

B.Sc., MICROBIOLOGY

SYLLABUS

PROGRAMME CODE: 3USMIC

2025-2028



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

*(Affiliated to Bharathidasan
University, Tiruchirappalli) (Accredited by NAAC)*
**SUNDARAKKOTTAI, MANNARGUDI – 614 016
TAMIL NADU, INDIA.**



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

(Affiliated to Bharathidasan University, Tiruchirappalli)
Accredited by NAAC-An ISO 9001:2015 Certified Institution
SUNDARAKKOTTAI, MANNARGUDI-614016.

TAMILNADU, INDIA.

B.Sc., MICROBIOLOGY
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 have 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 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 with in 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 programme are being offered by the college. Ability Enhancement Compulsory Courses “AECC” are the courses based upon the content that leads to Knowledge enhancement especially in Communicative English and other soft skills.

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, Ability Enhancement Compulsory Course, Value Education, Environmental studies, Skill Enhancement Courses/ Soft Skills, Internship / field visit / industrial visit/ Case Study), Professional Competency Course

Part –V

Extension activity, Gender studies and Health and wellness

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/ Match the following/True or False/ Multiple Choice Questions
Two Questions from Each unit

Part A 2 (5X2=10 marks)

Short Answers
One question from Each unit

Total Marks – 20

Part B: (5X5=25 marks)

Paragraph Answers
Either/ or type, One Questions 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/Analysing	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 SEMESTER EXAMINATION/ Continuous Internal Assessment	
PART	MARKS
PART –A I. (No choice ,One Mark) TWO questions from each unit (10x1 =10)	20
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 SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 100			
K- LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
PART							
PART –A (One Mark, No choice) (10x1 =10)	10						10
(2-Marks, No choice) (10x2=20)	10						10
PART –B (5- Marks) (Either/or type) (5x5=25)		5	10	10			25
PART -C (10 Marks) (3 out of 5) (3x10=30)					20	10	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	10	20	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:

- i) For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
- ii) 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.
- iii) Grade in Part –IV and Part-V shall be shown separately and it shall

not be taken into account for classification.

iv) A Pass in PART- V will be mandatory although the marks will not count for the calculation of the CGPA.

v) 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	0	RA

Table- 2: Grading of the Courses - PG

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
Below 50	0	RA

Table-3: 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

VISION

Empowering the women students with quality education on utility of microbes, microbial processes, products, to make them academics and entrepreneurs to serve for the welfare of society.

MISSION

- To initiate, promote, develop, sustain quality and innovative research using sophisticated instruments in the field of Microbiology.
- To motivate the students so as to exploit the potentiality of microbes and microbial processes for the betterment of the society

PROGRAMME OUTCOMES FOR B.Sc.,DEGREE PROGRAMMES

PO No.	Programme Outcomes <i>(Upon completion of the B.Sc. Degree Programme, the Undergraduate will be able to)</i>
PO-1	Disciplinary knowledge: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate 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 synthesize data 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.

PROGRAMME SPECIFIC OUTCOME (PSO) FOR B.Sc.,DEGREE PROGRAMMES

PSO No.	Program Specific Outcomes (B.Sc., Microbiology)
PSO1	Placement : Prepare the students in all disciplines like agriculture, industry-medical, pharma, dairy, hotel, food and food processing, immunologicals, cosmetics, vermitechnology and water treatment for effective and respectful placement.
PSO2	Entrepreneur : To create effective entrepreneur by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.
PSO3	Research and Development : Design and implement HR systems that comply with good laboratory practices, following ethical values, leading the organization towards growth and development.
PSO4	Contribution to society: To contribute to the development of society and produce microbiological products, by collaborating with stake holders, related to the betterment of environment and mankind at the national and global level.



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

(Affiliated to Bharathidasan University, Tiruchirappalli)
Accredited by NAAC-An ISO 9001:2015 Certified Institution
SUNDARAKKOTTAI, MANNARGUDI-614016.
TAMILNADU, INDIA.

B.Sc., MICROBIOLOGY

**CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED
CURRICULUM FRAMEWORK (CBCS – LOCF)**

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

ELIGIBILITY: A Pass in 10+2 with Biology as one of the core subjects

Sem	Part	Course	Course Code	Title of the Paper	Ins. Hour s/ Week	L	T	P	SCredit	Exam Hours	Marks		Total	
											CIA	ESE		
I	I	Language Course-I	U25LC101	Pothu Tamil-1 Tamil Illakiya Varalaru -1	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	U25MB101	Fundamentals of Microbiology	5	4	1	-	-	5	3	25	75	100
		Core Practical-I	U25MB102P	Fundamentals of Microbiology (P)	4	1	-	3	-	4	3	25	75	100
		Allied Course-I	U25ABC101	General Biochemistry	3	2	1	-	-	2	3	25	75	100
		Allied Practical-I	U25ABC102P	General Biochemistry (P)	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 studies in school level (or) b) Special Tamil if Tamil language was studied up to 10 th & 12 th std. Those who choose NCC in Part V must choose NCC course as Non- Major Elective	-	-	2	2	-	-	-	2	3	25	75	100
		Foundation Course	U25FCMB11	Introduction to Microbial World	2	2	-	-	-	2	3	25	75	100
			TOTAL		30	21	4	5		21	-	-	-	700
	I	Language Course-II	U25LC202	Pothu Tamil-II Tamil Illakiya Varalaru -2	6	5	1	-	-	3	3	25	75	100

II	II	English Language Course-II	U25ELC202	General English –II	6	5	1	-	-	3	3	25	75	100
		Core Course-II	U25MB203	Microbial Physiology	5	4	1	-	-	5	3	25	75	100
		Core Practical –II	U25MB204P	Microbial Physiology (P)	4	1	-	3	-	4	3	25	75	100
	III	Allied Course-II	U25AMB201	Bioinstrumentation	3	2	1	-	-	2	3	25	75	100
		Allied Practical I	U25ABC102P	General Biochemistry (P)	2	-	-	2	-	2	3	25	75	100
	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 studies in school level (or) b) Special Tamil if Tamil language was studied up to 10 th & 12 th std. Those who choose NCC in Part V must choose NCC course as Non- Major Elective	-	-	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course-I	U25SEMB21	Effective Microorganisms Technology	2	2	-	-	-	2	3	25	75	100
			Total		30	21	4	5	-	23	-	-	-	800
III	I	Language Course-III	U25LC303	Pothu Tamil-III	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
		Core Course-III	U25MB305	Bacteriology and Mycology	4	3	1	-	-	4	3	25	75	100
		Core Practical –III	U25MB306P	Bacteriology and Mycology (P)	4	1	-	3	-	4	3	25	75	100
	III	Allied Course-III	U25AMB302	Medical Laboratory Technology	2	2	-	-	-	2	3	25	75	100
		Allied Practical –II	U25AMB303P	Medical Laboratory Technology (P)	2	-	-	2	-	--	--	--	--	--
	IV	Skill Enhancement Course –II	U25SEMB32	Microbial Enzymes	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course –III	U25SEMB33	Microbiome Analysis	2	2	-	-	-	2	3	25	75	100
	V	Special Course	25UGSC	Health and Wellness	2	-	-	2	-	1	-	-	-	-

