

B. Sc., BIOCHEMISTRY

SYLLABUS

Programme Code: 3USBIC

2025-2028



**SENGAMALA THAYAR EDUCATIONAL TRUST
WOMEN'S COLLEGE (AUTONOMOUS)**

(Affiliated to Bharathidasan University, Tiruchirappalli)
(Accredited by NAAC)

**Sundarakkottai, Mannargudi – 614 016, Thiruvarur (Dt.),
Tamil Nadu, India.**



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

(Affiliated to Bharathidasan University, Tiruchirappalli)

(Accredited by NAAC)

SUNDARAKKOTTAI, MANNARGUDI-614016.
TAMILNADU, INDIA.

B.Sc., BIOCHEMISTRY
CHOICE BASED CREDIT SYSTEM–
LEARNING OUTCOMES BASED CURRICULUM FRAME WORK (CBCS–LOCF)
(For the candidates admitted in the academic year 2025–2026)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses within a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education Course: is defined as a theory, practical or theory cum practical subject studied in a semester.
Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally, three or more course outcomes may be specified for each course based on its weightage.
Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC) A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE) Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME). A student shall choose at least two Non – major Elective Courses (NME) from outside his /her department. Non –Major Elective I – Those who choose Tamil in Part I can choose a non –major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studies in school level or b) Special Tamil if Tamil language was studies up to 10th & 12th std.

Skill Enhancement Courses (SECs) These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Undergraduate Programme:

Programme Pattern: The Under Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part -I: Languages (Tamil / Hindi / French / Sanskrit)

Part-II: General English

Part-III: Core Course (Theory, Practicals, Generic Elective courses, Discipline Specific Elective courses, Compulsory and Optional Allied courses, Project)

Part-IV: Non Major Elective, Foundation Course, Value Education, Environmental studies, Skill Enhancement Courses/ Soft Skills, Internship / field visit / industrial visit/ Case Study), Professional Competency Course

Part –V: Health & Wellness, Extension activity, Gender studies

EXAMINATION**Continuous Internal Assessment (CIA):****UG - Distribution of CIA Marks**

Passing Minimum: 40 %

Assignment-3	=	30%
Test-2	=	50%
Seminar	=	10%
Attendance	=	10%

Question Paper Pattern**Part A:****Part A 1 (10X1=10 marks)**

One word question/ Fill in/ True or False/ Multiple Choice Questions

Two Questions from Each unit

Part A 2 (5X2=10 marks)

Short Answers / Match the following

One question from Each unit

Total Marks – 20

Part B: (5X5=25 marks)

Paragraph Answers

Either/ or type, One Question from each unit

Part C: (10X3=30)

Essay Type Answers

Answer 3 out of 5 Questions

One Question from each unit

Part A: K1 Level

Part B: K2, K3 and K4 Level

Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analyzing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS	Lower Order Thinking			Higher Order Thinking			Total	
	K1	K2	K3	K4	K5	K6		
END SEMESTER EXAMINATIONS (ESE)	20	25			30			75
Continuous Internal Assessment (CIA)	20	25			30			75
QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment								
PART							MARKS	
PART –A I. (No choice,One Mark) TWO questions from each unit					(10x1 =10)		20	
PART –A II. (No choice ,Two Mark) ONE question from each unit					(5x2 =10)			
PART -B (Either/ or type ,5-Marks) ONE questions from each unit					(5x5 =25)		25	
PART -C (3 out of 5) (10 Marks) ONE question from each unit					(3x10 =30)		30	
Total							75	

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 75			
K- LEVELS				K1	K2	K3	Total Marks
PART							
PART –A (1 Mark, No choice) (10x1 =10)				10			10
(2-Marks, No choice) (5x2=10)				10			10
PART –B (5-Marks) (Either/or type) (5x5=25)					5	10	25
PART –C (10 Marks) (3 out of 5) (3x10=30)							
Courses having only K5, K6 levels, K5 level- 3 Questions, K6 level- 2 Questions							
(One K6 level question is compulsory)							
Total				20	05	10	75

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$$

$$\text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$$

Where,

C_i is the Credit earned for the Course i

G_i is the Grade Point obtained by the student for the Course i

M_i is the marks obtained for the course i and

n is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

1. For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
2. For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/ Science/ Commerce/ Management as Outstanding/ Excellent/ Very Good/ Good/ Above Average/ Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Programme.
3. Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.
4. A Pass in PART- V will be mandatory although the marks will not count for the calculation of the CGPA.
5. Absence from an examination shall not be taken an attempt.

Table-1: Grading of the Courses – UG

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	NA	RA

The candidate's performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester /s is indicated by **Cumulative Grade Point Average (CGPA)**.

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appearance

The candidates who have passed in the first appearance and within the prescribed duration of the UG programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good".

VISION

Imparting quality education in Biochemistry to make the students to document the biological resources with scientific validation so as to enhance the quality of life.

MISSION

- To provide a learning environment to the students to understand, analyze and augment the basic analytical skills in Biochemistry.
- To expose the students and make them well versed in the various biochemical processes and update their knowledge and skills in advanced biochemical techniques.

PROGRAMME OUTCOMES FOR B.Sc., DEGREE PROGRAMMES

PO No.	Programme Outcomes (Upon completion of the B.Sc., Degree Programme, the Under graduate will be able to)
PO-1	Disciplinary knowledge: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an under graduate Program of study in Bachelor of Science.
PO-2	Critical thinking, Problem Solving and Reflective thinking: Think critically about the issues and identify, critically analyze and solve problems from the disciplines of concern using appropriate tools and techniques and the knowledge, skills and attitudes acquired and extrapolate the same to real life situations; show critical sensibility to life experiences, with self-awareness and reflexivity of both self and society.
PO-3	Analytical & Scientific Reasoning: Evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesized from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints; critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.
PO-4	Research-related Skills: Develop a sense of capability for relevant/ appropriate inquiry and asking questions, synthesize, articulate and report results and to recognize and predict cause and effect relationships, define problems, formulate and establish hypothesis, analyze and interpret and draw conclusions from data, execute and report the results of an experiment or investigation.
PO-5	Digital literacy and Effective Communication: Use ICT in a variety of learning situations and speak, read, write and listen clearly in person and through electronic media in English and in one or more Indian languages, and make meaning of the world by connecting people, ideas, books, media and technology; Efficiently communicate thoughts and ideas in a clear and concise manner.
PO-6	Individual and Team Work: Effectively accomplish tasks individually as well as work effectively and respectfully as member or leader with diverse teams, facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interest so for a common cause and work efficiently as a member of a team.
PO-7	Multicultural Competence and Social Interaction: Understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO-8	Awareness of Ethical issues, Human values and Gender Issues: Embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work and understand the value of relationship between self and the community and aware of the various issues concerning women and society.

