MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE
(Autonomous)
A UNIT OF VANETRA GROUP
ESTD-1994
Learn. Lead

www.muthayammal.in

DEGREE OF BACHELOR OF SCIENCE

Learning Outcomes – Based Curriculum Framework
– Choice Based Credit System

Syllabus for B.Sc., Biochemistry

(Semester Pattern)

(For Candidates admitted from the academic year
2021 -2022 and onwards)

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

RASIPURAM - 637408

VISION

- To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens.

MISSION

- To Ensure State of the world learning experience
- To espouse value based Education
- To empower rural education
- To instill the sprite of entrepreneurship and enterprise
- To create a resource pool of socially responsible world citizens

QUALITY POLICY

To seek – To strive – To achieve greater heights in Arts & Science, Engineering, Technological and Management Education without compromising on the quality of education.

DEPARTMENT OF BIOCHEMISTRY

VISION

- To ensure state of the world learning experience in science

MISSION

- To expose the scientific education to empower science in rural peoples Vision

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

PEO1: Graduates will be able to promote learning environment to meet the industry expectation.

PEO2: Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed.

PEO3: Graduates will be uphold the human values and environmental sustenance for the betterment of the society.

GRADUATE ATTRIBUTES

The Graduate Attributes of B.Sc., Biochemistry are

GA1: Analytical Reasoning

GA2: Critical Thinking

GA3: Problem Solving Skills

GA4: Communication Skills

GA5: Leadership Quality

GA6: Team work

GA7: Lifelong Learning

PROGRAMME OUTCOMES (POs):

PO1: Graduates will acquire dynamic skills through proper perception of the course objectives that leads to scientific and analytical comprehension of the concepts;

PO2: Graduates will focus on sustainable goals that might bring about spherical developments

PO3: Graduates will infuse a spirit converging on bricking a team work, interpersonal and administrative skills to think critically and execute effectively.

PO4: Graduates will apply reasoning appropriately to scale the humps in learning and solute them to the core.

PO5: Graduates will engage the skills obtained in independent and collaborative learning a perennial process.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: Incorporate the concepts of biological components that are required for optimal cell and system functioning.

PSO2: Illustrate biological techniques for assembling and assessing experimental results.

PSO3: Understand how modifications in the structure and metabolism of biomolecules results in abnormalities.

PSO4: Perform fundamental biochemistry research, integrating medicinal and diagnostic applications.

PSO5: Build a team, establish it with the proper attitude, and perform efficiently in employment either in government sector or can become an entrepreneur.

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE(Autonomous) - Rasipuram - 637 408
Scheme of Examinations LOCF-CBCS Pattern
dents Admitted from the Academic Year:2021-2022 Onwards)
Programme : B.Sc.BIOCHEMISTRY

S.No.	PART	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
				Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - I									
1	I	21M1UFTA01	TAMIL-I	5	-	3	25	75	100
2	II	21M1UCEN01	COMMUNICATIVE ENGLISH-I	5	-	3	25	75	100
3	III	21M1UBCC01	BASICS OF BIOCHEMISTRY	4		4	25	75	100
4	III	21M1UCHA01	ALLIED- CHEMISTRY I	4		4	25	75	100
5	III	21M2UBCP01	PRACTICAL : BIOCHEMICAL ANALYSIS	-	3				
6	IV	21M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY	-	3				
7	IV	21M1UVED01	YOGA	2		2	100		
8	IV	21M1UPEL01	PROFESSIONAL ENGLISH FOR LIFE SCIENCE - I	4		2	25	75	100
			TOTAL	24	6	18	225	375	500
SEMESTER - II									
1	I	21M2UFTA02	TAMIL-II	5	-	3	25	75	100
2	II	21M2UCEN02	COMMUNICATIVE ENGLISH - II	5	-	3	25	75	100
3	III	21M2UBCC02	TOOLS OF BIOCHEMISTRY	4	-	4	25	75	100
4	III	21M2UCHA02	ALLIED -CHEMISTRY II	4		4	25	75	100
5	III	21M2UBCP01	PRACTICAL : BIOCHEMICAL ANALYSIS		3	3	40	60	100
6	III	21M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY		3	3	40	60	100
7	IV	21M2UEVS01	ENVIRONMENTAL STUDIES	2	-	2	100		
8	IV	21M2UPEL02	PROFESSIONAL ENGLISH FOR LIFE SCIENCE – II	4		2	25	75	100
			TOTAL	24	6	24	305	495	700
SEMESTER - III									
1	I	21M3UFTA03	TAMIL-III	6	-	3	25	75	100
2	II	21M3UCEN03	COMMUNICATIVE ENGLISH - III	6	-	3	25	75	100
3	III	21M3UBCC03	ENZYMES	6	-	5	25	75	100
4	III	21M3USTA03	ALLIED -BIOSTATISTICS	4	-	4	25	75	100
3	III	21M4UBCP02	PRACTICAL : ENZYMES AND PHYTOCHEMISTRY	-	3				
6	III	21M3UBCS01	CELL BIOLOGY	3	-	2	25	75	100

7	IV	21M3UCHN01	NMEC - I	2	-	2	25	75	100
			TOTAL	27	3	19	150	450	600
SEMESTER - IV									
1	I	21M4UFTA04	TAMIL-IV	5	-	3	25	75	100
2	II	21M4UCEN04	COMMUNICATIVE ENGLISH - IV	5	-	3	25	75	100
3	III	21M4UBCC04	BIOENERGETICS & INTERMEDIARY METABOLISM	6	-	5	25	75	100
4	III	21M4UCSA01	ALLIED - COMPUTER APPLICATIONS IN BIOLOGY	4	-	3	25	75	100
5	III	21M4UBCP02	PRACTICAL : ENZYMES AND PHYTOCHEMISTRY	-	3	3	40	60	100
6	III	21M4UCSAP1	PRACTICAL : ALLIED - OFFICE AUTOMATION	-	3	2	40	60	100
7	IV	21M4UBCS02	PLANT BIOCHEMISTRY	2		2	25	75	100
8	IV	21M4UCHN02	NMEC - II	2	-	2	25	75	100
			TOTAL	**24**	**6**	**23**	**230**	**570**	**800**
SEMESTER - V									
1	III	21M5UBCC05	PATHOLOGY AND CLINICAL BIOCHEMISTRY	5	-	5	25	75	100
2	III	21M5UBCC06	HUMAN PHYSIOLOGY	5	-	5	25	75	100
3	III	21M5UBCC07	MOLECULAR BIOLOGY	5	-	5	25	75	100
4	III	21M6UBCP03	PRACTICAL : CLINICAL BIOCHEMISTRY AND PHYSIOLOGY	-	5				
5	III	21M5UBCE01	ELECTIVE - I	4	-	4	25	75	100
6	III	21M5UBCE02	ELECTIVE - II	4	-	4	25	75	100
7	IV	21M5UBCS03	NUTRITION AND DIETICS	2		2	25	75	100
			TOTAL	**25**	**5**	**25**	**150**	**450**	**600**
SEMESTER - VI									
1	III	21M6UBCC08	PHARMACOLOGY AND TOXICOLOGY	5	-	5	25	75	100

2	III	21M6UBCC09	ENDOCRINOLOGY	5	-	5	25	75	100
3	III	21M6UBCE03	ELECTIVE - III	5	-	5	25	75	100
4	III	21M6UBCE04	ELECTIVE - IV	4	-	4	25	75	100
5	III	21M6UBCP03	PRACTICAL : CLINICAL BIOCHEMISTRY AND PHYSIOLOGY		5	3	40	60	100
6	III	21M6UBCPR1	PROJECT WORK	-	4	4	40	60	100
7	III	21M6UBCOE1	COMPETITIVE ONLINE EXAMINATION IN BIOCHEMISTRY	-	-	2	100		
8	IV	21M6UBCS04	INDUSTRIAL BIOCHEMISTRY	2		2	25	75	100
9	V	21M6UEXA01	EXTENSION ACTIVITY		-	1	100		
			TOTAL	**21**	**9**	**31**	**405**	**495**	**700**
			OVERALL TOTAL	**145**	**35**	**140**	**1465**	**2835**	**3900**
		21M6UBCEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-

