

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

**DEPARTMENT OF BIOTECHNOLOGY**



**B.Sc., BIOTECHNOLOGY**

**SYLLABUS**

**2024 – 2025 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)**

<b>PEOs</b>	<b>Statements</b>
<b>PEO 1</b>	<b>LEARNING ENVIRONMENT</b>  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.
<b>PEO 2</b>	<b>ACADEMIC EXCELLENCE</b>  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.
<b>PEO 3</b>	<b>EMPLOYABILITY</b>  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.
<b>PEO 4</b>	<b>PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY</b>  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.
<b>PEO 5</b>	<b>GREEN SUSTAINABILITY</b>  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**

<b>PO NO</b>	<b>On completion of B.Sc., Biotechnology Programme, the students will be able to</b>
<b>PO 1</b>	<b>Academic Excellence and Competence:</b> 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.
<b>PO 2</b>	<b>Holistic and Social approach:</b> Create novel ideas related to the scientific research concepts through advanced technology and sensitivity towards sustainable environmental practices as well as social issues.
<b>PO 3</b>	<b>Professional ethics and Teamwork:</b> Explore professional responsibility through projects, internships, field trips/industrial visits and mentorship programmes to transmit communication skills.
<b>PO 4</b>	<b>Critical and Scientific thinking:</b> 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.
<b>PO 5</b>	<b>Social Responsibility with ethical values:</b> 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**

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



# Cauvery College for Women (Autonomous), Trichy -18

Department of Biotechnology

B.Sc., Biotechnology

Learning Outcome Based Curriculum Framework (CBCS - LOCF)

(For the Candidates admitted from the Academic year 2025-2026 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst Hrs.	Credits	Exam			Total
							Hrs.	Marks		
								Int	Ext	
I	I	Language Course-I (LC)	Tamil Ilakkiya varalaru –I	25ULT1	6	3	3	25	75	100
			Hindi ka Samanya Gyan aur Nibandh	23ULH1						
			Poetry, Grammar and History of Sanskrit Literature	23ULS1						
			Foundation Course: Paper I - French I	23ULF1						
	II	English Language Course- I(ELC)	General English -I	23UE1	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 (P)	22UBT1CC1P	3	3	3	40	60	100
		First Allied Course- I (AC)	General Microbiology	22UBT1AC1	4	3	3	25	75	100
		First Allied Course- II (AC)	Biochemistry	22UBT1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-I (AECC)	Universal Human Values	25UGVE	2	2	-	100	-	100
	Total				30	22				700
II	I	Language Course - II (LC)	Pothu Tamil -II	23ULT2	6	3	3	25	75	100
			Hindi Literature &Grammar – II	22ULH2						
			Prose, Grammar and History of Sanskrit literature	23ULS2						
			Basic French – II	22ULF2						
	II	English Language Course -II (ELC)	General English -II	23UE2	6	3	3	25	75	100
	III	Core Course – II (CC)	Molecular Biology& Genetics	22UBT2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Molecular Biology& Genetics (P)	22UBT2CC2P	3	3	3	40	60	100
		Core Course - III (CC)	Biomolecular Techniques	23UBT2CC3	2	2	3	25	75	100
		First Allied Course – III (AP)	Microbiology & Biochemistry (P)	22UBT2AC3P	4	3	3	40	60	100
	IV	Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
		Ability Enhancement Compulsory Course-III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM	As per UGC Recommendation						
	Total				30	22				800

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 cells and their cellular organelles and their functions.
- To study the specialized cells.
- To study about cell cycle and its regulations.
- To study cell signaling pathways

### 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	Relate and explain the basics of cell biology, types, structure, and properties of cells.	K1, K2
CO2	Apply the knowledge of cell biology in diverse research areas.	K3
CO3	Illustrate the Ultra structure and list the functions of cellular organelles in various types of cells	K2, K4
CO4	Explain the significance of cells and specialized cells	K5
CO5	Interpret the concepts of cell, cell division, compartmentalization, transport of nutrients and cell signalling in different types of cells.	K5

### 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	2
CO3	3	1	1	3	1	3	3	2	1	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.

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	<b>Fundamentals of cell structure:</b> Cell as basic unit of life: Basic properties of cells, cell theory, cell morphology, Ultrastructure - Prokaryotic and Eukaryotic cells.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	<b>Cellular membranes and matrices:</b> 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.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	<b>Endomembrane System:</b> 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.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	<b>Cell Division and Signaling:</b> Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, crossing over; Apoptosis; Signal transduction - Cell to cell recognition.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	<b>Specialized cells:</b> Motile cells (amoeboid and Sperm cells), nerve cells and nerve impulse conduction, muscle cells and muscle contraction and Egg cells.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	<b>Self Study for Enrichment</b> <b>(Not included for End Semester Examination)</b> Discovery of Cells, Cytoskeleton - Microfilaments, Types of Microbodies, Cell adhesion and Red Blood Cells.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6



## 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*. 5<sup>th</sup> International Student Edition. Garland Science.
4. De Robertis, E.D.D. & De Robertis, E.M.F. (2017). *Cell & Molecular Biology*. 8<sup>th</sup> 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*. 6<sup>th</sup> 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](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](https://tripurauniv.ac.in/Page/SubjectWiseOnline_EBooks_Cell_Molecular_Biology)

## Web Reference

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 (P)	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

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

CO Number	CO Statement	Cognitive Level
CO 1	Define and describe 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 Light Microscope.
3. Principles and working mechanism of rotary 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](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](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](https://www.deanza.edu/faculty/heyerbruce/b6b_pdf/Bio6B-Manual_W19.pdf)
4. [https://www.researchgate.net/publication/330654692\\_Cell\\_Biology\\_Practical\\_Manual](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 on the History and classification of Microorganisms.
- To study the structure and characteristics of microorganisms like bacteria, algae, fungi, protozoa and virus.
- To study the media composition and their types.
- To study the microbial diseases, pathogenesis, diagnosis and preventive measures.

### Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Recall and infer the factual and conceptual information required for understanding microbiology.	K1, K2
CO 2	Illustrate the different structural organization of bacteria, Algae, Fungi, protozoa and virus.	K2
CO 3	Develop the different microbial culture media for isolation of microbes and Compare the lifecycle of bacteria, algae, fungi, protozoa and virus.	K3, K4
CO 4	Classify the different kind of microbes (Classification) and explain the general characteristic features of the Algae, Fungi, protozoa and virus.	K4, K5
CO 5	Elaborate the diagnostic methods and controlling measures of various pathogenic microbial diseases for the human welfare.	K6

### Mapping of CO with PO and PSO

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

“1”-Slight (Low) Correlation,

“3”-Substantial (High) Correlation

“2”- Moderate (Medium) Correlation,

“-” - indicates no Correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	<b>History and Classification:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6
II	<b>Media Preparation and Sterilization:</b> Media Composition and their types based on physical state & ingredients. Microbial Growth- Factors influencing the growth of Microorganisms – Growth Curve.	10	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6
III	<b>Bacteria, Virus and Protozoa:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6
IV	<b>Algae and Fungi:</b> General characteristics of Algae ( <i>Chlamydomonas sp.</i> ) including occurrence, thallus organization, Ultra structure, pigments, eyespot, food reserves. Reproduction – Sexual and Asexual reproduction. Fungi ( <i>Aspergillus sp.</i> ) – General characteristics of fungi including habitat, distribution, nutritional requirements, Ultrastructure, thallus organization and aggregation.	13	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6
V	<b>Microbial Diseases:</b> 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.	13	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6
VI	<b>Self - Study for Enrichment (Not included for End Semester Examination)</b> Scope of Microbiology, Types of Sterilization, Size and morphology of Virus – Prions, Ultrastructure of Flagella and Corona Virus	-	CO1, CO2, CO3, CO4, CO5	K1, K2 K3, K4, K5, K6

### **Text Books**

1. Barry, C. (2020). *Talaro's Foundations in Microbiology*. 11<sup>th</sup> 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*. 11<sup>th</sup> Edition. Orient Blackswan Pvt. Ltd.
4. Gerard, J.T., Berdell, R.F. & Christine, L.C. (2018). *Microbiology - An Introduction*. 11<sup>th</sup> Edition. Pearson.
5. Robert, W. B. (2017). *Microbiology with Diseases by taxonomy*. 4<sup>th</sup> 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*. 3<sup>rd</sup> Edition. Jaypee Brothers.
2. Willey, J.M., Kathleen, M.S. & Dorothy, H.W. (2019). *Prescott's Microbiology*. Mc GrawHill.
3. Gerard, J.T., Berdell, R.F. & Christine, L.C. (2018). *Microbiology: An Introduction*. 13<sup>th</sup> Edition. Pearson.
4. Madigam, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M. & Stahl, D.A. (2017). *Brock Biology of Microorganism*. 15<sup>th</sup> 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 the basics of biomolecules.
- To study classification, structure and functional properties of carbohydrates, proteins, lipids, vitamins and minerals.
- To study the impact of proteins and enzymes.
- To study vitamin deficiency diseases.

### Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand and remember the chemistry and salient features of Macromolecules	K1, K2
CO2	In depth knowledge about the properties and significance of the Biomolecules	K2
CO3	Explain and differentiate the relationship between different kinds of biomolecules such as carbohydrates, lipids, nucleic acid and proteins.	K2, K4
CO4	Classify and demonstrate the various sources and functions of the nutrients. Calorific value of food.	K3, K4
CO5	Evaluate and analyze the concept of nutrition in health and disease, with metabolism and functions of a living system	K4, K5

### 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	1	2	1
CO2	3	2	2	1	1	3	2	1	1	1
CO3	3	2	2	1	1	3	2	2	2	1
CO4	3	2	3	2	2	3	3	2	2	2
CO5	3	2	3	2	2	3	3	3	2	2

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

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	<b>Carbohydrates:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	KI, K2, K3, K4, K5
II	<b>Lipids:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	KI, K2, K3, K4, K5
III	<b>Amino acids:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	KI, K2, K3, K4, K5
IV	<b>Proteins:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	KI, K2, K3, K4, K5
V	<b>Vitamins and Minerals:</b> 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.	12	CO1, CO2, CO3, CO4, CO5	KI, K2, K3, K4, K5
VI	<b>Self-Study for Enrichment:</b> <b>(Not Included for End Semester Examination)</b> Oligosaccharides – Stachyose, Structure and functions of – sphingolipids, importance of amino acids, Protein – denaturation and Vitamin deficiency diseases - Anemia.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5



## 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*. 5<sup>th</sup> Edition. Elsevier India.
4. Seema, P. U. (2020). *Textbook of Biochemistry*. 1<sup>st</sup> 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*. 7<sup>th</sup> 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**