			TOTAL		30	20	3	7	-	21		-	-	700
IV	I	Language Course-IV	U25LC404	Pothu Tamil-IV	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
	III	Core Course- IV	U25MB407	Immunology	5	4	1	-	-	5	3	25	75	100
		Core Practical - IV	U25MB408P	Immunology (P)	4	1	-	3	-	4	3	25	75	100
		Allied Practical- II	U25AMB303P	Medical Laboratory Technology (P)	2	-	-	2	-	2	3	25	75	100
		Allied Course- IV	U25AMB404	Food Processing Technology	3	2	1	-	-	2	3	25	75	100
	IV	Skill Enhancement Course –IV	U25SEMB44	Spirulina Cultivation	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course –V	U25SEMB45	Microbial Food Safety	2	2	-	-	-	2	3	25	75	100
			TOTAL		30	21	4	5	-	23	-	-	-	800
V	III	Core Course –V		Virology and Parasitology	6	5	1	-	-	5	3	25	75	100
		Core Course –VI		Environmental and Agriculture Microbiology	5	4	1	-	-	4	3	25	75	100
		Core Course-VII		Molecular Biology and Microbial Genetics	5	4	1	-	-	5	3	25	75	100
		Core Practical- V		Virology and Parasitology, Environmental and Agriculture Microbiology (P)	4	1	-	3	-	4	3	25	75	100
		Elective Course -I		Recombinant DNA Technology/ Biostatistics/Veterinary Microbiology	4	3	1	-	-	3	3	25	75	100
		Elective Course -II		Biosafety and Bioethics/ Research Methodology/ Bioinformatics	4	3	1	-	-	3	3	25	75	100
		Internship/ Industrial visit/ Field visit		Internship/ Industrial Visit/ Field Visit	-	-	-	-	-	2	-	-	-	-
		EVS		Environmental Studies	2	2	-	-	-	2	3	25	75	100
					30	22	5	3	-	28		-	-	700
	III	Core Course -VIII		Food, Dairy and Probiotic Microbiology	6	5	1	-	-	4	3	25	75	100
		Core Practical –VI		Molecular Biology and Microbial Genetics, Food, Dairy and Probiotic Microbiology (P)	6	5	1	-	-	4	3	25	75	100
		Core Project		Project with viva- voce / Group Project	5	-	1	4	-	5	3	25	75	100
		Elective Course-III		Pharmaceutical Microbiology / Bioinoculants / Cell Biology	4	3	1	-	-	3	3	25	75	100

VI		Elective Course-IV	Entrepreneurship and Bio-Business/ Antimicrobial Agents/ Fermentation Technology	4	3	1	-	-	3	3	25	75	100
	IV	Value Education	Value Education	2	2	-	-	-	2	3	25	75	100
		Professional Competency Course	Microbial Quality Control and Testing	2	2	-	-	-	2	3	25	75	100
	V	Extension activity	Extension activity	-	-	-	-	-	1	-	-	-	-
		Gender Studies	Gender Studies	1	1	-	-	-	1	3	25	75	100
	TOTAL			30	21	5	4	-	25	-	-	-	800
	GRAND TOTAL			180	126	25	29	-	141	-	-	-	4500
Extra Credit			Value added Courses (At least one per Year)	-	-	-	-	-	2	-	-	-	-

L-Lecture

T-Tutorial

P-Practical

S-Seminar

NON MAJOR ELECTIVE OFFERED BY THE DEPARTMENT

S.No	Part	Semester	Course Name	Course Code
1	IV	I	Microbial Medicine	U25NMEMB11
2		II	Microbial Cosmetics	U25NMEMB22

Credit Distribution for B.Sc., Microbiology

S.No	Part	Subject	No. of Courses	Total Credits
1.	I	Language	4	12
2.	II	English	4	12
3.	III	Core Course –Theory	8	37
4.		Core Practical	6	24
5.		Core Course-Project	1	5
6.		Allied Course	4	08
7.		Allied Course Practical	2	4
8.		Elective Course	4	12
9.	IV	Non-Major Elective	2	04
10		Foundation Course – FC	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		Professional competency skill	1	02
16	V	Gender Studies	1	01
17		Health and Wellness	1	1
18		Extension Activity	1	01
Total			48	141

SEMESTER - III

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



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

**DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY**

Semester: III- CC-III: Bacteriology and Mycology

Ins. Hours / Week: 4

Course Credit: 4

Course Code: U25MB305

UNIT- I

(12 Hours)

Classification of Medically Important Bacteria, Normal flora of human body, Koch's and River's postulates. Collection, transport, storage and processing of clinical specimens. Host-pathogen interactions: Definitions of infection, invasion, primary and opportunistic pathogens, pathogenicity, virulence, toxigenicity, carriers, endemic, epidemic, pandemic diseases and epidemiology – putative virulence factors of human pathogens.

UNIT-II:

(12 Hours)

Medically important Gram Positive bacterial infections - Causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment of the following bacterial diseases (a) Streptococcal infections (*Streptococcus pyogenes*), (b) Staphylococcal infections (*Staphylococcus aureus*), (c) Tetanus (*Clostridium tetani*) (d) Diphtheria (*Corynebacterium diphtheriae*) (e) Anthrax (*Bacillus anthracis*) (f) Tuberculosis (*Mycobacterium tuberculosis*), (g) Leprosy (*Mycobacterium leprae*).

UNIT-III:

(12 Hours)

Medically important Gram-Negative bacterial infections - Causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention, and treatment of the following bacterial diseases (a) Meningitis (*Neisseria meningitidis*) (b) Typhoid (*Salmonella typhi*) (c) Cholera (*Vibrio cholerae*) (d) Bacillary dysentery (*Shigella dysenteriae*); Sexually Transmitted disease (Syphilis–*Treponema pallidum*. Gonorrhoea - *Neisseria gonorrhoeae*); Nosocomial infections – definition, importance and their control. Mode of action of Antibacterial agents.

UNIT-IV:

(12 Hours)

Medically important Fungi - Classification of medically important fungi; Superficial mycoses: Pityriasis versicolor; Tinea Nigra; Piedra. Cutaneous mycoses: *Microsporum* sp., *Trichophyton* sp., and *Epidermophyton floccosum*. Subcutaneous mycoses: Chromoblastomycosis; Sporotrichosis.