List of Allied Course for any Degree offered by the B.Sc.,Biochemistry
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.No.	Sem	COURSE_CODE	TITLE OF THE COURSE
1	I	21M1UBCA01	Allied Biochemistry- I
2	II	21M2UBCA02	Allied Biochemistry- II
3	II	21M2UBCAP1	Allied Biochemistry Practical- I

List of Elective Course (DSE) Details for B.Sc.,Biochemistry
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.No.	COURSE_CODE	TITLE OF THE COURSE
1	21M1UBCE01	Genetic Engineering
2	21MXUBCE02	Phytochemistry
3	21MXUBCE03	Food Preservation and Adulteration
4	21MXUBCE04	Biomedical Instrumentation
5	21MXUBCE05	Microbial Biochemistry
6	21MXUBCE06	Cancer Biology

List of Non Major Elective Course (NMEC) offered by the B.Sc.,Biochemistry
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	III	21M3UBCN01	Fundamentals of Human physiology
2	IV	21M4UBCN02	Biochemistry in Nutrition
3	III	21M3UBCN01	Biochemistry and Health
4	IV	21M4UBCN02	Biochemistry in Diagnosis

UG-REGULATION

1. InternalExamination Marks- Theory

Components	**Marks**
CIA I&II	15
Attendance	5
Assignment	5
Total	25

Attendance Percentage	**Marks**
96 % to 100%	5
91% to 95%	4
86% to 90%	3
81% to 85%	2
75% to 80%	1
Below 75%	0

2. QUESTION PAPER PATTERN FOR CIA I, II AND ESE (3HOURS) MAXIMUM: 75Marks

SECTION-A (10 Marks) (Objective Type)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (10 x1=10 marks)

SECTION-B(10 Marks)(Short Answer)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 2 = 10 marks)

SECTION-C (25 Marks)(Either or Type)

Answer any **FIVE** questions

ALL Questions Carry **EQUAL** Marks

Either or Type.(5 x 5 = 25 marks)

SECTION-D (30 Marks)(Analytical Type)

Answer any **THREE** Questions out of **FIVE** questions

ALL Questions Carry **EQUAL** Marks (3 x 10 = 30 marks)

(**Syllabus for CIA-I 2.5 Unit, Syllabus for CIA-II All 5 Unit)**

2a) Components for Practical CIA

Components	Marks
CIA –I	15
CIA - II	15
Observation Note	5
Attendance	5
Total	**40**

2b) Components for Practical ESE

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
Total	**60**

3. Guidelines for Value Education Yoga and Environmental Studies (PartIV)

- The Course Value Education Yoga is to be treated as 100% C I A course which is offered in I Semester for I year UG students.
- The Course Environmental Studies is to be treated as 100% CIA course which is offered in II Semester for I year UG students.
- Total Marks for the Course=100

Components	Marks
Two Tests(2 x30)	60
Field visit and report(10+10)	20
Two assignments(2 x10)	20
Total	100

The passing minimum for this course is 40%

Incase, the candidate fails to secure 40%passing minimum, he/she may have to reappear for the same in the subsequent odd/even semesters.

4. Guidelines for Extension Activity (PartV)

- Atleasttwoactivitiesshouldbeconductedwithinsemesterconsistingoftwodayseach.
- The activities may be Educating Rural Children, Unemployed Graduates, Self Help Group etc.

The marks may be awarded as follows

No of Activities	Marks
2 x50 (Each Activity for two days)	100

5. Internship/Industrial Training, Miniproject and Major Project Work

Internship/Industrial Training		Mini Project	Major Project Work	
Components	**Marks**	**Marks**	**Components**	**Marks**
CIA*2 Work Diary Report Viva–voce Examination	 25 50 25	 - 50 50	**CIA** a) Attendance 10 Marks **b)** Review /Work Diary*1 30 Marks	40
Total	**100**	**100**	**ESE*2** a)Final Report 40Marks b)Viva-voce 20Marks	60
			Total	**100**

*1Review is for Individual Project and Work Diary is for Group Projects(Group consisting of minimum3 and maximum 5)

*2Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

6. Guidelines for Competitive Exams- Online Mode(PartIII)- Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1=100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is40%
- In case, the candidate fails to secure 40% passing minimum, he/she may have to reappear for the same in the subsequent semesters.

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1UBCC01	BASICS OF BIOCHEMISTRY	DSC THEORY - I	I	4	4			4
Objective	**To understand the simple and molecular structure of the different types of biomolecules, molecular formulae, diagrams or models, physicochemical properties and biological importance of biomolecules.**							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Carbohydrates: Introduction and general classification of carbohydrates. Monosaccharides: Structures, properties and biological functions of monosaccharides.Isomerism-structural and stereo isomerism, interconversion of sugars, muta-rotation. Oligosaccharides: Dissaccharides - structures, properties and biological functions of maltose, Lactose and Sucrose. Polysaccharides: Classifications of polysaccharides, Structures, properties and biological functions of Homo-polysaccharides - starch, cellulose, glycogen, pectin and Hetero-polysaccharides -Hyaluronic acid, Chondroitin sulphate, chitin and Heparin.	K1, K2	10
II	Amino acids: Structure, classification, physical, chemical and electrochemical properties, Non-standard aminoacids, Non-protein aminoacids. Peptides: Features of peptide bond, naturally occurring peptides – Glutathione, enkaphalins and endorphins. Proteins: Classification, physical and chemical properties of proteins, structural organization of proteins - Primary, secondary, tertiary and quaternary structures, Forces stabilizing each level of structure.	K1,K2	10
III	Fatty acids: Definition, nomenclature, classification of fatty acids-saturated and unsaturated fatty acids. Essential fatty acids. Lipids: Classification of lipids- simple, conjugated and derived lipids, occurrence, structure and physical and chemical properties of phospholipids, glycolipids, sphingolipids and cholesterol. Lipoproteins: Types and functions of lipoproteins – Chylomicrons, VLDL, LDL and HDL.	K1,K2	8

IV	Nitrogenous bases: - purines and pyrimidines, nucleosides, nucleotides, formation of phosphodiester bonds. DNA: - Types of DNA, Structure of DNA – Watson and Crick double helix model, physic-chemical properties and functions of DNA. Special base sequences of DNA – palindromic sequence, cruciforms. RNA: - Types and basic structural features of RNA – mRNA, tRNA and rRNA, properties and functions of RNA. Nucleoproteins: structure and functions of Histones and protamines.						K1,K2	10
V	Vitamins: Introduction to vitamins, classification of vitamins - structures, sources, RDA, functions, deficiency diseases of fat soluble and water-soluble vitamins.						K1, K2, K3	7
Course Outcome	**CO1: To define the design of the structures, isomerism and functions of different types of carbohydrates.**						**K1**	
	CO2: to classify the nature of amino acids and proteins with their structure and their roles.						**K2**	
	CO3: Classify about the lipids and lipoproteins along with their role.						**K2**	
	CO4: Explain the structure and properties of Nucleic acids and Nucleoproteins.						**K2**	
	CO5: Describe about source and importance of Vitamins.						**K3**	
Learning Resources								
Text Books	1. Biochemistry (2013) U.Satyanarayana and U. Chakrapani, 4th edition, Elsevier 2. Fundamentals of Biochemistry(2005)J.LJain, 6th Edition, S.Chand&Co Ltd., 3. .Biochemistry, 4th edition (1988) Zubay G L, W M C Brown Publishers.							
Reference Books	1. Lehninger's Principles of Biochemistry (2000) Nelson, David l. and Cox, M.M. Macmillan/worth, NY. 2. Biochemistry, 3rd (1994) Lubertstryer, W H freeman and co, Sanfrancisco. 3..Principles of Biochemistry (1994) Garrette& Grisham, Saunders College publishing.							
Website Link	1.https://www.phys.sinica.edu.tw/TIGP NANO/Course/2010_Spring/Classnotes/AAC_lehninger4e_ch03%20(Protein).pdf 2. https://nptel.ac.in/courses/104103121 3. https://onlinecourses.nptel.ac.in/noc20_cy07							
	L-Lecture	T-Tutorial	P-Practical		C-Credit			

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1UBCC01	BASICS OF BIOCHEMISTRY	DSC THEORY - I	I	4	4			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	M	S	S	L	M	L	L	M
CO2	L	M	M	S	S	S	L	S	M	S
CO3	L	M	S	M	S	S	M	M	M	S
CO4	L	M	M	S	S	S	M	L	S	M
CO5	L	M	S	S	M	S	M	M	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
R. Abirami	M. Shabana Begum	A. L. James

