

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED (III CYCLE) WITH “A” GRADE BY NAAC

ISO 9001:2015 CERTIFIED

TIRUCHIRAPPALLI – 620 018

DEPARTMENT OF BIOTECHNOLOGY



B.Sc., BIOTECHNOLOGY

SYLLABUS

2022 – 2023 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 to know and understand broad range of basic biological concepts and can apply and analyses these in at least one specialty area.
- Make the students to generate 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 professional 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 biological problem.
- To create opportunities for placement in leading industries through Internships.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	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.
PEO2	ACADEMIC EXCELLENCE To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	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.
PEO4	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.
PEO5	GREEN SUSTAINABILITY To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc., (LIFE SCIENCE) PROGRAMMES

PO NO	On completion of B.Sc., Biotechnology Programme, the students will be able to
PO1	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 future.
PO2	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.
PO3	Professional ethics and Teamwork: Explore professional responsibility through projects, internships, field trip/industrial visits and mentorship programmes to transmit communication skills.
PO4	Critical and Scientific thinking: Equip training skills in Internships, Research Projects to do higher studies in multidisciplinary path with higher level of specialization to become professionals of high quality standards.
PO5	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.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc., BIOTECHNOLOGY

PSO NO	The students of B.Sc., Biotechnology will be able to	POs Addressed
PSO 1	Acquire the knowledge of biological sciences with the implementation of technology on different living systems like plants, animals and microbes.	PO1 PO2
PSO2	Explain the fundamental concepts and develop skills in Immunology, Developmental biology, Nanobiotechnology, Genomics, Proteomics, Bioinformatics, Agriculture and Medicine	PO1 PO2
PSO3	Apply the technical aspects related to improvement of microbes, plants and live-stocks for the welfare of human and environment.	PO2 PO4
PSO 4	Impart hands-on techniques in various thrust areas of biotechnology to meet the emerging demands in industry, academia and research.	PO2 PO4
PSO5	Gaining knowledge to transform theoretical concept to practical products/process to move ahead in entrepreneurship and apply the laws concerning to IPR and bioethics	PO2 PO3 PO5



Cauvery College for Women (Autonomous), Trichy – 18

B.Sc., Biotechnology

(For the Candidates admitted from the Academic year 2022 – 2023 onwards)

Semester	Part	Course	Title	Course Code	Inst. Hrs./ week	Credits	Exam			Total		
							Hrs.	Marks				
								Int.	Ext.			
I	I	Language Course-I (LC)	Ikkala Ilakkiyam	22ULT1	6	3	3	25	75	100		
			Hindi Literature & Grammar – I	22ULH1								
			History of Popular Tales, Literature and Sanskrit Story	22ULS1								
			Basic French – I	22ULF1								
	II	English Language Course-I(ELC)	Functional English for Effective Communication – I	22UE1	6	3	3	25	75	100		
	III	Core Course – I(CC)	Cell Biology	22UBT1CC1	5	5	3	25	75	100		
				Core Practical - I (CP)	Cell Biology Practical	22UBT1CC1P	3	3	3	40	60	100
				First Allied I	General Microbiology	22UBT1AC1	4	3	3	25	75	100
				First Allied II	Biochemistry	22UBT1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course – I (AECC)	UGC Jeevan Kaushal - Universal Human Values	22UGVE	2	2	-	100	-	100		
					30	22				700		

Semester – I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22UBT1CC1	CELL BIOLOGY	CORE	5	5

Course Objectives

- To study about the basic concepts of cell and its types, cellular organelles and their functions.
- To study about the specialized cells.
- To study about cell cycle and its regulations.
- To study about cell signaling pathways

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Explain the structure, properties and types of prokaryotic and eukaryotic cells	K1, K2
CO2	Describe the structure and functions of cell organelles	K1, K2
CO3	Discuss the various types of cell division and cell signaling	K2
CO4	Demonstrate the role of specialized cells and their significance	K2, K3
CO5	Apply the basic knowledge of cell biology in diverse research areas	K2, K3

Mapping of CO with PO and PSO

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

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

Syllabus

Unit I - Fundamentals of cell structure

15 Hours

Cell as basic unit of life: Basic properties of cells, cell theory, cell morphology, Ultrastructure - Prokaryotic and Eukaryotic cells.