UNIT-V:

(12 Hours)

Systemic Mycoses - Blastomycosis; Histoplasmosis; Opportunistic Infections - Candidiasis; Cryptococcosis; Zygomycosis; Mycotoxins: Aflatoxin. Antifungal agents: Mechanism of action of Amphotericin B and Griseofulvin.

Total Lecture Hours – 60

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Explain the bacterial pathogenesis and processing of specimen for diagnosis
2. Compile a list of disease-causing Gram Positive bacteria and compare their modes of infection, symptoms, diagnosis and treatment.
3. Describe the Gram Negative bacterial disease and its control
4. Comprehend human fungal infection and mechanism behind the disease process.
5. Explain the types of mycoses caused in humans and categorize the modes of infection, pathogenesis, and treatment

TEXT BOOKS

1. Tom Parker, M. Leslie H. Collier. 1990. Topley & Wilson's Principles of Bacteriology, Virology and Immunity, 8th Edition. Edward Arnold, London
2. Greenwood, D., Slack, R.B. and Peutherer, J.F. 2012. Medical Microbiology, 18th Edition. Churchill Livingstone, London.
3. Finegold, S.M. 2000, Diagnostic Microbiology, 10th Edition. C.V. Mosby Company, St. Louis.
4. Ananthanarayanan, R. and Jayaram Panicker C.K. 2020. Text book of Microbiology. Orient Longman, Hyderabad.
5. Jagdish Chander, 2018. Textbook of Medical Mycology, 4th edition, Jaypee Brothers medical publishers.
6. Garbacz, K., and Jarzembowski, T. (Eds.). 2023. *Bacterial Infectious Diseases Annual Volume 2023*. IntechOpen. ISBN: 978-0-85014-253-2

- Chhaya Singh 2022, Principles of Bacteriology and Virology, 1st Edition, Pinakin Publishing, Mumbai.

REFERENCE BOOK(S)

- Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Editions), 1994. Methods for General and Molecular Bacteriology. ASM Press, Washington, DC.
- Kevin Kavanagh, 2018. Fungi Biology and Applications 3rd Edition. Wiley Blackwell publishers.
- C.J. Alexopoulos, C.W. Mims, M. Blackwell, 2007. Introductory Mycology, 4th edition. Wiley publishers, Hoboken, New Jersey, U.S.
- A.J. Salle, 2007. Fundamental principles of bacteriology, 4th edition, Tata McGraw-Hill Publications, New York, U.S
- Christopher C. Kibbler ,Richard Barton,Neil A. R. Gow, Susan Howell,Donna M. MacCallum, Rohini J. Manuel, 2017. Oxford Textbook of Medical Mycology. Oxford University Press, New York, NY, United States
- Chander, J. 2023. *Textbook of Medical Mycology* (4th ed.). Jaypee Brothers Medical Publishers. ISBN: 978-9386261830

E-RESOURCES

- <http://textbookofbacteriology.net/nd>
- <https://microbiologysociety.org/members-outreach-resources/links.html>
- <http://mycology.cornell.edu/fteach.html>
- <https://www.adelaide.edu.au/mycology/>
- <https://www.isham.org/mycology-resources/mycological-links>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3		2	3						3			3	
CO2	3	2	3	3						3	3	3	2	
CO3	3	2	3	3						3	3	3	2	
CO4		3	3	3		2	3		3	2	2		3	3
CO5	3	3	2	3						3			3	3

Strong -3; Medium -2; 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 MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: III- CP-III: Bacteriology and Mycology (P)

Ins. Hours / Week: 4

Course Credit: 4

Course Code: U25MB306P

- Collection of clinical specimens (Throat swab, pus sample, sputum, urine and stool sample).
- Preparation of Stains for bacterial – Simple, Gram, Capsular and Spore Staining
- Preparation of Stains for Fungi- Flagella – Silver staining, Nuclear Staining
- Isolation of pure cultures of bacteria by streak plate method.
- Motility of bacteria - hanging drop method.
- Biochemical test for identification of pathogenic bacteria (*S.aureus*, *E.coli*, *K.pneumoniae*, *S.typhi* and *V.cholerae*) – Indole, Methyl Red, Voges proskauer, Citrate Utilization, Catalase, Oxidase and Urease test
- Antimicrobial susceptibility testing by disc-diffusion method.
- Isolation and identification of Endophytic microbes
- Microscopic identification of medically important Fungi – KOH mount and Lactophenol cotton Blue staining.
- LPCB Preparation of skin/hair/nail for fungal observation
- Cultivation of Yeast
- Biochemical identification of *Candida* spp

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Demonstrate methods to observe and measure microorganisms by standard microbiological techniques
2. Identify pathogenic microorganisms and its sensitivity towards antibiotics.
3. Understand experimental tools used to cultivate and characterize clinically important viruses and bacteriophages

4. Elucidate clinically important fungi.
5. Investigate the medically important fungi from clinical specimens.

TEXT BOOKS

1. Dubey, R.C. and Maheswari, D.K. 2020. S. Chand Publishers. ISBN-13: 978-8121921534, ISBN-10: 8121921538., New Delhi.
2. K.R. Aneja, 2017. Experiments in Microbiology, Plant Pathology, Tissue Culture and Microbial Biotechnology. 5th Edition. New Age International Publishers. ISBN-10: 9386418304, ISBN-13: 978-9386418302, New Delhi.
3. Collee, J.G., Fraser, A.G., Marnion, B.P. and Simmons, A. 1996. Mackie & McCartney Practical Medical Microbiology. 14th Edition. Elsevier. ISBN-10: 813120393X, ISBN-13: 978-8131203934, US.
4. Prince CP, 2009.. Practical Manual of Medical Microbiology, 1st edition, Jaypee digital publishing, New Delhi.
5. James H. Jorgensen, Karen C. Carroll, Guido Funke, Michael A. Pfaller, Marie Louise Landry, Sandra S. Richter, David W. Warnock , 2015. Manual of Clinical Microbiology, 11th Edition, ASM press, New Delhi
6. Saha R, 2022, Microbiology Practical Manual, 2nd Edition, CBS Publishers & Distributors Pvt. Ltd. New Delhi

REFERENCE BOOK(S)

1. Patricia M. Tille, 2021. Bailey & Scott's Diagnostic Microbiology, 15th Edition. Elsevier. ISBN-10: 0323681050, ISBN-13: 978-0323681056, New Delhi.
2. Monica Cheesbrough, 2006. District Laboratory Practice in Tropical Countries. Part 1. 2nd Edition. Cambridge University Press. ISBN-10: 0521171571, ISBN-13: 978-0521171571, London.
3. Michael A. Pfaller (ed.) 2015. Manual of Clinical Microbiology. Vol. 1 and 2. 11th Edition. ASM Press. ISBN-10: 9781555817374, ISBN-13: 978-1555817374, New Delhi.
4. Josephine A. Morello, Paul A. Granato and Helen EckelMizer, 2002. Laboratory Manual and Workbook in Microbiology. 7th Edition. The McGraw Hill Company. ISBN: 0-07-246354-6, Hyderabad.

