

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)



ESTD-1994

**MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE**
(Autonomous)

A UNIT OF VANETRA GROUP

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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


(for the Students Admitted from the Academic Year:2021-2022 Onwards)

Programme : B.Sc.BIOCHEMISTRY

S.No.	PART	STUDY COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
					Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - I										
1	I	LANGUAGE-I	21M1UFTA01	TAMIL-I	5	-	3	25	75	100
2	II	LANGUAGE-II	21M1UCEN01	COMMUNICATIVE ENGLISH-I	5	-	3	25	75	100
3	III	DSC THEORY - I	21M1UBCC01	BASICS OF BIOCHEMISTRY	4		4	25	75	100
4	III	GEC THEORY - I	21M1UCHA01	ALLIED- CHEMISTRY I	4		4	25	75	100
5	III	DSC PRACTICAL - I	21M2UBCP01	PRACTICAL : BIOCHEMICAL ANALYSIS	-	3				
6	IV	GEC PRACTICAL - I	21M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY	-	3				
7	IV	AECC - VALUE EDUCATION	21M1UVED01	YOGA	2		2	100		100
8	IV	PROFESSIONAL ENGLISH	21M1UPEL01	PROFESSIONAL ENGLISH FOR LIFE SCIENCES - I	4		2	25	75	100
				TOTAL	24	6	18	225	375	600
SEMESTER - II										
1	I	LANGUAGE - I	21M2UFTA02	TAMIL-II	5	-	3	25	75	100
2	II	LANGUAGE - II	21M2UCEN02	COMMUNICATIVE ENGLISH - II	5	-	3	25	75	100
3	III	DSC THEORY - II	21M2UBCC02	TOOLS OF BIOCHEMISTRY	4	-	4	25	75	100
4	III	GEC THEORY - II	21M2UCHA02	ALLIED -CHEMISTRY II	4		4	25	75	100
5	III	DSC PRACTICAL - I	21M2UBCP01	PRACTICAL : BIOCHEMICAL ANALYSIS		3	3	40	60	100
6	III	GEC PRACTICAL - I	21M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY		3	3	40	60	100
7	IV	AECC - ENVIRONMENTAL STUDIES	21M2UEVS01	ENVIRONMENTAL STUDIES	2	-	2	100		100
8	IV	PROFESSIONAL ENGLISH	21M2UPEL02	PROFESSIONAL ENGLISH FOR LIFE SCIENCES - II	4		2	25	75	100
				TOTAL	24	6	24	305	495	800
SEMESTER - III										
1	I	LANGUAGE - I	21M3UFTA03	TAMIL-III	6	-	3	25	75	100
2	II	LANGUAGE - II	21M3UCEN03	COMMUNICATIVE ENGLISH - III	6	-	3	25	75	100
3	III	DSC THEORY - III	21M3UBCC03	ENZYMES	6	-	5	25	75	100
4	III	GEC THEORY - III	21M3USTA05	ALLIED -BIostatISTICS	4	-	4	25	75	100
3	III	DSC PRACTICAL - II	21M4UBCP02	PRACTICAL : ENZYMES AND PHYTOCHEMISTRY	-	3				
6	III	SEC - I	21M3UBCS01	CELL BIOLOGY	3	-	2	25	75	100
7	IV	NMEC - I	21M3UCHN01	NMEC - I	2	-	2	25	75	100
				TOTAL	27	3	19	150	450	600
SEMESTER - IV										
1	I	LANGUAGE - I	21M4UFTA04	TAMIL-IV	5	-	3	25	75	100
2	II	LANGUAGE - II	21M4UCEN04	COMMUNICATIVE ENGLISH - IV	5	-	3	25	75	100
3	III	DSC THEORY - IV	21M4UBCC04	BIOENERGETICS & INTERMEDIARY METABOLISM	6	-	5	25	75	100

4	III	GEC THEORY - IV	21M4UCSA05	ALLIED - COMPUTER APPLICATIONS IN BIOLOGY	4	-	3	25	75	100
5	III	DSC PRACTICAL - II	21M4UBCP02	PRACTICAL : ENZYMES AND PHYTOCHEMISTRY	-	3	3	40	60	100
6	III	GEC PRACTICAL - II	21M4UCSAP5	PRACTICAL : ALLIED - OFFICE AUTOMATION	-	3	2	40	60	100
7	IV	SEC - II	21M4UBCS02	PLANT BIOCHEMISTRY	2		2	25	75	100
8	IV	NMEC - II	21M4UCHN02	NMEC - II	2	-	2	25	75	100
				TOTAL	24	6	23	230	570	800
SEMESTER - V										
1	III	DSC THEORY - V	21M5UBCC05	PATHOLOGY AND CLINICAL BIOCHEMISTRY	5	-	5	25	75	100
2	III	DSC THEORY - VI	21M5UBCC06	HUMAN PHYSIOLOGY	5	-	5	25	75	100
3	III	DSC THEORY - VII	21M5UBCC07	MOLECULAR BIOLOGY	5	-	5	25	75	100
4	III	DSC PRACTICAL - III	21M6UBCP03	PRACTICAL : CLINICAL BIOCHEMISTRY AND IMMUNOLOGY	-	5				
5	III	DSE THEORY- I	21M5UBCE01	ELECTIVE - I	4	-	4	25	75	100
6	III	DSE THEORY- II	21M5UBCE02	ELECTIVE - II	4	-	4	25	75	100
7	IV	SEC - III	21M5UBCS03	NUTRITION AND DIETICS	2		2	25	75	100
8	III	INTERNSHIP	21M4UBCIS1	INTERNSHIP			-	-		
				TOTAL	25	5	25	150	450	600
SEMESTER - VI										
1	III	DSC THEORY - VIII	21M6UBCC08	PHARMACOLOGY AND TOXICOLOGY	5	-	5	25	75	100
2	III	DSC THEORY - IX	21M6UBCC09	ENDOCRINOLOGY	5	-	5	25	75	100
3	III	DSE THEORY- III	21M6UBCE04	ELECTIVE - III	4	-	4	25	75	100
4	III	DSE THEORY- IV	21M6UBCE07	ELECTIVE - IV	4	-	4	25	75	100
5	III	DSC PRACTICAL - III	21M6UBCP03	PRACTICAL : CLINICAL BIOCHEMISTRY AND IMMUNOLOGY		5	4	40	60	100
6	III	PROJECT WORK	21M6UBCP01	PROJECT WORK	-	5	4	40	60	100
7	III	ONLINE - COMPETITIVE EXAMINATION	21M6UBCOE1	BIOCHEMISTRY FOR COMPETITIVE EXAMINATION	-	-	2	100		100
8	IV	SEC - IV	21M6UBCS04	INDUSTRIAL BIOCHEMISTRY	2		2	25	75	100
9	V	EXTENSION ACTIVITY	21M6UEXA01	EXTENSION ACTIVITY		-	1	-	-	-
10		NAAN MUDHALVAN		EMPLOYABILITY READINESS	-	-	-	-	-	-
				TOTAL	20	10	31	305	495	800
				OVERALL TOTAL	144	36	140	1365	2835	4200
1		EXTRA CREDIT COURSE	21M6UBCEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-


 Dr. M. Shabana Begum, M.Sc., M.Phil.,
 Head, Department of Biochemistry,
 Mathayammal College of Arts and Science
 Rasipuram - 637 408, Namakkal Dist.


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RASIPURAM, NAMAKKAL Dt – 637 408**

Board of Studies (BOS) in Biochemistry

Minutes of BOS

BOS Meeting held on 13.05.2023 at 'D' Block Conference hall in Muthayammal College of Arts and Science (Autonomous), Rasipuram and passed the following resolutions.

- I. The Board resolved and approved the scheme of examination, syllabi, and regulations for the students admitted in the B.Sc., Biochemistry program from the academic year 2023 – 2024 onwards as per TANSHE Guidelines.
- II. The Board resolved and approved the Allied Courses for the students of B.Sc., Microbiology and Biotechnology admitted from the academic year 2023-2024 onwards.
- III. The Board was decided to add Elective course as "Immunology" in the sixth semester for the students who have admitted in the year 2021 – 2022 onwards.

S.No.	Semester	PART	STUDY COMPONENTS	COURSE CODE	TITLE OF THE COURSE	Hrs	Cr	CIA	ESE	TOTAL	Remarks
1	VI	III	DSE THEORY-VII	21M6UBCE07	IMMUNOLOGY	4	4	25	75	100	Added

- IV. The Board resolved and approved the incorporation of Value Added Course Medical laboratory Technology offered for Final Year UG programme and Naan Mudhalvan Courses offered for all UG programmes admitted from the academic year 2022 - 2023 onwards.
- V. The Board resolved and approved the scheme of examination, syllabi, and regulations for the students admitted in the M.Sc., Biochemistry program from the academic year 2023 – 2024 onwards as per TANSHE Guidelines.


Board Chairman Signature

M. Shabana Begum, M.Sc., M.Phil., Ph.D.
Head, Department of Biochemistry,
Muthayammal College of Arts and Science
Rasipuram - 637 408, Namakkal Dist.


Principal Signature

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NAMAKKAL DISTRICT.

**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**

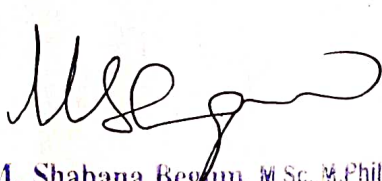
S.No.	Sem	COURSE_CODE	TITLE OF THE COURSE
1	I	21M1UBCA01	Allied Biochemistry- I
2	II	21M2UBCA02	Allied Biochemistry- II
3	II	21M2UBCAP1	Allied Biochemistry Practical- I


**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


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UG-REGULATION

1. Internal Examination 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% CIA 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)

- At least two activities should be conducted within a semester consisting of two days each.
- 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, Mini project and Major Project Work

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

*1 Review is for Individual Project and Work Diary is for Group Projects (Group consisting of minimum 3 and maximum 5)

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

6. Guidelines for Competitive Exams- Online Mode (Part III)- 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 is 40%
- In case, the candidate fails to secure 40% passing minimum, he/she may have to reappear for the same in the subsequent semesters.