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

B.Sc.,-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M2UBCC02	TOOLS OF BIOCHEMISTRY	DSC THEORY - II	II	4	4			4
Objective	**To understand the basis and general methodology of the molecular separation techniques specified in the course. and to expertise on the application of these techniques to the separation of mixtures with known compositions.**							

Unit	Course Content	Knowledge Levels	Sessions
I	pH and Buffers: Definitions for Acids and bases, pH: - Definition and determination of pH. Buffer system of human body. Cell Fractionation Techniques: Organ and tissue slice techniques, tissue homogenization, cell lysis - Methods of cell disruption, extraction, salting in and salting out. Dialysis and Ultrafiltration - Artificial membranes, semipermeable membranes, Donnan membrane equilibrium and biological significance of osmosis. Basic principles of cell sorting and counting. Maintenance and preservation of cells. Microscopy: Simple, Light, Dark, Phase Contrast	K1	8
II	Chromatographic Techniques: Principles, procedure and applications of paper chromatography, thin layer chromatography, column chromatography - ion exchange chromatography, gel filtration chromatography, affinity chromatography. Gas Liquid Chromatography, High performance Liquid Chromatography.	K2	8
III	Centrifugation: Basic principles of sedimentation,Svedberg's consant, sedimentation velocity and sedimentation equilibrium. Types of centrifuges - desk top, high speed and ultracentrifuges. Types of Rotors - swinging bucket, fixed angle, vertical tube and zonal rotor. Types of centrifugation: Preparative centrifugation - differential and density gradient centrifugation with applications, Analytical centrifugation - molecular weight determination.	K2	8
IV	Electrophoretic Techniques: Principles, techniques and applications of paper electrophoresis, gel electrophoresis - agarose, SDS-PAGE, Capillary electrophoresis, isoelectric focusing, Factors affecting electrophoresis. Spectroscopic Techniques: Laws of absorption -Beer - Lambert's law and its limiations. Principles, instrumentations and applications of colorimeter, spectrophotometer, spectrofluorimeter and flame photometer.	K3	10

V	Radioisotope Techniques: Radioactivity, stable and radioactive isotopes, Radioactive decay - rate of radioactive decay and units of radioactivity. Methods of detection of radioisotopes: - GM counter, Scintillation counter. Autoradiography and its applications. Advantages, disadvantages and safety aspects of radio isotopic techniques. Radioisotopes in Biology: Radioisotopes commonly used in biochemical studies - 14C, 32P, 35S, 3H, 131I.	K3	11
Course Outcome	**CO1: Explain the cell fractionation techniques and clarify about the microscope handling.**	**K1**	
	CO2: Relate the chromatographic techniques for the separation components	**K2**	
	CO3: Compare the principles of centrifugation techniques for the separation of components	**K2**	
	CO4: Value the basic principles behind electrophoretic and spectroscopic techniques	**K3**	
	CO5: Critique about the measurement and the applications of radioisotopes	**K3**	
Learning Resources			
Text Books	1. Biophysical chemistry Principles and Techniques - Avinash Upadhyaye and Nirmalendhe Nath, Himalaya Publishers. 2. A Biologist Guide to Principles and Techniques of Biochemistry, Keith Wilson and Kenneth Goulding, Edward Arnold publishers.		
Reference Books	1. Cell biology, T. Devasena, 2012, Oxford University press. 2. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995. Cambridge University Press. 3. An Introduction to Spectroscopy for Biochemist, Brown. SB Academic Press.		
Website Link	1.https://link.springer.com/content/pdf/bfm%3A978-1-4419-9785-2%2F1.pdf 2. https://onlinecourses.nptel.ac.in/noc22_cy43 3. https://nptel.ac.in/courses/104102009		

L-Lecture T-Tutorial P-Practical C-Credit

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M2UCSC02	TOOLS OF BIOCHEMISTRY	DSC THEORY - II	II	4	4			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	M	S	S	L	M	L	L	M
CO2	L	M	M	S	S	S	L	S	M	S
CO3	M	M	S	M	S	S	M	M	M	S
CO4	L	M	M	S	S	S	M	L	S	M
CO5	M	M	S	S	M	S	M	M	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	1.Group discussion 2.Flash cards 3.Listening skills 4.Roll play
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By

Curriculum Development Cell MCAS Autonomous Rasipuram

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M2UBCP01	BIOCHEMICAL ANALYSIS	DSC PRACTICAL - I	II	3+3			3	3
Objective	**To provide the students with an opportunity to develop their qualitative and quantitative skills, and to understand the biochemical analysis and identification of unknown compounds**							
S. No.	**List of Experiments / Programmes**						**Knowledge Levels**	**Sessions**
1	1.Preparations a) Percentage solutions b) Molar Solutions c) Normal Solutions d) Simple problems for preparation of solutions						K3	6
2	2. Preparation of Buffers and determination of pH.						K3	6
3	3.Biochemical Preparations a) Starch from potato. b) Casein from milk. c) Lecithin from egg yolk.						K3	9
4	4. Qualitative Analysis a) Monosaccharide's, Disaccharides and Polysaccharides. b) Amino acids. c) Lipids.						K4	38
5	5. Quantitative Analysis a) Determination of reducing sugar- Benedict's method - Titrimetric Analysis. b) Estimation of Glycine- Formal Titration. c) Determination of Acid number. d) Determination of Saponification number. e) Determination of Ascorbic acid - DCPIP method. f) Estimation of Calcium-Titrimetric method.						K4	21
Course Outcome	**CO1:Facilitate the learners to prepare solutions for biochemical experiments**						K3	
	CO2:Make the students to prepare buffer solution and to know the preparation of pH solution						K3	
	CO3:Prepare crude macromolecules like starch, casein etc						K3	
	CO4:Facilitate the learners to correctly identify the carbohydrates, amino acids and lipids						K4	
	CO5: Quantify the bio molecules						K4	
Learning Resources								

Text Books	1. Practical clinical biochemistry, volume I and II- Harold Varley, et al., 1980. Fifth Edition. CBS publishers. 2. Biochemical Methods. II Edition. Sadasivam. S and Manickam, A New Age International private Ltd Publishers. 3. A Text book of practical biochemistry. David Plummer
Reference Books	1.Laboratory Manual in Biochemistry, 1981. J.Jayaraman, New Age International publishers, New Delhi. 2. Plant Biochemistry - Practical. C.C. Giri & Archana Giri.
Website Link	1. https://ncert.nic.in/pdf/publication/science laboratory manuals/ 2. https://nptel.ac.in/courses/102103016

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M2UBCP01	BIOCHEMICAL ANALYSIS	DSC PRACTICAL - I	II	3+3			3	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	M	S
CO3	S	S	L	M	S	S	S	M	S	S
CO4	S	S	S	S	M	S	M	S	S	M
CO5	S	M	S	M	S	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Problem solving and group discussion
Teaching and Learning Methods	Explanation of Practical procedure and Demonstration of experiments
Assesment Methods	Observation, Performance, Attendance

