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 | Learn. Lead

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 2023-2024 and onwards)

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Regulation and Syllabus

for B.Sc., Biochemistry

(With effect from the Academic Year 2023-24)

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 and 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 people's vision

PREAMBLE

B.Sc. Biochemistry explores the molecular basis of life, focusing on how biological molecules interact and function. Students study areas such as enzymology, genetics, metabolism, and cell biology. The curriculum combines theoretical knowledge with practical skills in laboratory techniques, preparing graduates for careers in research, healthcare, pharmaceuticals, and biotechnology. There is a continuous demand for Biochemists as work force in education, industry and research. Hence Biochemical tools and techniques are used in almost all fields which are indispensable for people working in fields like Agriculture, Food Industry, Medical Sciences, Environmental Science and Pharmaceutical Science etc., The syllabi for the three-year B.Sc. degree course in Biochemistry are framed in such a way that the students at the end of the course, can be adept at Biochemical techniques for pursuing higher studies and can also apply Biochemical methods judiciously to a variety of industrial needs.

PROGRAMME LEARNING OUTCOME

NATURE AND EXTENT OF THE PROGRAMME

The undergraduate programme in Biochemistry is the first level of college or university degree in the country as in several other parts of the world. After obtaining this degree, a graduates may enter into the job market or opt for undertaking further higher studies in the subject. After graduation the students may join industry, academia, or public health departments and play their role as biochemists in a useful manner contributing their knowledge to the welfare of the society. Thus the undergraduate level degree in Biochemistry must prepare the students for all these objectives. The LOCF curriculum has been developed encompassing all the diversified aspects of Biochemistry with reasonable depth of knowledge and skills as to specialize them in the various aspects of the subject. It also equips them with the expected professional expertise.

AIM OF THE PROGRAMME

The aim of the undergraduate degree in Biochemistry is to make students knowledgeable about the various basic concepts in a wide ranging context which involve the use of knowledge and skills of Biochemistry. Their understanding, knowledge and skills in Biochemistry needs to be developed through a thorough teaching learning process in the class, practical skills through the laboratory work, their presentation and articulation skills, exposure to industry and interaction with industry experts.

GRADUATE ATTRIBUTES

The students graduating in this degree must have an intricate knowledge of the fundamentals of Biochemistry as applicable to wide ranging contexts. They should have the appropriate skills of Biochemistry so as to perform their duties as Biochemists. They must be able to analyze the problems related to Biochemistry and come up with most suitable solutions. As Biochemistry is an inter – disciplinary subject the students might have to take inputs from other areas of expertise. So the students must develop the spirit of team work. Biochemistry is a very dynamic subject and practitioners might have to face several newer problems. To this end, the Biochemists must be trained to be innovative to solve such newer problems. Several newer developments are taking place in Biochemistry. The students are trained to pick up leads and see the possibility of converting these into products through entrepreneurship. Furthermore, the students are made to interact with industry experts so that they may able to see the possibility of their transition in to entrepreneurs. They are also made aware of the requirements of developing a Biochemistry enterprise by having knowledge of patents, copyrights and various regulatory processes to make their efforts a success.

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

GA 1 Analytical Reasoning

GA 2 Critical Thinking

GA 3 Problem Solving Skills

GA 4 Communication Skills

GA 5 Leadership Quality

GA 6 Team work

GA 7 Lifelong Learning

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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.

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 as a perennial process.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO-1: Incorporate the concepts of biological components that are required for optimal cell and system functioning.

PSO-2: Illustrate biological techniques for assembling and assessing experimental results.

PSO-3: Understand how modifications in the structure and metabolism of biomolecules results in abnormalities.

PSO-4: Perform fundamental biochemistry research, integrating medicinal and diagnostic applications.

PSO-5: Build a team, establish it with the proper attitude, and perform efficiently in employment either in government sector or can become an entrepreneur.

REGULATIONS (2023-2024)

1. DURATION OF THE PROGRAME

1.1. Three years (six semesters)

1.2. Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to May of each year.

1.3. There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

1. A Pass in Higher Secondary with **Chemistry** as compulsory subject studied **Botany** and **Zoology / Biology** in +2 Exam / Vocational Stream Home Science, and Biochemistry as per norms set by the Government of Tamilnadu or an Examination Accepted as equivalent thereto by the syndicate.

3. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than three academic years and passed the examinations of all the Six Semesters prescribed earning a minimum of 140 credits as per the distribution given in Regulation for Part I, II, III, IV & V and also fulfilled such other conditions as have been prescribed thereof.

4. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

4.1. The Course Components and Credit Distribution shall consist of the following:

(Minimum Number of Credits to be obtained)

Part Wise Distribution	Study Components	Credit Distribution
PART I	Tamil or Other Languages	12
PART II	English	12
PART III	Core, Allied, Elective and Project Courses	91
PART IV	i. Basic Tamil/ Advanced Tamil/ NME	04
	ii. Soft Skill Courses / SBEC	10
	iii. Environmental Studies	02
	iv. Value Education	02
	v. Internship	02
	vi. Foundation Course	02
	vii. Professional Competency Skills	02
PARTV	Extension Activity	01
Total Credits		140

4.2 DETAILS OF COURSE OF STUDY OF PARTS I - V

4.2.1 PART I: Tamil and Other Languages Hindi or French at the option of candidates and according to the syllabus and text-books prescribed from time to time:

4.2.2 PART II: English: According to the syllabus and text-books prescribed from time to time

4.2.3 PART III: Core, Allied Project and Elective Courses: As prescribed by the concerned Board of Studies

4.2.4 PART IV:

i. Basic Tamil / Advanced Tamil/NME:

a. Students who have not studied Tamil up to XII STD and have taken any Language other than Tamil in Part I shall take Basic Tamil comprising of Two Courses (level will be at 6th Standard).
b. Students who have studied Tamil up to XII STD and have taken any Language other than Tamil in Part – I shall take Advanced Tamil comprising of Two Courses.
c. Students who have studied Tamil up to XII STD and also have taken Tamil in Part – I shall take Non-Major Elective comprising of Two Courses.

i. Soft Skill Courses/SBEC
ii. Environmental Studies
iii. Value Education
iv. Internship
v. Foundation Course
vi. Professional Competency Skills(Online)

4.2.5 PART V: Extension Activity:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Retract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the subsequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.3. Inclusion of the Massive Open Online Courses (MOOCs)available on SWAYAM and NPTEL

4.3.1 Students can choose the MOOC Course Available on SWAYAM and NPTEL under Core, Elective or Soft skill category. He/ she will be awarded degree only after producing valid certificate of the MOOC course for credit Mobility

5. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

5.1 Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed by the Periyar University.

5.2. Attendance: All Students must earn 75% and above of attendance for appearing for the End Semester Examination.(Theory/Practical)

5.3. Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the Principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after collecting the prescribed fee for Theory/Practical examination separately, towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

5.4. Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50% of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee

5.5. Detained students for want of attendance: Students who have earned less than 50% of attendance shall not be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the College from time totime.

5.6. Condonation of shortage of attendance for married women students: In respect of married women students undergoing UG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55% instead of 65% if they conceive during their academic career. Medical certificate from the Doctor (D.G.O) from the Government Hospital and the prescribed fee along with attendance details shall be forwarded to the college to consider the condonation of attendance mentioning the category

5.7. Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the College/University immediately to rejoin the program.

5.8 Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities by obtaining necessary permission from the university.

5.8.1 Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

5.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the College norms.

5.8.3 The transfer students are eligible for classification.

5.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

5.8.5 Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental/College Committee are allowed to get transfer of credits and marks which will be converted in to Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

5.9 Students are exempted from attendance requirements for online courses of the College and MOOC's.

6. EXAMINATION AND EVALUATION

6.1. Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

6.2. Marks for Internal and End Semester Examinations for PART I, II, III, and IV

Category	Theory	Practical
Internal Assessment	25	**40**
End semester Examination	**75**	**60**

6.3. Procedure for Awarding Internal Marks

Internal Examination Marks – Theory

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

6.4 Awarding Marks for Attendance (out of 5)

Percentage of Attendance	Marks
Below 60%	0 marks
60% to 75%	3 marks
75% to 90%	4 marks
Above 90%	5 marks

6.5 Components for Practical CIA.

Components	Marks
CIA -I	**15**
CIA - II	**15**
Observation Note	**05**
Attendance	**5**
Total	**40**

6.6 Components for Practical ESE.

Components	Marks
Completion of Experiments	**50**
Record	**05**
Viva voce	**05**
Total	**60**

6.7 Guidelines for Value Education Yoga and Environmental Studies(Part IV)

6.7.1. The Course Value Education Yoga is to be treated as 100% CIA course which is offered in V Semester for I year UG students.

6.7.2. The Course Environmental Studies is to be treated as 100% CIA course which is offered in IV Semester for I year UG students.

6.7.3 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%

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

6.8 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** a) Attendance **b)** Review / Work Diary*1	10 Marks 30 Marks	40
Work Diary	25	-			
Report	50	50			
Viva-voce	25	50			
Examination					
Total	**100**	**100**	**ESE***2 a) Final Report 40Marks b)Viva-voce 20Marks		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

6.9 Guidelines for Professional Competency Skill- Online Mode(Part IV)- 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.

QUESTION PAPER PATTERN FOR CIA I, II AND ESE	
(3 HOURS)	**MAXIMUM:75Marks**
SECTION-A (Objective Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(10 x1=10 marks)
SECTION-B (Either or Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(5 x 5 = 25 marks)
SECTION-C (Either or Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(5 x 8 = 40 marks)
(Syllabus for CIA-I 2.5 Unit ,Syllabus for CIA-II All 5 Unit)	

6.10 PASSING MINIMUM

6.10.1. There shall be no passing minimum for Internal.

6.10.2. For external examination, passing minimum shall be 40% [Forty Percentage] of the maximum marks prescribed for the course for each Course/Practical/Project and Viva-Voce.

6.10.3 In the aggregate [External/Internal] the passing minimum shall be of 40%.

6.10.4 He / She shall be declared to have passed the whole examination, if he/she passes in all the Courses and Practical wherever prescribed as per the scheme of the examinations by earning 140 CREDITS in Part I, II, III, IV& V. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

6.11. SUPPLIMENTARY EXAMINATION:

Supplementary Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

6.11.1. Eligibility: A Student who is having arrear of only one theory course in any of the semester or two theory course in the Final semester of the UG degree programme alone is eligible for Supplementary Examinations.

6.11.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

6.12. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

6.12.1. Re-totaling: All UG Students who appeared for their Semester Examinationsare eligible for applying for re-totaling of their answer scripts.

6.12.2. Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

6.12.3. Photo copy of the answer scripts: Students who have applied for revaluation can apply for the Photocopy of answer scripts by paying prescribed fee.

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

7

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	**ABSENT**

7.1 Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average(CGPA) and Classification

GPA for a Semester: = ∑iCiGi ,∑iCi

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

CGPA for the entire programme: = ∑n∑iCniGni ,∑n∑iCni That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Where,

Ci= Credits earned for course I in any semester,

Gi=GradePointsobtainedforcourseiinanysemestern=Semesterinwhichsuchcourseswere credited.

7.2 Letter Grade and Classification

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class -Exemplary*
9.0 and above but below9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.5 and above but below 5.0	C +	Third Class
4.0 and above but below 4.5	C	
0.0 and above but below 4.0	U	Re-appear

*The Students who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective courses only) are eligible.

8. RANKING

Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking I, II and III.

9. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAM TO QUALIFY FOR A DEGREE

9.11. A Student who for whatever reasons is not able to complete the program within the normal period (N) or the Minimum duration prescribed for the programme, may beallowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span =N+2years for the completion of programme.)

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MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous)

B.Sc., BIOCHEMISTRY abstract under LOCF-CBCS Pattern with effect from 2023-2024 Onwards

Structure of Credit Distribution as per the TANSCHE / UGC Guidelines

S.No.	Study Components	Part	Sem. I		Sem. II		Sem. III		Sem. IV		Sem. V		Sem. VI		No. of Paper	Total Credit
			No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit		
1	LANGUAGE - I	I	1	3	1	3	1	3	1	3					4	12
2	LANGUAGE - II	II	1	3	1	3	1	3	1	3					4	12
3	DISCIPLINE SPECIFIC COURSE(DSC)-THEORY	III	1	4	1	4	1	4	1	4	3	14	3	12	10	42
4	DSC - PRACTICAL	III	I	4	1	4	1	4	1	3	1	4			5	19
5	GENERIC ELECTIVE COURSES (GEC)- THEORY	III	1	3	1	3	1	4	1	3					4	13
6	GEC PRACTICAL	III			1	4			1	3					2	7
7	DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)	III									1	4	1	3	2	7
8	PROJECT WORK	III											1	3	1	3
9	INTERNSHIP	IV									1	2			1	2
10	Professional competency skill	IV											1	2	1	2
11	SKILL ENHANCEMENT COURSES (SEC)	IV			1	2	2	4	2	4					5	10

12	NON MAJOR ELECTIVE COURSES (NMEC)	IV	1	2	1	2									2	4
13	FOUNDATION COURSE (FC)	IV	1	2											1	2
14	ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)-EVS	IV							1	2					1	2
15	ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)- VALUE EDUCATION - YOGA	IV									1	2			1	2
16	EXTENSION ACTIVITY	V											1	1	1	1
	Cumulative Credits		**7**	**21**	**7**	**21**	**7**	**21**	**8**	**23**	**7**	**26**	**8**	**28**	**44**	**140**

Total No. of Subjects	44
Marks	**4300**

PART	No. of Credits
PART - I	12
PART - II	12
PART - III	91
PART - IV	24
PART - V	1
Grand Total	**140**

Extra Credit	4
	144

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous) - Rasipuram - 637 408
Scheme of Examinations LOCF-CBCS Pattern
(for the Students Admitted from the Academic Year:2023-2024 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	23M1UFTA01	TAMIL-I	6	-	3	25	75	100
2	II	LANGUAGE-II	23M1UFEN01	ENGLISH-I	6	-	3	25	75	100
3	III	DSC THEORY - I	23M1UBCC01	NUTRITIONAL BIOCHEMISTRY	4		4	25	75	100
4	III	DSC PRACTICAL - I	23M1UBCP01	PRACTICAL : NUTRITIONAL BIOCHEMISTRY	-	4	3	40	60	100
5	III	GEC THEORY - I	23M1UCHA01	ALLIED- CHEMISTRY I	4		3	25	75	100
6	III	GEC PRACTICAL - I	23M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY	-	2	-	-	-	-
7	IV	NMEC - I	23M1UCHN01	FOOD CHEMISTRY	2		2	25	75	100
8	IV	FC THEORY-I	23M1UBCFC1	FUNDAMENTALS OF BIOCHEMISTRY	2		2	25	75	100
				TOTAL	**24**	**6**	**20**	**190**	**510**	**700**

SEMESTER - II										
1	I	LANGUAGE - I	23M2UFTA02	TAMIL-II	6	-	3	25	75	100
2	II	LANGUAGE - II	23M2UFEN02	ENGLISH - II	6	-	3	25	75	100
3	III	DSC THEORY - II	23M2UBCC02	CELL BIOLOGY	4	-	4	25	75	100
4	III	DSC PRACTICAL - II	23M2UBCP02	PRACTICAL : CELL BIOLOGY		4	4	40	60	100
5	III	GEC THEORY - II	23M2UCHA02	ALLIED -CHEMISTRY II	4		3	25	75	100
6	III	GEC PRACTICAL - I	23M2UCHAP1	PRACTICAL : ALLIED CHEMISTRY		2	4	40	60	100
7	IV	NMEC - II		NME	2		2	25	75	100
8	IV	SEC- 1	23M2UBCS01	FIRST AID	2		2	25	75	100
				TOTAL	**24**	**6**	**25**	**230**	**570**	**800**
SEMESTER - III										
1	I	LANGUAGE - I	23M3UFTA03	TAMIL-III	6	-	3	25	75	100
2	II	LANGUAGE - II	23M3UFEN03	ENGLISH-III	6	-	3	25	75	100
3	III	DSC THEORY - III	23M3UBCC03	BIOMOLECULES	5	-	4	25	75	100
4	III	DSC PRACTICAL - III	23M3UBCP03	PRACTICAL : BIOMOLECULES	-	5	4	40	60	100
5	III	GEC THEORY - III	23M3USTA05	ALLIED -BIOSTATISTICS	4	-	4	25	75	100
6	IV	SEC - II	23M3UBCS02	MEDICAL LABORATORY TECHNOLOGY	2	-	2	25	75	100
7	IV	SEC - III	23M3UBCS03	BASICS OF FORENSIC SCIENCE	2	-	2	25	75	100
				TOTAL	**25**	**5**	**22**	**190**	**510**	**700**

SEMESTER - IV										
1	I	LANGUAGE - I	23M4UFTA04	TAMIL-IV	6	-	3	25	75	100
2	II	LANGUAGE - II	23M4UFEN04	ENGLISH - IV	6	-	3	25	75	100
3	III	DSC THEORY - IV	23M4UBCC04	BIOCHEMICAL TECHNIQUES	4	-	4	25	75	100
4	III	DSC PRACTICAL - IV	23M4UBCP04	PRACTICAL : BIOCHEMICAL TECHNIQUES	-	3	3	40	60	100
5	III	GEC THEORY - IV	23M4UMBA01	ALLIED -FUNDAMENTALS OF MICROBIOLOGY	4	-	3	25	75	100
6	III	GEC PRACTICAL - IV	23M4UMBAP1	PRACTICAL - FUNDAMENTALS OF MICROBIOLOGY	-	3	3	40	60	100
7	IV	SEC - IV	23M4UBCS04	MEDICAL CODING	2		2	25	75	100
8	IV	SEC - V	23M4UBCS05	MICROBIAL TECHNIQUES	2	-	2	25	75	100
9	IV	AECC-ENVIRONMENTAL STUDIES (EVS)*	23M4UEVS01	ENVIRONMENTAL STUDIES (EVS)	-	-	2	100	-	100
		*** - Self study Paper**		**TOTAL**	**24**	**6**	**25**	**330**	**570**	**900**
SEMESTER - V										
1	III	DSC THEORY - V	23M5UBCC05	ENZYMES	6	-	5	25	75	100
2	III	DSC THEORY - VI	23M5UBCC06	INTERMEDIARY METABOLISM	5	-	4	25	75	100
3	III	DSC THEORY - VII	23M5UBCC07	CLINICAL BIOCEMISTRY	6	-	5	25	75	100
4	III	DSC PRACTICAL - V	23M5UBCP05	PRACTICAL : CLINICAL BIOCHEMISTRY	-	6	4	40	60	100
5	III	DSE THEORY-I	23M5UBCE01	IMMUNOLOGY	5	-	4	25	75	100
6	IV	AECC-VALUE EDUCATION	23M5UVED01	YOGA	2	-	2	100	-	100
7	IV	INTERNSHIP	23M5UBCIS1	INTERNSHIP	-	-	2	100	-	100
				TOTAL	**24**	**6**	**26**	**340**	**360**	**700**