Unit II - Cellular membranes and matrices

18 Hours

Cell Membrane: Plasma Membrane – Fluid Mosaic Model and Sandwich Model; Chemical composition and fluidity of membranes; transport of nutrients - diffusion, facilitated diffusion and osmosis; Cell wall: structural organization; Cytoskeleton: Microtubules, and Intermediate filaments; Cell Motility-Flagella.

Unit III - Endomembrane System

18 Hours

Ultrastructure and functions: Nucleus; Endoplasmic Reticulum - Rough and Smooth; Golgi Complex, Ribosomes - Types and functions; Mitochondria - Ultrastructure, Chemical Composition and functions; Chloroplast - Ultrastructure, Chemical Composition and functions; Microbodies: Types - Peroxisomes, Glyoxisomes and Lysosomes - Types, structure and function.

Unit IV- Cell Division and Signalling

12 Hours

Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, crossing over; Apoptosis; Signal transduction - Cell to cell recognition.

Unit V- Specialized cells

12 Hours

Motile cells (amoeboid and Sperm cells), nerve Cells and nerve impulse conduction, muscle cells and muscle contraction, Egg cells.

Unit VI – Self Study for Enrichment

(Not to be Included for External Examination)

Discovery of Cells, Cytoskeleton - Microfilaments, Types of Microbodies, Cell adhesion and Red Blood Cells.

Text Books

1. Veer Bala, R. (2021). *Cell Biology*. Latest edition. Med tech.
2. Rastogi, S. C. (2020). *Cell and Molecular Biology*. New Age International Private Ltd.
3. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., Karen, H., Dennis, B., & Walter, P. (2019). *Essential Cell Biology*. 5th International Student Edition. Garland Science.
4. De Robertis, E.D.D. & De Robertis, E.M.F. (2017). *Cell & Molecular Biology*. 8th Edition. Waverly.
5. Verma, P. S. & Agarwal, V. K. (2016). *Cell Biology*. S. Chand Publication.

Reference Books

1. Cooper, G.M. & Hausman, R.E. (2018 Reprint). *The Cell A Molecular Approach*. 6th Edition. Ingram Publication.
2. Griffith, R. (2017). *Cell biology (Meiosis & Mitosis)*. Larsen and Keller Education.
3. Thomas, D. P., William, C. E., Jennifer, L. S. & Graham, J. (2017). *Cell Biology*. 3rd Edition. Elsevier IE (short Disc).
4. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., Karen, H., Dennis, B. & Walter, P. (2017). *Molecular Biology of Cell*. 6th Edition. Garland Science, Taylor & Francis group.
5. Hardin, J., Bertoni, G.P. & Kleinsmith, L.J. (2017). *Becker's World of the Cell*. Pearson Education.

E - Books

1. <https://open.umn.edu/opentextbooks/textbooks/244>
2. <http://standing.weebly.com/uploads/2/3/3/5/23356120/8 - unit 30c.pdf>
3. <https://www.infobooks.org/free-pdf-books/biology/cell-biology/>
4. <http://www.freebookcentre.net/Biology/Cell-Biology-Books.html>;
5. https://tripurauniv.ac.in/Page/SubjectWiseOnline_EBooks_Cell_Molecular_Biology

Web References

1. <https://ocw.mit.edu/courses/7-06-cell-biology-spring-2007/>
2. <https://sciencewiz.com/portals/cells/tour-inside-the-cell/a-tour-of-the-cell-more-advanced/>
3. <http://naturedocumentaries.org/17217/virtual-tour-cell-xvivo-scientific-animation-2018/>
4. <https://nptel.ac.in/courses/102103012>

Pedagogy

Chalk and Talk, PPT, Videos and Animations

Course Designers

1. Ms. P. ILAMATHY
2. Dr. S. ABINAYA

Semester – I	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22UBT1CC1P	CELL BIOLOGY PRACTICAL	CORE	3	3

Course Objectives

- To perform experiments using microscopes and micrometry.
- To study about cells and their morphology by appropriate techniques.
- To gain knowledge in cell division and their stages.
- To perform experiments on cell counting and viability.