Designed By	Verified By	Approved By

Curriculum Development Cell MCAS Autonomous Rasipuram

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCC03	ENZYMES	DSC THEORY - III	III	6	6			5
Objective	**To provide a deeper insight into the fundamentals of enzyme kinetics and their role in control of metabolism and industrial application of enzymes and to learn the current applications and future potential of enzymes**							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	Introduction to Enzymes: History and terminology, nomenclature, and IUB classification of enzymes. Units of enzyme activity. Holoenzymes, Apoenzyme, metalloenzymes, metal activated enzymes, monomeric enzymes, oligomeric enzymes, ribozymes, cofactors, activators and inhibitors. Structure and functions of coenzymes. Enzyme turnover.						K1	12
II	Active Site: Structure of active site and its characteristics, theories of ES complex - Lock and key, induced fit, and substrate strain theory. Nature of Enzyme Catalysis: Acid-base catalysis, covalent catalysis, Metal ion catalysis, Electrostatic catalysis. Mechanism of Action of Specific Enzyme: - lysozyme.						K1 ,K2	12
III	Enzyme Kinetics: Michaelis-Menten Equation: - Initial velocity and steady-state approach, Vmax, Km and their significance, Linear transformation of Michaelis-Menten Equation; - Lineweaver-Burk Plot, Eadie-Hofstee Plot, Hanes Plot. Factors Affecting Enzyme Activity: - Effect of pH, temperature, enzyme concentration, substrate concentration, and the presence of inhibitors and activators. Enzyme Inhibition: Types of inhibition - Reversible inhibition - Competitive, Non-competitive and Uncompetitive inhibition. Irreversible inhibition, Feedback inhibition, Regulation of Enzyme Activity: Allosteric inhibition, covalent modification.						K1 ,K2, K3	12
IV	Coenzymes: The structure and function of the following coenzymes in enzyme-catalyzed reactions – Thiamine pyrophosphate, nicotinamide nucleotides, Flavin nucleotides, Coenzyme A, Lipoate, Folate and biotin. Isoenzymes: Definition, features and clinical significance with examples – Lactate dehydrogenase (LDH) and creatine kinase (CK). Allosteric Enzymes: Definition, structure, and properties with an example - Aspartate transcarboxylase. Multienzymes Complex – Pyruvate dehydrogenase complex (PDH complex)						K1 ,K2, K3	12

V	Immobilized Enzymes: Principles, methods, and applications of immobilized enzymes. Isolation and Purification of Enzymes: Methods of isolation and purification of enzymes from microbial, plant and animal sources, determination of purity of isolated enzymes. Applications of enzymes- in food, textile, and leather industries and role of enzymes in medicine.							K1- K4	12
Course Outcome	**CO1: To list the basic features and classification of enzymes**							K1	
	CO2: Describe the characteristics of active site and nature of enzyme catalysis							K2	
	CO3: Explain the enzyme kinetics, enzyme inhibition and enzyme regulation with relevant examples							K2	
	CO4: Demonstrate the coenzymes, allosteric enzymes and multienzyme complex							K4	
	CO5:Diffentiate the various immobilization techniques and application of enzymes in different fields							K4	
Learning Resources									
Text Books	1. Enzymes - Dixon, E.C Webb, CJR Thorne and K.F. Tipton, Longmans, London. 2. Fundamentals of Enzymology 2 ed., (1998) - Nicholas C.Price, Lewis Stevans, Oxford University Press, First Edition (1990). 3. Devasena, T. 2010. Enzymology. Oxford University Press, New Delhi.4. Meena, M. and Chauhan, D. 2009. Fundamentals of Enzymology. [First Edition]. Aavishkar Publishers, Jaipur.								
Reference Books	1. Protein Biotechnology, Gary Walsh and Denis Headon, John Wiley and Sons, 1994. 2.. Protein Biochemistry and Biotechnology, Gary Walsh and John Wiley and Sons Ltd. 2002. 3. Understanding Enzymes, Trevor Palmer, Ellis Horwood Limited, Third Edition (1991).								
Website Link	1. https://nptel.ac.in/courses/102102033 2. https://archive.nptel.ac.in/courses/104/105/102105034 3. https://archive.nptel.ac.in/content/storage2/courses/104103071/pdf/mod13.pdf								
	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCC03	ENZYMES	DSC THEORY - III	III	6	6			5

CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	L	M	S	M	S	S	M	M	S		
CO2	S	L	S	S	M	S	M	S	S	L		
CO3	S	L	S	M	S	M	S	M	M	S		
CO4	S	L	M	M	S	M	S	S	S	M		
CO5	S	L	S	S	S	S	M	M	S	S		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**	**Approved By**
	M. Shabana Begm	

[Dr. G. Krishnamoorthy]

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCS01	CELL BIOLOGY	SEC - I	III	3	3			2
Objective	**To understand the structure and functions of prokaryotes and Eukaryotic cells, the cellular components and energy utilization process in the cell and the cellular molecules and applying the knowledge in cell biology.**							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	Biogenesis theory of origin of life. Cell as a Basic unit; Cell size and shape; Prokaryotic & eukaryotic cell organization. Structural comparison of microbial, plant and animal cells.						K1- K3	6
II	Cell wall and membrane: Plasma membrane-Model of plasma membrane; fluidity of membranes; Membrane proteins and their functions; Transport across the membrane- selective permeability of membrane; Cell adhesion; Cell junctions; Composition of bacterial cell wall.						K1- K2	8
III	Structure and function of cell organelle; Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi complex, lysosomes, Ribosomes, Peroxisomes, Vacuoles, Centrioles and Cytosols.						K1- K4	6
IV	Cell cycle and cell signaling: Cell Cycle, Mitosis, Meiosis. Cell signaling- types- Cell receptors, Cell membrane traffic. Cellular Senescence and Apoptosis.						K1- K4	8
V	Specialized cells: Motile cells (amoeboid, ciliary, flagellar movements), Nerve cells and nerve impulse conduction, Muscle cells and muscle contraction.						K1- K4	7
Course Outcome	**CO1: Label the plant cell.**						K1	
	CO2: Describe the process of photosynthesis and photorespiration.						K2	
	CO3:Demonstrate nitrogen fixation in plants.						K3	
	CO4:Illustrate about the plant growth through seed germination and seed dormancy.						K3	
	CO5: Explain hormones and secondary metabolites of plants.						K2	

Learning Resources									
Text Books	1. Cell Biology by T. Devasena, 2012, Oxford University press. 2. The Cell, a molecular approach by Geoffrey M Cooper, 5 th Edition, 2009, ASM press, Washington. 3. Cell and Molecular Biology by Gerald Carp, 3rdEdition, 2002, John wiley& sons.								
Reference Books	1. VK Agarwal and PS Varma Cytology (Cell Biology and Molecular Biology), 2000 4/e S Chand & Company, New Delhi. 2. Cell and Molecular Biology by Prakash S Lohar, 2007, MJP publishers. 3. Plant Biochemistry: Dey P. M. Harbone J. B., 1st Ed. 1997. 4. Advances In Plant Biochemistry: K.N. P. Singh, Agrotech Press, 2014								
Website Link	1. https://onlinecourses.nptel.ac.in/noc22_bt18/ 2.https://nptel.ac.in/courses/102103012 3. https://nptel.ac.in/courses/102108086								
	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCS01	CELL BIOLOGY	SEC - I	III	3	3			2

CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	S	S	S	S	S	M	S	S	S		
CO2	S	L	M	M	M	S	S	L	M	M		
CO3	S	S	S	M	M	S	L	M	S	S		
CO4	S	L	M	S	S	S	S	S	M	M		
CO5	S	S	S	S	M	S	S	S	S	S		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**	**Approved By**
S. Ambika.	M. Shabana Begum	A. H. Bur

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY	NMEC - I	III	2	2			2
Objective	**To educate non-bioscience students about human system, emphasize fundamentals of physiology of human anatomy and to provide knowledge on neuronal network.**							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	Digestive System: Overview of the digestive system, process of digestion, absorption of carbohydrates, proteins and fats.						K1- K2	4
II	Respiratory System: Overview of the respiratory system, transport and exchange of gases.						K1- K2	4
III	Cardiovascular System: overview of cardiovascular system, structure and function of heart.						K1- K2	4
IV	Renal System: Kidney and nephron structure, mechanism of glomerular filtration, tubular reabsorption and secretion.						K1- K2	4
V	Nervous System: Classification of nervous system, Structure of neuron, Action potential, signal transmission at synapse, neurotransmitters.						K1- K2	4
Course Outcome	**CO1: Describe about digestion and absorption process of biomolecules**						K2	
	CO2:Illustrate the respiratory system and mechanism of exchange of gaseous						K2	
	CO3:Implement the awareness on cardiovascular system, structure and functioning of heart						K3	
	CO4:Outline the urine formation and excretion through kidney.						K4	
	CO5:Obtain an imminent knowledge about nervous system						K2	

Learning Resources									
Text Books	1. Essentials of Medical Physiology by K. Sembulingam and PremaSembulingam, 6th Edition, 2012 2. Human Physiology, Chatterjee C. 11th edition Medical agency allied, Calcutta.								
Reference Books	1. Principles of Anatomy and Physiology by Tortora and Grabowski, 2003, John Wiley &Sons, Inc. 2. Text book of medical physiology, A.C. Guyton 10th edition. 3. Human body, Atlas, Publication Garden cheers. 4. Review of medical physiology, William. F. Ganong, 14th edition, A Lange Medical book.								
Website Link	1. https://nptel.ac.in/courses/102104058 2. https://onlinecourses.nptel.ac.in/noc20_bt42/preview 3.https://www.digimat.in/nptel/courses/medical/physiology/PY11.html								
	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY	NMEC - I	III	2	2			2