SEMESTER - VI										
1	III	DSC THEORY - VIII	23M6UBCC08	MOLECULAR BIOLOGY	5	-	4	25	75	100
2	III	DSC THEORY - IX	23M6UBCC09	HUMAN PYSIOLOGY	5	-	4	25	75	100
3	III	DSC THEORY - X	23M6UBCC10	PLANT BIOCHEMISTRTY AND PLANT THERAPEUTICS	5	-	4	25	75	100
4	III	DSE THEORY-II	23M6UBCE04	RESEARCH METHODOLOGY	5	-	3	25	75	100
5	III	PROJECT WORK	23M6UBCPR1	PROJECT WORK	-	8	3	40	60	100
6	III	PROFESSIONAL COMPETENCY SKILLS	23M6UBCOE1	BIOCHEMISTRY FOR COMPETITIVE EXAMINATION	2	-	2	100	-	100
7	V	EXTENSION ACTIVITY	23M6UEXA01	EXTENSION ACTIVITY	-	-	1	-	-	-
				TOTAL	**22**	**8**	**21**	**240**	**360**	**600**
				OVER ALL TOTAL	**143**	**37**	**140**	**1520**	**2880**	**4400**
1	V	EXTRA CREDIT COURSE - ONLINE		MOOC Courses offered in SWAYAM/NPTEL	-	-	2	-	-	-
2	V	VALUE ADDED COURSE		VALUE ADDED COURSE	-	-	2	-	-	-

HOD Member Secretary – Academic Council PRINCIPAL

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCC01	NUTRITIONAL BIOCHEMISTRY	DSC THEORY - I	I	5	3	2		4
Objective	The students can learn the importance of understanding the nutritional significance of carbohydrates, lipids, proteins, a balanced diet, the effects of additives, emulsifiers, and flavor enhancers in food.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Concepts of food and nutrition. Basic food groups-energy yielding, body building and functional foods. Modules of energy. Calorific and nutritive value of foods. Measurement of Calories by bomb calorimeter. Basal metabolic rate (BMR)- definition, determination of BMR and factors affecting BMR. Respiratory quotient (RQ) of nutrients and factors affecting the RQ. SDA- definition and determination- Anthropometric measurement and indices – Height, Weight, chest and waist circumference BMI.	K2	12
II	Physiological role and nutritional significance of carbohydrates, lipids and protein. Evaluation of proteins by nitrogen balance method- Biological value of proteins- Digestibility coefficient, Protein Energy Ratio and Net Protein Utilization. Protein energy malnutrition – Kwashiorkar and Marasmus, Obesity-Types and preventive measures.	K3	12
III	Balanced diet, example of low and high cost balanced diet- for infants, children, adolescents, adults and elderly people. ICMR classification of five food groups and its significance food pyramid. Junk foods- definition and its adverse effects.	K3	12
IV	Food additives: Structure, chemistry, function and application of preservatives, emulsifying agents, buffering agents, stabilizing agents, natural and artificial sweeteners, bleaching, starch modifiers, antimicrobials, food emulsions, fat replacers, viscosity agents, gelling agents and maturing agents. Food colors, flavors, anti-caking agent, antioxidants. Safety assessment of food additives.	K4	12
V	Nutraceuticals and Functional Foods: Definition, properties and function of Nutraceuticals, food Supplements, dietary supplements prebiotics and probiotics, and functional Foods. Food as medicine. Natural pigments from plants– carotenoids, anthocyanins and its benefits.	K4	12
Course Outcome	CO1: Comparison of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value	K2	
	CO2: Discover the nutrients in foods and their specific functions in maintaining health.	K3	
	CO3: Relate the food groups and its significance	K3	
	CO4: Contrast the effect of food additives	K4	
	CO5: Categorize the importance of nutraceuticals and pigments	K4	

Learning Resources				
Text Books	1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA. 2. M.Swaminadhan (1995) Principles of Nutrition and Dietics. Bappco. 3. Tom Brody (1998). Nutritional Biochemistry (2nded), Academic press, USA			
Reference Books	1. Branen, A.L., Davidson PM &Salminen S. 2001. Food Additives.2nd Ed. Marcel Dekker. 2. Advances in food biochemistry, FatihYildiz (Editor), CRC Press, Boca Raton, USA, 2010 3. Food biochemistry & food processing, Y.H. Hui (Editor), Blackwell Publishing, Oxford, UK, 2006.			
Website Link	http://old.noise.ac.in/SecHmscicour/english/LESSONO3.pdf https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-protein.html. https://www.nhsinform.scot/healthy-living/food-and-nutrition/eatingwell/vitamins-and-minerals			
	L-Lecture	T-Tutorial	P -Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCC01	NUTRITIONAL BIOCHEMISTRY	DSC THEORY - I	I	5	3	2		4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	M	S
CO3	S	M	S	M	S	M	S	L	S	S
CO4	S	M	S	S	S	M	S	S	S	S
CO5	S	M	M	S	M	M	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCP01	PRACTICAL : NUTRITIONAL BIOCHEMISTRY	DSC PRACTICAL - I	I	4	-	-	3	4
Objective	The students get training includes hands-on training in titrimetric method estimation, biochemical preparation, ash content determination, and lipid extraction.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**TITRIMETRY** 1. Estimation of ascorbic acid in a citrus fruit. 2. Estimation of calcium in milk. 3. Estimation of glucose by Benedict's method in honey. 4. Estimation of phosphorous (Plant source)	K5	20
II	**BIOCHEMICAL PREPARATIONS** Preparation of the following substances and its qualitative tests 5. Lecithin from egg yolk. 6. Starch from potato. 7. Casein and Lactalbumin from milk.	K6	15
III	**GROUP EXPERIMENT** 8. Determination of ash content and moisture content in food sample 9. Extraction of lipid by Soxhlet's method.	K6	10
Course Outcome	CO1: Plan to estimate the important biochemical constituents in the food samples.	K5	
	CO2: Develop the macronutrients from the rich sources.	K6	
	CO3: Determine the ash and moisture content of the food samples	K6	
	CO4: Extract and Grade the oil from its sources	K5	
	CO5: Invention of important food nutrients	K6	

Learning Resources	
Text Books	1. Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011, 2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw- Hill Publishing Company Limited, 2001.

Reference Books	1. Biochemical Methods, Sadasivam S and Manickam A, 4th edition, New Age International Publishers, 2016 2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan. 3. Bowman and Robert M. 2006. Present Knowledge in Nutrition. 9th edition, International Life Sciences Publishers			
Website Link	1. https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors 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_biochemistrypdf.pdf?sequence=1&isAllowed=y			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1UBCP01	PRACTICAL : NUTRITIONAL BIOCHEMISTRY	DSC PRACTICAL - I	I	4	-	-	3	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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	
Teaching and Learning Methods	Explanation of Practical procedure and Demonstration of experiments
Assessment Methods	Observation, Performance, Attendance

Designed By	Verified By	Approved by Member Secretary
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCC02	CELL BIOLOGY	DSC THEORY - II	II	4	4			4
Objective	The students can learn an in-depth understanding of cell architecture, genome organization, bio membrane structure, and cell cycle, cell division, and cell-cell interactions.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Architecture of cells- Structural organization of prokaryotic and eukaryotic cells microbial, plant and animal cells. The ultra-structure of nucleus, mitochondria, RER, SER, golgi apparatus, lysosome, peroxisome and their functions.	K2	10
II	Cytoskeleton- microfilament, microtubules and intermediary filament- structure, composition and functions. Organization of Genome - prokaryotic and eukaryotic genome. Organization of chromatin – histones, nucleosome concept, formation of chromatin structure. Special types of chromosomes – lamp brush chromosomes, polytene chromosomes.	K2	10
III	Biomembranes - Structural organization of bilipid layer model and basic functions- transport across cell membranes- uniport, symport and antiport. Passive and active transport.	K3	10
IV	Cell cycle-Definition and Phases of Cell cycle-Cell division-Mitosis and Meiosis and its significance, Cancer cells- definition, types and characteristics of cancer cells.	K3	10
V	Extracellular matrix – Collagen, laminin, fibronectin and proteoglycans- structure and biological role. Structure and role of cadherin, selectins, integrins, Cell -cell interactions- Types- gap junctions, tight junctions and Desmosomes.	K4	10
Course Outcome	CO1: Summarizing the structure and functions of basic components of prokaryotic and eukaryotic cells, especially the organelles.	K2	
	CO2: Relating the cytoskeleton and chromatin	K2	
	CO3: Integrating the structure, composition and functions of cell membrane related to membrane transport	K3	
	CO4: Applying the phases of cell cycle and cell division-mitosis and meiosis and characteristics of cancer cells.	K3	
	CO5: Linking the structure and biological role of extra cellular matrix in cellular interactions	K4	
Learning Resources			

Text Books	1. Arumugam.N, Cell Biology.Saras publication (10th ed, paperback), 2019 2. Devasena.T.Cell Biology.Oxford University Press India-ISBN: 9780198075516, 0198075510, 2012 3. Bruce Alberts and Dennis Bray. 2013, Essential Cell Biology. (4"ed). Garland Science.
Reference Books	1. S.C,R.Cell Biology.New age Publishers -ISBN-10: 8122416888/ISBN-13: 978- 8122416886, 2008 2. Cooper,G.A.The Cell: A Molecular Approach. Sinauer Associates, Inc -ISBN10: 0878931066 / ISBN 13: 9780878931064, 2013 3...E.M.F.,D.R,Cell and Molecular Biology. Lippincott Williams & Wilkins Philadelphia - ISBN: 0781734932 9780781734936, 2006
Website Link	https://nicholls.edu/biol-ds/bio1155/Lectures/Cell%20Biology.pdf https://www.medicalnewstoday.com/article/320878.php https://biologydictionary.net /cell

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

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2UBCC02	CELL BIOLOGY	DSC THEORY - II	II	4	4	-	-	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	S	S	S	M	S	S	S
CO3	S	S	S	M	M	S	M	S	S	S
CO4	S	S	S	M	S	S	M	S	S	S
CO5	S	S	S	S	M	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mrs.T.Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCP02	PRACTICAL : CELL BIOLOGY	DSC PRACTICAL - II	II	4			4	4

Objective	Students can Learn microscope parts, examine cells, use different stains, identify cells, organelles, and cell division stages, and identify spotters.

Unit	Course Content	Knowledge Levels	Sessions
I	MICROSCOPYANDSTAININGTECHNIQUES 1. Study the parts of light and compound microscope 2. Preparation of Slides and Micrometry 3. Examination of prokaryotic and eukaryotic cell 4. Visualization of animal and plant cell by methylene blue 5. Visualization of nuclear fraction by acetocarmine stain 6. Staining and visualization of mitochondria by Janus green stain	K5	20
II	**GROUP EXPERIMENT** 7. Identification of different stages of mitosis in onion root tip 8. Identification of different stages of meiosis in onion bulb	K5	10
III	SPOTTERS 9. a) **Cells**: Nerve, plant and Animal cell b) **Organelles**: Mitochondria, Chloroplast, Endoplasmic reticulum c) **Mitosis stages**: Prophase, Anaphase, Metaphase, Telophase	K5	20
Course Outcome	CO1: Identify the parts of microscope.	K5	
	CO2: Preparation of Slides	K5	
	CO3: Identify the stages of mitosis & meiosis	K5	
	CO4: Visualize nucleus and mitochondria by staining methods	K5	
	CO5: Identify the spotters of cells, organelles and stages of cell division	K5	

Learning Resources	
Text Books	1. Rickwood, D and J.R.Harris Cell Biology: Essential Techniques, John wikey1996. 2. Davis, J.M. Basic Cell culture: A practical approach, IRL 1994. 3. Ganesh M.K. and Shivashankara A.R. 2012. Laboratory Manual for Practical Biochemistry Jaypee publications, 2ndEdn

Reference Books	1. Essential practical handbook of Cell biology ,Genetics and Microbiology -A Practical manual- Debarati Das Academic publishers, ISBN, 9789383420599, 1st Edition 2017 2. Cell biology Practical, Dr. Venu gupta ISBN8193651219, Prestige publisher, 1st Jan 2018. 3. Cell and Molecular biology, De Robertis, 8th edition, 1st June, 1987
Website Link	1. http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1 2. https://www.microscopemaster.com/organelles.html 3. https://www.pdfdrive.com/biochemistry-books.htm

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

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2UBCP02	PRACTICAL : CELL BIOLOGY	DSC PRACTICAL - II	II	4			4	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S	M	S	S	S	S
CO2	M	S	S	S	S	M	S	S	S	S
CO3	M	S	S	M	M	S	S	S	S	S
CO4	M	S	S	M	S	M	S	S	S	S
CO5	M	S	S	S	M	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW				M-MEDIUM				S-STRONG	

Tutorial Schedule	
Teaching and Learning Methods	Explanation of Practical procedure and Demonstration of experiments
Assessment Methods	Observation, Performance, Attendance

Designed By	Verified By	Approved by Member Secretary
Mt.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3UBCC03	**BIOMOLECULES**	**DSC THEORY - III**	**III**	**5**	**3**	**2**	**-**	**4**
Objective	To gain knowledge about carbohydrates, amino acids, and various protein organizational levels, highlighting their composition, characteristics, and biological importance.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Carbohydrates**-Classification and biological significance, physical properties - stereo isomerism, optical isomerism, anomers, epimers and mutarotation. Monosaccharides: Occurrence, Linear and cyclic structure, Reactions of monosaccharides due to the presence of hydroxyl,aldehyde and keto groups. Disaccharides: Structure and properties of reducing disaccharides (lactose and man nose), non-reducing disaccharide (sucrose).Polysaccharides: Homopolysaccharides - Occurrence, structure and biological significance of starch, glycogen and cellulose. Heteropolysaccharides - Structure and biological significance of mucopolysaccharides –hyaluronic acid, chondroitin sulphate and heparin. (Structural elucidation not needed).	K2	12
II	**Amino acids** -Classification based on composition of side chain and nutritional significance. General structure of amino acids. 3 - And 1- letter abbreviations .Physical properties of amino acids, isoelectric point, titration curve (alanine, lysine, glutamic acid), optical activity. Chemical reactions due to carboxyl group, amino group and side chains. Color reactions of amino acids.	K3	12
III	**Proteins**-Classification based on shape, composition, solubility and functions. Properties of proteins – Ampholytes, isoelectric point, salting in and salting out, denaturation and renaturation, UV absorption. Levels of Organization of protein structure- Primary structure, Formation and characteristics of peptide bond, phi and psi angle, Secondary structure-α helix (egg albumin), β- pleated sheath (keratin), triple helix (collagen). Tertiary structure – with reference to myoglobin. Quaternary structure with reference to hemoglobin.	K3	12
IV	**Lipids-** Lipids: Bloor's classification, chemical nature and biological functions. Fatty acids: classification, nomenclature, structure and properties of fatty acids. Simple and mixed triglycerides: structure and general properties, Characterization of fats- iodine value, saponification value, acid number along with their significance. Compound lipids - Structure and functions of phospholipids and glycolipids. Derived lipids - Structure and functions of cholesterol, bile acids and bile salts.	K4	12
V	**Nucleic acids** - Structure of purine and pyrimidine bases, nucleosides and nucleotide sand their biological importance. Types of DNA: A, B, C, Z DNA, structure and biological significance, superficiality. Types of RNA: mRNA, tRNA, rRNA, hnRNA, snRNA, Secondary-and tertiary structure of t RNA. Properties of DNA- Hypochromic and hyper chromic effect, melting temperature, viscosity. Denaturation and annealing. **Current Trends-*** hnRNA, snRNA, *****	K5	12
	Self Study*……*		
	CO1: Identify the structure and explain the physical and chemical properties of Carbohydrates.	K1	
	CO2: Indicate the classification, structure, properties and biological functions of amino acids	K2	

	CO3: Analyze the classification and elucidate the different levels of structural organization of proteins	K3	
	CO4: Analyzing the classification, structure, properties, functions and characterization of lipid	K4	
	CO5: Illustrate the structure, properties and functions of different types of nucleic acids	K4	

Learning Resources	
Text Books	1. U.Sathyanarayana & U.Chakrapani, Biochemistry, Books & Allied Pvt.Ltd. 5'th edition Elsevier India Pvt. Ltd. 2013. 2.J.L.Jain, Sunjay Jain,NitinJain, Fundamentals of Biochemistry,7'th edition Chand & Company Ltd 2013. 3. M N Chatterjea, Rana Shinde, . Text book of Medical Biochemistry 9'th edition, Jaypee Brothers. 2023
Reference Books	1. David Nelson, Michael M.Cox, Principles of Biochemistry, 4'th edition W.H. Freeman and Company. 2005. 2. Voet. D, Voet.J.G.And Pratt, C.W, Principles of Biochemistry, 4'th edition John Wiley &Sons, Inc. 2004. 3. Zubay G.L, et.al, Principles of Biochemistry, Principles of Biochemistry 1'th edition 1995
Website Link	1. https://www.britannica.com/science/biomoleculehttps://en.wikipedia.org/wiki/Biomolecule 2. https://www.khanacademy.org/science/biology/macromolecule
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121356

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C	
23M3UBCC03	**BIOMOLECULES**	**DSC THEORY - III**	**III**	**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping										
CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	M	S	M	S	S	S	S	S	S
CO3	S	M	S	S	S	S	S	S	S	S
CO4	S	M	S	S	S	S	S	M	S	S
CO5	S	M	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mrs.M.Priyanga Gandhi	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCP03	**PRACTICAL III BIOMOLECULES**	**DSC PRACTICAL - III**	**III**	**5**	**-**	**-**	**5**	**3**
Objective	To provide an in-depth understanding of qualitative analysis of carbohydrates, amino acids and Lipids and isolation of nucleic acids from plant and animal source.							