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	Define and describe about the basic instruments involved in Biology.	K1, K2
CO 2	Discuss and differentiate the morphology of various types of cells.	K2
CO 3	Classify and illustrate the different cell organelles.	K3
CO 4	Categorize the different types and stages of cell division.	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 and safety measures.
2. Demonstration of Principles and working mechanism of Microscope.
3. Principles and working mechanism of Microtome (Demo).
4. Measurement of Cell Size by Micrometry.
5. Prokaryotic Cell Observation – *E. coli*.
6. Eukaryotic Cell Observation – Yeast and Onion.
7. Morphological Characterization of various types of Plant tissue cells.
8. Separation of cell organelles by centrifugation method.
9. Barr body identification from Buccal Smear.
10. Cell Division - Mitotic stages.
11. Cell Division - Meiotic stages.
12. Cell Division - Binary fission of Yeast Cells.
13. Enumeration of Eukaryotic Cells (Yeast), Red Blood Cells and White Blood Cells.
14. Assessment of Cell Viability by trypan blue staining.
15. Experiment on Osmosis.

Reference Books

1. Gupta, R., Seema, M. & Ravi, T. (2018). *Cell Biology: Practical Manual*. Prestige Publishers.
2. William, H. H. (2017). *Cell Biology: Laboratory Manual*, Pearson Education.
3. Amit, G. & Bipin Kumar, S. (2019). *Practical Laboratory Manual – Cell Biology*. Lambert Academic Publishing.
4. Thompson, D. A. (2011). *Cell and Molecular Biology Lab. Manual*. Create Space Independent Publishing Platform.
5. Mary, L. L. (1993). *Cell Biology: Laboratory Manual*. Ron Jon Publishing Incorporated.

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 Designers

1. **Dr. R. UMA MAHESWARI**
2. **Dr. G. GOMATHI**

Semester – I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22UBT1AC1	GENERAL MICROBIOLOGY	ALLIED	4	3

Course Objective

- To create basic knowledge about the History and classification of Microorganisms.
- To study about the structure and characteristics of microorganisms like bacteria, algae, fungi, protozoa and virus.
- To study about the media composition and their types.
- To study about the microbial diseases, pathogenesis, diagnosis and preventive measures.

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	Recall the history of Microbiology and classify the microbial groups.	K1, K2
CO 2	Apply the methods to prepare and sterilize media for microbial growth.	K3
CO 3	Explain and relate the structural organization of Bacteria, Virus and Protozoa	K2, K3
CO 4	Explain and distinct feature of the Algae and Fungi.	K2, K3
CO 5	Analyze, compare and distinguish the various microbial diseases, causative organism, pathogenesis, epidemiology, diagnosis and preventive measures	K4

Mapping of CO with PO and PSO

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

“1”-Slight (Low) Correlation,
“3”-Substantial (High) Correlation,

“2”- Moderate (Medium) Correlation,
“-” - indicates no Correlation

Syllabus

Unit I - History and Classification

12 Hours

Historical development of Microbiology - Theories of Spontaneous generation – Biogenesis. General principles and nomenclature – Bergey's Manual of Determinative Bacteriology, Whittaker's five kingdom concept- Carl Woese's three domain classification. Cavalier – Smith's Eight kingdom classification.

Unit II - Media Preparation and Sterilization

10 Hours

Media Composition and their types based on physical state & ingredients. Microbial Growth-Factors influencing the growth of Microorganisms – Growth Curve.