CO-PO Mapping												
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	S	M	M	S	M	M	S	S	S	S		
CO2	S	S	M	M	M	S	M	M	M	M		
CO3	S	M	S	M	S	M	M	M	M	M		
CO4	S	M	M	M	M	M	M	M	M	M		
CO5	S	M	M	M	M	M	M	M	M	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
S. Maharajan S. MAHARAJAN	M. Shaheena Begum	A-h- bam

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCC04	BIOENERGETICS AND INTERMEDIARY METABOLISM	DSC THEORY - IV	IV	6	6			5
Objective	To understand the principles of cellular energy metabolism, schematize the oxidative pathways of carbohydrates, Lipids, Proteins & Nucleic acids and to gain knowledge on mitochondrial Electron transport chain and Oxidative Phosphorylation							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Introduction to metabolism: Types of metabolic reactions. Bioenergetics- Principles of thermodynamics, concepts of free energy, standard free energy, oxidation-reduction reactions, redox potential, High energy phosphate compounds.	K1-K2	15
II	Biological oxidation: Mitochondrial Electron Transport Chain: electron carriers, sites of ATP production, inhibitors of ETC, Oxidative phosphorylation: -the structure of ATPase complex, chemiosmotic theory, inhibitors of oxidative phosphorylation and uncouplers, Mitochondrial shuttle system.	KI-K2	12
III	Carbohydrates Metabolism Glycolysis, Glycogenesis and glycogenolysis, Citric acid cycle, and Gluconeogenesis. Alternative pathways: HMP pathway, gluconeogenesis, glucuronic acid pathway.	KI-K3	13
IV	Lipid Metabolism Oxidation of fatty acids - Beta oxidation, alpha oxidation, and omega oxidation. Oxidation of fatty acids with the odd number of carbon atoms. Ketogenesis. Biosynthesis of saturated fatty acids and unsaturated fatty acids. Biosynthesis and degradation of triacylglycerol and phospholipids. Biosynthesis and degradation of cholesterol	K1-K4	15
V	Protein Metabolism, Degradation of proteins, Oxidative, Non-oxidative, deamination and decarboxylation of amino acids, Urea Cycle and Creatinine formation. Nucleic acid Metabolism Biosynthesis and degradation of purine and pyrimidine nucleotides	KI-K4	15
Course Outcome	**CO1:Understand the basic principles of metabolic pathways**	K1	
	CO2:Comprehend carbohydrate metabolism and its regulation	K2	
	CO3:Relate the big picture about the biological oxidation process	K3	

	CO4:Value the concepts of lipid metabolism and amino acid metabolism and urea cycle	K4	
	CO5:Defend the concepts of nucleic acid metabolism	K4	
Learning Resources			
Text Books	1. Fundamentals of Biochemistry, J.L. Jain, S. Chand publications, 2004. 2. Biochemistry, Lubert Stryer, 4th edition, W.H. Freeman & Co, 1995. 3. Fundamentals of Biochemistry (1999) - Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY.		
Reference Books	1. Lehninger's Principles of Biochemistry (2000) - Nelson, David l. and Cox, M.M. Macmillan / Worth,NY. 2. Harper's Biochemistry Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 24th edition, Prentice Hall International. Inc. 3. Principles of Biochemistry, Geoffrey L. Zubay, 3rd edition William W. Parson, Dennis E. Vance, W.C. Brown Publishers,1995. 26 4. Principles of Biochemistry, David L. Nelson, Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.		
Website Link	1. www.biosciencenotes.com 2. https://microbenotes.com/		

L-Lecture T-Tutorial P-Practical C-Credit

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M4UBCC04	BIOENERGETICS AND INTERMEDIARY METABOLISM	DSC THEORY - IV	IV	6	6			5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	M	S	M	S	M
CO2	S	M	M	M	S	M	S	M	M	M
CO3	S	M	S	S	M	S	S	M	S	M
CO4	S	M	M	M	S	M	S	M	M	M
CO5	S	M	S	M	S	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	1.Group discussion 2.Flash cards 3.Listening skills 4.Roll play
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
M. Dei		A. L. Sam

Curriculum Development Cell MCAS (Autonomous) Rasipuram

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCS02	PLANT BIOCHEMISTRY	SEC - II	IV	2	2			2
Objective	**To understand plant cell structure and specific biochemical functions to all compartments of the plant cell, the mechanism of photosynthesis and biosynthetic pathways in plants and to gain knowledge about secondary metabolites and their role in medicine.**							

Unit	Course Content	Knowledge Levels	Sessions
I	Physiology of Plants: Plant cell wall, Mechanism of water absorption, Ascent of sap. Transpiration-types, Stomatal opening, Mechanism and factors affecting transpiration.	K1- K2	5
II	Photosynthesis: Photosynthetic a, Photosynthetic pigments, Light reactions - cyclic and non-cyclic Phosphorylation, Calvin cycle, Photorespiration, C4 plants, CAM plants. Glyoxylate cycle.	KI-K2	5
III	Nitrogen Metabolism and Nitrogen Cycle: Nitrogen in soil, nitrate reduction in plants, Nitrogen fixation: - No biological and biological nitrogen fixation, biochemistry of symbiotic and non symbiotic nitrogen fixation, nitrogen cycle, sulphur cycle, phosphorus cycle.	K1-K3	5
IV	Plant Hormones: Chemistry, biosynthesis, storage, distribution, mode of action and physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene.	K3- K4	5
V	Medicinal plants and secondary metabolites: Medicinal value of different parts of plants. Primary and secondary metabolites. and Basic methods to identify them. Secondary metabolites: Terpenes, Phenols, flavonoids and nitrogenous compounds and their roles in alternative medicine. Medicinal value of Amla, Stevia, Aswagandha and Turmeric.	KI-K5	5
Course Outcome	**CO1: Understand the plant cell physiology.**	K1	
	CO2: Demonstrate the process of photosynthesis and photorespiration.	K2	
	CO3: Demonstrate nitrogen fixation in plants.	K3	
	CO4: Select the plant growth through seed germination and seed dormancy.	K4	
	CO5: Construct hormones and secondary metabolites of plants.	K4	

Learning Resources	
Text Books	1. Textbook Of Plant Physiology, Biochemistry And Biotechnology, Dr. S. K. Verma & Mohit Verma,, S Chand & Co Ltd 2. Pandey, S. N. and Sinha, B. K. 1999. Plant Physiology. [Third Edition]. Vikas Publishing House Pvt. Ltd., Pune. 3. Chawla, H. S. 2002. Introduction to Plant Biotechnology. [Second Edition]. Science Publishers, USA.
Reference Books	1. Plant Biochemistry: Hans-Walter Heldt & Heldt, 4th Ed. 2010. 2. Biochemistry & Molecular Biology of Plant: Bob B. Buchanan, Wilhelm Gruissem, Russell L. Jones, 2nd Ed. 2015. 3. Plant Biochemistry: Dey P. M. Harbone J. B., 1st Ed. 1997. 4. Advances In Plant Biochemistry: K.N. P. Singh, Agrotech Press, 2014
Website Link	1. https://nptel.ac.in/courses/102105058 2. https://pravara.in/wp-content/themes/twentyseventeen/essentials/pdf/elearn/Principles-of-Plant-Biotechnology.pdf

L-Lecture T-Tutorial P-Practical C-Credit

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M4UBCS02	PLANT BIOCHEMISTRY	SEC - II	IV	2	2			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	S
CO2	M	L	M	M	M	S	S	L	M	M
CO3	S	M	S	M	M	S	L	M	S	S
CO4	M	L	M	S	S	M	S	S	M	M
CO5	S	S	M	S	M	S	M	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	1.Group discussion 2.Flash cards 3.Listening skills 4.Roll play
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By