S. No	Course Content	Knowledge Levels	Total Hours
I	**Qualitative test for.** 1) Carbohydrates a) Glucose b) Fructose c) Arabinose d) Maltose e) Sucrose f) Lactose g)Starch 2) Amino acids a) Arginine b) Cysteine c) Histidine d) Proline e) Tryptophan f) Tyrosine g) Methionine	K5	35
II	II) **Titrimetric methods :** 1) Determination of Saponification value of edible oil 2) Determination of Iodine number of edible oil 3) Determination of Acid number of edible oil	K6	15
III	III) **Group Experiments**. 1) Isolation of DNA from plant/animal source. 2) Isolation of RNA from rich source.	K6	10
Course Outcome	**CO1:** Qualitatively evaluate the carbohydrates and report the type of carbohydrate based on specific tests	K5	
	CO2: Qualitatively evaluate amino acids and report the type of amino acids based on specific tests .	K5	
	CO3: Determine the Saponification, Iodine number and acid number of edible oil	K6	
	CO4: Isolate the nucleic acid from biological sources	K6	
Learning Resources			

Text Books	1. David T Plummer, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw-Hill Edition 2. J. Jayaraman Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015 3. S. Sadasivam A. Manickam Biochemical Methods New age International Pvt Ltd publisher's third edition 2018
Reference Books	1. Rageeb, KiranPatil, M. Bakshi Rahman, Sufiyan Ahmad Raees A Practical book on Biochemistry Everest publishing house1st Edition, 2019 2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005. 3. Biochemical Tests – Principles and Protocols. Anil Kumar, SarikaGarg and NehaGarg.VinodVasishtha Viva Books Pvt Ltd, 2012. 4. Harold Varley, Practical Clinical Biochemistry, CBS. 6 th edition, 2006. 5. Keith Wilson and John Walker. Principles and Techniques of Practical Biochemistry, 4 th Edition, Cambridge University press, Britain.1995.
Website Link	1. https://egyankosh.ac.in/bitstream/123456789/43420/1/Experiment-16.pdf 2.https://vlab.amrita.edu/?sub=3&brch=63&sim=631&cnt=2#:~:text=2)%20Fehling's%20Test%3A-,In%20a%20test%20tube%2C%20add%202%20ml%20of%20the%20test,in%20color%20or%20precipitate%20formation. 3.https://www.stemcell.com/protocol-for-genomic-dna-isolation-from-mouse-tail-animal-tissue-or-cultured-cells.html

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M3UBCP03	**PRACTICAL: BIOMOLECULES**	**DSC PRACTICAL - III**	**III**	**5**	**-**	**-**	**5**	**3**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	M	S	M	S
CO2	S	M	M	S	S	S	M	M	M	S
CO3	M	S	M	S	S	S	M	S	M	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	S	S	S	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule		
Teaching and Learning Methods	Explanation of practical procedure and demonstration of experiments	
Assessment Methods	Observation, Performance, Attendance	
Designed By	**Verified By**	**Approved by Member Secretary**
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCC04	**BIOCHEMICAL TECHNIQUES**	**DSC THEORY - IV**	**IV**	**5**	**5**	**-**	**-**	**5**
Objective	The students can learn the basic principles, types and applications of various sedimentation techniques, chromatographic techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Centrifugation:**-Basic principles, RCF, Sedimentation coefficient, Svedberg constant. Types of rotors. Preparative centrifugation-differential and density gradient centrifugation, Rate zonal and Isopycnic techniques, construction, working and applications of analytical ultracentrifuge – Determination of molecular weight (Derivation excluded).	K2	12
II	**Chromatography:** -adsorption, partition. Principle, instrumentation and applications of paper chromatography, thin layer chromatography, ion-exchange chromatography, gel permeation chromatography and affinity chromatography.	K3	12
III	**Electrophoresis:**-General principles, factors affecting electrophoretic mobility. Tiselius moving boundary electrophoresis. Electrophoresis with paper and starch. Principle, instrumentation and applications of agarose gel electrophoresis and SDS-PAGE.	K3	12
IV	**Electromagnetic radiations:** -Basics of Electromagnetic radiations-Energy, wavelength, wave number and frequency. Absorption and emission spectra, Lambert – Beer Law, Light absorption and transmittance. Colorimetry - Principle, instrumentation and applications. Visible and UV spectrophotometry – Principle, instrumentation and applications –enzyme assay, structural studies of proteins and nucleic acids.	K4	12
V	**Radioactivity:**-Types of Radioactive decay, half-life, units of radioactivity, Detection and measurement of radioactivity - Methods based upon ionization -Geiger Muller Counter. Methods based upon excitation - Solid & Liquids scintillation counters. Autoradiography, Biological applications and safety aspects of radioisotopes. **Current Trends-* PCR, GCMS ***	K5	12
	Self Study *……*		
	CO1: Describe types of rotors and identify the centrifugation technique.	K1	
	CO2: Summerize the principles, procedure and applications of column Chromatography.	K2	
	CO3: Discover the separation of DNA and Protein using electrophoretic technique.	K3	
	CO4: Illustrates the instrumentation and uses of spectrophotometer.	K4	

	CO5: Evaluate various methods of measurement of radioactivity	K5	

Learning Resources	
Text Books	1. . Avinash Upadhyay, Kakoli Upadhyay & Nirmalendu Nath, Biophysical Chemistry, Principles and Techniques, 3 rd edition, Himalaya Publishing House 2002. 2. L.Veerakumari, Bioinstrumentation, 1'th edition, MJP Publishers 2009, 3. KeithWilson & John Walker, Practical Biochemistry-Principles and techniques, Cambridge University Press, 4' th edition 2000
Reference Books	1. Terrance G. Cooper the tools of Biochemistry, John Wiley & Sons, Singapore 1977 2. Gurumani, Research Methodology for Biological Sciences, 2011, 1 stedition, MJP Publishers. 3. Saroj Dua, Neera Garg, Biochemical Methods of Analysis, 2010, 1 stedition, Narosa Publishing house.
Website Link	1. https://www.britannica.com/science/chromatography 2. http://ndl.ethernet.edu.et/bitstream/123456789/1007/1/137%2C2011.pdf.pdf 3. https://www.scribd.com/document/485375340/Biochemical-Analysis-Techniques-PDF
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121261

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

B.Sc. – Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCC04	BIOCHEMICAL TECHNIQUES	DSC THEORY - IV	IV	5	5	-	-	5

CO-PO Mapping

CO Number	PO 1	PO 2	PO3	PO 4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	**S**	**S**	**S**	**M**	M	**S**	**S**	**S**	**S**
CO2	M	**S**	**S**	**S**	**S**	M	**S**	**S**	**S**	**S**
CO3	M	**S**	**S**	**S**	**S**	M	**S**	**S**	**S**	**S**
CO4	M	**S**	**S**	**S**	**S**	M	**S**	**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	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
M.PRIYANGAGANDHI	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCP04	**BIOCHEMICAL TECHNIQUES**	**DSC - PRACTICAL - IV**	**IV**	**3**	**-**	**-**	**3**	**3**
Objective	To gain the knowledge about colorimetric Estimation and separation of Biomolecules, and blood components							

S. No	Course Content	Knowledge Levels	Total Hours
I	**I Colorimetry** 1. Estimation of amino acid by Ninhydrin method. 2. Estimation of protein by Biuret method. 3. Estimation of DNA by Diphenylamine method. 4. Estimation of RNA by Orcinol method. 5. Estimation of Phosphorus by Fiske and Subbarow method.	K5	15
II	**II Chromatography** 1. Separation and identification of sugars and amino acids by paper chromatography. 2. Separation and identification of amino acids and lipids by thin layer chromatography.	K5	15
III	**III Demonstration** 1. Separation of serum and plasma from blood by centrifugation-. 2. Separation of serum proteins by SDS-PAGE.	K6	15
	CO1: Estimate the amount of bio molecules by Colorimetric method.	K5	
	CO2: Quantify the amount of minerals by Colorimetric method	K5	
	CO3: Separate and identify sugars, lipids and amino acids by chromatography	K5	
	CO4: Operate centrifuge for the separation of serum and plasma	K5	
	CO5: Demonstrate the separation of proteins electrophoretic ally	K6	

Learning Resources	
Text Books	1. J. Jayaraman, Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015. 2. S. Sadasivam A.Manickam Biochemical Methods Newage International Pvt Ltd publishers 3rd edition 2018. 3. Keith Wilson and John Walker Principles and techniques of Practical Biochemistry Cambridge University Press2010, 7th edition.
Reference Books	1. S. K. Sawhney and Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2nd edition, 2005. 2. David T. Plummer, 2001, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw-Hill publishing company limited.

	3. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition,1988.
Website Link	https://www.pdfdrive.com/biochemistry-books.html

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCP04	**BIOCHEMICAL TECHNIQUES**		**DSC - PRACTICAL - IV**		**IV**	**3**	**-**	**-**	**3**	**5**

CO -PO Mapping

CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	**M**	**S**	**S**	**S**	**M**	**S**	**S**	**S**	**S**	**S**
CO2	**M**	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO3	**M**	**M**	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**M**	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Explanation of practical procedure and demonstration of experiments
Assessment Methods	Observation, Performance, Attendance

Designed By	**Verified By**	**Approved by Member Secretary**
T.Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCC05	**ENZYMES**	**DSC THEORY - V**	**V**	**6**	**4**	**2**	**-**	**5**
Objective	To gain fundamental knowledge about enzymes, their properties, mechanisms of action, kinetics, inhibitor effects, and their role in clinical diagnosis and industries							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to enzymes:** Nomenclature and Classification based on IUB with examples, enzyme as catalyst-Activation energy, Enzyme specificity-absolute, Group, linkage and stereo specificities. Concept of Active site, Lock and key hypothesis and induced fit theory, Enzyme expression Units-IU, turnover number, katal and specific activity.	K2	12
II	**Mechanism of enzyme catalysis** – Acid Base catalysis, covalent catalysis, electro static catalysis, metal ion catalysis, proximity and orientation effect. Coenzymes -Definition, types, co-enzymatic forms of vitamins- NAD/NADP, FAD, FMN, Coenzyme A TPP, PLP, lipoic acid and biotin. Multienzyme complexes - Pyruvate dehydrogenase complex. Isoenzyme with reference to LDH and CK.	K2	12
III	**Definition of kinetics**, Factors affecting enzyme activity - temperature, pH, substrate and enzyme concentration, activators-cofactors, Derivation of Michaelis-Menton equation for unisubstrate reactions , Line weaver - Burk plot, Eadie –Hofstee plot Significance of Km and V max and their determination using the plots.	K3	12
IV	**Enzyme inhibition -** Reversible and irreversible inhibition - types of reversible inhibitors, competitive, non-competitive, un-competitive inhibitors. Graphical representation by L-B plot, (Kinetic derivations not required), Determination of Km and Vmax in the presence and absence of inhibitors. Allosteric enzymes - Sigmoidal curve, positive and negative modulators.	K4	12
V	**Applications of enzymes -**Immobilized enzymes - methods of immobilization-adsorption, covalent bonding, cross linking, encapsulation, entrapment and applications of immobilized enzymes. Biosensors – e.g. Glucose sensors. Industrial applications of enzymes – Food, textile and pharmaceutical industries. **Current trend - * Cellulases for Biomass Conversion***	K5	12
	***……* Self Study.**		
Course Outcome	**CO1:** Classify the major classes of enzymes, differentiate between a chemical Catalyst and a biocatalyst and define the units of enzymes.	**K2**	
	CO2: Explain the mechanism of enzyme catalysis and the role of coenzymes in Enzyme action.	**K2**	
	CO3: Illustrate the steady state kinetics, interpret MM plot and LB plot based on Kinetics data, and determine Km and Vmax.	**K3**	
	CO4: Distinguish the types of inhibition along with its importance in biochemical Reactions	**K4**	

	CO5: Evaluate the various methods for production of immobilized enzymes and discuss the application of enzymes in clinical diagnosis and various Industries	**K5**	

Learning Resources	
Text Books	1. U.Sathyanarayana & U. Chakrapani, 2013, Biochemistry, 4th edition, Elsevier India Pvt. Ltd., Books & Allied Pvt. Ltd. 2. Dr. G.R Agarwal, Dr. Kiran Agarwal & O.P. Agarwal, 2015, Textbook of Biochemistry (Physiological chemistry), 18th edition, Goel Publishing House, 3. T. Devasena, 2010, Enzymology, 1st edition, Oxford University Press.
Reference Books	1. Trevor Palmer, 2008, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2nd edition, East West Press Pvt.Ltd. 2. David L. Nelson, Michael M. Cox, 2005, Principles of Biochemistry, 4thedition W.H. Freeman and Company, 3. Voet. D, Voet.J. G.and Pratt, C.W, 2004, Principles of Biochemistry, 4th edition John Wiley & Sons, Inc.
Website Link	https://www.biologydiscussion.com/notes/enzymes-notes/biology-notes-on-enzymes/69993 https://www.britannica.com/science/protein/The-mechanism-of-enzymatic-action https://www.youtube.com/watch?v=oVJ2LJxO6tU
Self-Study Material	https://link.springer.com/chapter/10.1007/1-4020-5377-0_3

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M5UBCC05	ENZYMES	DSC THEORY - V	V	6	4	2	-	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	M	S
CO3	S	M	M	M	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCC06	INTERMEDIARY METABOLISM	DSC THEORY - VI	V	5	5	-	-	5
Objective	This course provides information on free energy transformation, biological oxidation, metabolism of carbohydrate, lipid, amino acid and nucleic acid and their regulations.							
Unit	**Course Content**					**Knowledge Levels**		**Sessions**
I	**Bioenergetics-** High energy compounds: Role of high energy compounds, free energy hydrolysis of ATP and other organophosphates, ATP-ADP cycle. Biological Oxidation: Electron transport chain -its organization and function. Inhibitors of ETC. Oxidative phosphorylation, P/O ratio, Peter Mitchell's chemiosmosis hypothesis. Mechanism of ATP synthesis, uncouples of oxidative phosphorylation, substrate level Phosphorylation with examples					K3		12
II	**Metabolism of carbohydrates** - Glycolysis, TCA Cycle, Amphibolic nature and integrating role of TCA cycle. Anaplerosis, Pentose Phosphate Pathway (HMP shunt), Gluconeogenesis, Glycogenesis, Glycogenolysis and its regulation, glyoxylate cycle, Entner- Duodoroff pathway and Cori cycle.					K3		12
III	**Metabolism of lipids** -Oxidation of fatty acids - α, β and ω -oxidation of saturated fatty acids, Oxidation of fatty acids with odd number of carbon atoms and unsaturated fatty acids, Ketogenesis, Biosynthesis of saturated fatty acids and unsaturated fatty acids, Biosynthesis and degradation of triglycerides, phospholipids and cholesterol.					K4		12
IV	**Metabolism of amino acid-** Metabolic nitrogen pool, Catabolism of aminoacid: Oxidative deamination, non – oxidative deamination, transamination and decarboxylation, Biogenic amines, Urea cycle and its regulation.					K4		12
V	**Metabolism of nucleotides**-Biosynthesis of purines and pyrimidines, - denovo synthesis and salvage pathways, Degradation of purines and pyrimidines, Conversion of ribonucleotide to deoxyribonucleotide **Current Trend - *Metabolic engineering-golden rice ***					K4		12
	…… Self Study.							
	CO1: Explain the general design of metabolic pathways based on the bioenergetic principle					K2		
	CO2: Understand the catabolism & anabolism of biomolecules and interrelations of the pathways associated with carbohydrate, protein, nucleotide and lipid metabolism.					K2		
	CO3: Illustrate the order of metabolic intermediates and the corresponding enzyme names for the central metabolic pathway					K3		
	CO4: Recognize how different pathways are functionally interlinked and how they are regulated by extracellular and intracellular signals					K4		
	CO5: Analyze how metabolism can be related to issues in lifestyle, health and disease					K4		

Learning Resources	
Text Books	1. U.Sathyanarayana & U.Chakrapani,. Biochemistry, 4th edition. Elsevier India Pvt.Ltd. 2015 2. M.N. Chatterjea and Rana Shinde. Text book of Medical Biochemistry, 5th edition JaypeeBrothers Medical Publishers Pvt. Ltd 2002 3. Lehninger Principles of Biochemistry, David L. Nelson, Michael M.Cox, 5Th edition, W.H.Freeman and Company. 2008
Reference Books	1. Robert K.Murray, Daryl K.Granner, Victor W. Rodwell. Harper's Illustrated Biochemistry, 27th edition, McGraw Hill Publishers. 2006. 2. Voet.D, Voet. J.G, and Pratt C.W. Principles of Biochemistry. 4th edition, John Wiley&Sons, Inc., 2010 3. Geoffrey L. Zubay, William W. Parson, Dennis E.Vance. Principles of Biochemistry, 2nd Edition, Wm.C. Brown Publishers. 1995 4. Garret, R. H. and Grisham, C. M. Biochemistry, 3rd Edition.Thomson Learning INC, 2005
Website Link	1. https://nptel.ac.in/courses/104/105/104105102/ 2. https://www.osmosis.org/notes/Nucleic_Acid_Metabolism 3. https://www.osmosis.org/notes/Carbohydrate_Metabolism
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=331471

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCC06	INTERMEDIARY METABOLISM	DSC THEORY - VI	V	5	5	-	-	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**M**	**S**	**S**	**S**	**S**	**M**	**S**	**S**	**M**
CO2	**S**	**M**	**S**	**M**	**S**	**M**	**S**	**S**	**S**	**M**
CO3	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**S**
CO4	**S**	**M**	**S**	**M**	**S**	**S**	**M**	**S**	**S**	**S**
CO5	**S**	**M**	**S**	**S**	**M**	**S**	**S**	**S**	**S**	**M**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Dr.M.DEVI	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCC07	CLINICAL BIOCHEMISTRY	DSC THEORY - VII	V	6	4	2	-	5
Objective	The students will acquire knowledge on basic concepts and disorders of carbohydrate and lipid metabolism, liver, kidney and gastric function tests and clinical enzymology							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Disorders of carbohydrate metabolism:** Maintenance of blood glucose by hormone with special reference to insulin and glucagon. Abnormalities in glucose metabolism: Diabetes mellitus; types, causes, biochemical manifestations, diagnosis and treatment, glycated hemoglobin. Inborn errors of carbohydrate metabolism, glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen storage diseases.	K2	15
II	**Disorders of Lipid Metabolism:** Lipid Profile, Atherosclerosis, Fatty liver and hyperlipidemia. Hypercholesterolemia, Lipidosis and Xanthomatosis, Tay-Sach`s disease, Niemann-Pick disease, lipotropic agents.	K3	10
III	**Liver Function Tests:** Bilirubin metabolism and jaundice, Estimation of conjugated and total bilirubin in serum (Diazo method). Detection of bilirubin and bile salts in urine (Fouchet's test and Hay's Sulphur test). Thymol turbidity test, prothrombin time, serum enzymes in liver disease serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH). **Kidney Function Tests:** Measurement of urine pH, volume, specific gravity, osmolality, sediments in urine, inulin, urea and creatinine clearance tests.	K4	15
IV	**Gastric Function test:** Composition of gastric juice, collection of gastric contents, examination of gastric residuum, fractional test meal (FTM), stimulation test alcohol and histamine stimulation, Tubeless gastric analysis.	K4	10
V	**Clinical enzymology:** Enzymes of diagnostic importance- LDH, creatine kinase, transaminases, phosphatases, Isoenzymes of lactate dehydrogenase. **Current Trend - *cancer ***	K4	10
	…… Self Study.		
	CO1: Understand about the concepts of clinical biochemistry	K2	
	CO2: Gain knowledge about the different biological samples, their collection and preservation	K3	
	CO3: Illustrate the various disorders associated with carbohydrate. Lipids, and proteins in plasma and their importance in clinical diagnosis	K4	
	CO4: To provide detailed knowledge on various tests to assess the function of liver, kidney and gastric.	K4	
	CO5: Analyze the roles of clinical importance of enzymes in the diagnosis and treatment of diseases.	K4	
Learning Resources			

Text Books	1. MN Chatterjee and Rana Shinde, Text Book of Medical Biochemistry, Jaypee Brothers Medical Publishers (P) LTD, New Delhi, 8 th Edition, 2012 2. Ambika Shanmugam's Biochemistry for medical students, 8 th edition, published by Wolters Kluwer India Pvt. Ltd. 2016
Reference Books	1. Philip. D. Mayne. Clinical Chemistry in diagnosis and treatment. ELBS Publication, 6 th edition, 1994. 2. Thomas M. Devlin. Text book of Biochemistry with clinical correlations (7thed). John Wiley and sons. 2014. 3. Tietz. Fundamentals of clinical chemistry and molecular Diagnostics (7thed) Saunders 2014.
Website Link	1. https://www.britannica.com/science/metabolic-disease/Disorders-of-lipid-metabolism 2. https://www.slideshare.net/MohitAdhikary/gastric-and-pancreatic-function-tests 3. https://www.osmosis.org/notes/Carbohydrate_metabolism_disorders
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=861782

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M5UBCC07	CLINICAL BIOCHEMISTRY	DSC THEORY - VII	V	6	4	2	-	5	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**S**	**M**	**S**	**M**	**M**	**S**
CO2	**S**	**S**	**M**	**M**	**S**	**M**	**S**	**M**	**S**	**M**
CO3	**M**	**S**	**S**	**M**	**M**	**M**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**M**	**M**	**M**	**M**	**S**	**S**	**M**	**S**
CO5	**S**	**S**	**M**	**M**	**S**	**M**	**S**	**S**	**M**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Dr.M.DEVI	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCP05	PRACTICAL - CLINICAL BIOCHEMISTRY	DSC PRACTICAL -V	V	6	-	-	6	4
Objective	This course teaches the students about sample collection methods, assays for diagnostic enzymes, estimation procedures for biomolecules, routine qualitative urine analysis, and hematological tests, while also providing practical knowledge on these subjects.							