- Rowland, S.S., Walsh, S.R., Teel, L.D. and Carnahan, A.M. 1994. Pathogenic and Clinical Microbiology: A Laboratory Manual. Lippincott Williams & Wilkins. ISBN-10: 0316760498, ISBN-13: 9780316760492, US.

E-RESOURCES

- <https://www.microcarelab.in/media/microcarelab.in/files/Sample-Collection-Manual.pdf>
- http://ssu.ac.ir/cms/fileadmin/user_upload/Daneshkadaha/pezeshki/microb/file_amuzeshi/Lab_QA_Microbiology_QA.pdf
- https://www.academia.edu/11977315/Basic_Laboratory_Procedures_in_Clinical_Bacteriology
- <https://cmr.asm.org/content/31/3/e00062-17.full.pdf>
- <https://microbiologyinfo.com/techniques-of-virus-cultivation/>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3		3	2						3	3		3	
CO2	3	2	3	3		3	3		2	3	3		2	
CO3	3		3	2						3			3	2
CO4	1		3	2					3	3			3	3
CO5	2	3	3	2			3		3	3			3	3

Strong -3; Medium -2; 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 MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: III- AC-III: Medical Laboratory Technology

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U25AMB302

UNIT-I: (6 Hours)

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.

UNIT-II: (6 Hours)

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.

UNIT-III: (6 Hours)

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.

UNIT-IV: (6 Hours)

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.

UNIT-V: (6 Hours)

Quality Standards in Health Laboratories – Development and implementation of standards, Accreditation Boards –NABL, NABH, ISO, CAP, COLA, Performing quality assessment - pre-analytical, analytical and post-analytical phases of testing.

Total Lecture Hours – 30

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Demonstrate ethical and professional conduct with medical professionals
2. Explain the procedure for collection, storage and handling of laboratory specimens.
3. Develop scientific knowledge on haematological techniques.
4. Perform laboratory tests with accuracy and precision.
5. Establish quality assurance to ensure the accuracy and reliability of laboratory information.

TEXT BOOKS

1. Mukharji,K.L. 2000. Medical Laboratory Techniques, Vol - I, II & III, 5th Edition. Tata McGrawHill, New Delhi.
2. Ochei,A., Kolhatkar. A. 2000.Medical Laboratory Science: Theory and Practice, McGraw Hill Education, Delhi.
3. RamnikSood, 2015. Concise Book of Medical Laboratory Technology:Methods and Interpretation, 2ndEdition, Jaypee Brothers Medical Publishers, New Delhi.
4. S. Ramakrishnan, KN Sulochana, 2012. Manual of Medical Laboratory Techniques, Jaypee Brothers Medical Publishers Pvt. Ltd, Dharmatala, Kolkata
5. Talib V.H. 2019.Handbook Medical Laboratory Technology, 2ndEdition, Directorate of health services, Government of India. Goa.
6. Gupte, S. 2023. *The Short Textbook of Medical Laboratory for Technicians (3rd ed.)*. Jaypee Brothers Medical Publishers. ISBN: 9789390595044

REFERENCES BOOKS

1. Rutherford, B.H. Gradwohl , A.C. Sonnenwirth L. Jarett. Gradwohls. 2000. Clinical Laboratory Methods and Diagnosis, Vol-I, 8th edition, Mosby.
2. Baker, F.J., Silverton, R.E., and Pallister,.J. 1998. An Introduction to Medical Laboratory Technology, 7thEdition, CBS Publishers and Distributors Pvt. Ltd. New Delhi
3. Godkar 2021.Textbook of Medical Laboratory Technology, 3rdEdition, Bhalani Publishing House. Darya Ganj
4. M.N.Chatterjee and RanaShinde. 2008. Textbook of Medical Biochemistry, 7thEdition, Jaypee Brothers Medical Publishers Pvt. Limited, Delhi
5. James G Cappucino. and Natalie Sherman. 2016. Microbiology – A laboratory

manual.(5th Edition).The Benjamin publishing company. New York.

6. Darshan P. Godkar Praful B and Godkar, 2024, A Text Book of Medical Laboratory Technology Clinical Laboratory Sciences and Molecular Diagnosis, Bhalani Publishing House, Delhi.
7. Maheshwari, N. 2023. Handbook of Medical Laboratory Technology: A Book for DMLT Students. Jaypee Brothers Medical Publishers. ISBN: 9789356962941

E-RESOURCES

1. <https://www.jaypeedigital.com> › book
2. <https://www.pdfdrive.com> › wintrobcs-clinical-hematology
3. <https://currentprotocols.onlinelibrary.wiley.com/doi/pdf/10.1002/cpet.5>.<https://vlab.amrita.edu/index.php?sub=3&brch=272> 5. <https://nptel.ac.in/courses/102105087>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	Pos										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	3	2	3		3	3	3	3	3			3	3
CO2	2	3	3	3		3	3	2	3	3			3	3
CO3			3	3	3	3			2	3			2	3
CO4			3	3		3		2	3	3			3	3
CO5			3	3		2				3	2		3	3

Strong -3; Medium -2; 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 MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: III- AP-II: Medical Laboratory Technology (P)

Ins. Hours / Week: 4

Course Credit: 2

Course Code: U25AMB303P

- Collection of biological samples – Blood, Urine, Faeces, CSF, Sputum, Intestinal fluid, Semen.
- Handling of common laboratory equipment's
- Simple staining and Gram staining method
- Tests for motility bacteria.
- Biochemical testing – Catalase, Oxidase, Citrate utilization, Urease, TSI, Carbohydrate fermentation, MR VP, Indole
- Blood Grouping test
- Enumeration of RBC and Platelet
- Bleeding time and Clotting time
- Microscopic analysis of urine

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Demonstrate the collection and transport of biological sample
2. Acquire skills for handling the laboratory equipment's
3. Identify the pathogenic bacteria using staining and biochemical tests
4. Understand the Haematological examinations of samples
5. Interpret the clinical conditions of urine samples

TEXT BOOKS

1. Teitz, 2018. Clinical Chemistry. W.B. Saunders Company Harcourt (India) Private Ltd, New Delhi.
2. Kaplan, 2003. Clinical Chemistry, Mosby Company, St. Louis Washington, D.C. Toronto.
3. U. Satyanarayan, 2013. Biochemistry Books and Allied (P) Ltd. Kolkata-India

4. Ramanic Sood, 2023. Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi
5. Mukharji, 2022. Medical Laboratory Techniques, Vol - I, II & III, 5th Edn. Tata McGraw Hill, Delhi.

