



**Dr. MGR-JANAKI COLLEGE
OF ARTS & SCIENCE FOR WOMEN**

SATHYABAMA MGR MALIGAI
11 & 13, Durgabai Deshmukh Road, RA Puram, Chennai - 28

An ISO 9001:2015 CERTIFIED INSTITUTION
Affiliated to the University of Madras



DR.MGR JANAKI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

DEPARTMENT OF BIOCHEMISTRY AND BIOINFORMATICS



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B.Sc. Biochemistry

(With effect from the Academic Year 2023-24)

FIRST YEAR: SEMESTER I

Part	Code, Category & Course Name	Over all Credits	Total Contact hours	Marks		
				CIA	ESE	Total
Part -1	FC-I - Tamil & Other Languages	3	6	25	75	100
Part -2	100L1Z: FC-I – English	3	6	25	75	100
Part -3	122C1A: Core-I - Nutritional Biochemistry	4	4	25	75	100
	122C11: Core-II - Core Practical I -Nutritional Biochemistry	4	4	40	60	100
	122E1A: Elective-I - Chemistry-I	3	3	25	75	100
	122E11: Elective Practical-I - Chemistry Practical-I	2	3	40	60	100
Part -4	SEC-1 - Choose from the List*	2	2	25	75	100
	122B1A: Foundation Course - Basics Of Biochemistry For Beginners–Scope & Applications	2	2	25	75	100
Total		23	30			

FIRST YEAR: SEMESTER II

Part	Code, Category & Course Name	Over all Credits	Total Contact hours	Marks		
				CIA	ESE	Total
Part -1	FC-II – Tamil & Other Languages	3	6	25	75	100
Part -2	100L2Z: FC-II – English	3	6	25	75	100
Part -3	122C2A: Core-III - Cell Biology	4	4	25	75	100
	122C21: Core-IV - Core Practical II -Cell Biology	4	3	40	60	100
	122E2A: Elective-II - Chemistry - II	3	4	25	75	100
	122E21: Elective Practical-II -Chemistry Practical-II	2	3	40	60	100
Part -4	SEC-2 - Choose from the List*	2	2	25	75	100
	122S2A: SEC-3 - Biomedical Instrumentation (or) 122S2B: SEC-3 - First Aid	2	2	25	75	100
Total		23	30			

* List of Skill Enhancement Courses (SEC):

- 122S0A: Medicinal Diet
- 122S0B: Life Style Diseases
- 122S0C: Health and Nutrition



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B.Sc., Biochemistry

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1. Preamble

Biochemistry is the cross over scientific discipline that integrates the living world and chemistry. It involves the study of the structure of biomolecules and explores the biological processes at molecular level in the living organisms. It is the laboratory science that has several domains like cell biology, molecular biology, clinical biology, enzymology, immunology, physiology, pharmacology etc., It has enlightened many aspects of health and diseases and paved the way for many interdisciplinary technological innovations like metabolomics, genomics and proteomics. There is a continuous demand for biochemists in public and private health care sectors, agriculture, medical and forensic departments. Almost all food, pharmaceuticals, health and beauty care etc required quality control and safety checks for which experts in the field of Biochemistry are always in need. The syllabi for the three year B.Sc degree programme in Biochemistry was framed in such a way that at the end of the course they could apply the knowledge and expertise in industries, diagnostic laboratories and various research fields

2. Programme Learning Outcome

2.1 Nature and Extent of the Programme

B.Sc Biochemistry is the first level of college or university degree in the country as in several parts of the world. After successfully completing this undergraduate degree, as a Biochemist they could further pursue post graduation in related fields in life sciences. The critical thinking, computational and analytical skills lead to the development of new diagnostic techniques. After graduation they could observe safety practices in laboratories and could effectively communicate the biochemical concepts. They are empowered to work individually, elucidate and solve diverse problems for future developments. Thus the under graduate level degree in biochemistry must sensitize the students to the mentioned objectives. The LOCF has been developed in such a way the acquired knowledge and problem solving ability at the under graduate level could be contributed to the betterment of the society in various research and health care sectors.

2.2 Aim of the Programme

The aim of the undergraduate degree in Biochemistry is to provide a thorough understanding of the various subjects in the field of biochemistry. Subject Knowledge can be impacted by teaching learning process in the class and analytical skills by practical sessions. The presentation skills can be developed by seminars and group discussions. Research skills can be inculcated by exposure to industry, internships, data collection activity and project writing. Thus a combination of activities like lectures, practical classes, seminars, projects and field trips will enable the students to think critically and familiarise with various experiments in biochemical fields.