Part	Course Content	Knowledge Levels	Total Hours
I	**Blood Analysis** 1. Collection and preservation of blood and urine samples. 2. Estimation of creatinine by Jaffe's method (serum & urine) 3. Estimation of urea by diacetyl monoxime method (serum & urine) 4. Estimation of uric acid (serum & urine) 5. Estimation of cholesterol by Zak's method 6. Estimation of Glucose by Ortho Toluidine method 7. Estimation of Protein by Lowry's method 8. Estimation of Hemoglobin by Shali's/Drabkins method 9. Assay of SGPT and SGOT	K5	50
II	**Urine Analysis** 10. Qualitative analysis of A) Normal constituents of urine a) Urea, b) Creatinine, c) Phosphorus, d) Calcium B) Abnormal constituents a) Calcium b) Sugar (Glucose, fructose, pentose) c) Protein d) Amino acids (Tyrosine, Histidine, Tryptophan) e) Ketone bodies f) Bile pigments with clinical significance	K5	10
III	**DEMONSTRATION EXPERIMENTS (10 Hrs.)** **HEMATOLOGY** a. RBC Counting b. Total and differential count of white blood cells c. Packed cell volume d. Erythrocyte sedimentation rate e. Blood clotting time f. Blood grouping **Current Trend - * Clinical laboratory automation***	K6	20
	…… Self Study.		
	CO1: Acquaint knowledge on collection of biological samples (urine, blood) and their preparation for diagnostic purpose	K5	
	CO2: Assay the activity of various clinically important enzymes and relate their clinical importance.	K5	
	CO3: Estimate the important biomolecules in biological samples and relate their clinical significance	K5	

	CO4: Qualitatively analyze urine sample for normal and abnormal constituents in urine and interpret the result	K6	
	CO5: Perform the routine hematological tests.	K6	

Learning Resources	
Text Books	Manickam, S.S. Biochemical Methods. New age International PvtLtd publishers - ISBN 10: 8122421407 / ISBN 13: 9788122421408 . (3 rd Ed.). 2018. Plummer, D.T. An Introduction to Practical Biochemistry. Tata Mc GrawHill-ISBN: 97800708416 3rd edition, 2017. Alan H Gowenlock. Varley's Practical Clinical Biochemistry, 6 th edition, CBS Publishers, India. 1998.
Reference Books	Singh, S.K. Introductory Practical Biochemistry (2nd Ed.).Alpha Science International, Ltd- ISBN 10: 8173193029 / ISBN 13: 9788173193026 , 2005 Ashwood, B. A. Tietz, Fundamentals of Clinical chemistry. WB Saunders Company, Oxford Science Publications USA - ISBN 10: 0721686346 / ISBN 13: 978072168634, 2001. B. Godkar. Textbook of Medical Laboratory Technology, Bhalani Publishers, Vol 1 & 2 Paperback, 3 rd edition, 2020.
Website Link	https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.Pdf?Sequence=1&isAllowed=y
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=456889&query=

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCP05	PRACTICAL - CLINICAL BIOCHEMISTRY	DSC PRACTICAL – V	V	6	-	-	6	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	M	M	S	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	M	S	M	M	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Explanation of practical procedure and demonstration of experiments
Assessment Methods	Observation, Performance, Attendance

Designed By	Verified By	Approved by Member Secretary
Dr.M.DEVI	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCC08	**MOLECULAR BIOLOGY**	**DSC THEORY - VIII**	**VI**	**5**	**5**	**-**	**-**	**5**
Objective	To gain knowledge about the molecular biology, including DNA replication, transcription, protein synthesis, gene expression regulation, mutation types, and DNA repair mechanisms.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Central Dogma of molecular Biology, DNA as the unit of inheritance. Experimental evidences by Griffith's transforming principle, Avery, McLeod and McCarthy's experiment, and Hershey and Chase Experiment. **Replication in prokaryotes:** Modes of replication, Meselson and Stahl's experimental proof for semiconservative replication. Mechanism of Replication – Initiation, events at Ori C, Elongation – replication fork, semi discontinuous replication, Okazaki fragments, and termination. Bidirectional replication, Inhibitors of replication. Models of replication-theta, rolling circle and D loop model.	K2	12
II	**Transcription** - Mechanism of transcription: DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/ Pribnow box, elongation and termination. Post- transcriptional modifications; inhibitors of transcription. RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.	K3	12
III	**Genetic Code** and its characteristics, Wobble hypothesis. **Translation**: Adaptor role of tRNA, Activation of amino acids, Initiation, elongation and termination of protein synthesis, post-translational modifications and inhibitors of protein synthesis.	K4	12
IV	**Regulation Of Gene Expression** In Prokaryotes – Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, regulation of lac operon and trp operon.	K4	12
V	**Mutation**: Types-Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation – induced mutations. **DNA repair**: Direct repair, Photo reactivation, Excision repair, Mismatch repair, Recombination repair and SOS repair. **Current trend -*rDNA Technology***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Demonstrate the Central Dogma of molecular biology, explain the Multiplication of DNA in the cell and describe the types and modes of replication.	K2	
	CO2: Draw the mechanism of transcribing DNA into RNA and Discuss the formation of different types of RNA.	K3	
	CO3: Decipher the genetic code and summarize the process of translation.	K4	
	CO4: Comprehend the principles of gene expression and explain the Concept of operon in prokaryotes.	K4	

	CO5: Investigate the types of mutations and explain the various mechanisms of DNA repair.	K5	

Learning Resources	
Text Books	1. Veer Bala Rastogi, 2008, Fundamentals of Molecular Biology, 1st edition, An eBooks India. 2. David Friefelder, 1987, Molecular Biology, 2nd edition, Narosa Publishing House. **3.** Dr.P.S.Verma and Dr.V.K.Agarwal, 2013, Cell biology, Genetics, Molecular biology, Evolution and Ecology, 1stedition, S.Chand & Company Pvt.Ltd.
Reference Books	1. Karp, G., 2010, Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc. 2. De Robertis, E.D.P. and De Robertis, E.M.F., 2010, Cell and Molecular Biology, 8th edition, Lippincott Williams and Wilkins, Philadelphia. 3. James. D. Watson, 2013, Molecular Biology of the Gene 7th edition, Benjamin Cummings.
Website Link	www.mednotes.net/notes/biology https://www.onlinebiologynotes.com/repair-mechanism-of mutation/ https://teachmephysiology.com/biochemistry/protein-synthesis/dna-translation/
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121356&ppg=695

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M6UBCC08	**MOLECULAR BIOLOGY**	**DSC THEORY - VIII**	**VI**	**5**	**5**	**-**	**-**	**5**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	M	S	S	S
CO2	S	M	S	S	S	S	M	S	M	S
CO3	S	S	M	M	S	S	M	M	S	S
CO4	S	M	M	S	S	S	M	S	S	S
CO5	S	M	S	S	M	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc – Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCC09	**HUMAN PHYSIOLOGY**	**DSC THEORY - IX**	**VI**	**5**	**5**	**-**	**-**	**5**
Objective	The students can understand clearly about the human body system and their regulations							

Unit	Course Content	Knowledge Levels	Sessions
I	**Respiratory System** – Overview of respiratory system, Types of respiration, Transport of respiratory gases, Exchange of respiratory gases in lungs and tissues –Chloride Shift & Bohr's effect, Lung surfactant. Circulatory System-Structure and functions of the Heart. Arterial and venous system, Cardiac cycle, Pace maker, Blood pressure and Factors affecting blood pressure	K2	12
II	**Nervous system-** Structure of neuron, synaptic transmission, reflex action, neurotransmission- Resting membrane and Action potential. neurotransmitters- acetylcholine, Nor adrenaline, Dopamine, Serotonin, Histamine, GABA, Substance P. **Muscular system**-structure and types of muscles - skeletal, smooth and cardiac muscles, muscle proteins- types and functions, mechanism of muscle contraction.	K3	12
III	**Digestive system-** composition, functions of saliva, gastric pancreatic intestine and bile secretions, structure of digestive system, Digestion, absorption of carbohydrates, lipids, proteins. **Excretory system** – Structure of nephron, mechanism of urine formation, Concentration and acidification of Urine. Role of kidneys in the maintenance of acid base balance.	K3	12
IV	**Reproductive system:** Oogenesis, spermatogenesis, capacitation and transport of sperm- blood testis barrier. Fertilization, early development, Implantation, Placentation and Parturition.	K4	12
V	**Endocrinology-** Classification of hormones, endocrine glands and their secretions, structure and functions of Insulin, thyroxine. Steroid hormones - Corticosteroids, Sex hormones – testosterone and estrogen, menstrual cycle. **Current Trend - * ECMO-Kidney stone broker***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Explain the exchange of gases, design of blood vessels and cardiac Cycle.	K1	
	CO2: Summarize the events in transmission of nerve impulses mechanism of muscle contraction.	K2	
	CO3: Identify the structure and functions of digestive system, structure of nephron and mechanism of urine formation and role of kidney In maintenance of pH.	K3	
	CO4: Discover the process of Oogenesis, Spermatogenesis, Fertilization, and Parturition.	K4	

	CO5: Evaluate the role of different hormones that regulate Metabolism, growth, glucose homeostasis and reproductive function.	K5	

Learning Resources	
Text Books	1. K.Sembulingam & Prema Sembulingam, 2016, Essentials of Medical Physiology, 7th edition, Jaypee Brothers Medical Publishers (P) Ltd. 2. Text book of medical biochemistry physiology- MN. Chatterjee and Rana shinde, 7th edition, Jaypee brothers- medical publishers, 2007 3. Animal Physiology – Mariakuttikan and Arumugam, Saras publication, 2017.
Reference Books	1. Chatterjee.C.C., 1988, Human Physiology – Vol I & II, 1st edition, Medical Allied Agency. 2. Meyer, Meyer & Meij, 2002, Human Physiology, 3rd edition, A.I.T.B.S Publishers. 3. Guyton and Hall, 2011, Textbook of Medical Physiology, 12th edition, W.B. Saunders Company
Website Link	https://training.seer.cancer.gov/anatomy/cardiovascular/ https://www.uc.edu/content/dam/uc/ce/images/OLLI/Page%20Content/THE%20REPRODUCTION%20SYSTEMS.pdf https://www.nhlbi.nih.gov/health/lungs/respiratory-system
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121225&ppg=700

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

B.Sc. – Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCC09	**HUMAN PHYSIOLOGY**		**DSC THEORY - IX**		**VI**	**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M	S	M	S	S	S
CO2	S	M	S	S	S	S	M	S	M	S
CO3	S	M	M	M	S	S	M	M	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	S	S	M	S	M	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation	
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE	
Designed By	**Verified By**	**Approved by Member Secretary**
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCC10	**PLANT BIOCHEMISTRTY AND PLANT THERAPEUTICS**	**DSC THEORY - X**	**VI**	**5**	**5**	**-**	**-**	**5**
Objective	To gain knowledge about the importance of photosynthesis, secondary metabolites, plant hormones, antioxidants, free radical effects, and medicinal plants' role in disease treatment.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Photosynthesis**- Photosynthesis apparatus, pigments of photosynthesis, photo chemical reaction, photosynthetic electron transport chain, path of carbon in photosynthesis - Calvin cycle, Hatch – lack pathway (4 ways) CAM path way, significance of photosynthesis	K2	12
II	**Secondary metabolites:** Structure, Types, Sources, Biosynthesis and function of phenolics, tannins, lignins, terpenes and alkaloids. Medicinal properties of secondary metabolite	K3	12
III	**Plant hormones** Structure and function of plant hormones such as ethylene, cytokinins, auxins, Absicic acid, Florigin and Gibberlins	K3	12
IV	**Free radicals and Antioxidants**, types, production, free radical induced damages, lipid peroxidation, reactive oxygen species, antioxidant defense system, enzymatic and non-enzymatic antioxidants, role of antioxidants in prevention of disease, phytochemicals as antioxidants.	K4	12
V	**Plant therapeutics**: Bioactive principles in herbs, plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-inflammatory properties. **Current trend - *vermicompost***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Gain knowledge on photosynthetic apparatus, pigments present, pathways, and significance of photosynthesis.	K2	
	CO2: Learn in detail about the structure, types, sources, and biosynthesis and functions secondary metabolites..	K2	
	CO3: Understand the structure and functions of plant hormones	K3	
	CO4: Discuss about free radicals, types and its harmful effects. Role of enzymatic and non-enzymatic antioxidant in defence mechanism, prevention in disease	K4	
	CO5: Justify the plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-inflammatory properties	K5	

Learning Resources	
Text Books	1. Singh M.P and Panda. H2005. Medicinal Herbs with their formulations, Daya publishing house, Delhi 2. Plant Physiology-Devlin N.Robert and Francis H.Witham,CBS Publications 3. Molecular activities of plant cell – An Introduction to Plant Biochemistry. John. W. 4. Anderson and John Brardall, Black well Scientific Publications, 1994.

Reference Books	1. Khan, I.A and Khanum.A2004.Role of biotechnology in medicinal and aromatic plants, Vol.1and Vol.10, Ukka 2 publications, Hyderabad. 2. Plant Biochemistry and Molecular Biology – Hans Walter Heldt, Oxford University, 4th Edition, 2010 3. Plant biochemistry (2008), Caroline bowsher, Martin steer, Alyson Tobin, garland science.
Website Link	https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads https://syukur16tom.files.wordpress.com/2016/01/lect1f-intro-2016-ppt-color.pdf https://www.studocu.com/in/document/university-of-agricultural-sciences-dharwad/agriculture/biochemistry-notes/45303819
Self-Study Material	https://link.springer.com/book/10.1007/978-94-007-1712-1

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M6UBCC10	PLANT BIOCHEMISTRTY AND PLANT THERAPEUTICS	DSC THEORY - X	VI	5	5	-	-	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	M	M	S	S	S
CO2	S	M	S	S	S	S	S	S	M	S
CO3	S	M	M	M	S	S	M	M	M	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

List of Foundation Course (FC) offered for the B.Sc., Biochemistry
Syllabus – LOCF – CBCS Pattern
Effective from the academic Year 2023 – 2024 onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	I	23M1UBCFC1	Fundamentals of Biochemistry

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCFC1	FUNDAMENTALS OF BIOCHEMISTRY	FC - I	I	2	2			2
Objective	The students acquire the knowledge about an overview of entry education, academic skills, laboratory skills, research, determination, interest, and laboratory reagent preparation.							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	Overview of Biochemistry: Definition, Importance and significance of Biochemistry, Important discoveries in Biochemistry, scope of Biochemistry in different fields – in agriculture, pharmacy, nursing etc.., scope of clinical Biochemistry, Biochemistry Job opportunities.						K2	7
II	Chemical Characteristics of living matter: Biological macromolecules and importance of Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus and Sulphur in life's chemistry, Chemical bonding (covalent, ionic, Hydrogen, Van der Waal's, hydrophobic bonds) in Biological macromolecules						K2	8
III	Water and life: Molecular structure of water, Unique physical and chemical properties of water that support life, Effects of water on Biomolecules – hydrogen bonding in water and its importance in maintain the shape, stability and properties of biological macromolecules, Effects of non-polar compounds on water, Preparation of distilled water.						K2	8
IV	Introduction to Biochemistry Lab: Understanding of Lab Protocols, Safety aspects in Biochemical Laboratory. Glossary of technical terms in Biochemistry, Calibration of instruments and pipettes, Concentration units: Mole, mole fraction, Molarity, Equivalent weight, Normality, Molality, percentage. Biochemical reagent preparations for various solutions with respect to different Normality, Molarity, % Solutions (W/V), (V/V) (Problems to be worked out), Use of microscope in laboratory.						K3	8
V	Buffers: Buffers, buffer action, buffer capacity, Henderson – Hassel Balch equation, its limitations and uses, laboratory use of buffers, physiological importance of buffers in body fluids and tissues. Measurement of pH: indicators, pH meter, different types of electrodes, advantages and disadvantages of different electrodes, principle, working, application, factors affecting pH determination.						K3	9
Course Outcome	CO1: To become aware of basic knowledge about Biochemistry course						K2	
	CO2: To understand the chemical Characteristics of living matter						K2	

	CO3: To describe the importance of water in life	K2	
	CO4: To acquire knowledge on the preparation of lab solutions	K3	
	CO5: To illustrate buffers in body fluids and tissues and measurement of pH.	K3	

Learning Resources	
Text Books	1. Fundamentals of Biochemistry, J.L.Jain, Sunjay Jain, Nitin Jain, 2013, 7th edition S.Chand & Company Ltd. 2. Voet.D, Voet.J.G.and Pratt, C.W, 2004, Principles of Biochemistry, 4th edition John Wiley & Sons, 3. David T Plummer, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw-Hill
Reference Books	1. J. Jayaraman Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015 2. S. Sadasivam A. Manickam Biochemical Methods New age International Pvt Ltd publisher's third edition 2018 3. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.
Website Link	1. https://www.pdfdrive.com/biochemistry-books.html

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

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1UBCFC01	FUNDAMENTALS OF BIOCHEMISTRY	FC - I	I	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	M	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	M	M	M	S	S	S	S	S
CO4	M	S	M	M	S	S	S	S	S	S
CO5	S	M	M	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	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE
Assessment Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation

Designed By	Verified By	Approved by Member Secretary
Mrs.M.Priyanga Gandhi	Mr.P.Tamilmani	Dr.S.Shahitha