REFERENCE (BOOKS)

1. Fischbach, 2005. Manual of lab and diagnostic tests, Lippincott Williams Wilkins, New York.
2. Gradwohl, 2000. Clinical laboratory methods and diagnosis. (ed) Ales C. Sonnenwirthand leonard jarret, M.D.B.I., New Delhi.
3. J Ochei and Kolhatkar, 2002. Medical laboratory science theory and practice, TataMcGraw- Hill, New Delhi.
6. Kanai L. Mukherjee, 2007, Medical laboratory technology Vol.1. Tata McGraw Hill, Delhi.

E-RESOURCES

1. <https://www.jaypeedigital.com> › book
2. <https://www.pdfdrive.com> › wintrobess-clinical-hematology
3. <https://currentprotocols.onlinelibrary.wiley.com/doi/pdf/10.1002/cpet.5>. <https://vlab.amrita.edu/index.php?sub=3&brch=272> 5. <https://nptel.ac.in/courses/102105087>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	Pos										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	2	3			3	2	3	3	3	3	3		3
CO2	3	3	2	3		3		2	3	3			3	3
CO3			3	3		2				3		2	3	3
CO4	2			3		3				3		2	3	3
CO5				3		3	2	3	3	3		3	2	3

Strong -3; Medium -2; 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 MICROBIOLOGY
B.Sc., MICROBIOLOGY**

Semester: III- SEC- II -Microbial Enzymes

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U25SEMB32

UNIT I: (6 Hours)

Definition, nomenclature, and IUBMB classification of enzymes - Enzyme units: enzyme unit, specific activity, turnover number. Types of enzymes: Exo and endoenzymes Constitutive and inducible enzymes - Monomeric, oligomeric, multimeric enzymes. Isoenzymes, ribozymes, abzymes, lysozyme. Multi-enzyme complexes. Structure of enzymes: apoenzyme, holoenzyme, cofactors, coenzymes, prosthetic groups (TPP, NAD). Active site: properties and functions.

UNIT II: (6 Hours)

Mechanism of enzyme action Theories: Lock and Key Hypothesis. Induced Fit Hypothesis. Factors affecting enzyme activity: Substrate concentration - Temperature - pH. Activators and inhibitors. Enzyme kinetics: Michaelis-Menten Equation.

UNIT III: (6 Hours)

Enzyme inhibition: Reversible: competitive, non-competitive, uncompetitive. Irreversible inhibition. Feedback inhibition. Allosteric enzymes: properties and significance. Regulation of multi-enzyme complexes (e.g., pyruvate dehydrogenase).

UNIT IV: (6 Hours)

Sources of microbial enzymes: bacteria, fungi, yeast. Production of enzymes (fermentation methods). Purification and isolation techniques. Industrial applications: Pharmaceutical industry, Food and feed industry, Paper and pulp industry, Leather and textile industry Cosmetics and detergents. Therapeutic applications: Anti-inflammatory enzymes, Antibacterial enzymes (enzybiotics, fibrinolytic enzymes), Anticancer enzymes, Digestive enzymes.

UNIT V: (6 Hours)

Immobilized enzymes and their advantages - Industrially important enzymes: Proteases, cellulases, xylanases, pectinolytic and chitinolytic enzymes. Lysozyme: structure and catalytic mechanism. Vitamins as cofactors and coenzymes. Enzymes in metabolism: Nutrient transport in microbes. Basic metabolic pathways. Aerobic and anaerobic respiration Fermentation processes. ATP generation and energetics.

TEXT BOOKS

1. Nelson, D.L. & Cox, M.M. (2021). Lehninger Principles of Biochemistry (8th ed.). W. H. Freeman.
2. Berg, J.M., Tymoczko, J.L., Gatto, G.J. & Stryer, L. (2019). Biochemistry (9th ed.). W. H. Freeman.
3. Dixon, M. & Webb, E.C. (2019 reprint). Enzymes (3rd ed.). Academic Press.
4. Palmer, T. & Bonner, P.L. (2020). Enzymes: Biochemistry, Biotechnology, Clinical Chemistry (3rd ed.). Woodhead Publishing.
5. Chaplin, M. & Bucke, C. (2018). Enzyme Technology. Cambridge University Press.

REFERENCE BOOKS

1. Voet, D., Voet, J.G. & Pratt, C.W. (2019). Fundamentals of Biochemistry (5th ed.). Wiley.
2. Segel, I.H. (2018 reprint). Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady-State Enzyme Systems. Wiley.
3. Bisswanger, H. (2020). Enzyme Kinetics: Principles and Methods (3rd ed.). Wiley-VCH.
4. Whitaker, J.R. (2019). Principles of Enzymology for the Food Sciences. CRC Press.
5. Illanes, A. (2020). Enzyme Biocatalysis: Principles and Applications. Springer.
6. Rao, M.B. et al. (2019). Microbial Enzymes and Biotechnology. Springer.

E-LEARNING RESOURCES

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. <https://www.coursera.org>
4. <https://www.edx.org>
5. <https://ocw.mit.edu>
6. <https://www.khanacademy.org>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	1	3	2				3		3	3	2	3	3	3
CO2	3	3	2	2		2	3	2	3	3	3	3	3	3
CO3	3	3	2	3		3	3	3	3	3	2	3	3	3
CO4	2	3	2	3		3	3	2	3	3	3	3	3	3
CO5	3	3	2	3	3	2	3	2	3	3	2	3	3	3

Strong -3; Medium -2; Low - 1

SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE



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

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: III- SEC- III -Microbiome Analysis

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U25SEMB33

UNIT – I

(6 Hours)

The human microbiome: Understanding microbiome, importance of microbiome research, development of the microbiome. Vertical and horizontal transfer of human microbiomes, source of the organisms in the human microbiome. Diversity in oral, gut, respiratory and skin microbiome.

UNIT – II

(6 Hours)

Microbiome-Gut-Brain Axis. Methods to study the human microbiome: DNA-based analysis of microbial communities, 16S rDNA gene amplicon sequencing and whole metagenome shotgun sequencing methods. Data preprocessing and quality control.

UNIT – III

(6 Hours)

Microbiome data analysis: clustering and OTU picking, taxonomic analysis, alpha and beta-diversity. Comparing microbial communities: phylogenetic trees, UniFrac, principal coordinate analysis, Venn diagrams, heat maps. Functional and comparative analysis: metatranscriptome, metabolome, metaproteome.

UNIT – IV

(6 Hours)

Microbiome and its relation to health and disease: Dysbiosis, correlation of dysbiosis with disturbance in microenvironment. Dysbiosis in progression of non-communicable diseases such as cancer, Inflammatory Bowel Disease (IBD), obesity, diabetes, Alzheimer's, and incommunicable diseases such as COVID-19, tuberculosis and typhoid.