PO-9	Awareness of Environment and Sustainability: Understand the impacts of technology and business practices in societal and environmental contexts, and Sustainable development.
PO-10	Self-directed and Lifelong learning: Acquire knowledge and skills, including learning “how to learn”, that are necessary for participating in learning activities throughout life and to engage in independent and life-long learning in the Broadest context of socio-technological changes.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO No.	Program Specific Outcomes (B.Sc., Biochemistry)
PSO1	Comprehend the knowledge in the biochemical, analytical, bio statistical and Computational areas
PSO2	Ability to understand the technical aspects of existing technologies that help in Addressing the biological and medical challenges faced by human kind
PSO3	Acquiring analytical and hands on skills to perform research in multidisciplinary environments
PSO4	Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry



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TAMIL NADU, INDIA.

B.Sc., BIOCHEMISTRY COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM- LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS-LOCF)

(For the candidates admitted from the academic year 2025-2026)

ELIGIBILITY: A Pass in 10+2 with Chemistry

Semester	Part	Course	Course Code	Title of the Course	Ins. Hours/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
I	I	Language Course-I	U25LC101	Pothu Tamil-I: Tamil Elakkiya Varalaru-I	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-I	U25ELC101	General English -I	6	5	1	-	-	3	3	25	75	100
	III	Core Course-I	U25BC101	Biomolecules	5	4	1	-	-	5	3	25	75	100
		Core Practical-I	U25BC102P	Biomolecules Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-I	U25ACH101	Allied Chemistry-I	3	2	1	-	-	2	3	25	75	100
		Allied Practical-I	U25ACH102P	Allied Chemistry Practical	2	-	-	2	-	-	-	-	-	-
	IV	Non Major Elective-I Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level. (or) b) Special Tamil if Tamil language was studied upto 10th & 12th std. Those who choose NCC in part V must choose NCC course as Non Major Elective	-	-	2	1	1	-	-	2	3	25	75	100
		Foundation Course	U25FCBC11	Introduction to Biochemistry	2	1	1	-	-	2	3	25	75	100
		TOTAL			30	18	6	6	-	21	-	-	-	700
II	I	Language Course-II	U25LC202	Pothu Tamil- II Tamil Elakkiya Varalaru-II	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-II	U25ELC202	General English -II	6	5	1	-	-	3	3	25	75	100
	III	Core Course-II	U25BC203	Cell Biology	5	4	1	-	-	5	3	25	75	100
		Core Practical-II	U25BC204P	Cell Biology Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-II	U25ACH203	Allied Chemistry- II	3	2	1	-	-	2	3	25	75	100
		Allied Practical-I	U25ACH102P	Allied Chemistry Practical	2	-	-	2	-	2	3	25	75	100
	IV	Non Major Elective-II Those who choose Tamil in Part I can choose a non-major elective course offered by	-	-	2	1	1	-	-	2	3	25	75	100

		other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level. (or) b) Special Tamil if Tamil language was studied upto 10th & 12th std. Those who choose NCC in part V must choose NCC course as Non Major Elective												
		Skill Enhancement Course-I	U25SEBC21	Biomedical Instrumentation	2	1	1	-	-	2	3	25	75	100
			TOTAL		30	18	6	6	-	23	-	-	-	800
III	I	Language Course-III	U25LC303	Pothu Tamil-III Tamilaga Varalarum Panpadum	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-III	U25ELC303	General English -III	6	5	1	-	-	3	3	25	75	100
	III	Core Course-III	U25BC305	Human Physiology	4	3	1	-	-	4	3	25	75	100
		Core Practical-III	U25BC306P	Human Physiology Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-III	U25AMB301	Basic Microbiology	2	1	1	-	-	2	3	25	75	100
	IV	Allied Practical-II	U25AMB302P	Microbiology Practical	2	-	-	2	-	-	-	-	-	-
		Skill Enhancement Course-II	U25SEBC32	First Aid	2	1	1	-	-	2	3	25	75	100
	V	Skill Enhancement Course-III	U25SEBC33	Basics of Forensic Science	2	1	1	-	-	2	3	25	75	100
		Special Course	25UGSC	Health and Wellness	2	-	-	2	-	1	-	-	-	-
		TOTAL		30	16	6	8	-	21	-	-	-	700	
	I	Language Course-IV	U25LC404	Pothu Tamil-IV Tamilum Ariviyalum	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-IV	U25ELC404	General English-IV	6	5	1	-	-	3	3	25	75	100
IV	III	Core Course-IV	U25BC407	Biochemical Techniques	5	4	1	-	-	5	3	25	75	100
		Core Practical-IV	U25BC408P	Biochemical Techniques Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-IV	U25AMB403	Medical Microbiology	3	2	1	-	-	2	3	25	75	100
		Allied Practical-II	U25AMB302P	Microbiology Practical	2	-	-	2	-	2	3	25	75	100
	IV	Skill Enhancement Course-IV	U25SEBC44	Medical Coding	2	1	1	-	-	2	3	25	75	100
		Skill Enhancement Course-V	U25SEBC45	Medical Laboratory Techniques	2	1	1	-	-	2	3	25	75	100
		TOTAL		30	18	6	6	-	23	-	-	-	800	
V	III	Core Course-V	U25BC509	Enzymes	5	4	1	-	-	5	3	25	75	100
		Core Course-VI	U25BC510	Intermediary Metabolism	5	4	1	-	-	4	3	25	75	100
		Core Course-VII	U25BC511	Clinical Biochemistry	6	5	1	-	-	5	3	25	75	100
		Core Practical-V	U25BC512P	Clinical Biochemistry Practical	4	-	-	4	-	4	3	25	75	100
		Elective Course-I	U25BCE51A/ U25BCE51B/ U25BCE51C	Nutritional Biochemistry/ Plant Biochemistry and Plant Therapeutics/ /Environmental Biochemistry	4	3	1	-	-	3	3	25	75	100

Semester		Elective Course–II	U25BCE52A/ U25BCE52B/ U25BCE52C	Research Methodology/ Biotechnology/ Toxicology	4	3	1	-	-	3	3	25	75	100
	IV	EVS	25UGCES	Environmental Studies	2	2	-	-	-	2	3	25	75	100
		Internship/ Industrial Visit/ Field Visit	U25BCI51	Internship/ Industrial Visit/ Field Visit	-	-	-	-	-	2	-	-	-	-
		TOTAL			30	21	5	4	-	28	-	-	-	700
VI	III	Core Course-VIII	U25BC613	Molecular Biology	6	5	1	-	-	4	3	25	75	100
		Core Practical-VI	U25BC614P	Molecular Biology Practical	6	-	-	6	-	4	3	25	75	100
		Core Project	U25BCPW	Project with Viva- Voce/ Group Project	5	-	1	4	-	5	3	25	75	100
		Elective Course-III	U25BCE63A/ U25BCE63B/ U25BCE63C	Endocrinology/ Biochemical Pharmacology/ Genetics	4	3	1	-	-	3	3	25	75	100
		Elective Course-IV	U25BCE64A/ U25BCE64B/ U25BCE64C	Immunology/ Bioinformatics/ Pharmaceutical Biochemistry	4	3	1	-	-	3	3	25	75	100
	IV	Value Education	25UGVED	Value Education	2	2	-	-	-	2	3	25	75	100
		Professional Competency Course	U25PCBC61	Bioentrepreneurship	2	2	-	-	-	2	3	25	75	100
	V	Gender Studies	25UGGS	Gender Studies	1	1	-	-	-	1	3	25	75	100
		Extension activity		Extension activity	-	-	-	-	-	1	-	-	-	-
		TOTAL			30	16	4	10	-	25	-	-	-	800
		GRAND TOTAL			180	107	33	40	-	141	-	-	-	4500
Extra Credit				MOOC/SWAYAM/NPTEL	-	-	-	-	-	2	-	-	-	-
				Value Added Courses (Atleast One Per Year)	-	-	-	-	-	2	-	-	-	-