List of Elective Course (DSE) details for B.Sc., Biochemistry
Syllabus – LOCF – CBCS Pattern
Effective from the academic Year 2023 – 2024 onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	V	23M5UBCE01	Immunology
2	V	23M5UBCE02	Biochemical pharmacology
3	V	23M5UBCE03	Bioinformatics
4	VI	23M6UBCE04	Research methodology
5	VI	23M6UBCE05	Bioentrepreneurship
6	VI	23M6UBCE06	Biotechnology

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCE01	**IMMUNOLOGY**	**DSE - THEORY - I**	**V**	**5**	**3**	**2**	**-**	**4**
Objective	To learn about the immune system's structure, functions, antibodies, adaptive immune response, immunity types, vaccines, diseases, transplantation, Ag-Ab interaction, and immunological techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Primary lymphoid organs**: Structure and function of primary lymphoid organs (thymus, bone marrow), secondary lymphoid organs (spleen, lymph node), Cells involved in immune system- Functions- Phagocytes - Inflammation	K2	12
II	**Antigens:** - Nature, Immunogens, and hap tens, cross reactions - Immunoglobulin types- structure and function. Cells involved in antibody formation, Clonal selection theory, Cooperation of T-cell with B-cell. Differentiation of T and B lymphocyte -Hum oral and cell mediated immunity. Monoclonal antibody – Production and application in biology.	K3	12
III	**Immunity and its types:**-Innate, Acquired, active and passive.- Natural and Artificial -Commonly used toxoid vaccines, killed vaccines, live attenuated vaccines, r DNA Vaccines, DNA and sub unit vaccines	K3	12
IV	**Hypersensitivity:** – Immediate (Type 1) and Delayed (Type IV), Auto-immune diseases with examples. Organ specific and systemic autoimmunity. SLE, RA. Transplantation –Types of Grafts, structure& functions of MHC, graft Vs. host reaction, immunosuppressive Agents.	K4	12
V	**Antigen-antibody reactions**: General features of Antigen Antibody reactions. Precipitation, Immuno diffusion, SID and DID -Ou din Procedure, Oakley Fulthrope Procedure, Radio immunodiffusion, Ouchterlony double diffusion, CIE, Rocket electrophoresis, Wassermann's reaction, RIA, ELISA. **Current Trends-* DNA Damage and Repair Mechanisms***	K4	12
	…… Self Study.		
	CO1: Understand the structure and function of the organs involved in our body's natural Defense	K2	
	CO2: Sketch the antigens and antibodies and the role of lymphocytes in defending the host	K3	
	CO3: Discover the types of immunity and the uses of vaccines	K3	
	CO4: Correlate the immune related diseases and mechanism of transplantation	K4	
	CO5: Examine the immunological tests and relate it to the immune status of an Individual	K4	
Learning Resources			

Text Books	1. Kuby, J. (2018). Immunology (5th ed). W.H. Freeman - ISBN-10: 1319114709 / ISBN-13: 978-1319114701 2. Rao, C. V. (2017). Immunology (3rd Ed.). Chennai: Alpha Science Int. Ltd - ISBN-10: 1842652559/ ISBN 13:978-1842652558 3. Tizard (1995). An Introduction to Immunology. Harcourt Brace College Publications
Reference Books	1. Kenneth M. Murphy, Paul Traverse, Mark Walport - (2007), Jane way's Immuno biology, 7thedition, Garland Science. 2. Abdul K. Abbas, Andrew H. Lichtman, Jordan S. Pober - (1994), Cellular and molecular immunology, 2ndedition, B. Saunders Company. Page 68 of 116 3. Basic Immunology Functions and Disorders of the Immune System, 6th Edition - January 25, 2019 Authors: Abdul Abbas, Andrew Lichtman, Shiv Pillai, ISBN: 9780323549431eBook ISBN: 9780323639095 4. Peter Delves, Sea mus Martin, Dennis Burton, Ivan Roitt - (2006), Roitt's Essential Immunology, 11th edition, Wiley-Blackwell
Website Link	1. https://onlinecourses.nptel.ac.in/noc22_bt40/preview 2. https://onlinecourses.swayam2.ac.in/cec20_bt05/preview 3. https://youtube.be/8uahFPl6ny8
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121356

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**	
23M5UBCE01	**IMMUNOLOGY**	**DSE - THEORY - I**	**V**	**5**	**3**	**2**	**-**	**4**	

CO -PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S	S	M	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	S	M	M	M	S	S	M	S	M	S
CO4	S	M	M	M	S	S	S	S	M	S
CO5	S	M	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
T.Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCE02	BIOCHEMICAL PHARMACOLOGY	DSE THEORY-II	V	5	3	2	-	4
Objective	This course provides an introduction on pharmacology and explains drug metabolism, adverse reactions, side effects, and common metabolic disorders, as well as the action of antibiotics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Drugs** – classification based on sources, routes of drug administration - Oral/Enteral, Parenteral and Local application. Absorption of drugs, factors influencing drug absorption, distribution and excretion of drugs	K2	12
II	**Drug metabolism** - Phase I and Phase II reactions, role of cytochrome P450, nonmicrosomal reactions of drug metabolism. Factors influencing drug metabolism. Therapeutic index	K3	12
III	**Drug allergy, Drug tolerance** - IC 50, LD50 of a drug, Drug intolerance, Drug addiction, Drug abuses and their biological effects. Drug resistance - biochemical mechanism	K3	12
IV	**Therapeutic Drugs** - Analgesics and Non-steroidal anti-inflammatory drugs (NSAIDs) – Aspirin and Acetaminophen. Insulin, Oral antidiabetic drugs - Sulfonylureas, Biguanides. Antihypertensive drugs - ACE inhibitors, Calcium channel blockers. Anti-cancer agents – Antimetabolites	K4	12
V	**Antibiotics** - Definition, Examples and Biochemical mode of action of penicillin, streptomycin, tetracycline and chloramphenicol. **Current Trend - *Drug toxicity***	K4	12
	…… Self Study.		
	CO1: Classify the different routes of drug administration, describe the absorption, distribution, metabolism and excretion of drugs.	K2	
	CO2: Compute the mechanism of actions of major drugs related to inflammation, diabetes, hypertension and cancer	K3	
	CO3: Illustrate the various adverse response and side effects of drugs.	K3	
	CO4: Apply biochemical principles to explain drug metabolism, including phase I and phase II reactions, drug-drug interactions, and factors influencing drug clearance	K4	
	CO5: Outline the importance and explain the mode of action of important antibiotics.	K4	

Learning Resources	
Text Books	1. N. Murugesh, A concise text book of Pharmacology –Sathya Publishers. Eight edition 2022. 2. Jayashree Ghosh, A Textbook of Pharmaceutical chemistry –S. Chand & Company Ltd. 2010. 3. S C Metha, Ashutosh Kar, Pharmaceutical Pharmacology –New Age International (P) Limited,

	Publishers. 2011.
Reference Books	1. Richard D. Howland, Mary Julia Mycek, Richard A. Harvey, Pamela C. Champe. Lippincott's illustrated Reviews- Pharmacology, Lippincott Williams & Wilkins, Philadelphia, New Delhi. 2006 2. David. E. Golan, Principles of Pharmacology, Wolters Kluwer (India) Pvt.Ltd. 4th edition 2016. 3. RS Satoskar, Nirmala Rege, SD Bhandarkar. Elsevier Pharmacology and pharmacotherapy. - ISBN-10: 9788131248867 / ISBN-13: 978-8131248867, 2017. 4. Tripathi, K. Essentials of Medical Pharmacology. Jaypee Publishers- ISBN-10: 9350259370 / ISBN-13: 978- 9350259375. 2018
Website Link	1. https://slideplayer.com/slide/3728296/64/video/What+is+bioremediation%3F.mp4 2. https://www.osmosis.org/learn/Pharmacokinetics:_Drug_absorption_and_distribution
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1117023

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M5UBCE02	BIOCHEMICAL PHARMACOLOGY	DSE THEORY-II	V	5	3	2	-	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	M	S	S	M	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	M	S	M	S	S	S	M	M	S
CO4	S	S	S	M	S	S	S	M	S	S
CO5	S	S	S	M	S	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Dr.M.DEVI	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE03	**BIOINFORMATICS**	**ELECTIVE THEORY -III**	**V**	**5**	**5**	**-**	**-**	**4**
Objective	**To learn about visualization tools and structural genomics.**							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Bioinformatics** – Bioinformatics and its applications. – Genome, Metabolome - Definition and its applications. Metabolome – Metabolome database-E.coli metabolome database, Human Metabolome database. Transcriptome - Definition and applications.	K2	12
II	**Biological Databases** - definition, types and examples – Nucleotide sequence database(NCBI, EMBL, Genebank, DDBJ) Protein sequence database-SwissProt, TrEMBL, Structural Database - PDB, Metabolic database-KEGG.	K2	12
III	**Sequence Alignment-**Local and Global alignment-Dot matrix analysis, PAM, BLOSUM. Dynamic Programming, Needle man- Wunch algorithm, Smith waterman algorithm. Heuristic methods of sequence alignment.	K3	12
IV	**BLAST-**Features, types (BLASTP, BLASTN, BLASTX), PSI BLAST, result format. DNA Micro array-Procedure and applications.	K3	12
V	**Structural genomics:** Whole genome sequencing (Shotgun approach), Comparative genomics-tools for genome comparison, VISTA servers and p recomputed tools. Molecular visualization tools. RASMOL, Swiss PDB viewer. Nutrigenomics. Definition and applications. **Current Trend : *Drug designing-Virtual Techniques***	K4	12
	Self-Study *----------*		
	CO1: Recall the fundamentals of Bio informatics and its applications Genome.	K1	
	CO2: Classify biological database and to correlate the different file formats Used by nucleic acid, protein database, metabolic data base**.**	K2	
	CO3: Write the algorithms for interpreting biological data.	K3	
	CO4: Compare the concepts of sequence alignment and its types. The tool used to detect the expression of genes .	K3	
	CO5: Apply the various tools employed in genomics study and protein visualization, entire genome by shot gun method .	K4	

Learning Resources	
Text Books	1. Rui Jiang Xuegong Zhang and Michael Q. Zhang Editors by Basic of Bioinformatics 4'th edition2009

	2. Supratim Choudhuri (Author) Bioinformatics for Beginners Genes, Genomes, Molecular Evolution, Databases and Analytical Tools 2008. 3. Arthur Lesk . Introduction to Bioinformatics 3'rd edition2009.
Reference Books	1. S Balamurugan, Anand T. Krishnan, Danish Goyal, BalakumarChandrasekaran Computation in BioInformatics Multidisciplinary Applications. 2. Navneet Sharma PhD Pharmaceutics, HimanshuOjha, PawanRaghav, Ramesh K. Goyal Chemoinformatics and Bioinformatics in the Pharmaceutical Sciences
Website Link	1. https://nptel.ac.in/courses/102/106/102106065/ 2. http://www.digimat.in/nptel/courses/video/102106065/L65.html 3. https://www.slideshare.net/sardar1109/bioinformatics-lecture-notes
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1185420

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE03	**BIOINFORMATICS**	**ELECTIVE THEORY -III**	**VI**	**5**	**5**	**-**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**M**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**M**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**M**
CO5	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**S**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule			
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		
Designed By	**Verified By**	**Approved by Member Secretary**	
M.PRIYANGAGNDHI	Mr.P.Tamilmani	Dr.S.Shahitha	

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE04	**RESEARCH METHODOLOGY**	**DSE THEORY IV**	**VI**	**5**	**5**	**-**	**-**	**3**
Objective	Students can gain information about research components, experimental design, literature survey, statistical analysis, computation importance, and hands-on experience in writing research reports.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Characteristics and types of Research**, Research Methods versus Methodology, Research designs in Biochemistry: experimental, *in vitro, in vivo, in situ*, clinical trials. Identification and criteria of selecting a research problem (Hypothesis); Formulation of objectives; Research plan and its components.	K2	12
II	**Experimental design** - Objective, Design of work, Guidelines for design of experiments, Literature Search - Databases for literature search, Material and methods, Designing biological experiments, Compilation and documentation of data.	K3	12
III	**Statistical Analysis:** Measures of variation - standard deviation, Non-linear regression, Standard error. Analysis of variance for one-way and two-way classified data and multiple comparison procedures. Significance - students "t" test, chi-square test. Dunnet's test.	K3	12
IV	**Computer and its role in research**: Basics of MS word, MS Excel: tabulation, calculation and data analysis, preparation of graphs, histograms and charts. Use of statistical software SPSS. Power Point: preparation of presentations and scientific poster designing.	K4	12
V	**Scientific writing for journals** - Preparation of Abstract, Impact factor, h-index, i-10 index, citation index, Dissertation/Thesis writing: format, content and chapterization, writing style, drafting titles & sub-titles, captions and legends. Writing results, discussion and conclusions. Bibliography and references, referencing style - Harvard and Vancouver systems, Appendices and acknowledgement; Ethical issues in research; Intellectual property right and plagiarism. **Current Trend : *Mean, Median and mode***	K5	12
	Self Study *……*		
	CO1: Explain the types of research and formulate and plan the research.	K1	
	CO2: Describe the experimental setup, review the literature, compile and document the data. .	K2	
	CO3: Analyze and validate the experimental data using statistical tools	K3	
	CO4: Interpret the data using computational tools.	K4	
	CO5: Evaluate the research report, present results findings and publish ethically.	K5	

Learning Resources	
Text Books	1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers. 2. Kothari, C.R., Research Methodology: Methods and Techniques. 2004, New Age International. 3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications.2 volumes. 4. Gurumani.N, Research Methodology for biological Sciences, 2014, MJP Publishers.
Reference Books	1. Dr. Prabhat Pandey, Dr.Meenu Mishra Pandey, Research Methodology: Tools and Techniques 2015 2. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications. 3. Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
Website Link	1. https://explorable.com/research-methodology 2. http://www.scribbr.com 3. http://www.open.edu
Self-Study Material	https://www.britannica.com/science/mean-median-and-mode

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

B.Sc. -Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE04	**RESEARCH METHODOLOGY**	**DSE THEORY IV**	**VI**	**5**	**5**	**-**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO3	**M**	**M**	**S**	**M**	**S**	**M**	**M**	**S**	**S**	**S**
CO4	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Dr.Mohan Prabhu	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE05	**BIOENTREPRENEURSHIP**	**DSE THEORY - V**	**VI**	**5**	**5**	**-**	**-**	**3**
Objective	The students can gain knowledge about effective advertising often involves market research, understanding consumer behavior, and crafting compelling messages that resonate with the targeting							

Unit	Course Content	Knowledge Levels	Sessions
I	**Bio entrepreneurship**; Introduction to Bio entrepreneurship; Types of industries – Biopharma, Bio agriculture and CRO; Introduction to Trademarks, Copyrights and patents.	K2	12
II	**Business Plan, Budgeting and Funding Idea or opportunity**; Business proposal preparation; funds/support from Government agencies like MSME/banks, DBT, BIRAC, Start-up and make in India Initiative; dispute resolution skills; external environment changes; avoiding/managing crisis; Decision making ability.	K3	12
III	**Market Strategy**- Basics of market forecast for the industry; distribution channels –franchising, policies, promotion, advertising, branding and market; Introduction to information technology for business administration and Expansion.	K3	12
IV	**Legal Requirements,** Finance and Accounting; Registration of company in India; Ministry of Corporate Affairs (MCA); basics in accounting: introduction to concepts of balance sheet, profit and loss statement, double entry, book keeping; finance and break-even analysis; difficulties of entrepreneurship in India.	-K4	12
V	**Role of knowledge centers;** such as universities, innovation centers, research institutions (public & private) and business incubators in Entrepreneurship development; quality control and quality assurance; Definition, role and importance of CDSCO, NBA, GLP, GCP**, GMP.** **Current Trends-* Mushroom cultivation ***	K4	12
	Self -Study*……*		
	CO1: Understand the concept and scope for entrepreneurship	K2	
	CO2: Identify various operations involved in a venture creation	K2	
	CO3: Apply the funding formula and launching a winning business	K3	
	CO4: Illustrate the nurture of the organization and harvest the rewards	K4	
	CO5: Predict about the Business incubator centers and Bio entrepreneurship	K4	

Learning Resources	
Text Books	1. Adams, D. J. (2008). Enterprise for life scientists: Developing innovation and entrepreneurship in the bioscience. Bloxham: Scion - ISBN 10: 1904842364 / ISBN 13: 9781904842361 2. Shimasaki, C. (2014). Biotechnology Entrepreneurship: Starting, managing, and Leading Biotech Companies. Academic London Press - ISBN 10: 0124047300 / ISBN 13: 9780124047303

	3. Kapeleris, D. H. (2006). Innovation and entrepreneurship in biotechnology: Concepts, theories & cases - ISBN-13: 978-1482210125, ISBN-10: 1482210126
Reference Books	1. Desai, V. (2009). The Dynamics of Entrepreneurial Development and Management New Himalaya. New Himalaya House Delhi:pub - ISBN : 9789350440810 9350440814 2. Ono, R. D. (1991). The Business of Biotechnology, From the Bench of the Street. Butter worth Heinemann - ISBN 10: 1138616907 / ISBN 13: 9781138616905 3. Jordan, J. F. (2014). Innovation, Commercialization, and Start-Ups in Life Sciences. London: CRC Press - ISBN-10 : 812243049X ,ISBN-13 : 978-8122430493
Website Link	1. http://www.simply notes.in/e-notes/mbabba/entrepreneurship-development/ 2.https://www.studocu.com/in/document/jamia-millia-islamia/bioethics-biosafety/bio- entrepreneur-and-its-characteristics/19386932 3. https://onlinecourses.nptel.ac.in/noc21_mg70/preview
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=3019265

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE05	**BIOENTREPRENEURSHIP**	**DSE THEORY - V**	**VI**	**5**	**5**	**-**	**-**	**3**

CO -PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**M**	**S**	**S**	**S**	**M**	**S**	**M**	**S**	**S**
CO2	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**M**	**S**	**S**
CO3	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**M**	**S**	**S**
CO4	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**M**	**S**	**S**
CO5	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**M**	**S**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation	
Assessment Methods	Class Test, Unit Test, Assignment, CIA -I, CIA -II and ESE	
Designed By	**Verified By**	**Approved by Member Secretary**
T.Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCE06	**BIOTECHNOLOGY**	**DSE THEORY VI**	**VI**	**5**	**5**	**-**	**-**	**3**
Objective	To gain information about gene transfer technology, Tissue culture technology and Molecular techniques							