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 I. 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
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
R. Prabha	M. Shobana Begum	A. V. Suresh

R. Abilashini



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 constant, 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 limitations. 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 - ¹⁴ C, ³² P, ³⁵ S, ³ H, ¹³¹ I.	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	PO1	PO2	PO3	PO4	PO5	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
<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

[Signature]



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								

Learning Resources

Text Books	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	PO1	PO2	PO3	PO4	PO5	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
<i>S. Anitha</i>	<i>U. S. P.</i>	<i>A. K. S.</i>



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-Practica l		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
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
<i>[Signature]</i>	M. Shobane Begum	A. V. S. S. S.

[Dr. G. Krishnamoorthy]



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	PS01	PS02	PS03	PS04	PS05		
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
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
S. Anilika	M. Shabano Begum	A. h. Suresh



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
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
S. Mahalingam S. MAHARAJAN	M. Shobana Begum	A. h. b. b. b.



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.						K1-K2	12
III	Carbohydrates Metabolism Glycolysis, Glycogenesis and glycogenolysis, Citric acid cycle, and Gluconeogenesis. Alternative pathways: HMP pathway, gluconeogenesis, glucuronic acid pathway.						K1-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						K1-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 I. 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
21M4UBCC 04	BIOENERGETICS AND INTERMEDIARY METABOLISM	DSC THEORY - IV	IV	6	6			5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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. De	M. S.	A. h. Sanyal



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.						K1-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.						K1-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	

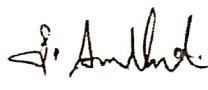
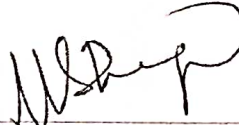
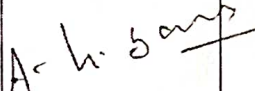
Learning Resources	
Text Books	1. Textbook Of Plant Physiology, Biochemistry And Biotechnology, Dr. S. K. Verma & Mohit Verma,, S Chand & Co Ltd 2. Pandey, S. N. and Sinha, B. K. 1999. Plant Physiology. [Third Edition]. Vikas Publishing House Pvt. Ltd., Pune. 3. Chawla, H. S. 2002. Introduction to Plant 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
21M4UBCS 02	PLANT BIOCHEMISTRY	SEC - II	IV	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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
		



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.							

[illegible]

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/

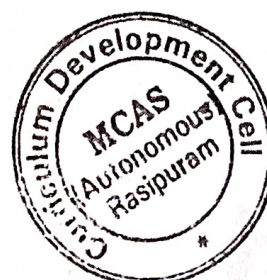
B.Sc.,-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	SEM	Hours	L	T	P	C
21M4UBCP 02	ENZYMES AND PHYTOCHEMISTRY	DSC PRACTICAL - II	IV	3+3			3	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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
<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>



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 complex, enzyme units, Enzyme kinetics: - MM equation and LB plot, factors affecting enzyme activity.						K1- K2	9
IV	Lipids: Classification of lipids, physical and chemical properties of fats, 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 of Biochemistry(2000) by Nelson,David I. and Cox, 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) by Zubay GL, WMC Brown 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
21M1UBCA01	ALLIED BIOCHEMISTRY I	GEC THEORY - I	I	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
Assessment Methods	Assignment, Class test, Unit test, Internal exams, Seminars, Attendance

Designed By	Verified By	Approved By
S. Arul. S. Ambika	M. Shabane Begum	A-h- bunn



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, Classssification 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								

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 University Press 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 of Biochemistry (1987) by Eric E. Conn, P.K. Stumpf, G. Brueins and Ray H. Doi, John Wiley & Sons, NY. 3. Biochemistry 3rd (1994) by Lubert Stryer, W H Freeman and Co, San Francisco. 4. Text book of biochemistry (1997) 4th edition, Thomas M Devlin, A John Wiley, 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	PO1	PO2	PO3	PO4	PO5	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
<i>FRB</i>	<i>MSR</i>	<i>A-hi Suresh</i>



Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
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21M2UBCAP01	ALLIED BIOCHEMISTRY PRACITCAL	GEC PRACTICAL - I	II	3+3			75	3
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Objective	To have hands on experience on qualitative analysis of biomolecules and to learn and understand the separation techniques.
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S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	I. Qualitative Analysis a. Analysis of carbohydrates b. Analysis of Amino 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. Quantitative Analysis a. Reducing Sugar – Benedict's method b. Amino acid – formal titration c. Ascorbic acid – using 2, 6 Dichloro phenol Indophenol 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 amino acids.	K2	
	CO3: Qualitative analyses of proteins and lipids	K2	
	CO4: Quantify the biomolecules	K2	
	CO5: Experimentation of chromatography techniques		

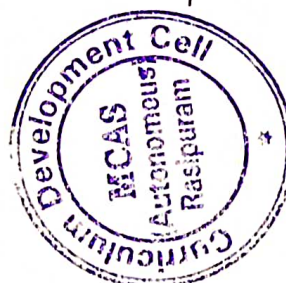
Learning Resources

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

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B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards												
Course Code	Course Title				Course Type		Sem	Hours	L	T	P	C
21M2UBCAPO1	ALLIED BIOCHEMISTRY PRACITCAL				GEC PRACTICAL - I		II	3				
CO-PO Mapping												
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5		
C01	S	L	S	S	S	S	S	S	S	M		
C02	M	S	S	S	M	S	M	S	M	S		
C03	S	S	L	M	S	S	S	M	S	S		
C04	S	S	S	S	M	S	M	S	S	M		
C05	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			
				T. R. Sub		M. S. S.			S. S. S.			

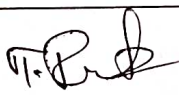
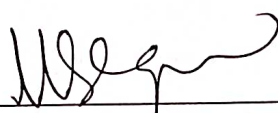
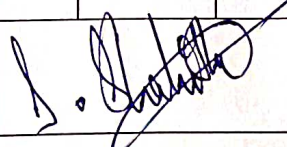


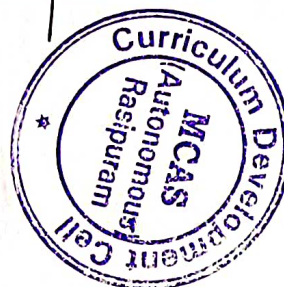
B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY	NMEC - I	III	2	2			2
Objective	To educate non-bioscience students about human system, emphasize fundamentals of physiology 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	C01: Describe about digestion and absorption process of biomolecules					K1- K2		
	C02:Grasp the respiratory system and mechanism of exchange of gaseous					K1- K2		
	C03:Gain awareness on cardiovascular system, structure and functioning of heart					K1- K2		
	C04:Understand the urine formation and excretion through kidney.					K1- K2		
	C05: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	PS01	PS02	PS03	PS04	PS05	
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
		

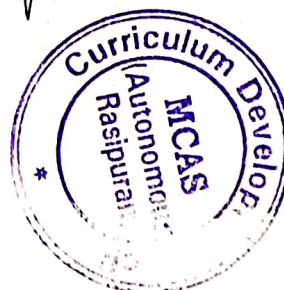


B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBCN02	BIOCHEMISTRY IN NUTRITION	NMEC - II	III	2	20			2
Objective	To create awareness on various nutrient content in food/food regulation act / food safety, the significance 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 metabolism, 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 nutraceuticals.						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	PS01	PS02	PS03	PS04	PS05		
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
M. De.	M. De.	S. De.



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	PS01	PS02	PS03	PS04	PS05		
C01	S	M	S	M	M	M	M	M	M	M		
C02	S	M	M	M	S	M	M	S	S	S		
C03	S	M	M	S	M	M	S	M	M	M		
C04	S	S	M	M	M	S	M	M	M	S		
C05	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
<i>H. De</i>	<i>U. S.</i>	<i>[Signature]</i>



B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBC N02	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	
21M4UBCN 02	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		
C01	S	M	M	M	M	M	M	S	M	M		
C02	S	S	M	M	S	M	M	M	M	M		
C03	S	M	M	M	M	M	S	M	M	S		
C04	S	M	S	M	M	M	M	M	S	M		
C05	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	
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B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCC05	Pathology and Clinical Biochemistry	DSC THEORY - V	V	5	5			5
Objective	<ul style="list-style-type: none"> To understand the clinical biochemistry and its related biochemical disorders that can be applied to medical diagnosis, treatment and management. To demonstrate clinical disorders, in born defects in metabolism and correlate with deficiency of key metabolic enzymes. 							
Unit	Course Content					Knowledge Levels		Sessions
I	Approaches to clinical Biochemistry: Automation and quality control methods in Clinical Biochemistry Collection, processing, preservation and transport of clinical specimens Normal and abnormal constituents of urine clinical significance of urine					KI-K3		12
II	Hematology: Blood:- composition and their functions Anemia:- classifications, erythrocyte indices. Blood coagulation system Clotting time, Bleeding time and Prothrombin time RBC count, WBC count, Platelet count, Differential count, Determination of Hb, PCV and ESR. Hemoglobinopathies and Thalassemias.					KI-K4		12
III	Disorders in carbohydrate metabolism : Diabetes mellitus:- Types, Clinical features, complications Glucose Tolerance Test Galactosaemia, fructosuria, and glycogen storage diseases. Disorders in lipid metabolism: Atherosclerosis - aetiology, clinical features and its complications. Lipid storage diseases and fatty liver.					KI-K4		12
IV	Disorders in protein metabolism: Phenylketonuria, alkaptonuria, cystinuria, albinism and tyrosinemia. Disorders in nucleic acid metabolism: Gout:- Types, aetiology and clinical features. Disorders in bilirubin metabolism: Jaundice:- classification, clinical features.					KI-K4		12