Unit III – Bacteria, Virus and Protozoa

12 Hours

Structural organization of bacteria – Size, shape and arrangement of bacterial cells – Ultrastructure of a bacterial cell. Size & Morphology of Virus; Viroids. Lifecycle – Lytic & Lysogenic. Morphology & Anatomy of Protozoa - Amoeba & Paramecium.

Unit IV – Algae and Fungi

13 Hours

General characteristics of Algae (*Chlamydomonas sp.*) including occurrence, thallus organization, Ultra structure, pigments, eyespot, food reserves. Reproduction – Sexual and Asexual reproduction. Fungi (*Aspergillus sp.*) – General characteristics of fungi including habitat, distribution, nutritional requirements, Ultrastructure, thallus organization and aggregation.

Unit V – Microbial Diseases

13 Hours

General account on Microbial diseases - Causative Organism, Pathogenesis, Epidemiology, Diagnosis, Prevention & Control. Bacterial Diseases: Typhoid & Tuberculosis. Fungal diseases: Candidiasis & Aspergillosis. Viral Diseases: Hepatitis, AIDS. Protozoan Diseases: Malaria & Amoebiasis.

Unit VI – Self Study for Enrichment

(Not to be Included for External Examination)

Scope of Microbiology, Types of Sterilization, Size & Morphology of Virus – Prions, Ultra structure of flagella and Corona Virus.

Text Books

1. Barry, C. (2020). *Talaro's Foundations in Microbiology*. 11th Edition. Mc Graw Hill.
2. Rajan, S. & Selvi Christy, R. (2020). *Essentials of Microbiology*. CBS Publishers Pvt. Ltd.
3. Ananthanarayan, R. & Paniker, C.K.J. (2020). *Textbook of Microbiology*. 11th Edition. Orient Blackswan Pvt. Ltd.
4. Gerarad, J.T., Berdell, R.F. & Christine, L.C. (2018). *Microbiology - An Introduction*. 11th Edition. Pearson.
5. Robert, W. B. (2017). *Microbiology with Diseases by taxonomy*. 4th Edition. Pearson.
6. Dr. Baveja, C. P. (2017). *Text Book of Microbiology*. Anja Publications.

Reference Books

1. Apurba, S. S. & Sandhya, B. (2021). *Essentials of Medical Microbiology*. 3rd Edition. Jaypee Brothers.
2. Willey, J.M., Kathleen, M.S. & Dorothy, H.W. (2019). *Prescott's Microbiology*. Mc Graw Hill.
3. Gerarad, J.T., Berdell, R.F. & Christine, L.C. (2018). *Microbiology: An Introduction*. 13th Edition. Pearson.
4. Madigam, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M. & Stahl, D.A. (2017). *Brock Biology of Microorganism*. 15th Edition. Pearson Education.
5. Rathoure, A.K. (2017). *Essentials of Microbiology*. Brillion Publishing.

E - Books

1. <https://www.pdfdrive.com/essentials-of-medical-microbiology-e33538815.html>
2. <https://www.pdfdrive.com/medical-microbiology-e18737002.html>
3. <https://www.pdfdrive.com/textbook-of-microbiology-and-immunology-e175896260.html>
4. <https://www.pdfdrive.com/sherris-medical-microbiology-d193153850.html>
5. <https://www.pdfdrive.com/oxford-handbook-of-infectious-diseases-and-microbiology-d158084200.html>
6. <https://www.pdfdrive.com/microbiology-with-diseases-by-body-system-d185840565.html>

Web References

1. <https://nptel.ac.in/courses/102103015>
2. <http://ecoursesonline.iasri.res.in/course/view.php?id=108>
3. <https://www.digimat.in/nptel/courses/medical/microbiology/MB11.html>
4. <https://www.iaritoppers.com/2019/06/fundamentals-of-microbiology-icar-ecourse-pdf-book-download.html>
5. <https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology/microbes-and-the-human-body/microbes-and-disease.html>

Pedagogy

Chalk and talk, PPT, Group Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

1. Ms. P. JENIFER
2. Dr. M. KEERTHIGA

Semester – I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22UBT1AC2	BIOCHEMISTRY	ALLIED	4	3

Course Objectives

- To study about the basics of biomolecules.
- To study about classification, structure and functional properties of carbohydrates, proteins, lipids, vitamins and minerals.
- To study about the impact of proteins and enzymes.
- To study about vitamin deficiency diseases.