Unit	Course Content	Knowledge Levels	Sessions
I	**Recombinant DNA technology** : Recombinant DNA technology - Principles of gene cloning: restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, linkers and adapters, homo polymer tailing, end labeling and construction maps of pBR322, λ bacteriophage.	K2	12
II	**Plant Tissue culture:** Plant tissue culture- basic requirements for culture, M S medium, callus culture, protoplast culture. Vectors – Ti plasmid (cointegration vector and binary vector), viral vectors- TMV, CaMV and their applications. Transgenic plants – pest resistant, herbicide resistant and stress tolerant plants.	K3	12
III	**Animal Tissue culture**: Animal cell lines and organ culture - culture methods and applications. Transgenic animals: transgenic mice- Production and its applications. Stem cell technology: definition, types, and applications.	K3	12
IV	**Molecular Techniques :** PCR –Principle, types and its application in clinical diagnosis and forensic science. Southern blotting, Northern blotting and DNA finger printing Technique-principle and their applications.	K4	12
V	**Fermentation technology:** Fermentation technology – Ferments - general design, fermentation processes - Media used, downstream processing. Production and applications of ethanol, Streptomycin and Protease. Production of edible vaccines. **Current Trends-* Synthesis of Human Growth Hormone by rDNA technology ***	K5	12
	Self Study *……*		
	CO1: Define the rDNA technology, DNA manipulation, and use of restriction endonuclease.	K1	
	CO2: **S**ummarize to get acquainted with the use of cloning and vectors in plant tissue culture.	K2	
	CO3: Classify the structure and functions of production of proteins using recombinant DNA technology and their applications, basics of tissue culture,trans genesis, stem cell technology	K3	
	CO4: Analyze the process of gain knowledge about the importance of gene and gene manipulation technologies.	K4	
	CO5: Evaluate the role of different. Know the concept fermentation technology and its applications	K5	

Learning Resources	
Text Books	1. James D. Watson, Amy A. Caudy , Richard M. Myers , Jan Witkowski Recombinant DNA: Genes and Genomes - a Short Course (3rd ed), W.H.Freeman& Co (2006) 2. Satyanarayana U (2008), Biotechnology, Books & Allied (P) Ltd 3'rd edition (2008). 3. Cassida L Industrial Microbiology, New Age International 2007
Reference Books	1. Reed G Prescott and Dunn's Industrial Microbiology, CBS Publishers & Distributors (2004) 2. Biotechnology: applying the genetic revolution- David P. Clark, Pazdernik N. J, Elsevier (2009). 3. Click B.R. and Pasternark J.J . Molecular Biotechnology: Principles and Applications of Recombinant DNA. (4th ed) American Society for Microbiology 2010.
Website Link	1. https://nptel.ac.in/courses/102/103/102103041/ Coursera Certification course –Vaccines 2.https://futureoflife.org/background/benefits-risks-biotechnology/ https://www.sciencedirect.com/topics/neuroscience/genetic-engineering 3.http://www.biology discussion.cm/biotechnology/techniques-
Self-Study Material	https://www.britannica.com/science/growth-hormone

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

B.Sc. -Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M6UBCE06	**BIOTECHNOLOGY**	**DSE THEORY VI**	**VI**	**5**	**5**	**-**	**-**	**3**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	M	S	S	S	M	M	S	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	M	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
M.Priyanga Gandhi	Mr.P.Tamilmani	Dr.S.Shahitha

List of Skill Enhancement Course (SEC) offered for the B.Sc., Biochemistry
Syllabus – LOCF – CBCS Pattern
Effective from the academic Year 2023 – 2024 onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	II	23M2UBCS01	First Aid
2	III	23M3UBCS02	Medical Laboratory technology
3	III	23M3UBCS03	Basics of forensic science
4	IV	23M4UBCS04	Medical coding
5	IV	23M4UBCS05	Microbial techniques
6	IV	23MXUBCS06	Biomedical Instrumentation
7	IV	23MXUBCS07	Tissue culture

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCS01	FIRST AID	SEC- I	II	2	2			2
Objective	The students imparting knowledge on first aid basics, performing respiratory issues, demonstrating injury treatments, learning emergency techniques, and familiarizing oneself with poisoning							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Aims and important rules of first aid, dealing with emergency, types and content of a first aid kit. First aid technique – Dressing and Bandages, fast evacuation technique, transport techniques.	K1	6
II	Basics of Respiration – CPR, first aid during difficult breathing, drowning, choking, strangulation and hanging, swelling within the throat, suffocation by smoke or gases and asthma.	K2	6
III	Common medical aid- first aid for wounds, cuts, head, chest, abdominal injuries, shocks, burns, amputations, fractures, dislocation of bones.	K2	6
IV	First aid related to unconsciousness, stroke, fits, convulsions-seizures, epilepsy	K3	6
V	First aid in poisonous bites (Insects and snakes), honey bee stings, animal bites, disinfectant, acid and alkali poisoning.	K3	7
Course Outcome	CO1:Discuss on the rules of first aid, dealing during emergency and first aid techniques	K1	
	CO2: Understand the first aid techniques to be given during different types of respiratory problems	K2	
	CO3: Provide first aid for injuries, shocks and bone injury	K2	
	CO4: Detail on the first aid to be given for unconsciousness, stroke, fits and convulsions	K3	
	CO5: Gain expertise in giving first aid for insect bites and chemical poisoning	K3	

Learning Resources	
Text Books	1) First aid and health Dr. Gauri Goel, Dr. Kumkum Rajput, Dr.Manjul Mungali 1SBN-978-93-92208-19-5 2) Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf 3) Red Cross First Aid/CPR/AED Instructor Manual
Reference Books	1) Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf 2) Red Cross First Aid/CPR/AED Instructor Manual

Website Link	1) https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online 2) https://www.firstaidforfree.com/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2UBCS01	FIRST AID	SEC- I	II	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCS02	**MEDICAL LABORATORY TECHNOLOGY**	**SEC - II**	**III**	**2**	**2**	**-**	**-**	**2**
Objective	To gain knowledge about construction of new well equipped diagnostic laboratory							

Unit	Course Content	Knowledge Levels	Sessions
I	**Collection, transport, analysis of specimen:** – blood, routine urine, feces, sputum, semen, CSF Documentation of samples & results. Disposal of laboratory/ hospital waste-Noninfectious waste, biomedical waste, infected sharp waste disposal, infected non sharp disposal – color coding as per guidelines.	K2	6
II	**Determination of Blood group:** And Rh factor -Basic blood banking procedures- cross matching, screening test. Blood transfusion and hazards.	K3	6
III	**Estimation of blood sugar** – Enzymatic method, HbA1C, Qualitative and quantitative analysis of urine sample- NP N-urea, uric acid, creatinine. Mineral, vitamin and CSF analysis	K3	6
IV	**Immuno diagnostics** -Widal test, VDRL test, ASO, RA, CRP and Complement fixation Test. RIA, ELISA, Skin test – Montaux and Lepramin test.	K4	6
V	**Assay of clinically important enzymes**- Estimation of clinically important hormones –Insulin, Thyroid and Reproductive hormones and its clinical significance. **Current Trend** *Gene therapy*	K5	6
	…… Self Study.		
	CO1: Collect & preserve of biological samples.	**K2**	
	CO2: Estimate the various constituents in biological sample	**K2**	
	CO3: Perform the routine procedures adopted in blood bank	**K3**	
	CO4: Analyze and interpret the values for both normal and disease Conditions.	**K4**	
	CO5: Discover the enzymes and hormones &interpret clinical implications	**K4**	

Learning Resources	
Text Books	1. Kanai L Mukherjee and Anuradha Chakravarthy Medical Laboratory Technology IVth edition, Vol I, 2022 2. Ramnik Sood, Text Book of Medical Laboratory Technology, Jaypee Publishers, 2006

Reference Books	1. Tietz, N. (2018) Fundamentals of Clinical Chemistry and Molecular Diagnostics 8th edition, W.B. Saunders Company			
Website Link	1. https://www.slideshare.net/AJAYSubedi3/agglutination-test-antigen-antibody-reaction 2. https://microbenotes.com/introduction-to-precipitation-reaction/			
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121139			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc. Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**		**Course Type**	**SEM**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCS02	**MEDICAL LABORATORY TECHNOLOGY**		**SEC - II**	**III**	**2**	**2**	**-**	**-**	**2**

CO -PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	M	S
CO3	S	M	M	M	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA -I, CIA -II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
T. Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCS03	**BASICS OF FORENSIC SCIENCE**	**SEC -III**	**III**	**2**	**2**	**-**	**-**	**2**
Objective	To gain knowledge on forensic analysis practices, perform investigations using fresh blood, body fluids, and identify drugs and poisons in body fluids, and execute identification tests on multiple samples.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Forensic Science**: Definition, History and Development. Crime scene management and investigation; collection, preservation, packing and forwarding of physical and trace evidences for analysis.	K2	12
II	**Blood** – grouping and typing of fresh blood samples including enzyme .Cases of disputed paternity and maternity problems, DNA profiling.	K2	12
III	**Analysis of body fluids**- Analysis of illicit liquor including methyl and ethyl alcohol in body fluids and breathe. Chemical examination, physiology and pharmacology of Insecticides and pesticides.	K4	12
IV	**Psychotropic drugs** -Sedatives, stimulants, opiates and drugs of abuse. Identification of poisons from viscera, tissues and body fluids	K3	12
V	**Identification tests**- Identification of hair, determination of species origin, sex, site and individual identification from hair. Classification and identification of fibers. Examination and identification of saliva, milk, urine and faecal matter**. Current trends - *Criminalistics***	K4	12
	…… Self Study.		
Course Outcome	CO1: Understand about the basics and different branches of forensic Sciences.	K2	
	CO2: Demonstrate various techniques for the analysis of body fluids	K2	
	CO3: Assess the presence of alcohol ,insecticides and pesticides, presence of drugs and poisons in body fluids	K4	
	CO4: Identify the drugs, species and sex from the available body fluids	K3	
	CO5: Analyze the different crime scenario and able to make decision based on analysis of crime exhibits	K4	

Learning Resources	
Text Books	1. An Introduction to Forensic DNA Analysis by Norah Rudin & Keith Inman USA, Second edition. 2. Forensic Science Handbook, Volume 2 & 3 by Saferstein, Richard E.

Reference Books	1. Forensic Medicine by Adelman, Howard C & Kobilinsky, Lawrence Page 24 of 63 2. Forensics by Embar-Seddon, Ayn and Pass. Allan D.
Website Link	1. https://www.studocu.com/in/document/punjabi-university/llb/forensic-science-notes/19780931 2. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000016FS/P000699/M011528/ET/1516257136FSC_P12_M2_e-text.pdf
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1031828&ppg=51

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCS03	**BASICS OF FORENSIC SCIENCE**	**SEC THEORY -III**	**III**	**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	M	S	S	M
CO2	M	S	S	M	S	S	S	S	S	M
CO3	M	S	S	S	S	S	S	S	S	S
CO4	M	S	S	M	S	S	M	S	S	S
CO5	M	S	S	S	M	S	S	S	S	M
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS04	**MEDICAL CODING**	**SEC - IV**	**IV**	**2**	**2**	**-**	**-**	**2**
Objective	To Acquire knowledge about the fundamentals of medical coding, medical terminology, disease classification based on WHO/AHA, and the American Medical Association's CPT code							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Medical Coding** - Introduction, coding theory, Health care Common Procedure Coding, First Aid and CPR.	K2	6
II	**Medical Terminology -** Introduction, specialization I & II, Diagnostic coding, factors affecting diagnostic coding.	K2	6
III	**Documenting medical records**- Importance of Documentation, Types of dictation formats.	K3	6
IV	**Anatomy:** Introduction to Human Anatomy and Coding, ICD-10- CM classification system.	K3	6
V	**CPT Coding**: Introduction, types of CPT coding Medical Law and Ethics. **Current trend - *Medical Billing***	K3	6
	…… Self Study.		
Course Outcome	**CO1:** Explaining the basic concept of coding and its application. Possess the knowledge about the First aid and CPR	K1	
	CO2: Possess the knowledge about medical terminology used in Medical coding industry	K2	
	CO3: Possess the knowledge about the ICD-10 CM international classification of diseases based on WHO	K2	
	CO4: Apply the knowledge about the CPT codes used for diseases as per American Medical Association (AMA)	K3	
	CO5: Organize CPT coding and its types	K3	

Learning Resources	
Text Books	1. Understanding Medical Coding, A comprehensive guide Sandra L Johnson Robin Linker 2. Buck's Step – by – step Medical Coding Elsevier reference
Reference Books	1. Terry Tropin M Shai, RHIA, CCS-P, AHIMAICD-10-CMcoding guidelines made easy 2017. 2. Besty J Shiland- Medical terminology and anatomy for ICD-10

Website Link	https://www.aapc.com/resources/what-is-cpt https://getinthepicture.org/sites/default/files/resources/Documenting%20Medical%20Records%20Handbook%20for%20Doctors_0.pdf https://www.capphysicians.com/articles/medical-record-documentation-time-essence			
Self-Study Material	https://www.aapc.com/resources/what-is-medical-billing			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS04	**MEDICAL CODING**			**SEC - IV**		**IV**	**2**	**2**	**-**	**-**	**2**
CO-PO Mapping										
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	**M**	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**L**	**M**
CO3	**M**	**S**	**S**	**M**	**S**	**M**	**M**	**S**	**M**	**M**
CO4	**M**	**S**	**S**	**S**	**S**	**S**	**M**	**S**	**S**	**L**
CO5	**M**	**M**	**M**	**S**	**S**	**S**	**M**	**S**	**M**	**M**
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			

Tutorial Schedule			
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		
Designed By	**Verified By**	**Approved by Member Secretary**	
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha	

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS05	**MICROBIAL TECHNIQUES**	**SEC – V**	**IV**	**2**	**2**	**-**	**-**	**2**
Objective	To Acquire knowledge about bacterial growth, microscope parts and uses, staining methods, culture methods, and food preservation techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Growth of bacteria-** Definition, growth phases, factors affecting growth (pH, temperature, and oxygen), cell count (hemocytometer, Bacterial cell- Bacillus subtilis), fungal cell (Saccharomyces) and human blood cell.	K2	6
II	**Microscopy-** Principle, types - Compound microscope, electron microscope- TEM, SEM, use of oil immersion objective.	K3	6
III	**Stains and staining-** Principles of staining, simple staining, negative staining, Differential staining, Gram and acid-fast staining, flagella staining, capsule and endospore Staining. Staining of yeast (methylene blue), lactophenol cotton blue, staining of mold (Penicillium, Aspergillus), Agaricus.	K3	6
IV	**Cultivation of bacteria–** Types of growth media (natural, synthetic, complex, enriched, selective- definition with example), culture methods (streak plate, spread plate, pour plate, stab culture, slant culture, liquid shake culture, anaerobiosis) - aerobic and Anaerobic bacteria.	K4	6
V	**Food microbiology-** Microbiological examination of food: microscopic examination and culture, phosphatase test of Pasteurized milk. Preservation of food- High temperature (boiling, pasteurization, appreciation), low temperature (freezing), dehydration, osmotic pressure, chemical preservations, radiation. Microorganisms as food SCP. **Current trend - * Wine Production***	K5	6
	…… Self Study.		
Course Outcome	**CO1:** Understand the growth of bacteria and to perform cell count	K2	
	CO2: Acquire knowledge of microscope and its uses	K3	
	CO3: Identify the microbes by staining methods	K3	
	CO4: Discover the Culture of microbes by various methods	K4	
	CO5: Evaluate and Preserve foods at high and low temperature	K5	
Learning Resources			

Text Books	1. Sherris Medical Microbiology, 7th Edition by Authors: Kenneth Ryan, C. George Ray, Nafees Ahmad, W. Lawrence Drew, Michael Lagunoff, Paul Pottinger, L. Barth Reller and Charles R. Sterling 2. Food Microbiology: Fundamentals and Frontiers, 5th Edition by Editor(s): Michael P. Doyle, Francisco Diez-Gonzalez, Colin Hill 3. Text book of microbiology by Ananthanarayan and Panicker's
Reference Books	1. Bailey& Scott's Diagnostic Microbiology, 14th Edition by Author: Patricia Title 2. Medical Microbiology, 7th Edition Authors: Patrick R. Murray, Ken S. Rosenthal and Michael A. Pfaller 3. Microbiology: Laboratory Theory and Application, 3rd Edition Authors: Michael J. Leboffe and Burton E. Pierce
Website Link	https://krishi.icar.gov.in/jspui/bitstream/123456789/20714/1/10_Staining%20methods.pdf https://www.britannica.com/science/bacteria/Growth-of-bacterial-populations https://www.davuniversity.org/images/files/study-material/methods%20for%20detecting%20food%20borne%20pathogens.pdf
Self-Study Material	https://link.springer.com/book/10.1007/978-0-387-74520-6

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M4UBCS05	**MICROBIAL TECHNIQUES**	**SEC – V**	**IV**	**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M	M	M	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	M	S	M	M	S	M	M	S	S	S
CO4	M	S	S	S	S	M	S	S	S	S
CO5	M	S	S	S	M	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation	
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE	
Designed By	**Verified By**	**Approved by Member Secretary**
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS06	**BIOMEDICAL INSTRUMENTATION**	**SEC - VI**	**IV**	**2**	**2**	**-**	**-**	**2**

Objective	To Acquire knowledge about the biochemical techniques includes spectrophotometry, centrifugation, electrophoresis, radioactivity etc.,		
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	K2	6
II	**Bioelectric signals and their recording** ,Bioelectric signals (ECG, EMG, EOG & ERG) and their characteristics	K3	6
III	**Biosensor**-mechanism and types. Autoanalyser- types and application. Automatic tissue processing and application of microtome.	K3	6
IV	**Advancements in Medical Diagnostic Technology:** Heart rate measurement pulse rate measurement, respiration rate measurement , blood pressure measurement, X- Ray Machine Basic X-Ray components, types of X-ray machines	K4	6
V	**Therapeutic instruments**. Introduction, types, life time, classification, power source and electrodes of cardiac pacemaker. **Current trend - *Angioplasty***	K4	6
	…… Self Study.		
Course Outcome	CO1: To attain the adequate knowledge about uses of instruments in medical field	K2	
	CO2: The students can gain knowledge about Bioelectric signals	K3	
	CO3: To gain knowledge of the role Biosensors in medical field	K3	
	CO4: Contrast the X-Ray technology	K4	
	CO5: Analyze the importance of Therapeutic instruments	K4	

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/			
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=832298&ppg=203 https://www.ncbi.nlm.nih.gov/books/NBK499894/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc. – Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS06	**BIOMEDICAL INSTRUMENTATION**		**SEC - VI**		**IV**	**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M	S	S	S	S	S
CO2	M	M	S	S	S	S	S	S	M	S
CO3	M	M	M	M	S	M	S	M	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			

Tutorial Schedule			
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		
Designed By	**Verified By**	**Approved by Member Secretary**	
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha	

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4UBCS07	**TISSUE CULTURE**	**SEC - VII**	**IV**	**2**	**2**	**-**	**-**	**2**

Objective	To gain knowledge about tissue culture techniques, growth medium preparation, gene transfer procedures, and their importance in producing and evaluating bioactive compounds in plants and animals.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction to Tissue culture**, Types- seed, embryo, Callus, Organ, Protoplast culture, Advantages and importance of tissue culture, Tools and techniques	K2	6
II	**Media and Culture Preparation** - pH, temperature, solidifying agents. Role of Micro and macro nutrients. Maintenance of cultures	K3	6
III	**Methods of gene transfer** in plants and animals - direct and indirect gene transfer Methods	K3	6
IV	**Cell culture technique** - Explants selection, sterilization and inoculation	K4	6
V	**Transgenic plants** for crop improvement. Transgenic plants for molecular farming. Animal Cloning - an overview - Applications of animal cell culture. **Current trend - *Regulations of GMF***	K4	6
	…… Self Study.		
Course Outcome	**CO1:** Understand about plant tissue culture	K2	
	CO2: Brief knowledge on preparation of tissue culture media	K2	
	CO3: Choose the different methods of gene transfer	K3	
	CO4: Gain knowledge on plant and animal cell culture techniques	K4	
	CO5: Study of applications of genetically modified plants and animals	K4	

Learning Resources	
Text Books	1. Trivedi, P.C.2000. Applied Biotechnology: Recent Advances. PANIMA Publishing Corporation. 2, Ignacimuthu. 1996. Applied Plant Biotechnology. Tata McGraw – Hill. 3.Lycett, G.W. and Grierson, D. (ed). 1990. Genetic Engineering of crop plants. 4.Grierson and Covey, S.N.1988. Plant Molecular biology.Blackie.
Reference Books	1. Gamburg OL, Philips GC, Plant Tissue & Organ Culture fundamental Methods, arias Publications. 1995. 2.Stewart Jr., C.N., "Plant Biotechnology and Genetics: Principles, Techniques and Applications" Wiley-Interscience, 2008.