2.3 Graduate attributes

The students graduating in this discipline must have sound understanding of the subjects. They should have excellent practical skills, validation and interpretation of results as a laboratory professional. They should be able to link theoretical and practical knowledge. They should possess the ability to clearly communicate the ideas with confidence and execute them. They should be innovative with problem solving ability to cope up with the new problems arising in various life science sectors. They should possess the ability to clearly communicate the scientific ideas and carry out research with ethics. As biochemist they should have self confidence and ability to work with team spirit. They should be well informed and updated about the current developments in the scientific community. Above all they should



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possess high order of research, social and environmental thinking to make a valuable contribution to the society.

Besides attaining the attributes related to the profession of Biochemistry, the graduates in this discipline should also develop ethical awareness which is mandatory for practicing a scientific discipline including ethics of working in a laboratory and ethics followed for scientific publishing of their research work in future. The students graduating in Biochemistry should also develop excellent communication skills both in the written as well as spoken language which is indispensable for them to pursue higher studies from some of the best and internationally acclaimed universities and research institutions spread across the globe.

3. COURSE STRUCTURE:

I SEMESTER

Course Components/Title of the paper	Ins. Hrs	Credits	Marks		
			CIA	EXT	TOTAL
Part-I-Tamil/Other Language paper-I	6	3	25	75	100
Part-II BP2-ENG01-Communicative English-I	3	3	50	50	100
Part-III-BBC-DSC01: Nutritional Biochemistry	8	5	25	75	100
Allied Paper- I	6	3	25	75	100
Allied Practical I	3	Examinations Conducted in II Semester			
Part- IV-Basic Tamil/Adv. Tamil/ Non Major Elective - I:*	-	2	25	75	100
BP4-ELSC01-English for Life Sciences-I	4	4	50	50	100

*NME;I Choose any one paper from the other Department

II SEMESTER

Course Components/ Title of the paper	Ins. Hrs	Credits	Marks		
			CIA	EXT	TOTAL
Part-I-Tamil/Other Language paper-II	6	3	25	75	100
Part-II BP2-ENG02-Communicative English-II	3	3	50	50	100
Part-III-BBC-DSC02: Cell Biology	5	5	25	75	100
BBC-DSC03: Core Practical-I	3	4	40	60	100
Allied Paper-II	6	3	25	75	100
Allied Practical-I & II	3	4	40	60	100



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Part- IV-Basic Tamil/Adv. Tamil/ Non Major Elective - II: *	-	2	25	75	100
BP4-ELSC02-English for Life Sciences-II	4	4	50	50	100

*NME-II- Choose any one paper from the other Department

III SEMESTER

Course Components/ Title of the paper	Ins. Hrs	Credits	Marks		
			CIA	EXT	TOTAL
Part-I Language paper-III	6	3	25	75	100
Part-II BP2-ENG03 - Language Through Literature - I	6	3	50	50	100
Part-III-BBC-DSC04: Biomolecules	9	5	25	75	100
Allied Paper-III	9	3	25	75	100
Part- IV Environmental Studies	-	2	Exam in IV semester		
Soft Skills	-	3	50	50	100

IV SEMESTER

Course Components/ Title of the paper	Ins. Hrs	Credit	Marks		
			CIA	EXT	TOTAL
Part- I Language paper-IV	6	3	25	75	100
Part-II BP2-ENG04- Language Through Literature- II	6	3	50	50	100
Part-III - BBC-DSC05: Biomolecules and Biochemical Techniques	6	5	25	75	100
BBC-DSC06: Core Practical-II	3	4	40	60	100
Allied Paper-IV	6	3	25	75	100
Allied Practical – III & IV	3	4	40	60	100
Part- IV-Environmental Studies	-	2	25	75	100
Soft Skills	-	3	50	50	100

V SEMESTER

Course Components/ Title of the paper	Ins. Hrs	Credits	Marks		
			CIA	EXT	TOTAL
Part-III-BBC-DSC07: Enzymes	6	5	25	75	100
BBC-DSC08: Metabolism	6	5	25	75	100
BBC-DSC09: Analytical Biochemistry	6	5	25	75	100



