semester												
Part-III												
26BCU5CA	Core- IX	Genetics and Molecular Biology	5	-	-	5	60	3	25	75	100	5
26BCU5CB	Core-X	Plant Biochemistry	4	-	-	4	48	3	25	75	100	4
26BCU5CC	Core-XI	Immunology	4	-	-	4	48	3	25	75	100	4
26BCU5CP	Core Practical -V	Plant Biochemistry	-	-	4	4	48	6	40	60	100	2
26BCU5CQ	Core Practical -VI	Immunology and Molecular Biology	-	-	4	4	48	6	40	60	100	2
26BCU5SA	SEC-III	Recombinant DNA Technology	3	-	-	3	36	3	25	75	100	2
26BCU5DA	DSE-I	Hematology	4	-	-	4	48	3	25	75	100	4
26BCU5DB		Environmental Biochemistry				4	48					
26BCU5DC		Dairy Biochemistry				4	48					
26BCU5TA	IT	Industrial Training	-	-	-	-	-	-	40	60	100	2
Part IV												
	GE-I		2	-	-	2	24	-	50	-	50	2
Total			22	-	8	30	360				850	27

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Sixth Semester												
Part-III												
26BCU6CA	Core-XII	Clinical Biochemistry	5	-	-	5	60	3	25	75	100	4
26BCU6CB	Core-XIII	Hormonal Biochemistry	4	-	-	4	48	3	25	75	100	4
26BCU6CV	Core	Project and Viva Voce	-	-	4	4	48	3	40	60	100	2
26BCU6CP	Core Practical-VII	Clinical and Hormonal Biochemistry	-	-	4	4	48	6	40	60	100	2
26BCU6SA	SEC-IV	Molecular Diagnostics	3	-	-	3	36	3	25	75	100	2
26BCU6DA	DSE-II	Neurobiochemistry	4	-	-	4	48	3	25	75	100	4
26BCU6DB		Marine Biochemistry				4	48					
26BCU6DC		Sports Biochemistry				4	48					
26BCU6DD	DSE-III	Pharmaceutical Biochemistry	4	-	-	4	48	3	25	75	100	4
26BCU6DE		Bioprocess Technology				4	48					
26BCU6DF		Bioresources and Bioprospecting				4	48					
Part-IV												
26BTU6AA	AECC-III	Innovation,IPR and Entrepreneurship	2	-	-	2	24	-	50	-	50	2
Total			22	-	08	30	360	-	-	-	750	24
		Grand Total								4500		142

DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective courses during Semesters V & VI

Semester V (Elective I)

List of Elective Courses

S.No.	Course Code	Name of the Course
1.	26BCU5DA	Hematology
2.	26BCU5DB	Environmental Biochemistry
3.	26BCU5DC	Dairy Biochemistry

Semester VI (Elective II)

List of Elective Courses

S.No.	Course Code	Name of the Course
1.	26BCU6DA	Neurobiochemistry
2.	26BCU6DB	Marine Biochemistry
3.	26BCU6DC	Sports Biochemistry

Semester VI (Elective III)

List of Elective Courses

S.No.	Course Code	Name of the Course
1.	26BCU6DD	Pharmaceutical Biochemistry
2.	26BCU6DE	Bioprocess Technology
3.	26BCU6DF	Bioresources and Bioprospecting

GENERIC ELECTIVE COURSE (GE)

The following is the course offered under Generic Elective Course

Semester V

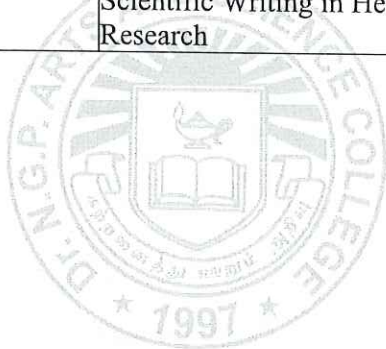
S.No.	Course Code	Course Name
1	26BCU5GA	Organic farming: principles and practices

EXTRACREDIT COURSES

The following are the courses offered under self-study to earn extra credits:

Semester III

S.No.	Course Code	Course Name
1	26BCUSSA	Forensic Biology
2	26BCUSSB	Scientific Writing in Health Research



Anand
24/26
BoS Chairman/HoD
Department of Biochemistry
Dr. N. G. P. Arts and Science College
Coimbatore - 641 048