	3.Freshney, R. I. (2010). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley-Blackwell, 2010.6th Edition. 4.Davis, J. M. (2008). Basic Cell Culture. Oxford University Press. New Delhi.
Website Link	https://www.britannica.com/science/tissue-culture https://en.wikipedia.org/wiki/Plant_tissue_culture https://microbeonline.com/animal-cell-culture-introduction-types-methods-applications/
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=2197272&ppg=216

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M4UBCS07	**TISSUE CULTURE**	**SEC - VII**	**IV**	**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M	S	S	S	S	S
CO2	M	M	S	S	S	S	S	S	M	S
CO3	M	M	M	M	S	M	S	M	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha

List of Non Major Elective Course (NMEC) for any Degree offered by the B.Sc., Biochemistry
Syllabus – LOCF – CBCS Pattern
Effective from the academic Year 2023 – 2024 onwards

S.No.	COURSE_CODE	TITLE OF THE COURSE
1	23M1UBCN01	Health and Nutrition
2	23M2UBCN02	Medicinal Diet
3	23M2UBCN03	Lifestyle Diseases

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCN01	**HEALTH AND NUTRITION**	NMEC - I	I	2	2			2
Objective	The learners can learn the basic health knowledge, understand vitamins, fat functions, minerals, carbohydrates, and proteins.							

Unit	Course Content	Knowledge Levels	Sessions
I	Health – definition, Factors affecting human health. Importance of health care of children, adults and elderly people. Balanced diet and calorific value.	K2	6
II	Vitamins-definition, classification, sources, properties, functions and deficiency symptoms. Recommended daily allowances.	K2	6
III	Sources and functions of dietary fats, role of fats in health and diseases	K3	6
IV	Minerals- Role of minerals on human health, sources, biological functions, deficiency disorders with special reference to Calcium, Phosphorus, Potassium, Copper, Iron, Zinc and Selenium. Minerals in biological systems and their importance –Iron, Calcium, Phosphorus, Iodine, Copper, Zinc.	K3	6
V	Role of proteins and carbohydrates in health. Functions of protein and carbohydrate and their calorific value. Dietary sources and deficiency disorders – Kwashiorkor and Marasmus – supplementation programs in India and their implications	K4	6
Course Outcome	CO1:Understand about the importance of health and diet	K2	
	CO2: Discuss about the classification properties and deficiencies of vitamins	K2	
	CO3: Identify the sources and functions of fats and lipids on health	K3	
	CO4: Select the different types of minerals and its role in health	K3	
	CO5: Relate the role of proteins and carbohydrates on health	K4	
Learning Resources			

Text Books	1.S.Davidson and J.R.Passmore (1986) Human Nutrition and Dietetics, (8th ed), Churchill Livingstone 2. J. S. Garrow, W. Philip T. James, A. Ralph (2000), Human Nutrition and Dietetics (10th ed), Churchill Livingstone 3. M.Swaminathan (1995) Principles of Nutrition and Dietetics, Bappco			
Reference Books	1. Margaret Mc Williams (2012). Food Fundamentals (10th ed), Prentice Hall			
Website Link	1. https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-differentages. 2. nhp.gov.in/healthyliving/healthydiet 3. www.anme.com.mx/libros/PrinciplesofNutrition.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1UBCN01	**HEALTH AND NUTRITION**	NMEC - I	I	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mrs.M.Priyanga Gandhi	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCN02	**MEDICINAL DIET**	NMEC - II	II	2	2			2
Objective	The students can acquire basic knowledge on diet, understanding diet modifications for GI, liver, infectious, diabetes, renal, and cardiovascular diseases, and prepares diet charts.							
Unit	**Course Content**					**Knowledge Levels**		**Sessions**
I	Principles of Therapeutic Diet: Definitions of Normal diet, Therapeutic diet, soft Diet and Liquid diet. Objectives of Diet Therapy. Advantages of using normal diet as the basis for Therapeutic diet. Normal Diet-therapeutic modification of normal diet.					K2		6
II	Diet modification in gastrointestinal diseases: Peptic ulcer, Diarrhea, Lactose intolerance, Constipation and Malabsorption syndrome					K2		6
III	Diet Modification in liver and gall bladder in diseases: Etiology, symptoms and dietary treatment in jaundice, hepatitis, cirrhosis of liver and hepatic coma					K3		6
IV	Diet Modification in Infectious Diseases: Fevers, Typhoid, Tuberculosis and Viral Hepatitis. Dietary modifications in Tuberculosis.					K3		6
V	Diet Modification in Diabetes, Renal and Cardio-vascular diseases-Diabetes, acute & chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension					K3		6
Course Outcome	CO1: Gain basic knowledge about diet					K2		
	CO2: Sketch diet plan for GI diseases					K2		
	CO3: Apply diet plan for liver diseases					K3		
	CO4: Choose a diet plan for Infectious diseases					K3		
	CO5: Prepare and select diet chart for Diabetes Renal and Cardio-vascular diseases					K3		
Learning Resources								

Text Books	**1.** M. Raheena Begum, A Text Book of Foods, Nutrition and Dietetics, Sterling Publishers Pvt. Ltd. **2.** M.V. Raja Gopal, Sumati. R., Mudambi, Fundamentals of foods and Nutrition, Wiley Eastern Limited, Year-1990. **3.** William S.R Nutrition and Diet Therapy, 1985, 5thedition, Mosly Co. St. Louis.			
Reference Books	1. Rodwell Williams Nutrition and Diet Therapy, 1985, the C.V Mosly St. Louis. 2. M.V. Krause & M.A. Mohan, Food Nutrition and Diet Therapy, 1992 by W.B Saunders Company, Philadelphia, London. 3. Davidson and Passmore, Human Methods and Diabetics, 1976 the English Language Book Society and Churchill.			
Website Link				
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCN02	**MEDICINAL DIET**	NMEC - II	II	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	S	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	S	M	M	S	S	M	S	S	S
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	M	M	M	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Dr.M.Devi	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCN03	**LIFESTYLE DISEASES**	NMEC - III	II	2	2			2
Objective	The students can aware of about lifestyle diseases among adolescents, explain their prevention, and educate women about health disorders, while also imparting life skills.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Lifestyle diseases: Definition, Factors contributing to lifestyle diseases – Physical inactivity, Poor food habits, disturbed biological clock, sleep deprivation.	K2	6
II	Top lifestyle diseases, Impact of Lifestyle diseases on family, society and economy of country	K2	6
III	Causes, symptoms**,** types, preventive measures and treatment of Obesity, cardiovascular diseases, diabetes and cancer	K2	6
IV	Women's lifestyle diseases : Polycystic Ovarian Disease, Infertility, Breast and cervical cancer and Osteoporosis	K3	6
V	Prevention of lifestyle diseases: Balanced diet, sufficient intake of water, physical activity, sleep-wake cycle, stress management and meditation.	K3	6
Course Outcome	CO1: Define Life style diseases and describe the contributing factors	K2	
	CO2: Enumerate the top life style diseases and its impact on life.	K2	
	CO3: Elaborate the treatment and prevention measures of common lifestyle diseases.	K2	
	CO4: Highlight the life style diseases that affects the women's health	K3	
	CO5: Illustrate the various measures for prevention of life style diseases	K3	

Learning Resources	
Text Books	1. JamesM R,LifestyleMedicine,2ndEdition,CRCPress,2013 2. AkiraMiyazaki,NewFrontiersinLifestyle-RelatedDisease,Springer,2008
Reference Books	1. Steyn K, Life style and related risk factors for chronic diseases 2. Willett WC, Prevention of chronic disease by means of diet and lifestyle. 3. Kumar M & R. Kumar,. Guide to prevention of lifestyle diseases. Deep & Deep publications

Website Link	1.https://youtu.be/jDdL2bMQXfE 2. https://youtu.be/7WnpSB14nDM 3. https://youtu.be/ollz9MqtW-U			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCN03	**LIFESTYLE DISEASES**	NMEC - III	II	2	2			2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**M**	**S**	**M**	**S**	**S**	**S**	**S**	**S**	**S**
CO2	**S**	**S**	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**S**
CO3	**S**	**S**	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**S**
CO5	**S**	**M**	**M**	**M**	**S**	**S**	**M**	**S**	**S**	**S**

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved by Member Secretary**
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

List of Allied Course for any Degree offered by the B.Sc., Biochemistry
Syllabus – LOCF – CBCS Pattern
Effective from the academic Year 2023 – 2024 onwards

S.No.	Sem	COURSE_CODE	TITLE OF THE COURSE
1	I	23M1UBCA01	Allied : Basic and Clinical Biochemistry
2	I	23M1UBCA02	Allied : Biological Chemistry
3	II	23M2UBCA03	Allied : Bioinstrumentation
4	II	23M2UBCA04	Allied : Microbial Physiology
5	III	23M3UBCA05	Allied : Clinical Laboratory Technology
6	IV	23M4UBCA06	Allied : Food Processing Technology

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCA01	BASIC AND CLINICAL BIOCHEMISTRY	GEC THEORY I	I	4	4	-	-	3
Objective	Develop a comprehensive understanding of the structure, function, and significance of carbohydrates, lipids, amino acids, and proteins in the context of essential biological processes.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Biomolecules -Carbohydrate – General properties, function, structure, classification– monosaccharides (Glucose, Fructose, Galactose), Oligoaccharides (Sucrose, Maltose, Lactose) and polysaccharides (Starch, Glycogen,) and biological significance. Lipids – General properties, functions, structure, classification (Simple, Derived and Complex), Cholesterol, LDL, HDL – biological significance.	K2	6
II	Biomolecules - Amino acids – General properties, functions, structure, classification and biological significance. Proteins– General structure, Properties, functions, classification and biological significance.	K2	6
III	Disorders of Metabolism: Disorders of carbohydrate metabolism: diabetes mellitus, ketoacidosis, hypoglycemia, glycogen storage diseases, galactosemia and lactose intolerance. Disorders of lipid metabolism: hyperlipidemia, hyperlipoproteinemia, hypercholesterolemia, hypertriglyceridemia, sphingolipidosis.	K3	6
IV	Disorders of Metabolism: Disorders of amino acid metabolism: alkaptonuria, phenylketonuria, phenylalaninemia, homocystineuria, tyrosinemia, aminoacidurias.	K3	6
V	Evaluation of organ function tests: Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions. Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase.	K4	6
Course Outcome	CO1: Explain the structure, classification , biochemical functions and significance of carbohydrates and lipids	K2	
	CO2: Differentiate essential and non-essential amino acids, biologically important modified amino acids and their functions, Illustrate the role, classification of Proteins and recognize the structural level organization of proteins, its functions and denaturation.	K2	
	CO3: Assess defective enzymes and Inborn errors. Recognize diseases related to carbohydrate and lipid metabolism.	K3	
	CO4: Discuss and evaluate the pathology of amino acid metabolic disorders.	K3	

	CO5: Appraise the imbalances of enzymes in organ function and relate the role of Clinical Biochemistry in screening and diagnosis.	K4	
Learning Resources			
Text Books	1. Satyanarayana, U. and Chakrapani, U(2014).Biochemistry,4 th Edition, Made Simple Publisher. 2. Jain J L, Sunjay Jain and Nitin Jain (2016).Fundamentals of Biochemistry, 7 th Edition, S Chand Company. 3. AmbikaShanmugam's (2016). Fundamentals of Biochemistry for Medical Students, 8th Edition. Wolters Kluwer India Pvt Ltd.		
Reference Books	1.AmitKessel&Nir Ben-Tal (2018). Introduction to Proteins: structure, function and motion. 2ndEdition, Chapman and Hall. 2. David L. Nelson and Michael M. Cox (2017).Lehninger Principles of Biochemistry, 7 thEdition W.H. Freeman and Co., NY. 3. LupertStyrer, Jeremy M. Berg, John L. Tymaczko, Gatto Jr., Gregory J (2019). Biochemistry. 9thEdition ,W.H.Freeman& Co. New York.		
Website Link	1 https://www.abebooks.com › plp 2 https://kau.in/document/laboratory-manual-biochemistry 3 https://metacyc.org		
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1UBCA01	BASIC AND CLINICAL BIOCHEMISTRY	GEC THEORY I	I	4	4	-	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	M	M	M	S	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mrs.T.Renuka	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UBCA02	BIOLOGICAL CHEMISTRY	GEC THEORY II	I	4	4	-	-	3
Objective	The students can understand the importance of Chemistry and Biochemistry, including acids and bases, chemical bonding, buffer solutions, carbohydrates, and proteins. Understand biochemical cycles, nutrient composition, and health functions in foods.							
Unit	**Course Content**					**Knowledge Levels**		**Sessions**
I	Atomic theory, formation of molecules, electronic configuration of atoms- s & p shapes of atomic orbitals. Periodic table, periodic classification, valency. Types of chemical bonds. Classification of organic compounds -. Hybridization in methane, ethane, acetylene, and benzene.					K2		6
II	Acids & Bases properties and differences, Concepts of acids and bases Arrhenius, Lowry-Bronsted and Lewis. Concentration of solution, ways of expressing concentrations of solutions – per cent by weight, normality, molarity, molality, mole fraction. pH of solution, pH scale, measurement of pH. Buffer solutions, properties of buffers, Henderson-Hasselbalch equation, mechanism of buffering action of acidic buffer and basic buffer.					K2		6
III	Classification of carbohydrates. Properties of carbohydrates. Metabolism of Carbohydrates – Glycogenesis, Glycogenolysis, Glycolysis, Gluconeogenesis TCA cycle, bioenergetics of carbohydrate metabolism.					K3		6
IV	Classification of Lipids. Characteristics, Properties and Biological importance of lipids. Metabolism of Fatty acids, phospholipids, cholesterol. B-oxidation of fatty acids.					K3		6
V	Classification and structure of amino acids. Structural conformation of proteins. Classification of proteins. Properties and biological importance of amino acids and proteins. Degradation of Amino acids and Urea Cycle. Vitamins (Biological functions, daily requirements, deficiency symptoms and diseases-Structure not required) and Hormones.					K4		6
Course Outcome	CO1: To make students have a strong foundation in chemical biology.					K2		
	CO2: To introduce them to metabolic pathways of the major biomolecules and relevance to clinical conditions					K2		
	CO3: To correlate Biochemical process with biotechnology applications					K3		

	CO4: To discuss the significance of various metabolic processes occurring in biological system	K3	
	CO5: To discuss the significance of various metabolic processes occurring in biological system	K4	

Learning Resources	
Text Books	1 P.L. Soni , A Text-book of Inorganic Chemistry, 11th Edition, S. Chand & Sons publications 2 Abhilasha Shourie, Shilpa S, Chapadgoankar & Anamika Singh (2020) Textbook of Biochemistry 1st Edition 3 J.L. Jain, 2016, Fundamentals of Biochemistry, S. Chand publication, 7th edition
Reference Books	1 Lehninger (2013) Principles of Biochemistrty 4th edition WH Freeman and Company NY 2 Murray et al., (2003) Harper‟s biochemistry 26th edition Appleton and Lange Publishers Florida USA 3 Geoffrey L. Zubay, William W. Parson, Dennis E. Vance, 1995, Principles of Biochemistry, W.C. Brown Publishers, 1995, 3rd edition
Website Link	1 http/dwb4.unl.edu/chem869p/chem869plinks/s 2 www.longwood.edu/staff/buckalewdw/C3%20Biomolecules.pp 3 https://www.britannica.com › science › biochemistry

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

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1UBCA02	BIOLOGICAL CHEMISTRY	GEC THEORY II	I	4	4	-	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	M	S	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	M	S	M	S	S	S	M	S	M	S
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	M	M	M	S	S	M	S	S	M
Level of Correlation between CO and PO	L-LOW				M-MEDIUM				S-STRONG	

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Dr.M.Devi	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCA03	Bioinstrumentation	GEC THEORY III	II	4	4	-	-	3
Objective	The students can gain knowledge of analytical instruments, basic principles in sciences, spectroscopy, chromatography, electrophoresis, medical diagnosis scans, and radioactivity measurements.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Basic instruments: pH meter, Buffer of biological importance, Centrifuge- Preparative, Analytical and Ultra, Laminar Air Flow, Autoclave**,** Hot Air Oven and Incubator. Biochemical calculations- preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.	K2	10
II	Spectroscopic Techniques: Spectroscopic Techniques: Colorimeter, Ultraviolet and visible, Infra red and Mass Spectroscopy.	K3	10
III	Chromatographic and Electrophoresis Techniques: Chromatographic Techniques: Paper, Thin Layer, Column, HPLC and GC. Electrophoresis Techniques: Starch Gel, AGE, PAGE.	K3	10
IV	Imaging techniques: Principle, Instrumentation and application of ECG, EEG, EMG, MRI, CT and PET scan radioisotopes.	K3	8
V	Fluorescence and radiation based techniques: Spectrofluorimeter, Flame photometer, Scintillation counter, Geiger Muller counter, Autoradiography.	K4	8
Course Outcome	CO1:Gain knowledge about the basics of instrumentation	K2	
	CO2: Exemplify the structure of atoms and molecules by using the principles of spectroscopy	K3	
	CO3: Evaluate by separating and purifying the components.	K3	
	CO4: Understand the need and applications of imaging techniques.	K3	
	CO5: Categorize the working principle and applications of fluorescence and radiation.	K4	

Learning Resources	
Text Books	1.Jayaraman J (2011). Laboratory Manual in Biochemistry, 2nd Edition. Wiley Eastern Ltd., New Delhi 2. Ponmurugan. P and Gangathara PB (2012). Biotechniques.1stEdition. MJP publishers 3. Veerakumari, L (2009).Bioinstrumentation- 5 thEdition -.MJP publishers. 4. Upadhyay, Upadhyay and Nath (2002). Biophysical chemistry – Principles and techniques 3rd Edition. Himalaya publishing home.