L-Lecture

T-Tutorial

P-Practical

S-Seminar

CREDIT DISTRIBUTION FOR UG PROGRAMME

S.No.	Part	Courses	No. of Courses	Total Credits
1	I	Language Course	4	12
2	II	English Language Course	4	12
3	III	Core Course-Theory	8	37
4		Core Practical	6	24
5		Core Project	1	05
6		Allied Course - Theory	4	08
7		Allied Course - Practical	2	04
8		Elective Course	4	12
9	IV	Non-Major Elective	2	04
10		Foundation Course	1	02
11		Skill Enhancement Course	5	10
12		Internship/ Industrial visit/ Field visit	1	02
13		Environmental Studies	1	02
14		Value Education	1	02
15	V	Professional Competency Course	1	02
16		Special Course	1	01
17		Gender Studies	1	01
18		Extension Activity	1	01
Total			48	141

Note:

		CIA	ESE
1	Theory	25	75
2	Practical	25	75
3	Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

NME OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Course
I	IV	NME-I	U25NMEBC11	Biochemistry in Human Health
II		NME-II	U25NMEBC22	Herbal Medicine

SEMESTER - III



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(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: III- CC- III: Human Physiology

Ins. Hrs./Week: 4

Course Credit: 4

Course Code: U25BC305

UNIT-I: Body fluids (12 Hours)

Extracellular fluid (ECF)-plasma, interstitial fluid and lymph; Intracellular fluid (ICF). Osmolarity of body fluids, ionic composition, electrolytes and body buffer systems. Composition and functions of Blood. Blood cells – types, morphology and functions. Structure and functions of haemoglobin. Haemopoiesis. Blood coagulation and blood groups.

UNIT-II: Respiratory and Circulatory Systems (12 Hours)

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.

UNIT- III: Nervous and Muscular Systems (12 Hours)

Structure of neuron, synaptic transmission, reflex action, neurotransmission-Resting membrane and Action potential. Neurotransmitters-Acetyl choline, Noradrenaline, 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.

UNIT- IV: Digestive and Excretory Systems (12 Hours)

Digestive system-composition and functions of salivary, gastric, pancreatic, intestine and bile secretions, structure of digestive system. Digestion and absorption of carbohydrates, lipids and 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.

UNIT-V: Reproductive System (12 Hours)

Oogenesis, spermatogenesis, capacitation and transport of sperm, Blood-Testis barrier. Fertilization, early development, implantation, placentation and parturition.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Explain the composition and functions of body fluids.
2. Describe the physiology of the respiratory system and circulatory system.
3. Illustrate the organization and physiological roles of the nervous and muscular systems.
4. Discuss the structure and functions of the digestive and excretory systems.

5. Assess the physiological events of human reproduction.

TEXT BOOK(S)

1. Jain, A. K. (2019). *Textbook of physiology with free QA physiology* (Vols. 1 & 2, 8th ed.). Arya Medical (APC) Publishers.
2. Fundamentals of Anatomy & Physiology — Frederic H. Martini & Judi L. Nath (2017). Pearson.
3. John, N. A. (2019). *Chatterjee's Human Physiology* (Vols. 1 & 2, 13th ed.). Kalyani Mukherjee Publications.
4. Subramaniam, S., Kutty, M., & Singh, H. D. (2006). *Textbook of Human Physiology* (6th ed.). S. Chand & Company.
5. Ganong's Review of Medical Physiology — Kim E. Barrett et al. (2023). McGraw Hill.
6. Hall, J. E. (2024). *Guyton and Hall textbook of medical physiology* (15th ed.). Elsevier.
7. Tortora, G. J., & Derrickson, B. (2023). *Principles of anatomy and physiology* (16th ed.). Wiley.

REFERENCE BOOK(S)

1. Textbook of Medical Physiology — Arthur C. Guyton & John E. Hall (2006). Saunders.
2. Shalya, S. (2000). *Human Physiology: Systemic & Applied* (1st ed.). CBS Publishers.
3. Human Physiology: An Integrated Approach — Dee Unglaub Silverthorn (2019). Pearson.
4. Davidson's Principles and Practice of Medicine — Stuart H. Ralston et al. (2022). Elsevier.
5. West, E. S., Todd, W. R., Mason, H. S., & Bruggen, J. T. V. (2011). *Textbook of Biochemistry* (4th ed.). Oxford IBH Publishers.
6. Berne & Levy Physiology — Bruce M. Koeppen & Bruce A. Stanton (2023). Elsevier.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/biochemistrystrayer-e25312085.html>
3. <https://www.pdfdrive.com/essentials-human-physiology-e1543905.html>
4. <https://www.pdfdrive.com/human-physiology-from-cells-to-systems-168189400.html>
5. <https://www.pdfdrive.com/human-anatomy-physiology-e51197.html>
6. <https://www.pdfdrive.com/essentials-of-medical-physiology-6th-edition-e32299678.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3		2		2			3	3	3	3
CO2	2	3	3	3		2		2			3	3	3	3
CO3	2	3	3	3		2		2			3	3	3	3
CO4	2	3	3	3		2		2			3	3	3	3
CO5	2	3	3	3		2		2			3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(Autonomous)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III- CP –III: Human Physiology Practical

Ins. Hrs./Week: 4

Course Credit: 4

Course Code: U25BC306P

Practicals

1. Histology of tissues – Columnar, Cubical, Ciliated, Squamous and Striated squamous
2. Microscopic Structure of Organs – Lungs, Artery vein, Stomach, Ovary, Uterus.
3. Histology of Muscles – Striated and Non-striated.
4. Determination of Respiratory Rate and Pulse Rate.
5. Measurement of Blood Pressure (Sphygmomanometer method).
6. Determination of Hemoglobin (Hb%) – Sahli's method.
7. Enumeration of RBC Count using hemocytometer.
8. Enumeration of WBC Count using hemocytometer.
9. Enumeration of Differential Leukocyte Count (DLC).
10. Determination of ABO Blood Group.
11. Determination of Rh factor.
12. Determination of Bleeding Time (BT).
13. Determination of Clotting Time (CT).