 Dr.N.G.P. Arts and Science College		
APPROVED		
R.S. 21st 02/04/26	AC -	GB -

Semester – I CORE I: BIOMOLECULES							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26BCU1CA	BIOMOLECULES	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The importance of biological macromolecules. • The influence and role of structure in reactivity of biomolecules. • Their role with regard to maintenance and perpetuation of the living systems.
Prerequisite	Knowledge on Biology

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Explain the structure, properties and biological significance of carbohydrates.	K2
CO2	Describe knowledge on the classification, properties and characterization of lipids.	K2
CO3	Articulate the classification, functions and acid base properties of amino acids. Illustrate the various levels of organization of proteins.	K3
CO4	Analyze the classification, structure, properties, and functions of nucleic acids.	K4
CO5	Evaluate the clinical consequences of mineral and vitamin deficiency, and justify the role of pH and buffers through experimentation.	K5

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	M	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

26BCU1CA BIOMOLECULES

Syllabus

Unit	Content	Hrs	Resources
I	Carbohydrates Introduction to biological macromolecules. Carbohydrate - Definition, classification, physical properties and biological significance. Monosaccharides: Linear and cyclic structure, reactions of monosaccharides due to presence of hydroxyl, aldehyde and keto groups. Structure and properties of disaccharides - Maltose, Lactose and Sucrose. Polysaccharides - structure & biological functions of Homopolysaccharides (Starch, glycogen and Cellulose) & Heteropolysaccharides (Hyaluronic acid, Chondroitin sulphate and Heparin). Occurrence, importance and the structure of sugar derivatives: amino sugars, bacterial cell wall polysaccharides - peptidoglycan.	10	Text Book, Reference book and NPTEL
II	Lipids Definition, classification and physico-chemical properties of lipids. Storage lipids: Fatty acids - types, nomenclature, structure & properties. Simple and mixed triglycerides. Characterization of fats - iodine value, saponification value, acid number, acetyl number, Polenske number, Reichert-Meissl number. Structural lipids - phospholipids and glycolipids. Structure and functions of steroids - cholesterol. Eicosanoids - an overview.	8	Text Book, NPTEL, E-Resources
III	Amino acids and Proteins Classification and general properties of amino acids. Chemical reactions of amino acids due to carboxyl groups and amino groups, colour reactions of amino acids. Peptide bond - structure and properties. Ramachandran plot - an overview. Protein - classification and physico-chemical properties. Organization of protein Structure - Primary (Insulin), Secondary (Keratin, Collagen), Tertiary (Myoglobin) & Quaternary structure (Hemoglobin). Denaturation and renaturation of proteins. AI tools in predicting 3D protein structures (e.g., AlphaFold).	10	Text book, NPTEL, and YouTube Videos
IV	Nucleic acids Structures of Purines, Pyrimidines, Nucleosides and Nucleotides. Structure and biological significance of DNA double helical structure. A, B & Z forms of DNA, superhelicity. Denaturation & renaturation of DNA. Properties of DNA - Hypochromic effect, melting temperature, viscosity. Structure and functions of mRNA, tRNA, rRNA, snRNA, miRNA, siRNA.	8	Text book, NPTEL, and E-resources
V	Minerals, Vitamins, Water, pH & Buffers Micro and Macro Minerals - Clinical Significance. Vitamins -	12	Text book and

	Definition, classification. Fat soluble (Vitamin A, D, E, K) and Water-soluble vitamins (Vitamin B Complex & Vitamin C) - sources, functions and deficiencies, hypervitaminosis. Water: Structure, Physical properties of water, weak interaction in aqueous solutions. pH - Introduction, buffers, Henderson-Hasselbalch equation, biological buffer system.		Reference book
	Total	48	

Text book	1.	Jain, J.L., Jain, N. and Jain, S., 2016, "Fundamentals of Biochemistry", 7th edition, S. Chand and Company Publication, Chennai.
	2.	Deb, A.C., 2019, "Fundamentals of Biochemistry", 10 th edition, New Central Book Agency Pvt Ltd, Kolkata.
Reference Books	1.	Nelson, D.L. and Cox, M.M., 2017, "Lehninger's Principles of Biochemistry", 7th edition, W.H. Freeman and Company, New York.
	2.	Berg, J.M., Tymoczko, J.L., Gatto Jr, G.J. and Stryer, L., 2015, "Biochemistry", 8th edition, W.H. Freeman and Company, New York.
	3.	Voet, D. and Voet, J.G., 2018, "Biochemistry", 5th edition, John Wiley and Sons Pvt. Ltd., New York
	4.	Rodwell, V.W., Bender, D.A., Botham, K.M., Kennelly, P. and Weil, P.A., 2018, "Harper's Illustrated Biochemistry", 31st edition, The McGraw-Hill Inc., New York.