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BBC-DSE01: Human Physiology	5	5	25	75	100
Part- IV-Value Education	2	2	25	75	100

VI SEMESTER

Course Components/ Title of the paper	Ins. Hrs	Credits	Marks		
			CIA	EXT	TOTAL
Part-III-BBC-DSC10: Clinical Biochemistry	6	5	25	75	100
BBC-DSC11: Molecular Biology	6	4	25	75	100
BBC-DSC12: Core Practical III	3	4	40	60	100
BBC-DSC13: Project	5	4	20	80	100
BBC-DSE02 : Immunology	5	5	25	75	100
BBC-DSE03 : Biotechnology	5	5	25	75	100
Part-V-Extension Activity		1			

(Core paper: 60 Credits; Core Elective paper: 15 Credits; Non-major elective:4 Credits; Part -I: 12 Credits; Part -II: 12 credits; Allied paper: 20 Credits; Soft Skills: 12 Credits; EVS: 2 Credits; Value Education: 2 Credits; Extension Activity: 1 Credit)

Course content: The syllabus consists of theory, practical papers, Internship and a project. The students are expected to present seminars on special topics.

VI LEARNING OUTCOME

Criteria 2.6.1 - Student Performance and Learning Outcome (New Syllabus)

Programme Name		B.Sc. BIOCHEMISTRY	
Course Name	Course Code	Course Outcome	Syllabus link
NUTRITIONAL BIOCHEMISTRY	BBC-DSC01	<ul style="list-style-type: none"> To create awareness about the role of nutrients in maintaining proper health to study effect of nutrients in the biochemical process. To understand the nutritional significance of carbohydrates, lipids and proteins 	https://drive.google.com/file/d/1pxbGoBvv6eea5laO8ILnrllBsFtAqF_k/view?usp=drive_link
ALLIED CHEMISTRY - I (THEORY)	CY-CSA1B	<ol style="list-style-type: none"> To know the fundamentals of nuclear chemistry To understand the industrial application of fuels, fertilizers and polymers To understand the basic concepts of Organic Chemistry To study the various laws of thermodynamics To learn basics of photochemistry 	https://drive.google.com/file/d/1LdcVyaRoUksKrKBf9Y1KfW-AlpxYfaNg/view?usp=drive_link



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CELL BIOLOGY	BBC-DSC02	<ul style="list-style-type: none"> • To study the concept that the cell is the fundamental unit of life. • To understand the structure and purpose of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes and organelles. • To understand the communication between the cells. 	https://drive.google.com/file/d/1uQLc_hjNkkwYdvmdoalrDaL1fu_Z5CnS/view?usp=drive_link
ALLIED CHEMISTRY - II (THEORY)	CY-CSA2B	<ol style="list-style-type: none"> 1. To understand the fundamentals of coordination chemistry and its applications 2. To learn the structural aspects of biologically important compounds 3. To know the applications of phase rule and freezing mixtures 4. To explain the basics of electrochemistry 5. To understand the basics of Analytical chemistry 	https://drive.google.com/file/d/1hFveZs-o5o780nz8yaB8ghAIPsXYLIU8/view?usp=drive_link
PRACTICAL – I	BBC-DSC03		https://drive.google.com/file/d/1GFD7rFYI9Jsd2HfTPDKfjkx4Uyo4AOI7/view?usp=drive_link
ALLIED CHEMISTRY I & II (PRACTICALS)	CY-CSAP1		https://drive.google.com/file/d/1LdcVyaRoUksKrKBf9Y1KfW-AIpxYfaNg/view?usp=drive_link
BIOMOLECULES	BBC-DSC04	<ul style="list-style-type: none"> • Demonstrate the chemistry and the role of mono and disaccharides in living systems. • Elucidate the structural conformation of different types of polysaccharides • Gain insight into the reactivity of amino acids and nutritional importance of proteins • Apply the relationship between the structure and functions of proteins in biological context • Elucidate the various levels of organization of Proteins and its biological importance 	https://drive.google.com/file/d/1Z2qtYn80DuYmyEXdVSO_NuT5psf3GJvJy/view?usp=drive_link
ALLIED MICROBIOLOGY - I (THEORY)	BMY-CSA01	<ol style="list-style-type: none"> 1. Outline landmark events in the History of microbiology and to classify Microorganisms into taxonomic groups. 2. Describe the structural and functional make up of a Bacteria. 3. Compile various staining and cultivation techniques. 4. Expose to techniques for obtaining pure cultures of microorganisms with knowledge on methods of measuring microbial growth. 5. Get acquainted with sterilization and preservation techniques. 	https://drive.google.com/file/d/11IEU1zSPtNOX3wFIKZg7uHoJGWXgocdE/view?usp=drive_link