Total Hours-60

COURSE OUTCOME

The students are able to,

1. Identify and differentiate the histological features of various tissues, muscles and organs using microscopic examination.
2. Demonstrate the measurement of physiological parameters including respiratory rate, pulse rate and blood pressure.
3. Perform hematological investigations such as hemoglobin estimation and enumeration of blood cells using standard laboratory methods.
4. Analyze blood samples for ABO blood grouping and Rh factor determination.
5. Evaluate hemostatic functions by determining bleeding time and clotting time.

TEXT BOOK(S)

1. Hall, J. E., & Arthur C. Guyton. (2021). *Textbook of medical physiology* (14th ed.). Elsevier.
2. Vasudevan, D. M., Sreekumari, S., & Vaidyanathan, K. (2019). *Textbook of biochemistry for medical students* (9th ed.). Jaypee Brothers Medical Publishers.
3. O. P. Ghai, Paul, V. K., & Bagga, A. (2018). *Ghai essential pediatrics* (9th ed.). CBS Publishers & Distributors.
4. Ramakrishnan, S., & Prasannan, K. G. (2012). *Medical biochemistry practical manual*. Universities Press.
5. Chatterjea, C. C., & Shinde, R. (2012). *Textbook of medical biochemistry* (8th ed.). Jaypee Brothers Medical Publishers.
6. Harper's Illustrated Biochemistry — Victor W. Rodwell et al. (2021). McGraw Hill.

REFERENCE BOOK(S)

1. Henry, J. B. (2011). *Clinical diagnosis and management by laboratory methods* (22nd ed.). Elsevier.
2. Mukherjee, K. L. (2014). *Medical laboratory technology* (Vol. 1 & 2). McGraw Hill Education.
3. Bain, B. J., Bates, I., & Laffan, M. A. (2017). *Dacie and Lewis practical haematology* (12th ed.). Elsevier.
4. Greer, J. P., Arber, D. A., Glader, B., List, A. F., Means, R. T., Paraskevas, F., & Rodgers, G. M. (2018). *Wintröbe's clinical hematology* (14th ed.). Wolters Kluwer.
5. Satyanarayana, U., & Chakrapani, U. (2021). *Biochemistry* (6th ed.). Elsevier.
6. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics — Nader Rifai (2023). Elsevier.

E RESOURCES

1. <https://www.nmlindia.nic.in>
2. <https://nptel.ac.in/>
3. <https://onlinecourses.nptel.ac.in/>
4. <https://pubmed.ncbi.nlm.nih.gov/>
5. <https://www.ncbi.nlm.nih.gov/books>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2		3			2					3	3	3	3
CO2	2		3			2					3	3	3	3
CO3	2		3								3	3	3	3
CO4	2		3			2					3	3	3	3
CO5	2		3			2					3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)



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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: III-SEC-II: First aid
Ins. Hrs. / Week: 2 **Course Credit: 2** **Course Code: U25SEBC32**

UNIT- I: First aid technique (06 Hours)

Aims and important rules of first aid, dealing with emergency, types, content and uses of a first aid kit. First aid technique-Dressing and Bandages, fast evacuation technique, transport techniques.

UNIT-II: First aid techniques of respiratory Problems (06 Hours)

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.

UNIT-III: Common medical aid (06 Hours)

First aid for wounds, cuts, head, chest, abdominal injuries, shocks, burns, amputations, fractures, dislocation of bones.

UNIT-IV: First aid for neural problems (06 Hours)

First aid related to unconsciousness, stroke, fits, convulsions- seizures, epilepsy.

UNIT-V: First aid for insect bites and chemicals poisoning (06 Hours)

First aid in poisonous bites (Insects and snakes), honey bee stings, animal bites, disinfectant, acid and alkali poisoning.

Total Lecture Hours-30

COURSE OUTCOME

The students are able to,

1. Explain the principles, objectives and procedures of first aid and patient management.
2. Demonstrate first aid techniques for respiratory and cardiac emergencies including CPR.
3. Apply appropriate first aid measures for wounds, burns, fractures, dislocations and shock.
4. Provide immediate care for neurological emergencies such as stroke, seizures and unconsciousness.
5. Illustrate first aid procedures for bites, stings and chemical poisoning emergencies.

TEXT BOOK(S)

1. Muthuvenkatachalam, S. (2015). First aid and emergency nursing (1st ed.). Jaypee Brothers Medical Publishers.
2. Bhatia, R. S. (2014). Essentials of first aid (2nd ed.). CBS Publishers & Distributors.
3. Clement, I. (2018). Textbook of first aid and emergency nursing (2nd ed.). Elsevier.
4. Sharma, R. K. (2013). Manual of first aid. Lotus Publishers.
5. Kumar, S., & Gupta, P. (2021). *Comprehensive guide to first aid and emergency care* (3rd ed.). CBS Publishers & Distributors.

6. Jain, A., & Mehta, R. (2022). *Essentials of emergency nursing and first aid* (2nd ed.). Jaypee Brothers Medical Publishers.
7. Lewis, S. L., Bucher, L., Heitkemper, M. M., & Harding, M. (2023). *Medical-surgical nursing: Assessment and management of clinical problems* (12th ed.). Elsevier.

REFERENCE BOOK(S)

1. St John Ambulance, St Andrew's First Aid, & British Red Cross. (2016). *First aid manual: The authorised manual of St John Ambulance, St Andrew's Ambulance Association and the British Red Cross* (10th ed.). DK Publishing.
2. American Academy of Orthopaedic Surgeons (AAOS). (2015). *Emergency care and transportation of the sick and injured* (12th ed.). Jones & Bartlett Learning.
3. American Heart Association. (2020). *Basic life support (BLS) provider manual*. AHA.
4. American Red Cross. (2021). *First aid/CPR/AED participant's manual*. StayWell.
5. David, S. (2016). *Textbook of emergency medicine* (2nd ed.). Wolters Kluwer.
6. American Heart Association. (2025). *Basic life support (BLS) provider manual* (Updated ed.). AHA.
7. Tintinalli, J. E., Ma, O., Yealy, D.M., Meckler, G.D., & Stapczynski, J. S. (2023). *Tintinalli's emergency medicine: A comprehensive study guide* (10th ed.). McGraw Hill.

E-RESOURCES

1. <https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online>.
2. <https://www.firstaidforfree.com/>
3. <https://www.who.int/health-topics/emergencies>.
4. <https://www.nhs.uk/conditions/first-aid>
5. <https://www.cdc.gov/nceh/hsb/disaster/default.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3		2		2		2	2	2		
CO2	3	3	2	3		2		2		2	3	3		
CO3	3	3	3	3		2		2		2	3	3		
CO4	3	3	2	3		2		2		2	2	2		
CO5	3	3	2	3		2		2		2	2	2		

S-Strong (3)

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L-Low (1)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III-SEC-III: Basics of Forensic Science

Ins. Hrs. / Week: 2

Course Credit: 2

Course Code: U25SEBC33

UNIT- I: Forensic Science: (06 Hours)

Definition, History and Development. Crime scene management and investigation; collection, preservation, packing and forwarding of physical and trace evidences for analysis.

UNIT-II: Blood Typing and Genetic Identity Analysis (06 Hours)

Blood-grouping and typing of fresh blood samples including enzyme. Cases of disputed paternity and maternity problems, DNA profiling.