Reference Books	1. Rodney.F.Boyer (2000). Modern Experimental Biochemistry, 3rd Edition. Pearson Publication. 2. Webster, J.G. (2004). Bioinstrumentation- 4th Edition - John Wiley & Sons (Asia) Pvt.Ltd, Singapore. 3. SkoogA.,WestM (2014). Principles of Instrumental Analysis – 14th Edition W.B.Saunders Co., Philadephia.
Website Link	1.http://www.biologydiscussion.com/biochemistry/centrifugation/centrifugeintroduction-types- uses-and-other-details-with-diagram/12489 2.https://www.watelectrical.com/biosensors-types-its-working-andapplications/ 3.https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html

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

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2UBCA03	BIOINSTRUMENTATION	GEC THEORY III	II	4	4	-	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	M	S	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	M	S	M	S	S	S	M	S	M	S
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	M	M	M	S	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UBCA04	ALLIED: MICROBIAL PHYSIOLOGY	GEC THEORY-II	II	3	3			3
Objective	To provide a comprehensive knowledge about growth, nutritional requirements, metabolic and biosynthethic pathways of microorganisms							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Nutrition: Nutritional requirements of Microorganisms – Autotrophs, Heterotrophs, Photoautorophs, Chemoautotrophs, Copiotrophs, Oligotrophs. Transport Mechanisms Diffusion – Facilitated Diffusion, Active Transport – Group Translocation. Phagocytosis – Pinocytosis	K2	10
II	Different phases of growth – Growth curve – Generation time – factors influencing Microbial growth – Temperature, pH, Pressure , Salt concentration , Nutrients – synchronous growth and continous cultivation . Diauxic growth. Sporulation – Endospore formation in bacteria.	K2	10
III	Metabolism – EMP – HMP – ED pathways – TCA cycle- Electron transport chain – Oxidative and Substrate level phosphorylation.	K2	10
IV	Anaerobic respiration – sulphur, nitrogenous compounds and CO2 as final electron Acceptor - Fermentation – alcoholic, propionic and mixed acid fermentation. Lactic acid fermentation.	K3	10
V	Bacterial Photosynthesis – Oxygenic and Anoxygenic , Carbon dioxide fixation, Biosynthesis of bacterial cellwall, Biosynthesis of aminoacids (Glutamic acid family)- Bioluminescence	K3	10
Course Outcome	**CO1:** To understand the nutritional requirements of microorganisms and their uptake.	K2	
	CO2: To elucidate the growth and growth factors of microorganisms	K2	
	CO3: To acquire knowledge about the metabolic and biosynthetic pathways.	K2	
	CO4: To acquire knowledge about aerobic and anaerobic respiration of microorganisms	K3	
	CO5: To facilitate the understanding on photosynthesis and bioluminescence.	K3	

Learning Resources	
Text Books	1. Prescott, L.M J.P. Harley and C.A. Klein 1995. Microbiology 2nd edition Wm, C. Brown publishers. 2. David White. The Physiology and Biochemistry of Prokaryotes. Oxford University Press. 4th Edition. 2011.

Reference Books	1. Moat. A.G. J.W.Foster. 1988. Microbial physiology. 2nd edition. Springer – Verlag. 2. Caldwell. D.R.1995, Microbial physiology and Metabolism. WmC Brown Publishers, England 3. Jacquelyn G Black & Laura J Black, 2015. Microbiology, Principles and Exporation, 9th Edition. Willey and Co			
Website Link	1. Horst W. Doelle (2004). Microbial Metabolism and Biotechnology. Proceedings of an E-seminar organized by the International organization for Biotechnology and Bioengineering (IOBB) 2. https://www.biologydiscussion.com/photosynthesis/mechanism-of-bacterial-photosynthesis-with-diagram/23056 3. https://www.britannica.com/science/bacteria/Autotrophic-metabolism			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2UBCA04	ALLIED: MICROBIAL PHYSIOLOGY	GEC THEORY-II	II	3	3			3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	S	M	S	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	M	S
CO4	S	S	M	M	S	S	S	S	S	S
CO5	S	M	M	S	S	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved by Member Secretary
Mr.S.Maharajan	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCA05	**CLINICAL LABORATORY TECHNOLOGY**	**GEC THEORY - V**	**III**	**4**	**4**	**-**	**-**	**3**
Objective	To Acquire knowledge about Clinical methods to identify the components in the specimens							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Clinical Laboratory Science**: Basic laboratory principles - Code of conduct for medical laboratory personnel -Organization of clinical laboratory and role of medical laboratory technician - Safety measures. Assessment of a patient and brief history of collection. Maintenance of Hygiene & Infection Control Practices.	K2	10
II	**Specimen collection and processing** - Blood, urine, stool, sputum CSF, amniotic fluid and bile. Separation of serum and plasma, Handling of specimens for testing, preservation of specimens, transport of specimens and factors affecting the clinical results.	K3	10
III	**Introduction to histopathology**-Methods of examination of tissues and cells, Fixation of tissues: Classification and properties of fixatives. Tissue processing - Collection of specimens, Labeling and fixation, Dehydration, Clearing, Impregnation, Embedding - Paraffin block making, Section Cutting, Microtomes – types and mounting of sections.	K4	10
IV	**Introduction to Haematology**- Laboratory methods used in the investigation of coagulation disorders - coagulation tests , Routine coagulation tests, (prothrombin time , plasma recalcification time, partial thromboplastin time , activated partial thromboplastin time, thrombin time), Laboratory diagnosis of bleeding disorders. Estimation of fibrinogen, Assay of coagulation factors.	K4	10
V	**Quality Standards in Health Laboratories** – Development and implementation of standards, Accreditation Boards –NABL, ISO, CAP, COLA, Performing quality assessment - pre-analytical, analytical, and post-analytical phases of testing. **Current trend - * Professional Practice and Biomedical Sciences ***	K5	10
	…… Self Study.		
Course Outcome	**CO1:** Recall characteristics of laboratory organizations and demonstrate professionalism by displaying professional conduct, model ethical behavior and operate as a vital member of the medical lab team.	**K2**	
	CO2: Collect specimens correctly for different purposes, choose suitable tests as per requests, follow safety protocols, and contribute to scientific research by understanding clinical study principles, procedures, and result sharing.	**K3**	
	CO3: Identify the basic structure of cells, tissues and organs and describe their contribution to normal function. Interpret light and electron microscopic histological images and identify the tissue source and structures.	**K4**	

	Relate and recognize the histological appearance of affected tissues to the underlying pathology		
	CO4: Recognize the pathologies behind benign and malignant disorders of erythrocytes, leucocytes, thrombocytes and familiar with the diagnosis, evaluation, and management of hematologic malignancies.	**K4**	
	CO5: Interpret, implement, and complying with laws, regulations and accrediting standards and guidelines of relevant governmental and non-governmental agencies.	**K5**	

Learning Resources	
Text Books	1. Mukharji,K.L. (2000).Medical Laboratory Techniques, Vol - I, II & III, 5th Edition. Tata McGrawHill, Delhi. 2. Ochei,A., Kolhatkar.A. (2000).Medical Laboratory Science: Theory and Practice, McGraw Hill Education 3. RamnikSood (2015).Concise Book of Medical Laboratory Technology:Methods and Interpretation, 2ndEdition, Jaypee Brothers Medical Publishers, NewDelhi.
Reference Books	1. Rutherford, B.H. Gradwohl , A.C. Sonnenwirth L. Jarett. Gradwohls. (2000). Clinical Laboratory Methods and Diagnosis, Vol-I, 8th edition, Mosby. 2. Godkar (2021).Textbook of Medical Laboratory Technology, 3rdEdition, Bhalani Publishing House. 3. M.N.Chatterjee and RanaShinde.(2008). Textbook of Medical Biochemistry, 7thEdition, Jaypee Brothers Medical Publishers Pvt. Limited.
Website Link	https://nptel.ac.in/courses/102105087 https://currentprotocols.onlinelibrary.wiley.com/doi/pdf/10.1002/cpet.5 https://vlab.amrita.edu/index.php?sub=3&brch=272
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=882650&ppg=413

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M3UBCA05	**CLINICAL LABORATORY TECHNOLOGY**	**GEC THEORY - V**	**III**	**4**	**4**	**-**	**-**	**3**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO2	PSO3	PSO 4	PSO 5
CO1	M	S	M	S	M	S	S	S	S	S
CO2	S	M	S	S	M	S	S	S	M	S
CO3	S	M	M	M	S	S	S	M	S	S
CO4	S	S	M	S	M	S	M	S	S	S
CO5	M	M	S	S	M	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule			
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		
Designed By	**Verified By**	**Approved By Member Secretary**	
Mr.P.Tamilmani	Mr.P.Tamilmani	Dr.S.Shahitha	

B.Sc - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCA06	**FOOD PROCESSING TECHNOLOGY**	**GEC THEORY – VI**	**IV**	**4**	**4**	**-**	**-**	**3**
Objective	To Acquire knowledge about food preservation and processing methods and also microbiological examination methods.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction to food preservation** –objectives and techniques of food preservation. Preservation: principles of high temperature, low temperature, radiation, chemical preservatives and bio preservatives	K2	10
II	**Freshness criteria and quality assessment** of meat and fish –spoilage and methods of preservation. Production of byproducts after processing waste and their utilization. Role of packaging material, types of packaging material.	K3	10
III	**Composition of milk**; assessment of milk, thermal processing of fluid milk-pasteurization (LTH, HTST&UHT techniques). Fermented milk products-cheese, Butter milk, Yogurt, Kumis, Kefir and Acidophilus milk. Hygiene and sanitation requirement in food processing and fermentation industries.	K4	10
IV	**Importance of fats and oils** in Food-Extraction of fats and Oils-Rendering, pressing, solvent extraction, pressing of oil- degumming, refining, bleaching, deodorization, fractionation, pyrolysis of fats, toxicity of frying oil.	K4	10
V	**Methods for the microbiological examination of foods**. Food borne illness and diseases. Microbial cultures for food fermentation. Indian Factories Act on safety, HACCP, Safety from adulteration of food. **Current trend - * Pasteurization Process design***	K5	10
	…… Self Study.		
Course Outcome	**CO1:** Assess the fundamental concepts of food preservation.	K2	
	CO2: Investigate the quality assessment of meat and fish.	K3	
	CO3: Design the processing of milk and milk quality assessment	K4	
	CO4: Explain about the importance of fats and oils.	K4	
	CO5: Plan the food safety and adulteration detection.	K5	

Learning Resources	
Text Books	1. Avantina Sharma. (2006). Text Book of Food Science and Technology, International Book Distributing Co, Lucknow, UP. 2. Sivasankar. (2005). Food Processing and Preservation, 3rd Edition., Prentice hall of India Pvt Ltd, New Delhi. 3. Ramaswamy H & Marcotte M. (2006). Food Processing: Principles & Applications. Taylor & Francis.

Reference Books	1. Fellos PJ. (2005). Food Processing Technology: Principle &Practice 2ndEdition. CRC 2. Peter Zeuthen and Leif Bogh-Sorenson. (2005). Food Preservation Techniques, WoodlandPublishing Ltd, Cambridge, England 3. Gustavo V. Barbosa-Canovas, Maria S. Tapia, M. Pilar Cano. (2004). Novel Food Processing Technologies, CRC.
Website Link	https://sites.google.com/a/uasd.in/ecourse/food-processing-technology https://nptel.ac.in/courses/126105015 https://engineeringinterviewquestions.com/biology-notes-on-food-adulteration/
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=871485&ppg=371 https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8976201&fileOId=8976204

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

B.Sc. - Biochemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3UBCA06	**FOOD PROCESSING TECHNOLOGY**			**GEC THEORY – VI**	**IV**	**4**	**4**	**-**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO2	PSO3	PSO 4	PSO 5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	M	M	S	S	M	S
CO3	M	S	M	M	S	S	S	S	S	M
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	M	S	S	M	M	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule			
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		
Designed By	**Verified By**	**Approved By**	
Mr.P.Tamilmani	Mr.P.Tamilmani	Member Secretary	

B. Sc Biochemistry Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UBCIS1	**INTERNSHIP**	**INTERNSHIP**	**V**	**-**	**-**	**-**	**-**	**2**
Objective	To give optimum exposure on the practical aspects of Biochemistry 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 / Research institutes in Government sector / Private sector during the vacation which starts at the end of the 4th 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 institute / 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 working hours 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	Viva – voce examination will be conducted with internal & external examiners at the end of the **5th semester** and the credits will be awarded.		
13	Report Evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100.		
Course	**CO1:** Apply new techniques and ideas in Biochemistry industry	K3	

Outcome	**CO2:** Analyze the results of new initiatives	K4	
	CO3: Create a new work plan with greater output	K6	
	CO4: Create a framework of work execution ideas	K6	
	CO5: Create a detailed technical work plan and terminologies to be followed in industry.	K6	

Learning Resources	
Text Books	1. The Successful Internship by H. Frederick Sweitzer, Mary A. King, 2013. 2. Social Media Tools in Experiential Internship Learning by Samuel Kai Wah Chu, 2020.
Reference Books	1. The Intern Files: How to Get, Keep and Make the Most of Your Internship by Jamie Fedorko, 2006.
Website Link	1. http://gen.lib.rus.ec/

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

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M5UBCIS1	INTERNSHIP	INTERNSHIP	V	-	-	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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 Member Secretary
Dr.M.Shabana Begum	Mr.P.Tamilmani	Dr.S.Shahitha

B.Sc., Biochemistry LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCPR1	**PROJECT WORK**	**PROJECT WORK**	**VI**	**8**	**-**	**-**	**8**	**3**
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, Statistical Presentations, Hypothesis Testing.		
	Chapter V- Summary and conclusion		
	Chapter VI- Scope of the Project		

	References		
Guidelines For Project Preparation			
Numbering	• 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.	K6	
Chapters	• 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	
TEXT			
Regular Text	**Regular Text**: Times Roman 12 pts and normal print.	K6	
Chapter Heading	**Chapter Heading -** Times Roman 14 pts. Bold and capital.	K6	
Section Headings	**Section Headings -** Times roman 12 pts. Bold and capital.	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.	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.	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.	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.	K6	
References	Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author. 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. Title and Journal names should be in italic.	K6	

	One Author: Williams, G. State and Society in. Onco State, Nigeria, Afrographika, 1980. Two Authors: Phizacklea, A & Miles, R. Labour and Racism. London, Routledge & Kegan Paul, 1980. 3+ Authors: O'Donovan, P., et al. The United States. Amsterdam, Time-Life International, 1966.		
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.	K5	
Justification	**Justification:** The text should be fully justified	K6	
Margins	**Margins:** The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K6	
Paragraph Spacing	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. Use 1.5 spacing between the regular text and quotations. Provide double spaces between: (a) From top of page to chapter title, (b) Chapter title and first sentence of a chapter, Use single spacing (a) In footnotes and endnotes for text. (b) In explanatory notes for tables and figures. (c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report. (d) Use single space in references and double space between references.	K6	
Tables	All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary. 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. 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.	K6	
Figures	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 etc. should be placed on	K6	

	the bottom of the figure. Figures should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including figures on a page, should be avoided. Provide double spaces on the top and the bottom of all figures to separate them from the regular text, wherever applicable. Figures should be centered with respect to the figure. The titles must be in the same font as the regular text and should be single spaced. The title format is given below: Fig. <blank><chapter number>.<serial number><left indent><figure		
Page Dimension & Binding Specifications	The project report should be prepared in A4 size. The dissertation shall be properly bound; The bound front cover should indicate in Silver and embossed letter.		
Course Outcome	**Co:1** Identification of research idea	K4	
	Co:2 Analyze of problem solving skills	K4	
	Co:3 Analyze sources for conduct of Research	K4	
	Co:4 Evaluate the research report	K5	
	Co:5 Create the research report	K6	

Learning Resources	
Text Books	1. Research Methodology: Methods and Techniques, by C.R. Kothari, New Age Publications, 2009.
Reference Books	1. Research Methodology: Methods and Techniques by C.R. Kothari, New Age Publications, 1985. 2. Essentials of Research Design and Methodology by: Geoffrey R. Marczyk, David DeMatteo, David Festinger, 2005.
Website Link	1. http://gen.lib.rus.ec/

B.Sc-Biochemistry Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M6UBCPR1	**PROJECT WORK**	**PROJECT WORK**	**VI**	**8**	**-**	**-**	**8**	**3**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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 Member Secretary
Dr.M.Devi	**Mr.P.Tamilmani**	Dr.S.Shahitha

B.Sc., Biochemistry for Competitive Examination Syllabus-LOCF-CBCS-Pattern with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M6UBCOE1	**BIOCHEMISTRY FOR COMPETITIVE EXAMINATION**	**Self study Online -Competitive Examination**	**VI**	**2**	**-**	**-**	**-**	**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**
	Assemblage of different papers related to Biochemistry in particular, Clinical Biochemistry, Immunology, Genetic Engineering, Nutritional Biochemistry, Biomolecules, Cell biology, Biochemical techniques Microbial techniques, Medical coding, Enzymology, Molecular Biology, Human Physiology, Plant Biochemistry and Plant Therapeutics 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, R and D centers, Water treatment plants, Clinical Laboratory, I0054 sector (Medical Coding, Medical Transcription and Medical Billing) and Blood Bank etc., In addition, it is also useful for UPSC and PSC. **Rules for creating MCQ pattern.** 1. Objective type online examination will be conducted at the end of 6th semester. 2. Questions must be taken from all previous question papers of UPSC, PSC, TNPSC and University Common Entrance test for higher studies. 3. **Test for critical thinking**. 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. 4. **Emphasize for Higher-Level Thinking** Use memory-plus, application oriented questions. These questions require students to recall the principles, rules and facts in a real life context. **Example.1**					K1- K6		

	Ability to Justify Methods and Procedures Which of the following is a physical carcinogen? a) Tobacco smoke **b) Ultraviolet (UV) radiation** c) Benzene d) Alcohol **Example.2** Which of the following is an example of probability sampling? a) Convenience sampling b) Snowball sampling **c) Simple random sampling** d) Purposive sampling **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.		
Course Outcome	**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	

	CO4: To analyze and create the new ideas for various competitive examinations.	K4	
	CO5: To assess forms and levels of critical thinking.	K5	
Text Books	1. MCQ's in Biochemistry by G.Vidya Sagar, New Age International Publisher Pvt. Ltd, 2018		
	2. Owen,J., Punt,J and Strand ford, S."Kuby Immunology", 7th Ed., W.H.Freeman Publication, NewYork, 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.		
Reference Books	400 Biochemistry MCQ's (Mcqs) For Neet and Net Examinations.		
Website Link	https://swayam.gov.in/nc_details/NPTEL		

B.Sc., Biochemistry for Competitive Examination Syllabus-LOCF-CBCS-Pattern with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M6UBCPOE1	**BIOCHEMISTRY FOR COMPETITIVE EXAMINATION**	**Self study Online -Competitive Examination**	**VI**	**2**	**-**	**-**	**-**	**2**	

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	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 Member Secretary**
Mrs.M.Priyanga Gandhi	Mr.P.Tamilmani	Dr.S.Shahitha