Programme : B.Sc.BIOCHEMISTRY					
V	Liver function tests: Detoxification and excretory function. Renal function test: Glomerular filtration tests Tests for renal blood flow Tests of tubular function Enzymology : Clinical significance of SGOT and SGPT ALP and ACP CPK and LDH			KI-K4	12
Course Outcome	CO1: To appreciate the biological significance of sample collection and awareness of the diagnostic/screening tests to detect common non-communicable diseases				
	CO2: To understand the etiology of diseases like anemia and Hemoglobinopathies and correlate the symptoms with underlying pathology. To study the blood composition and coagulation systems.				
	CO3: To gain knowledge about the complications of carbohydrate and lipid metabolic disorders like diabetes and atherosclerosis				
	CO4: The students can understand the Protein and nucleic acid metabolic disorders like Gout, Jaundice, Phenyl ketonuria, etc.,				
	CO5: The students can understand the importance of liver function test and kidney function test.				
Learning Resources					
Text Books	1. Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. JohnWiley-Liss Inc. Publication. 2. Fundamentals of Biochemistry (2005) J.LJain, 6th Edition, S.Chand &Co Ltd., 3. Textbook of <i>Medical Laboratory Technology</i> by Praful B. Godkar and Darshan P. Godkar.				
Reference Books	1. Medical Biochemistry by MN Chatterjee, Rana Shinde, 8 th edition, 2013, Jaypee publications 2. Medical Laboratory Technology by Ramnik sood, 5 th Edition, 1999, Jaypee publishers. 3. Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.				
Website Link	Quality control in clinical laboratory 1. https://www.westgard.com/clia.htm 2. https://www.labroots.com/webinar/bio-rad-unity-solution-molecular-quality-control-data-management 3. https://www.aacc.org/science-and-research/clinical-chemistry-trainee-council/trainee-council-in-english/pearls-of-laboratory-medicine/2018/utility-of-hil-in-clinical-chemistry				
	L-Lecture	T-Tutorial	P -Practical	C-Credit	

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

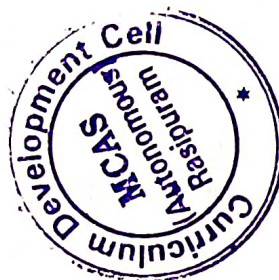
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCC05	Pathology and Clinical Biochemistry	DSC THEORY - V	V	5	5	-	-	5

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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. D.	U. S.	J. S. S.

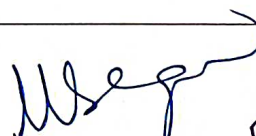
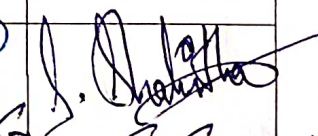


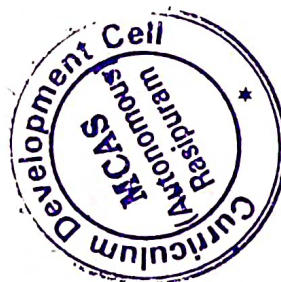
B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCC05	Pathology and Clinical Biochemistry	DSC THEORY - V	V	5	5	-	-	5

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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. D.		



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

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	CO2: Students will be able to Explain the exchange and transport of gases in human body			
	CO3: To gain knowledge about the muscle types and cardiac systems			
	CO4: The students can understand the role of kidney in urine formation and significance of reproductive organs			
	CO5: The students can understand the importance nervous system in signal transmission and some sensory organs in human body			
Learning Resources				
Text Books	1. Essentials of Medical Physiology by K.Sembulingam&PremaSembulingam,2016, 7thedition, Jaypee Brothers Medical Publishers (P)Ltd. 2. Human Physiology by Chatterjee.C.C.,1988, Voll&II,1stedition,MedicalAllied Agency. 3,AnimalPhysiology-MariakuttikanandArumugam,Saraspublication,2017 4.TestbookofMedicalPhysiology –Guyton&Hall,12thedition,Saunders Publishers, 2010			
Reference Books	1. Human Physiology, Meyer, Meyer &Meij,2002, 3rdedition,A.I.T.B.SPublishers. 2. Textbook of Medical Physiology Guyton and Hall,2011,,12thedition,W.B.Saunders Company 3.Humananatomyandphysiology–ElaineN.Marieb,3rdedition,Benjamin/Cummings (a Pearson education company), 1995			
Website Link	https://slideplayer.com/slide/9431799/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5760509/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3249628/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

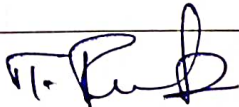
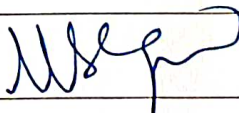

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

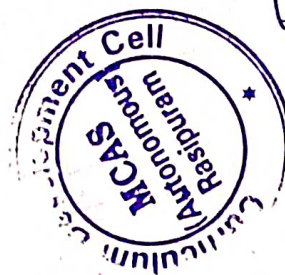
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCC06	Human Physiology	DSC THEORY - VI	V	5	5			5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PS01	PS02	PS03	PS04	PS05
CO1	M	M	S	M	S	M	S	S	M	M
CO2	S	S	M	S	S	M	M	S	M	S
CO3	S	S	M	M	M	S	M	S	M	S
CO4	M	S	M	M	S	M	M	S	S	M
CO5	S	M	M	S	M	S	M	M	S	S
Level of Correlation between CO and PO					L-LOW		M-MEDIUM		S-STRONG	

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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
		



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hour s	L	T	P	C
21M5UBCC07	Molecular Biology	DSC THEORY - VII	V	5	5			5
Objective	<ul style="list-style-type: none"> To describe the general principles of gene organization and central dogma of molecular biology To explain various level of gene regulation and its functions. 							
Unit	Course Content						Knowledge Levels	Sessions
I	Replication: Organization of genes. Experimental evidence to prove DNA as genetic material, Semi conservative replication, experimental evidence for semi conservative replication, replication in prokaryotes and eukaryotes, enzymes involved in replication, inhibitors of DNA replication.						KI-K4	13
II	Transcription: Basic features of RNA synthesis, E.Coli RNA polymerases, initiation, chain elongation and termination of transcription, RNA processing. Inhibitors of transcription.						KI-K4	13
III	Translation: Genetic code and its features, tRNA and amino acyl tRNA synthetases. Initiation, elongation and termination of translation, post translational modifications, Inhibitors of protein synthesis.						KI-K4	12
IV	Regulation of gene expression: General aspects, operon model in prokaryotes - lac operon, tryp operon and arab operon. Eukaryotic operon						KI-K4	10
V	DNA damage and repair: Types of mutation:- Base substitution, insertion, deletion, inversion, duplication, translocation, mutagens. DNA Repair mechanisms:- Excision repair, mismatch repair, phoreactivation, direct demethylation, double strand break repair. Regulation of DNA repair:- SOS repair						KI-K4	12
Course Outcome	CO1: The Students will be able to Illustrate the Central Dogma of molecular biology, explain the multiplication of DNA in the cell and describe the types and modes of replication.							
	CO2: The Students can elaborate the mechanism of transcribing DNA into RNA, discuss the formation of different types of RNA.							



	CO3: The Students will be able to describe the genetic code and summarize the process of translation.			
	CO4: The Students can know the principles of gene expression and explain the concept of operon in prokaryotes.			
	CO5: The students can understand the the types of mutations and explain the various mechanisms of DNA repair.			
Learning Resources				
Text Books	1. Text Book of Cell and Molecular Biology by Dr. Ajay Paul, 2015, Arunabha Sen, Books & Allied (P) Ltd.,. 2. Lehninger's Principles of Biochemistry (2000) Nelson, David I. and Cox, M.M. Macmillan/worth, NY. 3. Friefelder's essentials of molecular biology, 4 th Edition, George M Malacinski, Narosa publishing House, 2006			
Reference Books	1.Molecular biology, 3rd edition, Henry lodish et al. 2.Genes - IX, Benjamin Lewin, Oxford University. 3.Molecular biology of gene, James D. Watson, Nancy H.Hopkins, Jeffrey W.Roberts, Joan.			
Website Link	1. Molecular Biology Free Online Course by MIT Part 3: RNA Uploaded by edX 2. https://mooc.es/course/molecular-biology/ 3. https://onlinecourses.swayam2.ac.in/cec20_ma13/preview 4. https://learn.genetics.utah.edu/ 5. https://www.cellbio.com/education.html			
	L-Lecture	T-Tutorial	P-Practical	C-Credit



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21MSUBCC07	Molecular Biology	DSC THEORY - VII	V	5	5			5

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listining skills 3.Role play 4.Flash cards
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



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCP03	Practical : Clinical Biochemistry And Immunology	DSC PRACTICAL - III	V	5			5	3
Objective	<ul style="list-style-type: none"> To learn and understand the biochemical analysis and estimation of various biomarkers. To have hands on experience on immunological assays. 							
Unit	Course Content						Knowledge Levels	Sessions
1	HEMATOLOGY 1. Estimation of Hemoglobin - colorimetric method 2. Enumeration of RB C & WB C 3. Differential Smear - Blood cells count 4. Bleeding time & Clotting time 5. Evaluate ESR & PCV						K6	10
2	ASSAY OF SERUM MARKER ENZYMES 1. Determination of activity of AST and ALT 2. Determination of activity Acid Phosphatase and Alkaline Phosphatase						K5	10
3	BLOOD ANALYSIS 1. Estimation of blood glucose by OT method. 2. Estimation of serum creatine and creatinine by - Alkali-Picrate method. 3. Estimation of Determination of Total proteins in whole blood - Biuret method 4. Determination of urea in serum- DAM -TSC method 5. Estimation of Cholesterol in serum- Zak's method 6. Determination of Bilirubin [Conjugated & Unconjugated] in serum.						K6	20
4	URINE ANALYSIS 1. Estimation of Urea in urine by DAM -TSC method 2. Determination of Creatine and Creatinine in urine - Alkali-Picrate method 3. Estimation of Uric acid - Caraway's method 4. Physical and chemical examinations of urine						K6	20