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BIOMOLECULES AND BIOCHEMICAL TECHNIQUES	BBC-DSC05	<ul style="list-style-type: none"> • Establish the diverse role of lipids in biological system • Relate the structure of lipids with their reactivity in biological membrane systems and life processes. • Establish the role of purine and pyrimidine bases in nucleic acid structure • Acquire knowledge about principle of various centrifugation types and its applications • Appreciate the principle, instrumentation and the difference between various spectroscopic methods to choose analysing biological samples 	https://drive.google.com/file/d/1RB35UjPbSe9vMkqH7CalWOoI-xI9ifd8/view?usp=drive_link
ALLIED MICROBIOLOGY-II (THEORY)	BMY-CSA02	<ol style="list-style-type: none"> 1. Focus on Microbial spoilage, preservation, testing and production of food products. 2. Explain types of soil microbes with their role in the various Bio Geo cycles and their applications. 3. Discuss the different sources of water, their purification methods and threats of water borne diseases. 4. Explain the composition of air, its quality with remedial sanitary measures to combat air borne diseases. 5. Get insights on industrial production of human utility products and regulatory bodies of Environmental pollution. 	https://drive.google.com/file/d/1bFjQ4GJSRyVsevWD1jZtYuHUKCF7bdJq/view?usp=drive_link
PRACTICAL-II	BBC-DSC06		https://drive.google.com/file/d/1dG_B2pBrQJhN37AJkqJd6onXltt0Dkr/view?usp=drive_link
ENZYMES	BBC-DSC07	<p>Students gain knowledge about the nature, classification, specificity, kinetics, inhibition, mechanism of action, co-enzymes, isolation, Purification and characterization, immobilization, and applications of enzymes.</p>	https://drive.google.com/file/d/12vmSgl1wmsg9IHkwhFwN=k5ftTZBcHjiK/view?usp=drive_link
METABOLISM	BBC-DSC08	<p>Student will learn the Concepts of thermodynamics and the mechanism of energy transfer in ETC the fate of the dietary carbohydrates the fate of the dietary lipids ,fate of the dietary proteins and the metabolism of nucleotides, the interrelation among the carbohydrates, fat and protein metabolism.</p>	https://drive.google.com/file/d/1y_oT20yOkBWwhFLKT9DZRn4fJqW8MZH1/view?usp=drive_link
ANALYTICAL BIOCHEMISTRY	BBC-DSC09	<p>Students understands the concepts of acids, bases, buffers, various units used in expressing their strength and measuring their pH, buffers in body fluids. The students also will gain in depth knowledge about the techniques, types, operation and applications of oxygen electrode, Microscopy, chromatography, electrophoresis, understanding radioactivity, its measurements and applications, Basics of bioinformatics, Nanotechnology and its applications in various fields.</p>	https://drive.google.com/file/d/1iddG-zNOuvzwJyM11V7psbrQBP0hS3Rw/view?usp=drive_link