UNIT-III: Forensic Toxicology and Body Fluid Analysis (06 Hours)

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.

UNIT-IV: Psychotropic drugs (06 Hours)

Psychotropic drugs-Sedatives, stimulants, opiates and drugs of abuse. Identification of poisons from viscera, tissues and body fluids.

UNIT-V: Biological Evidence and Trace Material Analysis (06 Hours)

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.

Total Lecture Hours-30

COURSE OUTCOME

The students are able to,

1. Gain knowledge on basics of forensic science and method for collection and preservation of samples.
2. Assess the paternity, maternity problems and DNA profiling.
3. Discuss the presence of alcohol, insecticides and pesticides in body fluids.
4. Describe the test performed to identify the presence of drugs and poisons in body fluids.
5. Identify species and sex from the available body fluids.

TEXT BOOK(S)

1. Lee, H. C. (2021). Henry Lee's crime scene handbook (1st ed.). Academic Press.
2. Turvey, B. E. (2021). Criminal profiling: An introduction to behavioral evidence analysis (3rd ed.). Academic Press.
3. Jones, P. (2020). Crime scene processing and laboratory workbook. CRC Press.
4. James, S. H., & Nordby, J. J. (2020). Forensic science: An introduction to scientific and investigative techniques (4th ed.). CRC Press.

5. Saferstein, R. (2017). Criminalistics: An introduction to forensic science (9th ed.). Pearson Prentice Hall.
6. Tiwari, R. K. (2023). Computer crime and computer forensic. Selective & Scientific Books.

REFERENCE BOOK(S)

1. Saferstein, R. E. (2001). Forensic science handbook (Vols. 2 & 3).
2. Embarras-Seddon, A., & Pass, A. D. (2008). Forensics (1st ed.). Pearson.
3. Adelman, H. C., & Kobilinsky, L. (2007). Forensic medicine (Illustrated ed.). Chelsea House Publications.
4. Sharma, B. R. (2019). Forensic science in criminal investigation and trial (6th ed.). Lexis Nexis.
5. Krishnamurthy, Dr. R. (2021). Crime scene management with special emphasis on national level crime cases (3rd ed.).

E-RESOURCES

1. http://www.crcnetbase.com/page/forensic_ebooks
2. <https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view>
1. <http://www.forensic-science-society.org.uk/>
2. <https://nij.ojp.gov/topics/forensics>
3. <https://www.sciencedirect.com/book/9780128000373/fundamentals-of-forensic-science>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3		2		2		2	3	3		
CO2	3	3	3	3		2		2		2	3	3		
CO3	3	3	3	3		2		2		2	3	3		
CO4	3	3	3	3		2		2		2	3	3		
CO5	3	3	3	3		2		2		2	3	3		

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M-Medium (2)

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: III- Special Course- Health and wellness

Ins. Hrs/Week: 2

Course Credit: 1

Course Code: 25UGSC

1. Introduction to Holistic Well-being

1. Introduce the core components of Health & Well-being namely Physical, mental and emotional well-being
2. Provide worksheets on all the four components individually and explain the interconnectedness to give an overall understanding.

2. Wellness Wheel Exercise (Overall Analysis)

- Guide students to assess their well-being in various life dimensions through exercises on various aspects of well-being, and explain the benefits of applying wellness wheel.
- Introduce Tech Tools:
- Explore the use of technology to support well-being.
- Introduce students to apps for meditation, sleep tracking, or healthy recipe inspiration.

3. Breaking Bad Habits (Overall Analysis)

- Open a discussion on bad habits and their harmful effects.
- Provide a worksheet to the students to identify their personal bad habits.
- Discuss the trigger, cause, consequence and solution with examples.
- Guide them to replace the bad habits with good ones through worksheets.

4. Physical Well-being

1. Fitness

Introduce the different types of fitness activities such as basic exercises, cardiovascular exercises, strength training exercises, flexibility exercises, so on and so forth.
(Include theoretical explanations and outdoor activity).

2. Nutrition

Facilitate students to reflect on their eating habits, their body type, and to test their knowledge on nutrition, its sources and the benefits.

3. Yoga & Meditation

Discuss the benefits of Yoga and Meditation for one's overall health.

Demonstrate different yoga postures and their benefits on the body through visuals (pictures or videos)

4. Brain Health

Discuss the importance of brain health for daily life.

Habits that affect brain health (irregular sleep, eating, screen time).

Habits that help for healthy brains (reading, proper sleep, exercises).

Benefits of breathing exercises and meditation for healthy lungs.

5. Healthy Lungs

Discuss the importance of lung health for daily life.

Habits that affect lung health (smoking, lack of exercises).

Benefits of breathing exercises for healthy lungs.

6. Hygiene and Grooming

Discuss the importance of hygienic habits for good oral, vision, hearing and skin health.

Discuss the positive effects of grooming on one's confidence level and professional growth.

Suggested Activities (sample):

Nutrition:

Invite a nutritionist to talk among the students on the importance of nutrition to the body or show similar videos shared by experts on social media. Organize a 'Stove less/fireless cooking competition' for students where they are expected to prepare a nutritious dish and explain the nutritive values in parallel.

5. Emotional Well-being

1. Stress Management

Trigger a conversation or provide self-reflective worksheets to identify the stress factors in daily life and their impact on students' performance.

Introduce different relaxation techniques like deep breathing, progressive muscle relaxation, or guided imagery.

(Use audio recordings or visuals to guide them through these techniques).

After practicing the techniques, have them reflect on how these methods can help manage stress in daily life.

2. Importance of saying 'NO'

Explain the students that saying 'NO' is important for their Physical

Explain the students that saying 'NO' is important for their Physical and mental well-being, Academic Performance, Growth and Future, Confidence, Self-respect, Strong and Healthy Relationships, building reputation for self and their family (avoid earning a bad name).

Factors that prevent them from saying 'NO'.

How to practice saying 'NO'.

3. Body Positivity and self-acceptance

Discuss the following with the students.

What is body positivity and self-acceptance?

Why is it important?

Be kind to yourself.

Understand that everyone's unique.

Suggested Activities (Sample):

(Importance of saying 'NO')

Provide worksheets to self-reflect on...

How they feel when others say 'no' to them the situations where they should say 'no'

Challenge students to write a song or rap about the importance of saying no and how to do it effectively.

Students can perform their creations for the class.

6. Social Well-Being

1. Practicing Gratitude

Discuss the importance of practicing gratitude for building relationships with family, Friends, relatives, mentors and colleagues.

Discuss how one can show gratitude through words and deeds.

Explain how practicing gratitude can create 'ripple effect'

2. Cultivating Kindness and Compassion

Define and differentiate between kindness and compassion.

Explore practices that cultivate these positive emotions

Self-Compassion as the Foundation.

The power of small gestures.

Understanding another's perspective.

The fruits of compassion.

3. Practising Forgiveness

Discuss the concept of forgiveness and its benefits.

Forgiveness: What is it? and What it isn't?