5	IMMUNOLOGY AND GENETIC ENGINEERING 1. Single [Radial] Immunodiffusion 2. Rocket Immunoelectrophoresis 3. Blood Grouping 4. Isolation of Genomic DNA and Separation in Electrophoresis	K6	10
Course Outcome	CO1: The students can gain adequate knowledge on collection of biological samples (urine, blood) and their preparation for diagnostic purpose.		
	CO2: To get knowledge about the activity of various clinically important enzymes and relate their clinical importance.		
	CO3: To gain knowledge about the estimation of the important biomolecules in biological samples and relate their clinical significance		
	CO4: The students can understand the qualitatively analysis of urine sample for normal and abnormal constituents in urine and interpret the results		
	CO5: To understand the Immuno techniques and separate the DNA		
Learning Resources			
Text Books	1. Biochemical Methods (3 rd ed.).Manickam,S.S.(2018). NewageInternationalPvtLtd publishers - ISBN 10: 8122421407 / ISBN 13: 9788122421408 2. An Introduction to Practical Biochemistry Plummer, D.T.(n.d.). Tata McGraw Hill ISBN: 97800708416 3. Alan H Gowenlock. 1998. Varley"s Practical Clinical Biochemistry, 6th edition, CBS Publishers, India.		
Reference Books	1. Introductory Practical Biochemistry(2nded.). Singh,S.K.(2005). Alpha Science International, Ltd- ISBN 10: 8173193029 / ISBN 13: 9788173193026 2. Fundamentals of Clinical chemistry. Ashwood, B. a. (2001). Tietz WB Saunders Company, Oxford Science Publications USA - ISBN 10: 0721686346 / ISBN 13: 978072168634		
Website Link	1. https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-forauthors 2. http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/ Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf 3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistypdf.pdf?sequence=1&isAllowed=y		
	L-Lecture	T-Tutorial	P-Practical
			C-Credit





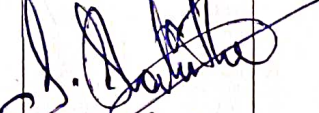
B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCP03	Practical : Clinical Biochemistry and Immunology	DSC PRACTICAL - III	V	5			5	3

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3. Demonstration 4. Hands on training
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
		



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hour s	L	T	P	C
21M5UBCE01	ELECTIVE – I Genetic Engineering	DSE - I	V	4	4			4
Objective	<ul style="list-style-type: none"> To impart the practical knowledge on nucleic acid isolation, digestion and ligation. To familiarize the students with the basic concepts in genetic engineering and it also gives knowledge on transformation and recombinant selection. To acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology and its applications genetic engineering. 							
Unit	Course Content						Knowled ge Levels	Session s
I	Introduction to genetic engineering: Introduction to rDNA technology, DNA manipulative enzymes:- Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases.. Restrictionmodification system: Restriction endonucleases and its types.						KI-K4	8
II	Vectors: Characteristics of an ideal vector, cloning vectors for E.Coli:- pBR322, pUC8. Vectors based on M13 bacteriophage, Cosmids, Phagemids, Vectors for eukaryotes:- vectors for yeast:- Yep, YAC, Vectors for higher plants:- Ti plasmid, Ri plasmid.						KI-K4	10
III	Methods of gene transfer: Vector mediated gene cloning, Direct/vectorless methods:- Electroporation, biolistics, microinjection, chemical mediated gene transfer, liposome mediated gene transfer, silicon carbide method. Vector mediated gene transfer:- Agrobacterium mediated gene transfer.						KI-K4	10
IV	Techniques in genetic engineering: Isolation and purification of genomic DNA, plasmid DNA and 1 phage. Molecular probes:- Types and its uses. Methods of nucleic acid labeling. Blotting techniques:- southern, northern and western blotting. DNA sequencing methods. PCR:- Procedure, important considerations of PCR for primer designing, Applications of PCR						KI-K4	10



V	Genomic and cDNA libraries: Methods of generating genomic and cDNA library, comparison between two types of libraries, advantages and disadvantages of cDNA library. Applications of rDNA technology: Recombinant DNA products in medicine (insulin, GGH), recombinant vaccines, gene therapy, DNA finger printing, transgenic plants and transgenic animals.	KI-K4	10	
Course Outcome	CO1: Get an idea about the role of DNA manipulative enzymes and restriction enzymes used in rDNA technology.			
	CO2: Advance their knowledge about the vectors suitable for rDNA technology			
	CO3: Understanding of various methods adapted for gene transfer and screening of recombinants			
	CO4: Obtain knowledge about advance techniques in genetic engineering			
	CO5: Understand applications of rDNA technology in various fields			
Learning Resources				
Text Books	1. Gene Cloning and DNA analysis, T.A Brown, Blackwell Science Publishers, 2001. 2. Biotechnology Fundamentals & Applications, S.S.Purohitt, Agrobios Publishers, 2001. 3. Text book of Biotechnology by R.C. Dubey, 2009, S.Chand & Co Ltd			
Reference Books	1. Genetic Engineering by Smitha Rastogi, Neelam Pathak, 2009, Oxford University press. 2. Principles of gene manipulation, Old and Primrose, Blackwell Science. Genetic engineering and its applications, P. Joshi, Botania Publishers & Distributors. Recombinant DNA: A short course, Watson et al, Scientific American Books. 3. Genes - IX, Benjamin Lewin, Oxford University			
Website Link	https://www.genome.gov/genetics-glossary/Genetic-Engineering https://www2.nau.edu/fpm/bio205/Sp-10/chapter-10.pdf https://archive.nptel.ac.in/courses/102/103/102103013/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit


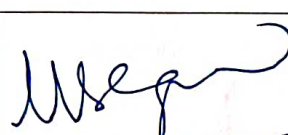
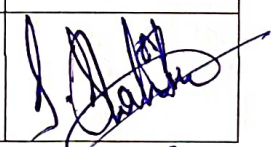
B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCE01	ELECTIVE – I Genetic Engineering	DSE - I	V	4	4			4

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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
		



(Do So Signature)

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCE02	ELECTIVE - II Phytochemistry	DSE - II	V	4	4			4
Objective	To gain knowledge about secondary metabolites and their therapeutic role against disorders.							
Unit	Course Content						Knowledge Levels	Sessions
I	Overview of secondary metabolites: Definition, Classification, Distribution and Economic importance of secondary metabolites.						KI-K3	10
II	Secondary metabolites: Structure, biosynthesis, mechanism of Pathway and regulation of secondary metabolites (alkaloids, terpenoids, glycosides, Saponins, tannins and flavonoids).						KI-K	10
III	Screening of secondary metabolites – Phytochemical analysis, Biochemical methods, quantitative and qualitative analysis. Separation procedures, purification and structural elucidation of secondary compounds by HPLC, NMR spectroscopy, GCMS and LCMS						KI-K4	8
IV	ROS, Antioxidants – Definition, property and biological significance. Enzymatic and nonenzymatic antioxidants						KI-K4	10
V	Therapeutic role of Phytochemical in disorders (Liver and Kidney disorders, Colon Cancer)						KI-K3	7
Course Outcome	CO1: Students can understand the classification of secondary metabolites							
	CO2: To gain the basic knowledge of biosynthesis of secondary metabolites							
	CO3: To get knowledge about the separation of bioactive components from plants							
	CO4: Obtain knowledge about antioxidants							
	CO5: Understand applications of Phytochemical in disorders							
Learning Resources								



Text Books	1.Handass., Kaul.M.K.,1996. Supplement to cultivation and utilization of medicinal plants. Regional research laboratory . Chapter 1, 2 & 5. 2. Colleen smith, Allan D., Marks. Lieberman., Basic medical biochemistry- a clinical approach. Second edition. 2005. Cippincott Williams and wilkings publishers 439 : 842. 3. Trivedi.P.C. Plant Biotechnology. Recent advances. 2000. Panima publishing corporation. 350			
Reference Books	1.Gajera HP, Patel Sr. Gdakiya BA 2005. Antioxidant properties of some therapeutically active medicinal plants – an overview. Journal of medicinal and aromatic plant sciences. 27.91-100. 2. Seth SD, Bhawana Sharana. Medicinal Plants in India, Indian journal of medical research 120, July 2004,pp 9-11. 3. Buchanan, B.Gruissem. W.Jones.R.L. Biochemistry and Molecular biology of Plants. 1 st edition. 2004. I.K. International .Pvt. Ltd. Chapter 24.			
Website Link	1. https://www.intechopen.com/chapters/62731 2. https://www.sciencedirect.com/topics/neuroscience/phytochemical 3. https://www.mdpi.com/2073-4395/11/5/968			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

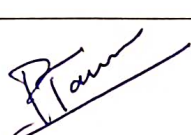
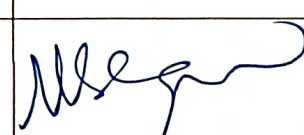

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5SUBCE02	ELECTIVE - II Phytochemistry	DSE - II	V	4	4			4

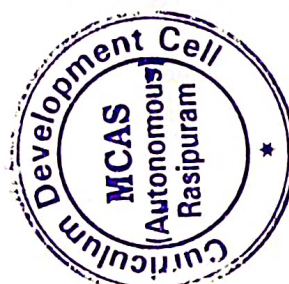
CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listining skills 3.Role play 4.Flash cards
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
		

Dr. S. S. Srinivasan



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hour s	L	T	P	C
21M5UBCS03	SBEC – III Nutrition and Dietics	SEC - III	V	2	2			2
Objective	To describe the general principles and nutritional aspects of various foods and its dietary requirements. To learn and explore the biochemical, physiological and clinical impact of inadequate intakes of specific nutrients.							
Unit	Course Content						Knowledg e Levels	Session s
I	Nutritional profile of principal 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. Energy content of foods: Determination of calorific value by Bomb calorimeter.						KI-K2	6
II	Dietary requirements: Balanced diet, Recommended dietary allowances for infants, children, adolescent, pregnant, lactating women, athletes and geriatrics. Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action. BMR:- Measurement of BMR and factors influencing BMR						KI-K2	6
III	Dietary protein: Biological value of proteins and nitrogen balance. Essential and non- essentials amino acids. Protein energy malnutrition - etiology, management of kwashiorkor and marasmus.						KI-K3	6
IV	Minerals: Nutritional significance of dietary macro minerals (Ca, P, Mg, S, K, Na, Cl) and trace minerals (Iron, Iodine, Zinc and copper). Disorders related to the deficiency of minerals. Nutraceuticals: Introduction and classification of nutraceuticals.						KI-K3	8
V	Nutrition and body defenses: Drug - nutrient interaction, nutritional therapy for inborn errors of metabolism, role of diet and nutrition in the prevention and treatment of diseases:- Peptic ulcer, Gout, blood pressure, cardiovascular diseases.						KI-K4	7
Course	CO1: Describe energy content of various foods and nutritional							