Journal and Magazines	https://www.mdpi.com/journal/biomolecules https://www.pulsus.com/journal-biomolecules-biochemistry.html https://biotech.journalspub.info/?journal=IJBB
E-Resources and Website	https://archive.nptel.ac.in/courses/104/102/104102016/ [NPTEL] https://www.khanacademy.org/test-prep/mcat/biomolecules https://www.mooc-list.com/course/biochemistry-saylororg https://courseware.cutm.ac.in/courses/biomolecules/ https://www.biologydiscussion.com/biomolecules/biomolecules-top-4-classes-of-biomolecules/11169

Learning Method	Lecture/ Video tutorials/ PPT/ GD/ Assignment/ Seminar
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Focus of the Course	Skill Development / Employability
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Semester - I
CORE II : CELL BIOLOGY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26BCU1CB	CELL BIOLOGY	CORE	36	-	-	3

Preamble	This course has been designed for students to learn and understand • structure and purpose of basic components of Prokaryotic and Eukaryotic cells • how various tissue types are united to form organs and how those organs operate, which is determined by the characteristics of the individual tissues	
Prerequisite	Knowledge of the structure of cells	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Differentiate cellular types based on origin and evolution.	K3
CO2	Explain the structure and functions of various cellular organelles.	K1
CO3	Demonstrate microfilament polymerization, assembly and intracellular organization	K3
CO4	Analyze the importance of cell-matrix and cell-cell interactions in tissue organization and cellular communication.	K4
CO5	Evaluate the principles of the cell cycle and cell division in regulating growth, genetic stability, and cellular function	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

26BCU1CB

CELL BIOLOGY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Introduction to cell biology An overview of cells - origin and evolution of cells and cell theory. Classification of cells: prokaryotic (Archaea and Eubacteria) and eukaryotic cells (animal and plant cells). Comparison of cells: microbial, plant, and animal cells. Cells as experimental models- prokaryotic and eukaryotic cells. Exceptions to cell theory- Mycoplasma, Viruses, Virioids, prions.	07	Text Book
II	Structure and Functions of different cell organelles Structure and functions- Golgi apparatus, Ribosomes, Nucleus, Nuclear envelope, Nuclear-pore complex, RER, SER, Lysosomes, Glyoxysomes, Mitochondria, Chloroplast and Peroxisomes. Chromosomes- Structure, Types and functions, Special types of chromosomes – lamp brush chromosomes, polytene chromosomes. Organization of chromatin – histones, nucleosome concept, formation of chromatin structure.	08	Reference Book
III	Cytoskeleton proteins Structure and organization- Actin filaments. Microfilament polymerization: tread milling and role of ATP. Non-muscle myosin. Intermediate filament proteins- assembly and intracellular organization. Assembly, organization and movement- cilia and flagella.	07	Text Book
IV	Cell wall, extracellular matrix, cell membrane and transport Cell wall and cell matrix proteins- prokaryotic and eukaryotic cells. Structure and function- capsule. Interactions- Cell-matrix and cell-cell. Junctions- adherence, tight and gap, desmosomes, hemi-desmosomes, focal adhesions and plasmodesmata. Cell signaling and receptors (overview). Cell membrane- Fluid Mosaic Model. Transport across membrane- Osmosis, diffusion, uniport, symport antiport, active and passive transport, and ion channels	07	NPTEL
V	Cell Division and cell cycle Cell division- Mitosis and Meiosis (prokaryotes and eukaryotes). Cell cycle- phases of cell cycle (eukaryotic cell cycle, restriction point and checkpoints- overview). Cell death- apoptosis and necrosis (overview). Transformed cells-	07	You Tube Videos

	salient features. Stem cells and maintenance of adult Tissues, Embryonic Stem cells and Therapeutic cloning.		
	Total	36	

Text Book	1.	Verma, P S and Agarwal, V K, 2004, "Cell Biology, Genetics, Molecular Biology, Evolution and Ecology", 1st edition, S. Chand Publications, New Delhi.
Reference Books	1.	Cooper G M. and Hausman R E, 2015, "The cell: A Molecular approach", 6th edition, ASM Press, Washington D.C, USA.
	2.	Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P, 2015, "Molecular Biology of the cell" 6th edition, Taylor and Francis Company, United Kingdom.
	3.	Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Lawrence Zipursky and James Darnell, 2016. "Molecular Cell Biology", 8th edition, WH Freeman and Company, New York
	4.	Kar G, Iwasa J and Marshall M, 2016. "Karp's Cell and Molecular Biology: Concepts and Experiments", 8th edition, John Wiley and Sons, USA.