Course Outcome and Cognitive Level Mapping

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Cognitive Level
CO1	Explain about the chemistry and salient features of carbohydrates	K1, K2
CO2	In depth knowledge about the metabolism of lipids	K2
CO3	Understanding the importance and significance of amino acids	K2, K3
CO4	Explain about the relationship between different types of proteins	K3
CO5	Demonstrate and analyze the various vitamins and its deficiency Diseases	K3, K4

Mapping of CO with PO and PSO

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

“1” – Slight (Low) Correlation,

“2” – Moderate (Medium) Correlation,

“3” – Substantial (High) Correlation,

“-” indicates there is no correlation.

Syllabus

Unit I - Carbohydrates

12 Hours

Definition, structure, classification and functions of carbohydrates - Monosaccharides: Glucose and Fructose. Disaccharides: Sucrose and Maltose, Oligosaccharides: Raffin. Polysaccharides: Starch and Glycogen. Physical and chemical properties of carbohydrates.

Unit II - Lipids

12 Hours

Definition, classification and importance of lipids - Simple lipids: Triglycerides, Compound lipids: Phosphatides and Derived lipids: Cholesterol. Structure and functions of glycerol, phospholipids, glycolipids and lipoproteins. Physical and chemical properties of lipids.

Unit III - Amino acids

12 Hours

Introduction, structure and classification of amino acids - Essential amino acids, Semi - essential amino acids, Non-essential amino acids and carboxyl groups of amino acids. Physico-chemical properties of amino acids. Functions of amino acids.

Unit IV- Proteins

12 Hours

Definition and classification based on shape, composition, solubility and functions of proteins. Structure of proteins - Primary, secondary, tertiary and quaternary structure - protein folding. Structure, classification and properties of enzymes. Mechanism of enzyme activity. Enzyme inhibition - Competitive, non-competitive and uncompetitive inhibition.

Unit V- Vitamins and Minerals

12 Hours

Vitamins: Definition and Classification. Fat soluble vitamins - sources, structure and physiological functions; Water soluble vitamins - sources, structure and physiological functions. Vitamin deficiency diseases (Scurvy and Rickets). Minerals: Macro minerals and micro minerals - sources and functions.

Unit VI – Self Study for Enrichment

(Not to be Included for External Examination)

Oligosaccharides – Stachyose, Structure and functions of – sphingolipids, importance of amino acids, Protein – denaturation and Vitamin deficiency diseases - Anemia.

Text Books

1. Singh, S. P., & Singh, A. N. (2021). *Textbook of Biochemistry*. CBS Publications.
2. Gupta, S. N. (2020). *Concepts of Biochemistry*. Rastogi Publications.
3. Sathyanarayana, U., and Chakrapani, U. (2020). *Biochemistry*. 5th Edition. Elsevier India.
4. Seema, P. U. (2020). *Textbook of Biochemistry*. 1st Edition. Dreamtech Press.
5. Padmaja H. A., Dr. Yogesh, K. & Dr. Rammohan R. (2019). *Biochemistry*. Nirali Prakashan Publications.
6. Denise, R.F. (2017). *South Asian Edition of Lippincott Illustrated Reviews Biochemistry*. 7th Edition. Wolters Kluwer Publications.

Reference Books

1. Manzoor, M. M. (2021). *Fundamentals of Biochemistry*. Lambert Academic Publishing (LAP).
2. Voet, D. & Voet, J.G.(2021). *Voet's Biochemistry*. Adapted Edition 2021. Wiley India.
3. Brailsford, R. T. (2020). *Principles of Biochemistry*. MJP Publisher.
4. Jeremy M., Berg, Lubert, S., John, T., Gregory, G. (2019). *Biochemistry*. Freeman and Company publications.
5. Appling D.R., Anthony-Cahill, S. J., Mathews, C. K. (2017). *Biochemistry: Concepts and Connections*. Pearson Education.
6. Vikrant, V. (2021). *Biochemistry*. Discovery Publishing House Pvt Ltd.