UNIT – V

(6 Hours)

Nutritional modulation of the gut microbiome. Prakriti and gut bacteria: perspective of traditional ayurveda. Microbiome and host immune system interaction. Effect of antibiotics on microbiota, oral dysbiosis and oral diseases, skin microbiome alterations and cutaneous allergic diseases.

Total Lecture Hours: 30

COURSE OUTCOME

After successful completion of the course, the students will be able to:

1. Understand the basic concepts of enzymes including classification, structure, nomenclature, enzyme units, cofactors, coenzymes, and active site characteristics.
2. Explain the mechanism of enzyme action and enzyme kinetics, including theories of enzyme-substrate interaction and factors influencing enzyme activity.
3. Differentiate various types of enzyme inhibition and regulatory mechanisms such as allosteric regulation, feedback inhibition, and regulation of multi-enzyme complexes.
4. Describe the production, purification, and industrial applications of microbial enzymes in pharmaceutical, food, textile, paper, detergent, and therapeutic sectors.
5. Apply the principles of applied enzymology and microbial metabolism including immobilized enzymes, industrially important enzymes, fermentation processes, respiration, and ATP energetics+

TEXT BOOKS

1. Bryan Tungland (2023). Medical Microbiology and Immunology Warren Levinson McGraw-Hill, 18th Edition.
2. Jacques Izard & Maria Rivera (2021). Metagenomics for Microbiology Academic Press, Useful for sequencing technologies, OTU analysis, metagenomics, and data analysis.
3. Niall Hyland & Catherine Stanton (2023), The Gut Microbiome in Health and Disease Academic Press, Detailed coverage of gut microbiome, nutrition, immunity, obesity, diabetes, and neurological disorders.
4. Jonathan Pevsner (2023), Bioinformatics and Functional Genomics Wiley-Blackwell, 4th Edition, Important for microbiome data preprocessing, sequencing analysis, clustering, diversity indices, and phylogenetic tools.

REFERENCE BOOKS

1. Osborn & Smith (2020). Molecular Microbial Ecology, Garland Science.
2. Julian R. Marchesi Wiley, 2021 Human Microbiome: Symbiosis to Pathogenesis
Robert G. Beiko, 2022. Microbiome Analysis: Methods and Protocols
Edited Springer Protocols.
3. K. E. Nelson, (2021), Introduction to Metagenomics, Springer.
4. Jonathan Pevsner(2023). Principles of Microbiome Analysis
Springer Nature.

E-Resources

- [NIH Human Microbiome Project \(HMP\)](#)
- [MG-RAST Metagenomics Server](#)
- [QIIME 2 Documentation](#)
- [EMBL-EBI Metagenomics](#)
- [Coursera – Gut Check: Exploring Your Microbiome](#)
- [FutureLearn – The Human Microbiome](#)

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	Pos										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	1	3	2	3					3	3		2	3	3
CO2	2	3	2	3		3		3	3	3	3	3	2	3
CO3	3	2	3	2		3	2	3	3	3	2	3	3	3
CO4	3	2	3	2		3		3	3	3	3	3	2	3
CO5	3	2	3	2		3		3	3	3	3	3	2	3

Strong -3; Medium -2; 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 MICROBIOLOGY
B.Sc., MICROBIOLOGY

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.

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
(AUTONOMOUS)**



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

**DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY**

Semester: IV- CC-IV: Immunology

Ins. Hours / Week: 5

Course Credit: 4

Course Code: U25MB407

UNIT- I

(15 Hours)

Organs and Cells in Immune System and Immune Response: Primary lymphoid organs, Secondary lymphoid organs and lymphoid tissues; T – cell and B –cell membrane bound receptors – apoptosis; T - cell processing, presentation and regulation; T –cell subpopulation, properties, functions and T – cell suppression; Physiology of immune response- Innate, Humoral and Cell Mediated Immunity; Immunohematology.

UNIT-II:

(15 Hours)

Antigen and Antibody: Antigens - Properties of haptens, epitopes, adjuvants, and cross reactivity. Antibodies- Structure, Properties, Classes. Antigen and Antibody Reactions: Precipitation, Agglutination, Complement Fixation, Opsonization, Neutralization; Vaccines – Active and Passive immunization; Classification of vaccines; Other approaches to new vaccines; Types of vaccine – antibacterial and antiviral Vaccines. Vaccination schedule.

UNIT-III:

(15 Hours)

Immunoassay and Immunotechniques - Preparation and standardization of bacterial antigens; Raising of monoclonal and polyclonal antibodies; Purification of antibodies. Immunotechniques - RIA, RAST, ELISA, Immuno fluorescence techniques and Flow cytometry. Complement (Classical and Alternative Pathway). Theories of Antibody production.

UNIT-IV:

(15 Hours)

Transplantation and Tumor Immunology - MHC Antigens - structure and function; HLA system - Regulation and response to immune system; Transplantation immunology - tissue transplantation and grafting; Mechanism of graft acceptance and rejection; HLA typing; Tumor specific antigens; Immune response to tumors; Immune diagnosis; Cancer Immune Therapy.

UNIT-V:**(15 Hours)**

Immunological disorders and diseases - Hypersensitivity reactions (Type I, II, III and IV); Acquired Immunodeficiency Syndrome; Auto immune disorders and diseases: organ specific and non-organ specific.

Total Lecture Hours – 75**COURSE OUTCOME**

After the completion of the course, students should be able to,

1. Recall the fundamental concepts of immunity, contributions of the organs and cells in immune responses
2. Investigate the structure and functions of Antigen and Antibody.
3. Evaluate the Immunoassay and Immunotechniques
4. Explain about the immunologic processes governing graft rejection and therapeutic modalities for immunosuppression in transplantation
5. Analyze the overreaction by our immune system leading to hypersensitive conditions and its consequences.

TEXT BOOKS

1. Richard Coico, Geoffrey Sunshine, Eli Benjamini. 2003. Immunology – A Short Course. 5th Edition., Wiley-Blackwell, New York.
2. Judith A.Owen, Jenni Punt, Sharon A. Stranford, Janis Kuby. 2013. Immunology, 7th Edition., W. H. Freeman and Company, New York.
3. Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai. 2021. Cellular and Molecular Immunology, 10th Edition., Elsevier, Amsterdam.
4. Robert R. Rich, Thomas A. Fleisher, William T. Shearer, Harry Schroeder, Anthony J. Frew, Cornelia M. Weyand. 2018. Clinical Immunology: Principles and Practice, 5th Edition. Elsevier, Amsterdam.
5. Pravash Sen. Gupta. 2003. Clinical Immunology. Oxford University Press, Oxford, England.
6. Arumugam, M., Kathiresan, S., and Nagaraj, S. (Eds.). 2023. *Applied algal biotechnology*. Nova Science Publishers. ISBN: 978-1536175242

REFERENCE BOOK(S)

1. Janeway Travers. 1997. Immunobiology- the immune system in health and disease. 3rd Edition. Current Biology Ltd. London, New York.