Programme : B.SC.BIOCHEMISTRY				
Outcome	significance of different biomolecules			
	CO2: Understand nutritional requirements and techniques to measure energy expenditure			
	CO3: Explain the effect protein energy malnutrition			
	CO4: Describe nutritional requirement, significance and deficiency disorders of dietary minerals			
	CO5: Obtain an insight about Regulation and standardization of foods in food industry			
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. 3. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition			
Reference Books	1. Modern nutrition in health and diseases, Whol and Good hart. 2. Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996 3. Advances in food biochemistry, FatihYildiz (Editor), CRC Press, Boca Raton, USA, 2010			
Website Link	http://nsdl.niscair.res.in/jspui/bitstream/123456789/586/1/NutritionDietary.pdf https://nios.ac.in/media/documents/SrSec314NewE/Lesson-28.pdf https://ncert.nic.in/textbook/pdf/kehe103.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

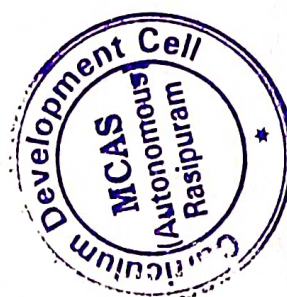
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBCS03	SBEC – III Nutrition and Dietics	SEC - III	V	2	2			2

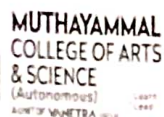
CO-PO Mapping

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

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

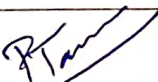
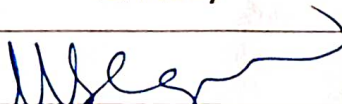
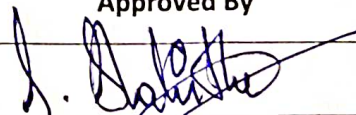
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S. Mahalingam	U. S. S.	[Signature]

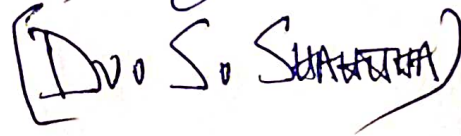




B. Sc Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hou rs	L	T	P	C
21M3UBCIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	
Objective	To give optimum exposure on the practical aspects of Microbiology industry							
S. No.	Guidelines for Internship Training Programme				Knowledge Levels		Sessions	
1	The student should undergo 15 Days Internship training in any Clinical Diagnostic lab/ Food industry / Water plant / Health care industry / Pharma industry / Biotech industry during the vacation which starts at the end of the 2 nd Semester.				K2-K4			
2	The training bridges the gap between the theoretical knowledge gained in the college and the practical application of the same in the industry / company. The student will have a better exposure about the workplace and its nuances.							
3	Schedule of visit to be made by the staff is to be prepared by the HOD / Staff-in-charge.							
4	The trainees should strictly adhere to the rules and regulations and office timings of the institutions to which they are attached.							
5	A Staff member of a Department (Guide) will be monitoring the performance of the Candidate.							
6	The students should maintain a daily logbook where the student should record his details of the training.							
7	The trainees have to obtain a certificate on successful completion of the internship from the chief executive of an organization.							
8	The student should submit an attendance certificate to the institution for 15 days internship training from an organization.							
9	Internship Training Report (30 – 50 pages) should be prepared by the student and submitted in a month's time and at the end of the semester student should present the report with a power point presentation.							
10	Industrial training reports shall be prepared by the students under the supervision of the faculty of the department.							
11	Industrial training report must contain the following: Cover page Copy of training certificate, Profile of an industry report about the work undertaken by them during the tenure of training observation about the concern findings.							
12	Practical viva – voce examination will be conducted with internal & external examiners at the end of the 3 rd semester and the credits will be awarded.							
13	Report Evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100.							

B. Sc - Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards										
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C		
21M3UBCIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2		
CO-PO Mapping										
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	M	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	M	S	S	S	S	M	S	S	S	S
Level of Correlation between CO and PO		L-LOW			M-MEDIUM			S-STRONG		
Tutorial Schedule				-						
Teaching and Learning Methods				-						
Assessment Methods				CIA – 100 Marks 1. Work Log Book – 25 Marks 2. Training Report and Viva-Voce – 75 Marks						
Designed By			Verified By				Approved By			
										



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCC08	Pharmacology and Toxicology	DSC THEORY - VIII	VI	5	5			5
Objective	To provide an in-depth knowledge about sources of drugs, pharmacokinetics and pharmacodynamics. To gain a better understanding of toxicity of drugs.							
Unit	Course Content						Knowledge Levels	Sessions
I	Introduction: Sources of drugs, routes of drug administration, dosage forms, drug dosage. Bioavailability:- Bioavailability of drugs, determination and its importance, Bioequivalence. Combined effect of drugs:- Synergism, antagonism.						K1-K4	12
II	Pharmacokinetics: Absorption, distribution of drugs, factors influencing drug absorption and distribution. Drug elimination:- Renal excretion, fecal excretion, biliary excretion, pulmonary excretion and other routes of excretion.						K1-K4	13
III	Pharmacodynamics: Mechanism of phase I and Phase II metabolic reactions, factors affecting drug metabolism, significance of drug metabolism. Mechanism of drug action: Basis of drug action, drug - receptor interactions, Receptor mediated and non-receptor mediated drug action, Placebo effects, Factors modifying drug action.						K1-K3	13
IV	Adverse drug reactions: Classification:- Pharmacologic ADRs, Non-pharmacological ADRs, disease- related ADRs, multiple drug reactions, miscellaneous ADRs, Acute poisoning:- General principles and management. Drug dependence, drug tolerance and intolerance.						K1-K4	12
V	Toxicology: Basic Principles of Toxicology: Toxicants and its types, Classification of Poisons, Sources of Poisoning, Factors affecting toxicity, Chemical food poisoning, Toxic effects of metals (Arsenic Lead, Mercury, Copper, Iron) and nonmetals (Phosphorus, Chlorine, Bromine, Iodine, Formaldehyde) Toxic effects of Poisonous plants (Abrus precatorius, Ricinus communis, Calotropis). Toxic						K1-K4	10



	Effects Caustics, Treatment and management of poisoning, Antidotes.				
Course Outcome	CO1: To attain the adequate knowledge about the drugs and their significances				
	CO2: The students can gain knowledge about absorption, distribution and elimination of drugs				
	CO3: To analyze the different stages of mechanism of action of the drugs				
	CO4: The students can understand the adverse reactions of the drug interactions				
	CO5: To understand and explain the basic concepts of drug discovery and drug development process.				
Learning Resources					
Text Books	1.Textbook of Drug Design. Krogsgaard-Larsen, Liljefors and Madsen (Editors), Taylor and Francis, London UK, 2002. 2.Drug Discovery Handbook S.C. Gad (Editor) Wiley-Interscience Hoboken USA, 2005 3.Pharmacology in Drug Discovery. T. P. Kenakin. Elsevier, 1st Edition 2012.				
Reference Books	1.Practical Application of Computer-Aided Drug Design, Ed. Charifson P., Marcel Dekker Inc. 3D QSAR in Drug Design: Theory, Methods and Applications, Ed. Kubinyi H., Ledien 2.Pharmaceutical Profiling in Drug Discovery for Lead Selection, Borchardt RT, Kerns, EH, Lipinski CA, Thakker DR and Wang B, AAPS Press, 2004 3.Drug Discovery and Development; Technology in Transition. HP Rang. Elsevier Ltd 1st edition 2006.				
Website Link	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6297296/#:~:text=An%20adverse%20drug%20reaction%20(ADR,alteration%20of%20the%20dosage%20regimen%2C 2. https://www.studocu.com/row/document/kings-college-london/drug-discovery-and-development/drug-discovery-and-development-full-notes/1787042 3. https://www.lecturio.com/magazine/pharmacokinetics/#:~:text=Pharmacokinetics%20is%20the%20movement%20of,the%20effect%20of%20a%20drug.				
	L-Lecture	T-Tutorial	P-Practical	C-Credit	



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCC08	Pharmacology and Toxicology	DSC THEORY - VIII	VI	5	5			5

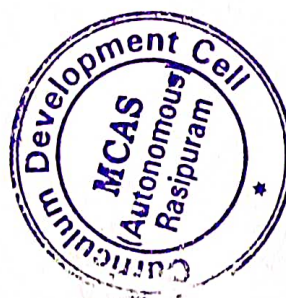
CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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

(Do So Signature)