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<p>HUMAN PHYSIOLOGY</p>	<p>BBC- DSE01</p>	<ul style="list-style-type: none"> • Understand the structure and function and different components of Digestive and urinary system. • Have Knowledge about Blood composition and its function, blood clotting mechanism. • Gain knowledge about blood pressure and to create awareness about cardiovascular diseases. • To inculcate knowledge about the muscular and nervous system, role of neurotransmitters in Physiology. • To acquire in depth knowledge about respiratory and to create awareness about lung disorders. • To learn about the reproductive system and to know about the reproductive disorders • To introduce the organization of endocrine system and classification of hormones 	<p>https://drive.google.com/file/d/1UoB3gJ4RTLxM-Jf8KV3SwGSgcCW_e_vkb/view?usp=drive_link</p>
<p>CLINICAL BIOCHEMISTRY</p>	<p>BBC- DSC10</p>	<ul style="list-style-type: none"> • To gain knowledge on scope of clinical biochemistry • To understand the alteration in biochemical components during various clinical conditions • To highlight the importance of various biochemical parameters in the diagnosis of diseases. 	<p>https://drive.google.com/file/d/1LfKkYK8Xpj_RMAQBpa_w3Y22_ORIEhbcw/view?usp=drive_link</p>
<p>MOLECULAR BIOLOGY</p>	<p>BBC- DSC11</p>	<ul style="list-style-type: none"> • Gain knowledge about the various types of DNA, the organization of genes to chromosomes in prokaryotes and eukaryotes. • Understand the molecular basis of DNA synthesis, Know the importance of the process, and the role of inhibitors of DNA as drugs. • Understand the process of RNA synthesis, post transcriptional modifications and apply the same to understand the role of antibiotics. • Discuss about the genetic code, molecular basis of protein synthesis & modification. • Detail the mechanism of DNA mutation, Repair system and understand the use of molecular process in disease diagnosis. 	<p>https://drive.google.com/file/d/19Zipqsn0YZLs_dstc-TNbWm_28yAOeap/view?usp=drive_link</p>
<p>ELECTIVE-II: IMMUNOLOGY</p>	<p>BBC- DSE02</p>	<ul style="list-style-type: none"> • Understand about the types of immunity, lymphoid organs and the cellular basis of immunity • Obtain knowledge on types of antigens, antibodies and activation of complements • Gain insight into various in vitro reactions between antigen and antibody and its application in clinical diagnosis • Apprehend the enormous scope of different types of vaccines • Acquire knowledge on autoimmunity, hypersensitivity and transplantation immunology 	<p>https://drive.google.com/file/d/1Mk-6T_824EAeXgRuD87ShWQUOfNUFzCu/view?usp=drive_link</p>
<p>ELECTIVE-III: BIOTECHNOLOG Y</p>	<p>BBC- DSE03</p>	<ul style="list-style-type: none"> • The students will acquire basic knowledge of recombinant DNA technology, DNA manipulation in prokaryotes and eukaryotes, engineering of DNA molecules using restriction and modification enzymes. • They will get acquainted with the use of cloning and vectors, creation of genomic and cDNA libraries and their applications. 	<p>https://drive.google.com/file/d/1tEGLWchjR-xAhXP75g6K5HjgS6H-oV_y/view?usp=drive_link</p>



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		<ul style="list-style-type: none"> Students will also understand the methods for production of proteins using recombinant DNA technology and their applications, basics of tissue culture, transgenes is, stem cell technology, risks, and safety aspects and patenting in biotechnology. 	
PRACTICAL- III	BBC-DSC12	<ol style="list-style-type: none"> Collection and preservation of urine samples. Qualitative analysis of normal constituents of urine such as urea, Creatinine, Phosphorus, Calcium and abnormal constituents such as calcium, sugar, protein, amino acid ketone bodies and bile pigments with clinical significance Collection and preservation of blood sample 	https://drive.google.com/file/d/14mZdjY4YwNYohtPLpLUu9JmM9WMygirE/vi?usp=drive_link
PROJECT	BBC-DSC13		https://drive.google.com/file/d/1MP4g-hw5sfKT3xLC3F4B8BpVd4Q_lyRG/view?usp=drive_link

ASSESSMENT PATTERN

CORE PAPERS, ELECTIVE PAPERS AND EXTRA DISCIPLINARY PAPERS

INTERNAL ASSESSMENT: 25 Marks

EXTERNAL ASSESSMENT: 75 Marks

TOTAL: 100 Marks

INTERNAL ASSESSMENT PATTERN

Attendance (5 Marks)			Seminar	Assignment	Test	Total
90-100	80-90	70-80	(5 Marks)	(5 Marks)	(10 Marks)	25

EXTERNAL ASSESSMENT

End Semester External University Examination: 75 MARKS

Duration 3 Hours

- Part -A-(10X1=10) Answer any 10 out of 12 Questions 1-12
- Part -B-(5X5=25) Answer any 5 out of 7 Questions 13-19
- Part -C-(3X10=30) Answer any 3 out of 5 Questions 20-24



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QUESTION PAPER PATTERN

Subject Name	Marks	Total
Language, English, Core, Allied and NME Papers	PART- A: 10 out of 12 = $10 \times 2 = 20$ marks	75
	PART- B: 5 out of 7 = $5 \times 5 = 25$ marks	
	PART- C: 3 out of 5 = $3 \times 10 = 30$ marks	