Benefits of forgiveness.

Finding forgiveness practices.

4. Celebrating Differences

Appreciate the value of individual differences and foster inclusivity.

The World: A Tapestry of Differences (cultures, backgrounds, beliefs, abilities, and appearances).

Finding strength in differences (diverse perspectives and experiences lead to better problem-solving and innovation).

Celebrating differences, not ignoring them (respecting and appreciating the unique qualities).

Activities for celebrating differences (share culture, learn about others, embrace new experiences)

5. Digital Detox

Introduce the students to:

The concept of a digital detox and its benefits for social well-being How to disconnect from devices more often to strengthen real-world connections

7. Intellectual Well-being

1. Being a lifelong Learner

Give students an understanding on:

The relevance of intellectual well-being in this 21st century to meet the expectations in personal and professional well-being

The Importance of enhancing problem-solving skills Cultivating habits to enhance the intellectual well-being (using the library extensively, participating in extra-curricular activities, reading newspaper etc.)

2. Digital Literacy

Discuss:

The key aspects of digital literacy and its importance in today's world.

It is more than just liking and sharing on social media.

The four major components of digital literacy (critical thinking, communication, Problem-solving, digital citizenship).

Why is digital literacy important?

Boosting one's digital skills.

3. Transfer of Learning

Connections between different subjects How knowledge gained in one area can be applied to others.

Suggested Activities (sample):

Intellectual Well-being.

Provide worksheets to students for teaching them how to boost intellectual well-being.

Ask the students to identify a long-standing problem in their locality and come up with a solution and present it in the classroom. Also organize an event like 'Idea Expo' to display the designs, ideas, and suggestions, to motivate the students to improve their intellectual well-being.

8. Environmental Well-being

1. The Importance of initiating a change in the environment.

The session could be around:

Defining Environmental well-being (physical, chemical, biological, social, and psychosocial factors) People's behaviour, crime, pollution, political activities, infra-structure, family situation etc. Suggesting different ways of initiating changes in the environment (taking responsibility, creating awareness, volunteering, approaching administration).

Suggested Activities (sample):

Providing worksheets to self-reflect on how the environment affects their life, and the ways to initiate a change

Dedicate a bulletin board or wall space (or chart work) in the classroom for students to share their ideas for improving Environmental well-being.

Creating a volunteers' club in the college and carrying out monthly activities like campus cleaning, awareness campaigns against noise pollution, (loud speakers in public places), addressing anti-social behaviour on the campus or in their locality.

9. Mental Well-being

1. Importance of self-reflection

Discuss:

Steps involved in achieving mental well-being (self-reflection, self-awareness, applying actions, achieving mental well-being).

Different ways to achieve mental well-being (finding purpose, coping with stress, moral compass, connecting for a common cause).

The role of journaling in mental well-being

2. Mindfulness and Meditation Practices.

Benefits of practicing mindful habits and meditation for overall well-being.

1. Connecting with nature

Practising to be in the present moment Nature walk, feeling the sun, listening to the natural sounds Exploring with intention Hiking, gardening to observe the nature

Reflecting on the emotions, and feeling kindled by nature.

2. Serving people

Identifying the needs of others

Helping others.

Volunteering your time, skills and listening ear.

Finding joy in giving.

3. Creative Expressions

Indulging in writing poems, stories, music making/listening, creating visual arts to connect with inner selves.

Suggested Activities (Sample):

(Mindfulness and Meditation) Conducting guided meditation every day for 10 minutes and directing the students to record the changes they observe.

10. Situational Awareness (Developing Life skills)

1. Being Street smart

Discuss:

Who are street smart?

Why is it important to be street smart?

Characteristics of a street smart person: Importance of acquiring life skills to become street smart (General First-aid procedure, CPR Procedure, Handling emergency situations like fire, flood etc).

2. Digital Awareness

Discuss:

Cyber Security

Information Literacy.

Digital Privacy

Fraud Detection

Suggested Activities (sample):

(Street Smart) Inviting professionals to demonstrate the CPR Procedure

Conducting a quiz on Emergency Numbers

11. Understanding Addiction

Plan this session around:

Identifying the environmental cues, triggers that lead to picking up this habit

Knowing the impact of substance abuse Adverse health conditions, social isolation, ruined future, hidden financial loss and damaging the family reputation.

Seeking help to get out of this addiction

Suggested Activities:

Provide Worksheets to check the students' level of understanding about substance addiction and their impacts.

Share case studies with students from real-life.

Play/share awareness videos on addiction/de-addiction, experts talk.

*Conduct awareness programmes on Drugs and its ill effects.

(Arrange Experts from the concerned government departments and

NGOs working in drug addiction issues) and maintain the documents of the program.

COURSE OUTCOME

The students are able to,

1. Demonstrate proficiency in sports training and physical fitness practices.
2. Improve their mental and emotional well-being fostering a positive outlook on health and life.
3. Develop competence and commitment as professional in the field of health and wellness.
4. Awareness on drug addiction and its effects.

TEXT BOOK(S)

1. Edlin, G., & Golanty, E. (2020). Health and wellness (13th ed.). Jones & Bartlett Learning.
- 2.Sizer, F., & Whitney, E. (2021). Nutrition: Concepts and controversies (15th ed.). Cengage Learning.
3. Madanat, H., & Kindratt, T. B. (2021). Introduction to health promotion & behavioral science in public health. Cengage Learning.
4. Gabbard, C. (2017). Lifelong motor development (7th ed.). Pearson Education.
5. Carter, M. (2013). Mental health in education: Building on student strengths. Pearson Education.

REFERENCE BOOK(S)

1. Tolle, E. (2004). The power of now: A guide to spiritual enlightenment. New World Library.
2. Clear, J. (2018). Atomic habits: An easy & proven way to build good habits & break bad ones. Avery.
3. Ratey, J. J. (2008). Spark: The revolutionary new science of exercise and the brain. Little, Brown Spark.
4. Covey, S. (1998). The 7 habits of highly effective teens. Touchstone.
5. Goleman, D. (2006). Emotional intelligence: Why it can matter more than IQ. Bantam Books.
6. Newport, C. (2024). *Slow productivity: The lost art of accomplishment without burnout*. Portfolio.
7. Holiday, R. (2023). *Discipline is destiny: The power of self-control*. Profile Books.

E- RESOURCES

1. <https://www.who.int/health-topics>
2. <https://www.cdc.gov/healthyweight/index.html>
3. <https://www.nimh.nih.gov/health>
4. <https://www.headspace.com/>
5. <https://www.calm.com/>
6. <https://greatergood.berkeley.edu/>
7. <https://www.mayoclinic.org/healthy-lifestyle>

SEMESTER - IV



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-CC- IV: Biochemical Techniques

Ins. Hrs. /Week: 5

Course Credit: 5

Course Code: U25BC407

UNIT-I: Centrifugation

(15 Hours)

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.