Programme : B.Sc.BIOCHEMISTRY					
V	Gonadotropic hormones: Chemical nature, secretion, circulation, biological function, disorders of male and female reproductive hormones. Others: Local hormones in tissues - Prostaglandins and Thromboxanes, Local hormones in blood - Kinins.			KI-K4	10
Course Outcome	CO1: To attain the adequate knowledge about the hormones, their classification, mechanism of action and the role of second messengers				
	CO2: The students can gain knowledge about Hypothalamus and pituitary gland synthesizing hormones				
	CO3: To gain knowledge of the role of the thyroid and pancreatic hormones in human systems				
	CO4: The students can understand the G.I. Tract hormones and Adrenal gland hormones				
	CO5: The students can understand the importance of Gonadotropic hormones and some local hormones				
Learning Resources					
Text Books	1. Textbook of Biochemistry, Edward Staunton West, Wilbert R. Todd, Howard S. Mason, John T. Van Bruggen, 4th edition, Oxford & IBH publishing Co.Pvt.Ltd., 1996. 2. Fundamentals of Biochemistry (2005) J.L.Jain, 6th Edition, S.Chand &Co Ltd., 3. Textbook of Medical Physiology, John E. Hall (2010). Guyton and Hall (12 th ed), Saunders 4. Harrison's Endocrinology by J. Larry Jameson Series: Harrison's Specialty, 19th Edition Publisher: McGraw-Hill, Year: 2016				
Reference Books	1.Essentials of Medical Physiology by K. Sembulingam and Prema Sembulingam, 6 th Edition, 2012 2.Principles of Biochemistry, David L. Nelson, Michael M.Cox, Lehninger, 4th edn, W.H. Freeman and Company. 3.Principles of Biochemistry: <i>Mammalian Biochemistry</i> by Emil Smith, Robert Hill, Robert Legman, Robert Lefkowitz, Philip Handler, Abraham white, 7 th Edition, McGraw Hill & Co.				
Website Link	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3249628/ 2. https://my.clevelandclinic.org/search?q=hormones 3. https://www.ncbi.nlm.nih.gov/pmc/?term=hormones 4. https://www.ncbi.nlm.nih.gov/books/?term=Hypothalamus+and+pituitary+gland				
	L-Lecture	T-Tutorial	P-Practical	C-Credit	



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

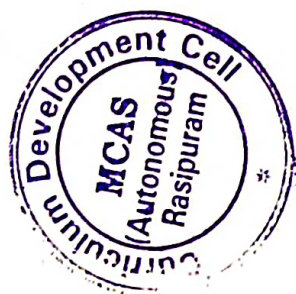
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCC09	Endocrinology	DSC THEORY - IX	V	45	3	2		4

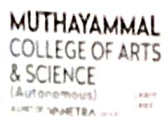
CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listining skills 3.Role play 4.Flash cards
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
S.maharajan	Weg	S. S. S. S. S.





B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

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	CO3: To gain knowledge of the Antigen - Antibody interactions and immune techniques			
	CO4: The students can understand the immunization and Transplantation methods			
	CO5: The students can understand the importance of Autoimmunity and complement systems			
Learning Resources				
Text Books	1. Immunology(5th ed). Kuby, J. (2018). W.H. Freeman - ISBN-10 : 1319114709 / ISBN-13 : 978-1319114701 2. Immunology (3rd ed.). Rao, C. V. (2017). Chennai: Alpha Science Int. Ltd - ISBN-10 : 1842652559/ ISBN 13:978-1842652558 3. An Introduction to Immunology. Tizard(1995). Harcourt Brace College Publications			
Reference Books	1.Kenneth M. Murphy, Paul Travers, Mark Walport - (2007), Janeway's Immunobiology, 7thedition, Garland Science. 2. Abul K. Abbas, Andrew H. Lichtman, Jordan S. Pober - (1994), Cellular and molecular immunology, 2ndedition, B. Saunders Company. 3. Basic Immunology Functions and Disorders of the Immune System, 6th Edition - January 25, 2019 Authors: Abul Abbas, Andrew Lichtman, Shiv Pillai, ISBN: 9780323549431eBook ISBN: 9780323639095			
Website Link	1. https://onlinecourses.nptel.ac.in/noc22_bt40/preview 2. https://onlinecourses.swayam2.ac.in/ccc20_bt05/preview 3. https://youtu.be/8uahFPl6ny8			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCE04	ELECTIVE – III Immunology	DSE - III	VI	4	4			4

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listining skills 3.Role play 4.Flash cards
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. De	U. S. S.	J. S. S.



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCE04	ELECTIVE - IV Biomedical Instrumentation	DSE - IV	VI	4	4			4
Objective	This course focus on the biochemical techniques includes spectrophotometry, centrifugation, electrophoresis, radioactivity etc., Learning these techniques will be very useful for operating instruments and become the basic knowledge in their future.							
Unit	Course Content						Knowledge Levels	Sessions
I	Classification of Biomedical Equipment, Diagnostic, therapeutic and clinical laboratory equipment. Introduction, types, merits, demerits, limitations, diagnostic and therapeutic application of endoscope, laparoscope and cardio scope. Transducers for biomedical application. Types, properties, characteristics and selection of transducers for biological instrumentation						K1-K4	10
II	Bioelectric signals and their recording ,Bioelectric signals (ECG, EMG, EOG & ERG) and their characteristics, Bioelectrodes, electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EM						K1-K4	10
III	Biosensor-mechanism and types. Autoanalyser- types and application. Automatic tissue processing and application of microtome. Pulse oximetry – Introduction ,principle and clinical application of sphygmomanometer. Magnetic resonance imaging system and its application in medicine.						K1-K3	8
IV	Heart rate measurement pulse rate measurement, respiration rate measurement , blood pressure measurement, X- Ray Machine Basic X-Ray components, types of X-ray machines e.g. general purpose,dental image intensifier system, table shooting and maintenance of X- Ray machine						K1-K4	10
V	Therapeutic instruments. Introduction, types, life time, classification, power source and electrodes of cardiac pacemaker . Application of surgical diathermy equipment and haeme dialysis in medicine. Computer application in medicine- computerized catheterization laboratory , computerized patient monitoring system.						K1-K4	7
Course Outcome	CO1: To attain the adequate knowledge about uses of instruments in medical feild							

	CO2: The students can gain knowledge about Bioelectric signals			
	CO3: To gain knowledge of the role Biosensors in medical field			
	CO4: The students can understand the X-Ray technology			
	CO5: The students can understand the importance of Therapeutic instruments			
Learning Resources				
Text Books	1.Medical electronics and instrumentation by Sanjay Guha.-andbook of medical instruments by R.S Khandpur. 2.Hand book of Medical instruments by R.S. Khandpur –TMH, New Delhi 3..Biomedical instrumentation by Cromwell Prentice Hall of India, New Delhi			
Reference Books	1.Medical instrumentation by John G.Webster-John Wiley. 2.Principles of applied Biomedical instrumentation by Goddes and Baker-John Wiley. 3..Biomedical instrumentation and measurement by Carr and Brown-Pearson. 4.Introduction to Biomedical electronics by Edwand J. Bukstein –sane and Co. Inc. USA			
Website Link	https://www.robots.ox.ac.uk/~gari/teaching/b18/lecture_slides/B18_LectureA.pdf https://www.eecs.umich.edu/courses/bme458/download/bme458_notes1.pdf https://biomedikal.in/2009/12/lecture-notes-on-biomedical-instrumentation/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit



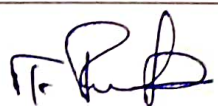
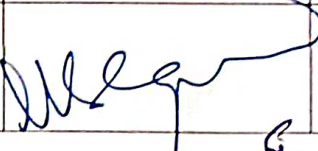
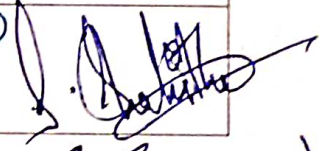
B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCE05	ELECTIVE - IV Biomedical Instrumentation	DSE - IV	VI	4	4			4

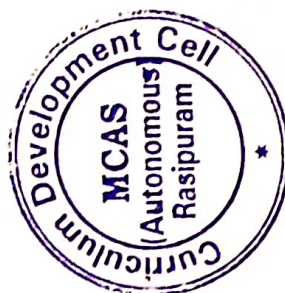
CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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
		

(Dr. S. S. Srinivasan)



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

[illegible]



	CO5: The students can understand the importance of microbial production of polysaccharides and antibiotics				
Learning Resources					
Text Books	1.Microbiology, Pelczar. Jr. M. J. Chan, McGraw – Hill Inc. NY 2.Textbook of microbiology, Ananthanarayanan. R. and Jayaram Panicker. C.K. Orient Longman,1994 3.Industrial microbiology, A.H. Patel				
Reference Books	1.Principles of Fermentation technology, Stanburry. P.Whitalcer and S.J. Hall, 1995 2.Medical microbiology, David Green Wood, Richard C.B.Slack. John Foreest Pevtherer, 14th edition, ELBS with Churchill Living Stone, 1992. 3.Biotechnology –U.Sathyanarayana				
Website Link	https://microbiologynote.com/fermentation/ https://prog.lmu.edu.ng/colleges_CMS/document/books/Dahunsis%20MCB%20422%20first%20note.pdf https://en.wikipedia.org/wiki/Industrial_microbiology				
	L-Lecture	T-Tutorial	P-Practical	C-Credit	


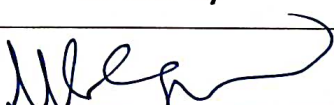
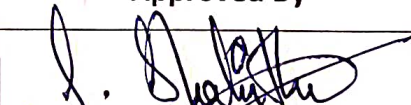


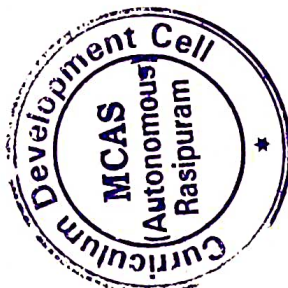
B.Sc., Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCPR1	PROJECT WORK	PROJECT WORK	IV	5	-	-	5	4
Objective	To inculcate/impart skills on experiment designing, experiment execution and research report to provide skills on writing thesis dissertation							
Details	Course Content				Knowledge Levels		Sessions	
PROJECT PREPARATION FORMAT								
Cover Page & Title Page	Cover Page & Title Page: The fonts and locations of various items on this page should be exactly as shown in a specimen copy.							
Inside cover page	Inside cover page Same as cover page.							
Bonafide Certificate	Bonafide Certificate: The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14.							
Acknowledgement	Acknowledgement: This should not exceed one page.							
Abstract	Abstract: Abstract should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.							
Contents	Table of Contents: The table of contents should list all headings, sub headings after the table of contents page, as well as any titles preceding it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents. One and a half spacing should be adopted for typing the matter under this head.							
Tables	List of Tables: The list should use exactly the same captions as they appear above the tables in the text. 1.5 spacing should be adopted for typing the matter under this head.							
Figures	List of Figures: The list should use exactly the same captions as they appear below the figures in the body of the text. One and a half spacing should be adopted for typing the matter under this head. All charts, graphs, maps, photographs and diagrams should be designated as figures. X and Y axes titles are mandatory for all the graphs.							
Symbols	List of Symbols, Abbreviations and Nomenclature: 1.5 spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.							
Chapters	Chapter I - Introduction: Statement of the Problem, Significance, Need for the study, Objectives							
	Chapter II- Review of literature							
	Chapter III- Methodology: Tools used, Procedures, Hypothesis.							
	Chapter IV- Results and Discussion: Tables and Figures,							