E-Books

1. <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-d158404366.html>
2. <https://www.pdfdrive.com/biochemistry-d196362531.html>
3. <https://www.pdfdrive.com/biochemistry-genetics-molecular-biology-d18198970.html>
4. <https://www.pdfdrive.com/biochemistry-biochemistry-e19576202.html>
5. <https://www.pdfdrive.com/marks-basic-medical-biochemistry-a-clinical-approach-5th-edition-e158491166.html>

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://sites.google.com/a/uasd.in/ecourse/biochemistry> <https://youtu.be/f7jRpniCsaw>
5. <https://agrimoon.com/fundamentals-of-biochemistry-pdf-book/>

Pedagogy

Blackboard, PPT, Videos, Animations, Group Discussion and Quiz.

Course Designer

Ms. M. AZEERA

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hours/Week	CREDITS
22UGVE	UNIVERSAL HUMAN VALUES	Part IV	2	2

COURSE OBJECTIVES

1. To enable the learners to learn the values of love and compassion.
2. To foster the values of righteousness and service among the learners.
3. To enhance the morale of the learners by inculcating the values renunciation and peace.
4. To inspire the learners to practice the basic human values so as to make them become responsible citizens of the Nation.

COURSE OUTCOMES AND COGNITIVE LEVEL MAPPING

CO Number	CO Statement On the successful completion of this course, the students will able to	Cognitive Level
CO1	Define the values of Love and Compassion	K1
CO2	Understand the value of Truth and Non - Violence	K2
CO3	Explain the value of Righteousness and Service	K3
CO4	Practice the values of Renunciation (sacrifice) & Peace	K4
CO5	Prioritize Human Values in their day today life	K5

Syllabus

Unit I: (6 Hours)

Love and Compassion

- **Introduction:** what is love? Forms of love for self, parents family friend, spouse community, nation, humanity and other beings both for living and non-living.
- Love and Compassion and Inter-relatedness
- Love, compassion, empathy, sympathy and nonviolence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore

Unit II : (7 Hours)

Truth and Non - Violence

- **Introduction:** what is truth? Universal truth, truth as value, truth as fact (veracity. sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- **Introduction:** what is non violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non violence
- Ahimsa as non -violence and non- killing.

- Individuals and organisations that are known for their commitment to non - violence
- Narratives and anecdotes about non - violence from history and literature including local folklore

Unit III : (6 Hours)

Righteousness and Service

- **Introduction:** What are Righteousness and service?
- Righteousness and dharma, Righteousness and Propriety
- Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings- living and non-living persons in distress for disaster.
- Individuals who are remembered in history for practicing Righteousness and Service
- Narratives and anecdotes dealing with instances of Righteousness and Service from history, literature, including local folklore

Unit IV : (6 Hours)

Renunciation (sacrifice) & Peace

- Introduction: what is renunciation? Renunciation and sacrifice. Self restraint and ways of overcoming greed. Renunciation with action as true renunciation. What is peace? It's need, relation with harmony and balance.
- Individuals who are recommended in history for practicing Renunciation and sacrifice. Individuals and organisations that are known for their commitment to peace.
- Narratives and anecdotes from history and literature including local folklore about individuals who are remembered for their renunciation and sacrifice. Narratives and anecdotes about peace from history and literature including local folklore practicing peace

Unit V : (5 Hours) Practicing human values

- What will learners learn/gain if they practice human values? What will learners lose if they Don't Practice human values?
- Sharing learner's individual and/ or group experience(s)
- Simulated situations
- Case studies

Pedagogy: Chalk & Talk, Seminar, PPT Presentation, Group Discussion, Blended Method, and Case Study.

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