UNIT-II: Chromatography

(15 Hours)

Chromatography - adsorption, partition. Principle, instrumentation and applications of Paper Chromatography, Thin Layer Chromatography, Ion-Exchange Chromatography, Gel Permeation Chromatography Affinity Chromatography, GC-MS, LC-MS, HPLC and HPTLC.

UNIT- III: Electrophoresis

(15 Hours)

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.

UNIT-IV: Basics of Electromagnetic radiations

(15 Hours)

Electromagnetic radiation and its properties: energy, wavelength, frequency and wavenumber. Absorption and emission spectra, Lambert-Beer Law, Light absorption and transmittance. Colorimetry-principle, instrumentation and applications. Visible and UV spectrophotometry - principle, instrumentation and applications in enzyme analysis and the study of protein and nucleic acid structure.

UNIT-V: Radioactivity and Field Work

(15 Hours)

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 & liquid scintillation counters. Autoradiography. Biological applications and safety aspects of radioisotopes.

Total Lecture Hours-75

COURSE OUTCOME

The students are able to,

1. Explain the principles, instrumentation and applications of centrifugation techniques used in biochemical analysis.
2. Describe the principles and analytical applications of various chromatographic techniques for separation of biomolecules.
3. Illustrate the principles, methodology and applications of electrophoretic techniques in biomolecular analysis.

4. Apply the concepts of electromagnetic radiations and spectrophotometric techniques in biochemical investigations.
5. Discuss the principles, detection methods, biological applications and safety aspects of radioisotopes and radioactivity.

TEXT BOOK(S)

1. Pathway, A., Upadhyay, K., & Nath, N. (2022). Biophysical chemistry: Principles and techniques (3rd ed.). Himalaya Publishing House.
2. Veerakumari, L. (2019). Bioinstrumentation (1st ed.). MJP Publishers.
3. Wilson, K., & Walker, J. (2018). Practical biochemistry: Principles and techniques (8th ed.). Cambridge University Press.
4. Kalidas, C., & Sangaranarayanan, M. V. (2023). Biophysical chemistry (1st ed.). Springer Cham.
5. Pandey, P. (2023). A textbook of bioinstrumentation. Walnut Publication.

REFERENCE BOOK(S)

1. Cooper, T. G. (1977). The tools of biochemistry. John Wiley & Sons.
2. Gurumani. (2011). Research methodology for biological sciences (1st ed.). MJP Publishers.
3. Dua, S., & Garg, N. (2020). Biochemical methods of analysis (1st ed.). Narosa Publishing House.
4. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). Principles of instrumental analysis (7th ed.). Cengage Learning.
5. Alberts, B., et al. (2017). Molecular biology of the cell (6th ed.). Garland Science.
6. Wilson, K., & Walker, J. (2022). *Principles and techniques of biochemistry and molecular biology* (9th ed.). Cambridge University Press.
7. Nielsen, S. S. (2023). *Food analysis laboratory manual* (4th ed.). Springer Nature.

E-RESOURCES

1. <https://www.britannica.com/science/chromatography>
2. <https://www.youtube.com/watch?v=xgxFBQZYXIE>
3. <https://www.youtube.com/watch?v=7onjVBsQwQ8>
4. <https://www.khanacademy.org/science/physics>
5. <https://www.coursera.org/courses?query=chromatography>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3		2		2			3	3	3	3
CO2	2	3	3	3		2		2			3	3	3	3
CO3	2	3	3	3		2		2			3	3	3	3
CO4	2	3	3	3		2		2			3	3	3	3
CO5	2	3	3	3		2		2			3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(Autonomous)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-CP- IV: Biochemical Techniques Practical

Ins. Hrs. /Week: 4

Course Credit: 4

Course Code: U25BC408P

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.

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.

III. Demonstration

1. Separation of serum and plasma from blood by centrifugation.
2. Separation of serum proteins by Agarose gel electrophoresis.
3. Separation of serum proteins by SDS-PAGE.

Total Hours-60

COURSE OUTCOME

The students are able to,

1. Estimate the amount of biomolecules by Colorimetric method.
2. Quantify the amount of minerals by Colorimetric method.
3. Separate and identify sugars, lipids and amino acids by chromatography.
4. Operate centrifuge for the separation of serum and plasma.
5. Demonstrate the separation of proteins electrophoretically.

TEXT BOOK(S)

1. Wilson, K., & Walker, A. (2018). Practical biochemistry: Principles and techniques (7th ed.). Cambridge University Press.
2. Dixon, M., & Webb, W. C. (2019). Enzymes: A practical introduction to structure, mechanism, and data analysis (3rd ed.). Wiley-Blackwell.
3. Guthrie, R. H., Jr., & Pelley, W. W. (2022). Biochemistry and molecular biology of plants (2nd ed.). Wiley-Blackwell.
4. Stryer, L. (2015). Biochemistry (8th ed.). W.H. Freeman and Company.
5. Hames, B. D., & Hooper, D. H. (2007). Protein purification: Principles and practice (3rd ed.). Springer. Springer, 2007.

REFERENCE BOOK(S)

1. Glick, B. R., & Pasternak, J. J. (2010). Molecular biotechnology: Principles and applications of recombinant DNA (4th ed.). ASM Press.
2. Berg, J. M., Tymoczko, J. L., & Stryer, L. (2012). Biochemistry (7th ed.). W.H. Freeman and Company.
3. Zubay, G. L. (1995). Biochemistry (4th ed.). McGraw-Hill.
4. Freeman, S. (2013). Biological science (6th ed.). Pearson.
5. Benson, H. J. (2024). Microbiological applications: Laboratory manual in general microbiology (13th ed.). McGraw-Hill Education.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7023142/>.
3. <https://onlinelibrary.wiley.com/doi/abs/10.1002/bit.20663>.
4. <https://www.ncbi.nlm.nih.gov/books/NBK21340/>.
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3418254/>.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2		3			2					3	3	3	3
CO2	2		3			2					3	3	3	3
CO3	2		3								3	3	3	3
CO4	2		3			2					3	3	3	3
CO5	2		3			2					3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)



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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-SEC-IV: Medical Coding

Ins. Hrs. / Week: 2

Course Credit: 2

Course Code: U25SEBC44

UNIT-I: Fundamentals of Medical Coding (06 Hours)

Introduction to Medical coding, coding theory, Healthcare Common Procedure Coding, First Aid and CPR.

UNIT-II: Medical Terminology and Diagnostic Coding (06 Hours)

Introduction to Medical Terminology, specialization I & II, Diagnostic coding, factors affecting diagnostic coding.

UNIT- III: Medical Record Documentation (06 Hours)

Documenting medical records- Importance of Documentation, Types of dictation formats.

UNIT-IV: Anatomy-Based Coding and Classification Systems (06 Hours)

Introduction to Human Anatomy and Coding, ICD-10- CM classification system.

UNIT-V: CPT Coding and Legal Aspects in Healthcare (06 Hours)

Introduction to CPT coding, types of CPT coding Medical Law and Ethics.