- Peter J. Delves, Seamus Martin, Dennis R. Burton, Ivan M. Roitt. 2006. Roitt's Essential Immunology, 11th Edition., Wiley-Blackwell, Hoboken, New Jersey , United States
- William R Clark. 1991. The Experimental Foundations of Modern Immunology. 3rd Edition. John Wiley and Sons Inc. New York. Stanier
- Frank C. Hay, Olwyn M. R. Westwood. 2002. Practical Immunology, 4th Edition., Wiley-Blackwell, Hoboken, New Jersey , United States
- Noel R. Rose, Herman Friedman, John L. Fahey. 1986. Manual of Clinical Laboratory Immunology 3rd Edition. ASM, Washington, DC, United States.
- Wang, Q. (Ed.). 2023. *Algal biotechnology*. CABI. ISBN: 978-1800621930, Wiley-Blackwell, Hoboken, New Jersey , United States

E-RESOURCES

- <https://www.ncbi.nlm.nih.gov/books/NBK279395/>
- <https://med.stanford.edu/immunol/phd-program/ebook.html>
- <https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/>
- [Immunology Overview - Medical Microbiology - NCBI Bookshelf \(nih.gov\)](#)
- [Immunology - an overview | ScienceDirect Topics](#)

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	Pos										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	2	3	2						3			3	
CO2		2	3	2						3			3	2
CO3	3	2	3	2		3		3		3			3	2
CO4	3	2	3	2						3			3	2
CO5	3			2		3			3	3			3	2

Strong -3; Medium -2; 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 MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: IV- CP-IV: Immunology (P)

Ins. Hours / Week: 4

Course Credit: 4

Course Code: U25MB408P

- Separation of serum from blood
- ABO Blood grouping
- Rh typing
- While Blood Cell Count
- Red Blood Cell Count
- WIDAL tube and slide Test
- Rapid Plasma Reagin (RPR)
- Cross Reactive Protein (CRP)
- Anti Streptolysin 'O'(ASO)
- Visit to blood bank
- Double immunodiffusion
- Demonstration of ELISA

Course Outcome

1. Assess the blood groups and their types
2. Competently perform serological diagnostic tests such as ASO, CRP
3. Demonstrate the antigen antibody reactions in gel.
4. Differentiate the Blood cells using Haemocytometer
5. Examine the concept of ELISA.

TEXT BOOKS

1. Talwar. 2006. Hand Book of Practical and Clinical Immunology, Vol. I, 2nd edition, CBS, New Delhi.

2. Asim Kumar Roy. 2019. Immunology Theory and Practical, Kalyani Publications, New Delhi
3. Richard Coico, Geoffrey Sunshine, Eli Benjamini. 2003. Immunology – A Short Course. 5th Edition., Wiley-Blackwell, New York.
4. Judith A.Owen, Jenni Punt, Sharon A. Stranford, Janis Kuby. 2013. Immunology, 7th Edition., W. H. Freeman and Company, New York.
5. Pravash Sen. Gupta. 2003. Clinical Immunology. Oxford University Press, London.

REFERENCES BOOKS

1. Frank C. Hay, Olwyn M. R. Westwood. 2008. Practical Immunology, 4th Edition, Wiley-Blackwell, US.
2. Wilmore Webley. 2016. Immunology Lab Manual, LAD Custom Publishing, US.
3. Rose. 1992. Manual of Clinical Lab Immunology, ASM, New Delhi.
4. Janeway Travers. 1997. Immunobiology- the immune system in health and disease. 3rd Edition, Current Biology Ltd. London, New York.
5. Peter J. Delves, Seamus Martin, Dennis R. Burton, Ivan M. Roitt. 2006. Roitt's Essential Immunology, 11th Edition., Wiley-Blackwell, US.

WEB RESOURCES

1. https://www.researchgate.net/publication/275045725_Practical_Immunology-A_Laboratory_Manual
2. <https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelinger-lab/documents/Immunology-Lab-Manual.pdf>
3. https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf
4. [Immunology Overview - Medical Microbiology - NCBI Bookshelf \(nih.gov\)](#)
5. [Immunology - an overview | ScienceDirect Topics](#)

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3		3	2		3				3	3	3	3	
CO2		2	3	2		2		3	3	3			3	2
CO3		3	3	2		2		3	3	3			3	2
CO4		2	3	2		2		3	3	3			3	2
CO5		2	3	2		2	3	3	3	3			3	2

Strong -3; Medium -2; 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 MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: IV- AC-IV- Food Processing Technology

Ins. Hours / Week: 3

Course Credit: 2

Course Code: U25AMB404

UNIT- I (9 Hours)

Introduction to food preservation –objectives and techniques of food preservation - principles of high temperature, low temperature, radiation, chemical preservatives and bio preservatives.

UNIT-II (9 Hours)

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.

UNIT-III (9 Hours)

Composition of milk; assessment of milk, thermal processing of fluid milk-Pasteurization (LTH, HTST & UHT techniques). Fermented milk products-Cheese, Butter milk, Yoghurt, Kumiss, Kefir and Acidophilus milk. Hygiene and sanitation requirement in food processing and fermentation industries.

UNIT-IV (9 Hours)

Juice extraction: Juice – Types of juices, process flow diagram for fruit juice production, Juice extraction process- fruit selection, sorting, washing, juice extraction, deaeration, straining/ filtration, clarification, adding of sugars, fortification, bottling, sealing and storage; method of juice preservation, Causes of juice spoilage.

UNIT-V (9 Hours)

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.

Total Lecture Hours - 45

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Assess the fundamental concepts of food preservation
2. Investigate the quality assessment of meat and fish.
3. Design the processing of milk and milk product quality assessment.
4. Understand the production of fruit juice and clarification.
5. Examine the food safety and adulteration detection.

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 and Marcotte M. 2006. Food Processing: Principles & Applications. Taylor & Francis, Oxford shire. United Kingdom
4. NIIR Board of Food and Technologist. 2005. Modern Technology of Food Processing and Agrobased industries, National Institute of Industrial Research, Delhi.
5. Adams M.R. and Moss M. O 2007. Food Microbiology. New Age International Ltd, Darya Ganj.
6. Abbas, A. K., and Lichtman, A. H. 2023. *Basic Immunology: Functions and Disorders of the Immune System* (7th ed.). Elsevier.
7. Fellows, P.J. Food Processing Technology: Principles and Practice, 2022, (5th Edition,) Woodhead Publishing (Elsevier), Woodhead Publishing, Cambridge, United Kingdom.
8. Bhanu Prakash, N. R. Thakur, 2021. Textbook of Food Science and Technology, New India Publishing Agency (NIPA), New India Publishing Agency, New Delhi ,India.