Curriculum Development Cell MCAS Autonomous Rasipuram

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCP02	ENZYMES AND PHYTOCHEMISTRY	DSC PRACTICAL - II	IV	3+3			3	3
Objective	**To practice calorimetric determinations, enzyme assays and molecular separation techniques and to practice extraction and estimation of plant components.**							
S. No.	**List of Experiments / Programmes**						**Knowledge Levels**	**Sessions**
1	1. Isolation and purification of Amylase (saliva/potato/wheat)						KI-K2	7
2	2. Determination of optimum pH of salivary amylase 3. Determination of Km and Vmax of salivary amylase 4. Determination of optimum temperature and substrate concentration of salivary amylase						KI-K2	15
3	5. Isolation of sub-cellular organelles.						KI-K3	8
4	6. Study of various stages of mitosis using cytological preparation of Onion root tips						K1-K4	15
5	7. Estimation of chlorophyll in leaves 8. Extraction of Pectin from orange peel 9. Extraction of Caffeine from tea						KI-K5	15
Course Outcome	**CO1:Know about analytical techniques of separation and purification of enzymes**						K1	
	CO2:Analyse the enzymes by colorimeter						K2	
	CO3:Know about cell organelles						K3	
	CO4:Extraction of plant materials						K4	
	CO5:To analyse the secondary metabolites quantitatively						K5	
Learning Resources								
Text Books	1. Practical clinical biochemistry, volume I and II- Harold Varley, et al., 1980. Fifth Edition. CBS publishers. 2. Biochemical Methods. II Edition. Sadasivam. S and Manickam, A New Age International private Ltd Publishers. 3. A Text book of practical biochemistry. David Plummer 4. Plant Biochemistry - Practical. C.C. Giri & Archana Giri. 5. Biochemical methods, S. Sadasivam and A. Manickam 1992. Willey Eastern Limited, New Delhi.							

Reference Books	1. Laboratory techniques in Biochemistry and Molecular biology, Copyright 2017. Ed. T.S. Work and E.Work., 1969. Vol I & II, Elsevier. 2. A Biologist's guide to principles and Techniques of Practical Biochemistry, Modern Experimental Biochemistry Boyer, R III Edition, Benjamin Cummings Publishers. 3. Enzymes Structure and Mechanism, AlnFessht 1997.
Website Link	1. https://ncert.nic.in/pdf/publication/science laboratory manuals/ 2. https://srjcstaff.santarosa.edu/~jfassler/chem60/

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M4UBCP02	ENZYMES AND PHYTOCHEMISTRY	DSC PRACTICAL - II	IV	3+3			3	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	M	S	M	M	S	M	M
CO2	M	S	M	S	M	S	M	S	M	S
CO3	S	M	L	M	S	M	S	M	S	S
CO4	M	S	M	S	M	S	M	S	M	M
CO5	S	M	M	M	S	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Problem solving and group discussion
Teaching and Learning Methods	Explanation of Practical procedure and Demonstration of experiments
Assesment Methods	Observation, Performance, Attendance

Designed By	Verified By	Approved By

Curriculum Development Cell MCAS Autonomous Rasipuram

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1UBCA01	ALLIED BIOCHEMISTRY I	GEC THEORY - I	I	4	4			4
Objective	**To understand the simple and molecular structure of the different types of biomolecules, enzymes and vitamins and to gain knowledge the physicochemical properties and biological importance of biomolecules.**							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	Carbohydrates: Classification of carbohydrates, Monosaccharides: - Structures, Stereoisomers and structural isomers, mutarotation, and chemical properties. Oligosaccharides: - Dissaccharides-structure and importance of sucrose, Lactose, maltose, Polysaccharides: - Structure and significance of homopolysaccharides and heteropolysaccharides.						K1- K2	8
II	Amino Acids: Structures and Classifications of amino acids, Essential and Non-essential amino acids, properties of amino acids. Protein: Classification and functions of proteins, bonds involved in protein structure, structural levels of organization: - primary, secondary, tertiary and quaternary structures with examples.						K1- K2	9
III	Enzymes: Holoenzyme, Apoenzyme, coenzymes, cofactors/prosthetic groups, IUB classification of enzymes with example. Active site: - characteristic features and theories of ES compex, enzyme units, Enzyme kinetics: - MM equation and LB plot, factors affecting enzyme activity.						K1- K2	9
IV	Lipids:Classificationsoflipids, physical and chemical properties offats,structure and functions of saturated and unsaturated fatty acids. Nucleic Acids: Nitrogenous bases, structures of Ribonucleotides and deoxyribonucleotides, structure and functions of DNA and RNA.						K1- K2	9
V	Vitamins: Sources, RDA, biochemical functions, deficiency disorders of fat soluble and water-soluble Vitamins. Minerals: Sources, Biological importance and disorders of Phosphorus, Calcium, Magnesium and Iron.						K1- K2	10
Course Outcome	**CO1:Describe structures, properties and functions of carbohydrates.**						K2	
	CO2:Explain the structures, properties and role of amino acids and proteins.						K2	

	CO3:Illustrate the nomenclature and identify the classes of enzymes and factors affecting their action with kinetics							K3	
	CO4:Demonstrate about the structure and properties of lipids and Nucleic acids with their importance							K3	
	CO5:Describe about source, importance and deficiency disorders of vitamins and minerals							K2	
Learning Resources									
Text Books	1. Lehninger's Principles ofBiochemistry(2000) byNelson,David l. andCox, M.M.Macmillan/worth,NY. 2. Fundamentals Of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley&Sons, NY. 3. Biochemistry (2013) by U.Satyanarayana and U. Chakrapani, 4th edition, Elsevier								
Reference Books	1. Biochemistry4th edition (1988) byZubayGL,WMCBrown Publishers. 2. Principles of Biochemistry (1994) Garrette& Grisham, Saunders college publishing. 3. Text book of biochemistry (1997) 4th edition Thomas M devlin, A John Wiley, Inc publication, New York.								
Website Link	1.http://en.bookfi.net/ 2. 1.https://www.phys.sinica.edu.tw/TIGP NANO/Course/2010_Spring/Classnotes/AAC_lehninger4e_ch03%20(Protein).pdf 3. https://nptel.ac.in/courses/104103121 4. https://onlinecourses.nptel.ac.in/noc20_cy07								
	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1UBCA01	ALLIED BIOCHEMISTRY I	GEC THEORY - I	I	4	4			4

CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	S	S	M	M	M	M	M	M	M		
CO2	S	M	M	M	M	S	M	S	M	M		
CO3	S	M	S	M	S	M	S	M	S	S		
CO4	S	M	M	M	M	M	M	M	M	M		
CO5	S	M	M	M	M	M	M	M	M	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**	**Approved By**
S. Ambika	M. Shahana Begum	A. L. Banu

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
21M2UBCA02	ALLIED BIOCHEMISTRY II	GEC THEORY - II	II	4	4	-	-	4
Objective	**To learn biochemical techniques, metabolism of bio molecules and energy production and to gain knowledge the physicochemical properties and biological importance of hormones.**							

Unit	Course Content	Knowledge Levels	Sessions
I	pH and Buffers: Definitions for Acids and bases, pH: - Definition and determination of pH, Henderson - Hasselbalch equation, Buffer systems of humanbody. Biochemical Techniques: Principles and Applications of paper and thin layer.	K1- K2	9
II	Carbohydrate Metabolism: Glycolysis, Citric acid cycle, gluconeogenesis, glycogen metabolism and HMP shunt.	K1- K2	9
III	Bioenergetics: Redox potential, Electron transport chain, Oxidative phosphorylation, inhibitors of ETC, uncouplers of oxidative phosphoryation, High energy compounds.	K1- K3	9
IV	Lipid Metabolism: Beta and omega oxidation, Biosynthesis of Saturated fatty acids. Interrelationship between carbohydrates, proteins and fat metabolism. Protein Metabolism: Transamination, oxidative and non-oxidative deamination, decarboxylation, urea	K1- K4	9
V	Introduction to Hormones: Definition, Classsification and Biological significance of hormones, mechanism of hormone action. Second Messengers: - Role of cAMP, cGMP, IP3, DAG and Ca2+	K1- K4	9
Course Outcome	**CO1: Understand the basics of acid - base balance of human body and gain and develop competence in handing various chromatographic techniques.**	K1	
	CO2: Describe carbohydrate metabolism and gain knowledge about Diabetes mellitus.	K2	
	CO3: Learn basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation.	K3	
	CO4: Describe the concepts of lipid metabolism and amino acid metabolism.	K4	
	CO5:Gain knowledge about the basic terminologies, classification and mechanism of action of hormones and to demonstrate various types of second messengers.	K4	
Learning Resources			