Total Lecture Hours-30

COURSE OUTCOME

The students are able to,

1. Explain the fundamentals of medical coding, healthcare coding systems and basic first aid and CPR concepts.
2. Describe the medical terminology and diagnostic coding procedures used in healthcare.
3. Demonstrate knowledge of medical record documentation and healthcare dictation formats.
4. Apply anatomy-based coding principles and interpret the ICD-10-CM disease classification system.
5. Discuss CPT coding systems and the legal and ethical aspects of healthcare documentation and coding.

TEXT BOOK(S)

1. Chabner, D.-E. (2021). Medical terminology: A short course (9th ed.). Elsevier.
2. Buck, C. J. (2022). Step-by-step medical coding. Elsevier Health Sciences.
3. Green, M. A. (2023). Understanding health insurance: A guide to billing and reimbursement (15th ed.). Cengage Learning.
4. Bowie, M. J., & Green, M. A. (2021). Essentials of health information management: Principles and practices (5th ed.). Cengage Learning.
5. American Medical Association. (2023). CPT 2024 professional edition. American Medical Association.

REFERENCE BOOK(S)

1. AAPC. (2023). ICD-10-CM expert for physicians: 2024. AAPC Publishing.
2. Fremgen, B. F. (2022). Medical law and ethics (6th ed.). Pearson.
3. Chabner, D.-E. (2021). The language of medicine (12th ed.). Elsevier.
4. Marieb, E. N., & Hoehn, K. N. (2019). Human anatomy & physiology (11th ed.). Pearson.
5. Sayles, N. B. (2020). Health information management technology: An applied approach (6th ed.). AHIMA Press.
6. Buck, C. J. (2024). *Step-by-step medical coding* (11th ed.). Elsevier.
7. Leon-Chisen, N. (2023). *Coding and reimbursement for hospital inpatient services*. American Hospital Association Publishing.

E-RESOURCES

1. <https://ijcrt.org/papers/IJCRT2212449.pdf>
2. https://resources.uscareerinstitute.edu/eBooks/usci/1693/e0201693TB01B-53_MedicalCoding_1-11.pdf
3. http://www.ehealthwork.eu/FC/Presentations/Clusters_3-4/19-FC-C4M6U5-Introduction_to_Medical_Coding.pdf
4. [Introduction_to_Medical_Coding.pdf](http://www.ehealthwork.eu/FC/Presentations/Clusters_3-4/19-FC-C4M6U5-Introduction_to_Medical_Coding.pdf)
5. <https://www.coursera.org/>
6. <https://www.icd10data.com/>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2	3				3					3		2	3
CO2	2	3				3					3		2	3
CO3	2	3				3					3		2	3
CO4	2	3				3					3		2	3
CO5	2	2				2					3		2	3

S-Strong (3) M-Medium (2) L-Low (1)



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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-SEC-V: Medical Laboratory Techniques

Ins. Hrs. / Week: 2

Course Credit: 2

Course Code: U25SEBC45

UNIT-I: Specimen Handling and Laboratory Waste Management (06 Hours)

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.

UNIT-II: Hematological Techniques and Blood Banking (06 Hours)

Determination of Blood group and Rh factor, Estimation of Hb, Determination of RBC, WBC
and Platelets. Basic blood banking procedures- cross matching, screening test. Blood
transfusion and hazards.

UNIT-III: Clinical Analysis of Blood and Urine (06 Hours)

Estimation of blood sugar – Enzymatic method, HbA1C, Qualitative and quantitative analysis
of urine sample- NPN-urea, uric acid, creatinine. Mineral, vitamin and CSF analysis.

UNIT-IV: Immuno diagnostics Techniques (06 Hours)

Immuno diagnostics -Widal test, VDRL test, ASO, RA, CRP and Complement fixation Test.
RIA, ELISA, Skin test – Montaux and Lepramin test.

UNIT-V: Enzymes and hormone Assay (06 Hours)

Assay of clinically important enzymes- SGOT, SGPT, ALP and CK-MB. Estimation of
clinically important hormones – Insulin, Thyroid and Reproductive hormones and its clinical
significance

Total Lecture Hours-30

COURSE OUTCOME

The students are able to,

1. Perform collection, processing, analysis and safe disposal of clinical specimens following standard laboratory guidelines.
2. Demonstrate hematological techniques including blood grouping, Rh typing, blood cell counting and blood banking procedures.
3. Apply biochemical methods for the clinical analysis of blood, urine, cerebrospinal fluid, minerals and vitamins.
4. Explain the principles and clinical applications of immunodiagnostic techniques used in disease diagnosis.
5. Analyze enzyme and hormone assays for clinical diagnosis and interpretation of diseases.

TEXT BOOK(S)

1. Godkar, P. B., & Godkar, D. P. (2024). Textbook of medical laboratory technology (2nd ed.). Bhalani Publishing House.

2. Mukherjee, K. L. (2010). Medical laboratory technology: Procedure manual for routine diagnostic tests (Vols. 1–3). Tata McGraw-Hill.
3. Turgeon, M. L. (2017). Clinical hematology: Theory and procedures (6th ed.). F.A. Davis Company.
4. Marshall, W. J., & Lapsley, M. (2014). Clinical biochemistry: Metabolic and clinical aspects (3rd ed.). Churchill Livingstone Elsevier.
5. Owen, J. A., Punt, J., & Stranford, S. (2018). Kuby immunology (8th ed.). W.H. Freeman.

REFERENCE BOOK(S)

1. Burtis, C. A., & Bruns, D. E. (Eds.). (2018). Tietz textbook of clinical chemistry and molecular diagnostics (6th ed.). Elsevier.
2. McPherson, R. A., & Pincus, M. R. (2016). Henry's clinical diagnosis and management by laboratory methods (23rd ed.). Elsevier.
3. Stites, D. P., & Terr, A. I. (2001). Basic and clinical immunology (10th ed.). Lange Medical Books/McGraw-Hill.
4. Gladwin, M., & Trattler, W. (2019). Clinical microbiology made ridiculously simple (7th ed.). MedMaster Inc.
5. Devlin, T. M., & Fevery, J. (2010). Textbook of biochemistry with clinical correlations (7th ed.). Wiley.
6. Rifai, N., Horvath, A. R., & Wittwer, C. T. (2023). *Tietz fundamentals of clinical chemistry and molecular diagnostics* (9th ed.). Elsevier.
7. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2022). *Clinical chemistry: Principles, techniques, and correlations* (9th ed.). Wolters Kluwer.

E-RESOURCES

1. <https://www.youtube.com/watch?v=QNYIX5Ne9IQ>
2. <https://www.slideshare.net/doctorrao/agglutination-tests-and-immunoassays>
3. <https://microbenotes.com/introduction-to-precipitation-reaction/>
4. <https://medlineplus.gov/laboratorytests.html>
5. <https://www.cdc.gov/labtraining>.

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CO2	3	3	3	3		2		2		2	3		3	
CO3	3	3	3	3		2		2		2	3		3	
CO4	3	3	3	3		2		2		2	3		3	
CO5	3	3	3	3		2		2		2	3		3	

S-Strong (3)

M-Medium (2)

L-Low (1)