Journal and Magazines	https://bmcmolcellbiol.biomedcentral.com/ , https://www.springer.com/gp/journal-impact/life-sciences/cell-biology
E-Resources and Website	https://onlinecourses.nptel.ac.in/noc22_bt33 https://www.udemy.com/course/basics-on-cell-biology

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester – I							
CORE PRACTICAL -I: BIOMOLECULES AND CELL BIOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26BCU1CP	BIOMOLECULES AND CELL BIOLOGY	CORE PRACTICAL		-	48	2

Preamble	This course has been designed for students to learn and understand • The essential laboratory skills for preparing and analysing biomolecules • The fundamental cell biology concepts • The practical competency in modern biological investigations
Prerequisite	Basic Biological knowledge

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Recall the basic principles of biomolecule classification and cell structure.	K1
CO2	Identify monosaccharides, disaccharides, amino acids, and nucleic acids using qualitative tests.	K2
CO3	Demonstrate preparation of molar, normal, and buffer solutions with appropriate pH adjustments.	K3
CO4	Analyze lipid samples for saponification, acid, and iodine numbers.	K4
CO5	Evaluate and distinguish the stages of mitosis and meiosis through microscopic examination.	K5

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

26BCU1CP	BIOMOLECULES AND CELL BIOLOGY
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S.No

List of Practicals

BIOMOLECULES

- 1 Preparation of Normal and Molar solutions, Preparation of Buffer Solutions- Phosphate, Citrate, Tris, Acetate
- 2 Determination and adjustment of pH using pH paper and pH meter
- 3 Qualitative Analysis of carbohydrates: Monosaccharides: Glucose, Fructose, Galactose. Disaccharides: Sucrose, Lactose, Maltose. Polysaccharides: Starch
- 4 Qualitative analysis of amino acids: Histidine, Tyrosine, Tryptophan, Cysteine and Arginine.
- 5 Determination of Saponification number, acid number and Iodine number of edible oil.
- 6 Qualitative test for nucleic acids.

CELL BIOLOGY (DBT Star Scheme Practicals)

- 7 Mitosis in Onion root tip squash.
- 8 Meiosis in grasshopper testis squash.
- 9 Fractionation of cellular components.
- 10 Staining and visualization of mitochondria by Janus green stain.
- 11 Cell Types - Microbial, Animal and Plant Morphometric measurements
- 12 Identification and study of cancerous cells using permanent slides and photomicrographs.

Text Books	1.	Jayaraman, J, 2011, "Laboratory Manual in Biochemistry", 2nd Edition, New Age International Pvt. Ltd., India.
	2.	Kleinsmith, L J, Hardin, J and Bertoni, G P, 2011, "Becker's The World of the Cell", 8th Edition, Pearson/Benjamin-Cummings, Boston, USA.

Learning Method	Demonstration/ Hands on Experiments
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Focus of the Course	Skill Development/ Employability
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Semester – I IDC I: CHEMISTRY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26CEU1IA	CHEMISTRY	IDC	36	-	-	3

Preamble	This course has been designed for students to learn and understand • The concept of expressing concentration of solutions • The concepts of catalysts and their applications • About the bonding in organic compounds.
Prerequisite	Knowledge on basic chemistry

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the concept of concentration of the solutions.	K2
CO2	Infer the acid and basic properties of solutions.	K3
CO3	Interpret the concept of the bonding in molecules.	K3
CO4	Evaluate the concepts of the stereo chemistry.	K5
CO5	Explain the types of catalysis.	K4

Mapping with Program Outcomes:					
Cos/ POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	M	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	M	S

26CEU1IA	CHEMISTRY
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Syllabus

Unit	Content	Hrs	Resources
I	Solutions Normality- Molarity - Molality - Mole fraction - Mole concept. Primary and secondary standards - Preparation of standard solutions. Principle of Volumetric analysis (with simple problems) - Indicators - Theory of indicators - Ostwald and quinonoid theory.	7	Text Book
II	Acids and Bases Acid-base concepts - Arrhenius, Bronsted-Lowry, and Lewis's theories (basic understanding) - Strong, weak acids and bases in biological systems. pH and pOH - Definition - Biological importance and simple calculations - Buffer solutions- definition - Types and importance in biological systems (blood, cells).	7	Text Book
III	Chemical Bonding in biological and food systems Types of bonding - Ionic Bond: formation, nature, and importance in salts and biological fluids. Covalent bond: formation and significance in biomolecules like carbohydrates, proteins and lipids. Coordinate (dative) bond: basic concept and role in biological complexes (e.g., metal-enzyme interactions). Hydrogen bonding - DNA stability - Van der Waals force.	8	Text Book
IV	Stereo Chemistry Isomerism - Structural isomerism - Symmetry of elements (Plane, Centre and Axis of symmetry) - Optical isomerism of lactic acid and tartaric acid - Enantiomers - Diastereomers - Separation of racemic mixture - Geometrical isomerism (maleic and fumaric acid).	7	Text Book
V	Catalysis Homogenous - Heterogeneous - Enzyme catalysis - Industrial catalyst - hydrogenation of oils - Applications in food industry and pollution control.	7	Text Book
	Total	36	