	<p>Afrographika, 1980.</p> <p>Two Authors: Phizacklea, A & Miles, R. Labour and Racism. London, Routledge & Kegan Paul, 1980.</p> <p>3+ Authors: O'Donovan, P., et al. The United States. Amsterdam, Time-Life International, 1966.</p>		
Typing Instructions	Typing Instructions: The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12. Use A4 (210 mm X 297 mm) bond un-ruled paper (80 gsm) for all copies submitted. Use one side of the paper for all printed/typed matter.	K4-K6	
Justification	Justification: The text should be fully justified	K4-K6	
Margins	Margins: The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K4-K6	
Paragraph Spacing	<p>Use 6 pts before & 6 pts after paragraphs. All paragraphs in the seminar/project report should be left justified completely, from the first line to the last line.</p> <p>Use 1.5 spacing between the regular text and quotations.</p> <p>Provide double spaces between:</p> <p>(a) From top of page to chapter title,</p> <p>(b) Chapter title and first sentence of a chapter,</p> <p>Use single spacing</p> <p>(a) In footnotes and endnotes for text.</p> <p>(b) In explanatory notes for tables and figures.</p> <p>(c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report.</p> <p>(d) Use single space in references and double space between references.</p>	K4-K6	
Tables	<p>All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary.</p> <p>Tables should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including tables on a page, should be avoided.</p> <p>Provide double spaces on the top and the bottom of all tables to separate them from the regular text, wherever applicable. The title of the table etc. should be placed on the top of the table. The title should be centered with respect to the table. The titles must be in the same font as the regular text and should be single spaced.</p>	K4-K6	
Figures	<p>All figures, drawings, and graphs should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. The title of the figure</p>	K4-K6	

	Statistical Presentations, Hypothesis Testing.		
	Chapter V- Summary and conclusion		
	Chapter VI- Scope of the Project		
	References		
Guidelines For Project Preparation			
Numbering	<ul style="list-style-type: none"> Every page in the project report, except the project report title page, must be accounted for and numbered. The page numbering, starting from acknowledgements and till the beginning of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv.. The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5.. All printed page numbers should be located at the right corner at the bottom of the page. 	K4-K6	
Chapters	<ul style="list-style-type: none"> Use only Arabic numerals. Chapter numbering should be centered on the top of the page using large bold print. <Size 14><Times New Roman> 	K4-K6	
TEXT			
Regular Text	Regular Text: Times Roman 12 pts and normal print.	K4-K6	
Chapter Heading	Chapter Heading - Times Roman 14 pts. Bold and capital.	K4-K6	
Section Headings	Section Headings - Times roman 12 pts. Bold and capital.	K4-K6	
Subsection Headings	Subsection Headings - times roman 12 pts. bold print and Leading capitals i.e, only first letter in each word should be in capital.	K4-K6	
Special Text	Special Text- Italics/Superscript /Subscript/Special symbols, etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical notations, etc.	K4-K6	
Sections	Sections: Use only Arabic numerals with decimals. Section numbering should be left justified using bold print. Example: 1.1, 1.2, 1.3, etc.	K4-K6	
Sub Sections	Sub Sections: Use only Arabic numerals with two decimals. Subsection numbering should be left Justified using bold print. Example: 1.1.1, 1.1.2, 1.1.3, etc.	K4-K6	
References	<p>Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author.</p> <p>The format is written like, author name followed by year followed by title of the work followed by details of the journal. Same font as regular text, serial number and all authors names to be in bold print.</p> <p>Title and Journal names should be in italic.</p> <p>One Author: Williams, G. State and Society in. Onco State, Nigeria,</p>	K4-K6	

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards											
Course Code	Course Title			Course Type		Sem	Hours	L	T	P	C
21M6UBCPR1	PROJECT WORK			PROJECT WORK		IV	5	-	-	5	4
CO-PO Mapping											
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	L	M	M	L	S	L	M	S	S	S	
CO2	S	S	S	S	S	M	S	S	S	S	
CO3	S	S	S	S	S	S	S	S	M	M	
CO4	S	S	S	M	S	S	S	S	M	M	
CO5	M	M	M	S	S	M	M	S	L	S	
Level of Correlation between CO and PO		L-LOW			M-MEDIUM			S-STRONG			
Tutorial Schedule				-							
Teaching and Learning Methods				-							
Assessment Methods				EA - 100% 1. Project Report & Viva-voce - 60 Marks 2. Internal - 40 Marks 3. Total - 100 Marks							
Designed By			Verified By				Approved By				
											



B.Sc., Biochemistry for Competitive Examination Syllabus-LOCF-CBCS-Pattern with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
21M6UBCOE1	Biochemistry For Competitive Examination	Self study Online - Competitive Examination	VI	-	-	-	-	2
Objective	Creating the awareness on competitive examination among students. Imparting knowledge about appearing for Competitive Examination and it impacts and developing an attitude for appearing such Examinations.							
	Course Content				Knowledge Levels		Sessions	
	<p>Assemblage of different papers related to Microbiology in particular, General Microbiology, Immunology, Bacteriology, Mycology, Virology, Food, Dairy, Environmental and Agri. Microbiology etc., Major emphasis has been put forth to include recent developments in the subjects. This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams for higher studies. Getting job in various fields such as Food and Dairy Industries, Pharma Companies, Water treatment plants, Clinical Laboratory and Blood Bank etc., In addition, it is also useful for UPSC and PSC.</p> <p>Rules for creating MCQ pattern.</p> <p>1. Objective type online examination will be conducted at the end of 6th semester.</p> <p>2. Questions must be taken from all previous question papers of UPSC, PSC and University Common Entrance test for higher studies.</p> <p>3. Test for critical thinking.</p> <p>Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain the causes and effect, make inferences, and predict the results.</p> <p>4. Emphasize for Higher-Level Thinking</p> <p>Use memory-plus, application oriented questions. These questions require students to recall the principles, rules and facts in a real life context.</p> <p>Eg.1</p> <p><u>Ability to Justify Methods and Procedures</u></p>				K1- K6			

Why is adequate lighting necessary in a balanced aquarium?

- a. Fish need light to see their food.
- b. Fish take in oxygen in the dark.
- c. Plants expel carbon dioxide in the dark.
- d. Plants grow too rapidly in the dark.

Eg.2

Ability to Interpret Cause-and-Effect Relationships

What does a viral DNA becomes after being associated with the bacterial chromosome?

- a) plasmid
- b) plaque
- c) prophage
- d) gene

5. Mix up the order of the correct answers

Keep correct answers in random positions and don't let them fall into a pattern that can be detected

6. Use a Question Format

Multiple-choice items to be prepared as questions (rather than incomplete statements)

Incomplete Statement Format:

The capital of California is in Direct Question Format----- Less Effective.

In which of the following city is the capital of California? This is Best format.

7. Keep Option Lengths Similar

Avoid making your correct answer the long or short answer

8. Avoid the "All the Above" and "None of the Above" Options

Students merely need to recognize two correct options to get the answer correct

9. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students.

CO1: Students will remember the advanced biochemical and molecular techniques.

K1

CO2: Students will be able to understand the basic rules and the concepts.

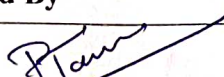
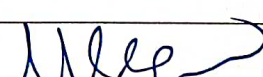

K2

CO3: To be able to apply in real life situations.

K3

Course Outcome

	CO4: To analyze and create the new ideas for various competitive examinations.	K4-K5	
	CO5: To assess forms and levels of critical thinking.	K2	
Text Books	1. Tortora, G.J., Funke, B.R. and Case, C.L. (2016) Microbiology: An Introduction, 11th Edition, Pearson Education, India.		
	2. Owen, J., Punt, J. and Strandford, S. "Kuby Immunology", 7th Ed., W.H. Freeman Publication, New York, USA, 2012.		
	3. Watson JD, Hopkins NH, Roberts JW et al. (1987) Molecular Biology of the Gene, 4th edn. Menlo Park, CA: Benjamin-Cummings		
	4. Brown, T.A. 1995. Gene Cloning—An Introduction. [Third Edition]. Chapman and Hall, UK.		
	5. MCQ'S IN MICROBIOLOGY: ADVANCED by Balaram Mohapatra., 2019.		
Reference Books	1. Chetan D. M., Dr. S. Nanjunda Swamy, (2021). Microbiology Multiple-Choice Questions (Mcqs) For Neet and Net Examinations.		
Website Link	https://www.ugc.ac.in/old_pdf/model_curriculum/env.pdf https://swayam.gov.in/nc_details/NPTEL		

CO - PO Mapping											
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	S	S	S	S	M	S	S	M	S	S	
CO2	S	M	S	S	S	S	S	S	S	M	
CO3	M	S	S	S	S	M	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	M	S	
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					CET/TRB/TNPSC/Bank/ Railway, Old question papers – solutions –online mock test						
Teaching and Learning Methods					Self study, Group discussion, Chalk and Talk, Audio-Video Learning, learning through mock test and experienced learning						
Assessment Methods					100 multiple choice questions through computer based online examinations passing minimum is 50%						
Prepared By					Verified By				Approved By		
											