Text Books	1. Biochemistry (2013) by U.Satyanarayana and U. Chakrapani, 4th edition, Elsevier 2. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995.Cambridge UniversityPress 3. Biophysical chemistry Principles and Techniques- Avinash Upadhyaye and Nirmalendhe Nath, Himalaya Publishers.
Reference Books	1. Fundamentals of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley&Sons, NY. 2. Outlines ofBiochemistry (1987) byEric E.Conn, P.K.Stumpf, G.Brueins and RayH.Doi,JohnWiley& Sons, NY. 3. Biochemistry3rd (1994) byLubertstryer,WH freeman and co, Sanfrancisco. 4. Text book of biochemistry (1997) 4th edition,Thomas M devlin,AJohnWiley,In
Website Link	1. www.biosciencenotes.com 2. https://microbenotes.com/ 3. http://en.bookfi.net/

L-Lecture T-Tutorial P-Practical C-Credit

B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M2UBCA02	ALLIED BIOCHEMISTRY II	GEC THEORY - II	II	4	4	-	-	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L	M	S	M	M	M
CO2	M	M	M	M	M	S	M	M	S	M
CO3	S	S	M	S	M	M	M	S	M	M
CO4	M	M	S	M	S	M	M	L	M	S
CO5	S	M	M	M	S	M	L	M	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	1.Group discussion 2.Flash cards 3.Listening skills 4.Role play
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By

Curriculum Development Cell MCAS Autonomous Rasipuram

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2UBCAP01	ALLIED BIOCHEMISTRY PRACITCAL	GEC PRACTICAL - I	II	3+3			75	3
Objective	**To have hands on experience on qualitative analysis of biomolecules and to learn and understand the seperation techniques.**							
S.No.	**List of Experiments / Programmes**						**Knowledge Levels**	**Sessions**
1	I. QualitativeAnalysis a. Analysis ofcarbohydrates b. Analysis ofAmino acids						K2	15
2	c. Test for proteins d. Test for lipids – cholesterol						K2	15
3	II. Biochemical preparation a. Starch from Potato b. Casein from milk c. Lecithin from egg yolk						K2	15
4	III. QuantitativeAnalysis a. Reducing Sugar –Benedict'smethod b. Amino acid – formal titration c. Ascorbic acid – using 2, 6 Dichloro phenolIndophenol method.						K2	15
5	IV. Techniques a. Separation of sugar & amino acid by paper chromatography b. Separation of lipid by thin layer chromatography						K2	15
Course Outcome	**CO1:Analyse biomolecules for qualitative study**						K2	
	CO2:Learn about biochemical preparation of sugars and aminoacids.						K2	
	CO3: Qualitative analyses of proteins and lipids						K2	
	CO4: Quantify the biomolecules						K2	
	CO5: Experimententation of chromatography techniques							
Learning Resources								
Text Books	1. Biochemical Methods 1992, by S.Sadasivam and A. Manickam, Second Edition, New Age International Publishers, New Delhi. 2. Laboratory Manual in Biochemistry, 1981. J.Jayaraman, New Age International publishers, New Delhi.							
Reference Books	1. Introductory practical Biochemistry (2005), by S. K. Sawhney and Radhir singh, Alpha Science International publishers, 2ndEdition.							
Website Link	1. https://ncert.nic.in/pdf/publication/science laboratory manuals/ 2. https://nptel.ac.in/courses/102103016							

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2UBCAP01	ALLIED BIOCHEMISTRY PRACITCAL				GEC PRACTICAL - I		II	3				
CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	L	S	S	S	S	S	S	S	M		
CO2	M	S	S	S	M	S	M	S	M	S		
CO3	S	S	L	M	S	S	S	M	S	S		
CO4	S	S	S	S	M	S	M	S	S	M		
CO5	S	M	S	M	S	S	S	S	M	S		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								
Tutorial Schedule					Problem solving and group discussion							
Teaching and Learning Methods					Explanation of Practical procedure and Demonstration of experiments							
Assessment Methods					Observation, Performance, Attendance							
	Designed By				**Verified By**				**Approved By**			

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY	NMEC - I	III	2	2			2
Objective	**To educate non-bioscience students about human system, emphasize fundamentals of physiology of human anatomy and to provide knowledge on neuronal network.**							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Digestive System: Overview of the digestive system, process of digestion, absorption of carbohydrates, proteins and fats.	K1- K2	4
II	Respiratory System: Overview of the respiratory system, transport and exchange of gases.	K1- K2	4
III	Cardiovascular System: overview of cardiovascular system, structure and function of heart.	K1- K2	4
IV	Renal System: Kidney and nephron structure, mechanism of glomerular filtration, tubular reabsorption and secretion.	K1- K2	4
V	Nervous System: Classification of nervous system, Structure of neuron, Action potential, signal transmission at synapse, neurotransmitters.	K1- K2	4
Course Outcome	**CO1: Describe about digestion and absorption process of biomolecules**	K1- K2	
	CO2:Grasp the respiratory system and mechanism of exchange of gaseous	K1- K2	
	CO3:Gain awareness on cardiovascular system, structure and functioning of heart	K1- K2	
	CO4:Understand the urine formation and excretion through kidney.	K1- K2	
	CO5:Obtain an imminent knowledge about nervous system	K1- K2	

Learning Resources	
Text Books	1. Essentials of Medical Physiology by K. Sembulingam and Prema Sembulingam, 6th Edition, 2012 2. Human Physiology, Chatterjee C. 11th edition Medical agency allied, Calcutta.
Reference Books	1. Principles of Anatomy and Physiology by Tortora and Grabowski, 2003, John Wiley &Sons, Inc. 2. Text book of medical physiology, A.C. Guyton 10th edition. 3. Human body, Atlas, Publication Garden cheers. 4. Review of medical physiology, William. F. Ganong, 14th edition, A Lange Medical book.
Website Link	1. https://nptel.ac.in/courses/102104058 2. https://onlinecourses.nptel.ac.in/noc20_bt42/preview 3.https://www.digimat.in/nptel/courses/medical/physiology/PY11.html

	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	**Course Title**				**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY				NMEC - I	III	2	20			2	
CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	M	M	S	M	M	S	S	S	S		
CO2	S	S	M	M	M	S	M	M	M	M		
CO3	S	M	S	M	S	M	M	M	M	M		
CO4	S	M	M	M	M	M	M	M	M	M		
CO5	S	M	M	M	M	M	M	M	M	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	1.Group discussion 2.Role play 3.Listening skills 4.Flash cards
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**		**Approved By**	

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCN02	BIOCHEMISTRY IN NUTRITION	NMEC - II	III	2	20			2
Objective	**To create awareness on various nutrient content in food/food regulation act / food safety, the significance of nutrients in metabolic process and to study the importance of nutrients during physiological changes and in sports**							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Nutritional Profile of Foods: - Cereals, pulses, vegetables, fruits, nuts, oil seeds, animal foods, milk and milk products, egg, fish, meat, drinks and spices. Role of dietary carbohydrates, proteins, fats, fiber and antioxidants	K1- K2	4
II	Determination of calorific value of foods by Bomb calorimeter. Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action. BMR: - Measurement of BMR and factors influencing BMR. RDA for patients: - Anemic, Diabetic, Blood pressure and obese.	K1- K2	4
III	Recommended dietary allowances for infants, children, adolescent, pregnant, lactating women, athletes and geriatrics.	K1- K2	4
IV	Drug - nutrient Interactions, food toxins, food allergy, adverse effects of alcohol, tobacco, tea, Acidic and alkaline foods. Nutraceuticals: - Introduction and classification of nutraceuticals.	K1- K2	4
V	Nutritional therapy for inborn errors of metebolism, role of diet and nutrition in the prevention and treatment of disorders: - Diabetes mellitus, peptic ulcer, jaundice, hypertension and cardiovascular diseases.	K1- K2	4
Course Outcome	**CO1: Describe the nutritional profile of various foods and the role of biomolecules, fiber and antioxidants**	K1- K2	
	CO2: Describe the techniques to measure energy expenditure and BMR; RDA for various disorders.	K1- K2	
	CO3: Understand the recommended dietary allowances for different age group people	K1- K2	
	CO4: Gain awareness on drug – nutrient interactions, food allergy and importance of nutraceticals.	K1- K2	
	CO5: Obtain an impending knowledge about nutritional therapy for various metabolic disorder	K1- K2	