Text book	1.	Puri. B.R, Sharma. L.R and Pathania. M.S, 2017, "Principles of Physical Chemistry", 47 th Edition, John Wiley and Sons & USA.
	2.	Madhan. R.D, 2016, "Modern Inorganic Chemistry", Tenth edition, Mc Graw Hill Company & USA.
Reference Books	1.	Lee. J.D, 2002, "A New Concise Inorganic Chemistry", 5 th Edition, ELBS &UK.
	2.	Jain. M.K and Sharma. S.C, 2012, "Modern Organic Chemistry", Vishal publishing Co & New Delhi.
	3.	Puri. B.R, Sharma. L.R and Kalia. K.C, 2016, "Principles of Inorganic Chemistry", Vishal Publishing & Co & New Delhi.
	4.	Glasstone. S and Lewis. D, 2014, "Elements of Physical Chemistry", Second Edition, Macmillan Ltd, London.

Journal and Magazines	https://onlinelibrary.wiley.com/journal/10974601
E-Resources and Website	https://www.uou.ac.in/lecturenotes/science/MSCCH-17/CHEMISTRY%20LN%201%20STERIOCHEMISTRY.pdf

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion/Case Study
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Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations
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Semester - I IDC PRACTICAL: CHEMISTRY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26CEU1IP	CHEMISTRY	IDC PRACTICAL	-	-	48	2

Preamble	This course has been designed for students to learn and understand • The practical skills in volumetric and qualitative analysis of organic compounds • The standard titration techniques and systematic identification of organic functional groups • The accuracy, observation and analytical reasoning in chemical experiments
Prerequisite	Knowledge of general chemistry and organic functional groups

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Demonstrate the volumetric titrations to estimate concentrations of acids, bases	K3
CO2	Interpret the redox titration techniques for quantitative determination of ferrous ions	K3
CO3	Evaluate organic functional groups using systematic qualitative tests	K4
CO4	Differentiate between various organic compounds through chemical reactions	K4
CO5	Apply precision, accuracy, and proper laboratory practices in quantitative and qualitative chemical analysis	K5

Mapping with Program Outcomes:

Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	M	S
CO3	M	M	S	S	M
CO4	S	S	S	S	S
CO5	M	S	S	M	S

26CEU1IP	CHEMISTRY
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S.No

List of Experiments

Volumetric analysis

- 1 Estimation of sodium hydroxide using standard sodium carbonate.
- 2 Estimation of hydrochloric acid using standard oxalic acid.
- 3 Estimation of oxalic acid using standard sulphuric acid.
- 4 Estimation of ferrous sulphate using standard mohr's salt solution.
- 5 Estimation of oxalic acid using standard ferrous sulphate solution.
- 6 Estimation of ferrous ions using mohr's salt solution.

Systematic analysis of organic compounds

- 7 Systematic analysis of organic compounds containing diamides.
- 8 Systematic analysis of organic compounds containing carbohydrates.
- 9 Systematic analysis of organic compounds containing monocarboxylic acids.
- 10 Estimation of Iodine in common salt
- 11 Estimation of calcium in milk powder
- 12 Determination of peroxide value of oil (Iodometric Method).

Text Books	1.	V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, 1997, "Basic Principles of Practical Chemistry" 2nd Edition. Sultan Chand and Sons, New Delhi.
	2.	J. Mendham, R.C. Denney, J.D. Barnes and M. Thomas, 1989, "Vogel's Text book of Quantitative Analysis" 6th Edition, Pearson Education.

Learning Method	Demonstration/ Hands on Experiments
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Focus of the Course	Skill Development/ Employability
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 2/4/26
 BoS Chairman/HoD
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Dr. N.G.P. Arts and Science College
 B.Sc Biochemistry (Students admitted during the AY 2026-27)
APPROVED
 BoS- 215
 02/04/26
 AC -
 GB -