B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hour s	L	T	P	C
21M6UBCE05	ELECTIVE Microbial Biochemistry	DSE THEORY - IV	VI	4	4			4
Objective	The aim of the study is to get knowledge about microorganisms and their characters. Gain knowledge about the applications of microorganisms.							
Unit	Course Content						Knowledg e Levels	Session s
I	Microbes; Bacteria, fungi, algae and protozoa. Viruses: Classification, characteristics. Ultra structure of bacteria - cell wall, cell membrane, cytoplasmic structures and cell inclusions. Microbial growth–growth curve, measurement of growth, continuous culture, factors affecting growth. Microbial culture-sterilization, preparation of culture media, enrichment culture techniques for isolation of autotrophs and heterotrophs						KI-K4	10
II	Microbial metabolism – overview. Photosynthesis in microbes. Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. Bacterial photosynthesis, pectin and aldo-hexuronate pathway. Nitrogen metabolism, nitrogen fixation, hydrocarbon transformation. Anaphlerotic reactions. Autotrophic metabolism. Amino acid synthesis in microbes						KI-K4	10
III	Introduction to fermentation technology: Isolation and screening of industrially important microbes, Inoculum preparation - primary and secondary strain improvement. Detection and assay of fermentation products. Fermentation – Submerged and solid state fermentation. Fermenter - Types, Downstream processing.						KI-K3	8
IV	Industrial Production: Antibiotics - Penicillin and streptomycin. Vitamins - B12 and riboflavin. Amino acid – Glutamic acid, Enzymes production; commercial purposes and industrial production - Amylases						KI-K4	10

V	Wastewater treatment- physical, chemical and biological . treatment processes. Effluent treatment. Bioremediation, oil spill clean-up. Microbial mining. Bio fertilizers - bacteria and blue-green algae. Biopesticides in integrated pest management – Bascillus and Pseudomonas as biocontrol agents.	KI-K4	7	
Course Outcome	CO1: Understand the classification and controlling of microbes and study isolation of microbes and maintenance			
	CO2: Describe important characteristic of microorganisms, thereby identify different type of microorganisms.			
	CO3: Study about various types of microorganisms involved in infection of food products.			
	CO4: Recognise the sources and transmission of infections and how the factors involving in infection.			
	CO5: Know about the different types of microscopes and its functioned			
Learning Resources				
Text Books	1. Basic Biotechnology Ratledge and Kristiansen 3rdedn., 2006. Cambridge Univ. Press. 2. Understanding Biotechnology, Borem, Santos, Bowen. 2003. Prentice Hall. 3. Industrial Microbiology, Casida L.E. JR 1987, 3rd Wiley Eastern reprint. John Wiley and Sons Inc.			
Reference Books	1. Environmental Microbiology, Scragg A. 2005.1st ed. Amer Society for Microbiology. 2. Industrial and Environmental Biotechnology, 2001 Ahmed N.. Horizon Scientific Press. 3. Principles of gene manipulation, Primrose Twyman and Old.2001. 6th Blackwell Science.			
Website Link	1. https://instruct.uwo.ca/biology/090b/1290b%201-7.pdf 2. https://www.basu.org.in/wp-content/uploads/2020/03/Fundamentals-of-Microbiology-1.pdf 3. https://www.mednotes.in/2021/07/microbiology.html			
	L-Lecture	T-Tutorial	P-Practical	C-Credit



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBCE05	ELECTIVE Microbial Biochemistry	DSE THEORY - IV	VI	4	4			4

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listening skills 3.Role play 4.Flash cards
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
<i>S. Mahalingam</i>	<i>U. S. S.</i>	<i>S. S. S.</i>



(Dr. S. S. S.)



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hour s	L	T	P	C
21M3UBCE03	ELECTIVE Food Preservation and Adulteration	DSE THEORY - IV	VI	4	4			4
Objective	The aim of the study is to get knowledge about microorganisms and their characters. Gain knowledge about the applications of microorganisms.							
Unit	Course Content					Knowledge Levels		Session s
I	Introduction to Food Preservation Food Spoilage - Definition, causes, microorganisms involved in spoilage of bread, fruits and vegetables, meat, fish, egg, milk, juices and pickles. Classification of foods based on shelf life Food preservation - Definition, principles and importance, classification – bactericidal and bacteriostatic methods.					KI-K4		10
II	Preservation by high temperature Methods used- blanching, pasteurization, sterilization, UHT processing, canning, extraction cooking, dielectric heating, Dehydration.					KI-K4		10
III	Preservation by low temperature Methods commonly used- refrigeration, freezing, dehydro-freezing-advantages and limitations					KI-K3		8
IV	Preservation by drying and non- thermal treatments Preservation by drying, concentration and evaporation: Sun drying, tray or tunnel drying, spray drying, drum drying, freeze drying, fluidized bed drying; advantages and disadvantages.					KI-K4		10
V	Preservation by other methods and Food packaging Preservation by addition of sugar, salt, chemicals, smoking, irradiation Food additives used in preservation: Definition, types and functions, and safety aspects; permissible limits of preservatives in fruit and vegetable products. Food packaging-types, advantages and disadvantages; ; Food labeling types and nutritional information					KI-K4		7



Course Outcome	CO1: Describe the role of microorganisms in food spoilage, principles and importance of food preservation.			
	CO2: Classify the different food preservation methods and foods based on shelf life			
	CO3: Apply the various techniques of food preservation to preserve different foods and increase the shelf life			
	CO4: Evaluate the uses of various food preservation methods and explain the role of packaging in food processing			
	CO5: Justify the use of various preservation techniques, natural and chemical food additives used for preservation ,food labeling and food packaging materials			
Learning Resources				
Text Books	1. Arthey D and Ashurst, P.R (1996), Fruit processing, Blackie academic and professional. London. 2. Fellows, P.J (2016): Food Processing Technology: Principles and Practice, 2nd edition, CRC Wood head publishing Ltd, Cambridge. 3. Gould. G.W (1995), New methods of food preservation. Blackie academic and professional. London			
Reference Books	1. Rahman M S (2020) Handbook of Food Preservation CRC Press, USA 2. Srilakshmi B (2017) Food Science, New Age International Publications, New Delhi. 3. Suganthi.V and Subaratinam.R (2021) Textbook on Food preservation, Dipti Press(OPC) Pvt. Ltd, Chenna			
Website Link	https://www.sciencedirect.com/topics/agricultural-and-biological- https://ecoursesonline.iasri.res.in/mod/page/view.php?id=111435 https://www.homepreservingbible.com/2247-an-introduction-to-the-drying-food-			
	L-Lecture	T-Tutorial	P-Practical	C-Credit



B.Sc-Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

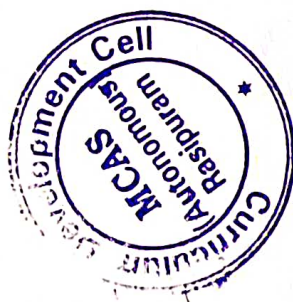
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBCE03	ELECTIVE - Food Preservation and Adulteration	DSE THEORY - IV	VI	4	4			4

CO-PO Mapping

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

Tutorial Schedule	1.Group discussion 2.Listining skills 3.Role play 4.Flash cards
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



B. Sc Biochemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C (Extra)
21MSUBCV41	MEDICAL LABORATORY TECHNOLOGY	VAC	V	-	-	-	-	2
Objective	<ul style="list-style-type: none">To demonstrate the basic requirements of clinical laboratory, external quality assurance and internal quality assurance.To impart skills on sampling, laboratory analysis and disposal of wastes.To impart knowledge on standards and interpretation of diagnostic values.							
Unit	Course Content				Knowledge Levels		Session	
1	Specimen collection and handling, transportation of specimens, disposal of specimen after laboratory use. Composition of blood. Methods of estimation of Haemoglobin, PCV, total and differential count of WBC, platelet count, clotting, bleeding and prothrombin time.				K2-K4		30 hrs	
2	Blood Group - methods of grouping and Rh factor. Determination of proteins in serum and plasma. Determination of glucose, glycated hemoglobin, triglycerides, cholesterol, lipoproteins.							
3	Examination of body fluids - ascitic fluid, pleural fluid, synovial fluid, pericardial fluid, CSF and amniotic fluid.							
4	Urine analysis, abnormal constituents. Faecal specimen - Macroscopic and microscopic examinations - detection of occult blood, Semen analysis.							
5	Functional components of clinical laboratories. Basic requirements of clinical laboratory technician. Maintenance of glassware and equipments. Quality assurance in clinical laboratory. External QC and internal QC – Assessment - Corrective and preventive actions.							
Course Outcome	CO1: Understand the basic concepts of specimen collection, transportation and disposal of specimens.				K3			
	CO2: Comprehend the methods of blood grouping, determination of protein, glucose, cholesterol, triglycerides and lipoproteins.				K4			
	CO3: Apprehend the examination of body fluids such as ascitic fluid, pleural fluid, synovial fluid, CSF etc.				K6			

CO4: Interpret the presence of abnormal constituents in urine, detection of occult blood analysis.	K6	
CO5: Interpret the presence of abnormal constituents in urine, detection of semen analysis.	K6	

Learning Resources

	<ol style="list-style-type: none"> 1. Baker, F.J., R.E. Silverton, Butterworth - Heinemann. <i>Introduction to Medical Laboratory Technology</i>. Butterworth- Heinemann, 2014. 2. Harold Varley. <i>Practical clinical biochemistry</i>. CBS Publisher. 6th ed. 2002. 3. Mayne. <i>Clinical Chemistry in Diagnosis and Treatment</i>. ELBS. 6th ed. 1994.
reference books	<ol style="list-style-type: none"> 1. Praful. B. Godkar, Darshan. P. Godkar. <i>Text book of Medical Laboratory Technology</i>. Bhalani Publishing House. 2014 2. Todd & Stanford. <i>Clinical Diagnosis and Management by Laboratory Methods</i>. 16th ed. 2016..
website link	

B. Sc - Biochemistry LOCF-CBCS with effect from 2021-2022 Onwards

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5UB3V41	VALUE ADDED COURSE	VAC	V	-	-	-	-	2

PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	M	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	M	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO

L-LOW

M-MEDIUM

S-STRONG

Tutorial Schedule

1.Group discussion 2.Listening skills

Teaching and Learning Methods

Chalk and talk method, PPT Classes, demonstration, ppt

Assessment Methods

Test

Designed By	Verified By	Approved By
		