Learning Resources	
Text Books	1. Human nutrition by B. Srilakshmi, New age International Pvt Ltd, 2009 2. Human nutrition and dietetics, S. Davidson and J.R. Passmore.
Reference Books	1. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition. 2. Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996. 3. Modern nutrition in health and diseases, Whol and Good hart.
Website Link	1. https://nptel.ac.in/courses/126104004 2. http://www.nitttrc.edu.in/nptel/courses/video/126104004/L31.html 3. https://ciet.nic.in/swayam_FNHL_module07.php

	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCN02	BIOCHEMISTRY IN NUTRITION				NMEC - II		III	2	20			2
CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	M	S	M	M	S	S	M	M	M		
CO2	S	M	M	S	S	M	M	M	S	M		
CO3	S	M	M	M	M	M	M	S	M	M		
CO4	S	S	M	M	M	M	M	M	M	S		
CO5	S	M	M	M	M	M	S	M	M	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	1.Group discussion 2.Role play 3.Listening skills 4.Flash cards
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**		**Approved By**	

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3UBCN01	BIOCHEMISTRY AND HEALTH	NMEC - I	IV	2	20			2
Objective	**To understand the different types of biomolecules, the common disorders of nutritional deficiency and to gain knowledge on the biological importance of micro nutrients.**							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Carbohydrate – Source of carbohydrates, Importance of carbohydrates in living organisms, Normal level of sugar in humans, Diabetes mellitus and its complications in human. Control and prevention of Diabetes mellitus.	K1- K2	4
II	Proteins –Sources of proteins and amino acids. Importance of proteins in living organisms. Normal level of proteins in human. Protein deficiency disease-Kwashiorkor and Marasmus, Protein quality.	K1- K2	4
III	Lipids - Source of fats and importance of fats and lipids in living organism and. Role of lipoproteins in human body. Normal levels of cholesterol hypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and myocardial infarctions. Prevention and control of heart related diseases.	K1- K2	4
IV	Vitamins –Source of water soluble and fat soluble vitamins. Deficiency /disorders of Vitamins and importance of vitamins in humans	K1- K2	4
V	Minerals - Source and deficiency disorders of calcium, magnesium, sodium, potassium, phosphorus, Iron, Iodine in humans.	K1- K2	4
Course Outcome	**CO1:Summarize the sources, importance of carbohydrates and gain awareness about Diabetes mellitus.**	K1- K2	
	CO2:Understand the importance of proteins in living organism with their deficiency disorders.	K1- K2	
	CO3:Describe the sources and importance of lipids along with the disorders of lipid metabolism	K1- K2	
	CO4:Explain the sources, RDA, importance and deficiency disorders of vitamins.	K1- K2	
	CO5:Describe about sources and biological importance of minerals	K1- K2	

Learning Resources	
Text Books	1. Deb.A.C., Fundamentals of Biochemistry, Books and allied (p) Ltd, 2002. 2. Essentials of Biochemistry Sathyanarayanan.U. Books and allied (p) Ltd, 2002. 3. Biochemistry by Ambika Shanmugam.
Reference Books	1. Text book of Medical Physiology – Guyton.A.C. 2. Human Physiology by Chatterjee. 3. Food facts and principles, Shakuntala Manay.
Website Link	1. https://onlinecourses.swayam2.ac.in/cec20_ag01/preview 2. https://www.digimat.in/nptel/courses/medical/biochemistry/BC22.html 3. https://nptel.ac.in/courses/104105076

	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	**Course Title**				**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
21M3UBCN01	BIOCHEMISTRY AND HEALTH				NMEC - III	IV	2	2	20		2	
CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	M	S	M	M	M	M	M	M	M		
CO2	S	M	M	M	S	M	M	S	S	S		
CO3	S	M	M	S	M	M	S	M	M	M		
CO4	S	S	M	M	M	S	M	M	M	S		
CO5	S	M	M	M	M	M	M	M	S	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								

Tutorial Schedule	1.Group discussion 2.Role play 3.Listening skills 4.Flash cards
Teaching and Learning Methods	Chalk and talk method, PPT Classes, Smart classroom
Assesment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	**Verified By**		**Approved By**	

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCN02	BIOCHEMISTRY IN DIAGNOSIS	NMEC - II	IV	2	2			2
Objective	**To understand the different types of diagnostic tests in biochemistry, common techniques to collect, preserve and processing the biological samples and to gain knowledge on the enzyme assays.**							

Unit	Course Content	Knowledge Levels	Sessions
I	Approaches to Clinical Biochemistry: Collection of clinical specimens, preservatives for blood and urine, transport of biological samples. Quality Control: Concepts of accuracy, precision, sensitivity and reproducibility	K1- K2	4
II	Hematology: Composition and functions of blood, Haemoglobin, PCV, ESR, RBC, WBC and Platelet count. ESR and PCV.	K1- K2	4
III	Physical Examination of Urine: Volume, colour, odour, appearance, specific gravity and pH. Chemical examination of urine: Qualitative tests for Reducing sugar, protein, ketone bodies, Bile pigment, bile salt, Urobilinogen, and mucin. Microscopic Examination of urine.	K1- K2	4
IV	Stool Examination: Collection of fecal specimens, preservation, physical examination: - volume, colour, odour and appearance. Chemical examination: - reducing sugar, occult blood test, detection of steatorrhea. Microscopic examination of stool.	K1- K2	4
V	Estimation of Biochemical Components in serum: Glucose, GTT, Glycosylated hemoglobin, Protein, cholesterol, Urea, Uric acid and Creatinine. Determination of Enzyme Activity: AST, ALT, ALP and LDH.	K1- K2	4
Course Outcome	CO1: Summarize the use of standard precautions applied in clinical laboratory and during the collection, processing, preservation and transportation of biological specimens for analysis.	K1- K2	
	CO2:Gain knowledge of the normal composition of blood and their analysis along with their significance in maintaining good health.	K1- K2	
	CO3:Become skilled at performing clinical urine tests for diagnostic purposes and Identify abnormal constituents of urine	K1- K2	
	CO4:Describe physical, chemical and microscopic examination of stool and analysis of its constituents using standard procedures	K1- K2	
	CO5: Become aware with the variations in the levels of biochemical components of blood and their relationship with various diseases and also get acquainted with the role of enzymes in diagnosis of a variety of diseases.	K1- K2	

Learning Resources

Text Books	1. Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi. 2. Medical Biochemistry by MN Chatterjee, Rana Shinde, 8th edition, 2013, Jaypee publications. 3. Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.
Reference Books	1. Sabitri Sanyal, Clinical pathology, B. I. Churchill Livingstone (P) Ltd, New Delhi.2000. 2. Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. John Wiley- Liss Inc. Publication. 3. Tietz Fundamentals of Clinical Chemistry- (5th edition) C.A. Burtis, E.R. Ashwood (eds) Saunders WB Co.
Website Link	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6279435/ 2. https://www.digimat.in/nptel/courses/medical/biochemistry/BC45.html. 3. https://onlinecourses.swayam2.ac.in/cec20_bt19/preview

	L-Lecture	T-Tutorial	P-Practical		C-Credit				

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4UBCN02	BIOCHEMISTRY IN DIAGNOSIS				NMEC - IV		IV	2	2	20		2
CO-PO Mapping												
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	M	M	M	M	M	M	S	M	M		
CO2	S	S	M	M	S	M	M	M	M	M		
CO3	S	M	M	M	M	M	S	M	M	S		
CO4	S	M	S	M	M	M	M	M	S	M		
CO5	S	M	M	M	M	S	M	M	M	M		
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG								
Tutorial Schedule					1.Group discussion 2.Role play 3.Listening skills 4.Flash cards							
Teaching and Learning Methods					Chalk and talk method, PPT Classes, Smart classroom							
Assesment Methods					Assignment, Class test, Unit test, Internal exams, Seminars, Attendance							
				Designed By			**Verified By**				**Approved By**	