REFERENCE BOOKS

1. Fellows PJ. 2005. Food Processing Technology: Principle & Practice 2nd Edition. CRC
2. Peter Zeuthen and Leif Bogh-Sorenson. 2005. Food Preservation Techniques, Wood land Publishing Ltd, Cambridge, England.
3. Gustavo V. Barbosa-Canovas, Maria S. Tapia, M. Pilar Cano. 2004. Novel Food Processing Technologies, CRC press, Boca Raton, Florida
4. Suman Bhatti, Uma Varma. 1995. Fruit and vegetable processing organizations and institutions, 1st Edition., CBS Publishing, New Delhi.
5. Mirdula Mirajkar, Sreelatha Menon. 2002. Food Science and Processing Technology

Vol-2, Commercial processing and packaging, Kanishka publishers, New Delhi.

6. Foster W.M. 2020. Food Microbiology, CBS Publishers, New Delhi.
7. Actor, J. K. 2023. *Introductory Immunology: Basic Concepts for Interdisciplinary Applications* (3rd ed.). Elsevier.
8. Zeki Berk, 2021. Food Process Engineering and Technology (4th Edition) Academic Press (Elsevier) Academic Press, USA.
9. Megh R. Goyal, Megha Goyal, 2022. Food Engineering: Emerging Issues, Modeling, and Applications Editors: Apple Academic Press (part of CRC Press, Taylor & Francis) Canada L6

E-RESOURCES

1. <https://sites.google.com/a/uasd.in/ecourse/food-processing-technology>
2. <https://nptel.ac.in/courses/126105015>
3. [https://engineeringinterviewquestions.com/biology-notes-on-food-adulteration/food processing | Definition, Purpose, Examples, & Facts | Britannica](https://engineeringinterviewquestions.com/biology-notes-on-food-adulteration/food-processing-Definition-Purpose-Examples-&Facts-Britannica)
4. [Food Processing Technology | Food News & Views Updated Daily \(foodprocessing-technology.com\)](http://Food Processing Technology | Food News & Views Updated Daily (foodprocessing-technology.com))

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	2		3	3		3			3	3			3	3
CO2	2		3	3		3			3	3			2	3
CO3	2		3	3		3	3		3	3			3	3
CO4	2		3	3		3	3		3	3			2	3
CO5	2		3	3		3		3	3	3			3	3

Strong -3; Medium -2; Low - 1

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



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

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: IV- SEC-IV: Spirulina Cultivation

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U25SEMB44

UNIT- I: (6 Hours)

Introduction to Spirulina- History and discovery of Spirulina - Nutritional value and Biochemical Composition - Health benefits and medicinal importance - Global and Indian market trends.

UNIT- II: (6 Hours)

Cultivation Requirements - Environmental conditions (light, temperature, pH) - Culture media and nutrients - Water quality and preparation - Selection of strains.

UNIT- III: (6 Hours)

Cultivation Techniques – Open Pond cultivation method - Photobioreactor systems - Inoculation and growth monitoring Contamination control - Scale-up techniques.

UNIT- IV (6 Hours)

Harvesting methods (filtration, centrifugation) - Drying techniques (sun drying, spray drying) - Processing into powder, tablets, capsules - Packaging and storage.

UNIT V: (6 Hours)

Quality Control and Marketing - Quality standards and testing - Nutritional analysis - Safety regulations - Marketing strategies and business opportunities -Cost analysis and profitability.

COURSE OUTCOME

1. Understand the fundamentals of Spirulina including its history, taxonomy, nutritional composition, health benefits, and commercial importance.
2. Explain the environmental and nutritional requirements necessary for the successful cultivation of Spirulina under laboratory and commercial conditions.
3. Demonstrate knowledge of different cultivation techniques such as open pond systems and photobioreactors, including inoculation, growth monitoring, contamination control, and scale-up processes.
4. Describe harvesting, drying, processing, packaging, and storage methods used in Spirulina production while maintaining product quality.

5. Apply quality control measures and evaluate marketing opportunities related to Spirulina production, including safety regulations, profitability analysis, and entrepreneurship development.

TEXT BOOKS

1. Becker, E.W. (2019). Microalgae: Biotechnology and Microbiology. Cambridge University Press.
2. Richmond, A. & Hu, Q. (2021). Handbook of Microalgal Culture: Applied Phycology and Biotechnology (2nd ed.). Wiley-Blackwell.
3. Vonshak, A. (2020). Spirulina platensis (Arthrospira): Physiology, Cell Biology and Biotechnology. CRC Press.
4. Olaizola, M. (2018). Commercial Production of Microalgae. Elsevier.
5. Pulz, O. & Gross, W. (2019). Valuable Products from Biotechnology of Microalgae. Applied Microbiology and Biotechnology.
6. Singh, R. & Sharma, S. (2022). Algal Biotechnology and Its Applications. Springer.

REFERENCE BOOKS

1. Borowitzka, M.A. & Moheimani, N.R. (2020). Algae for Biofuels and Energy. Springer.
2. Spolaore, P. et al. (2018). Commercial Applications of Microalgae. Journal of Bioscience and Bioengineering.
3. Lee, Y.K. (2019). Microalgal Mass Culture Systems and Methods. Elsevier.
4. Priyadarshani, I. & Rath, B. (2020). Commercial and Industrial Applications of Microalgae.
5. FAO (2021). Microalgae-based Food and Feed Systems Report.

E-LEARNING RESOURCES

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. <https://www.fao.org>
4. <https://www.coursera.org>
5. <https://www.edx.org>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	Pos										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	2	3	3		3	2	2	3	3	2	3	3	3
CO2	3	2	3	3		3	3	3	3	3	2	3	2	3
CO3	3	2	3	3		3	2	2	3	3	2	3	3	3
CO4	3	2	3	3		3	3	3	3	3	2	3	2	3
CO5	3	2	3	3		3	3	2	3	3	2	3	3	3

Strong -3; Medium -2; Low - 1

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



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

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: IV- SEC -V : Microbial Food Safety

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U25SEMB45

UNIT – I: (6 Hours)

Scope and importance of food microbiology- Food as a substrate for microbial growth- Beneficial and harmful microorganisms in food- Sources of microbial contamination in food- Principles of food safety and food hygiene- Factors affecting microbial growth in foods: temperature, pH, moisture and oxygen.

UNIT – II: (6 Hours)

Microbial spoilage of cereals, fruits, vegetables, milk, meat and seafood- Food spoilage by bacteria, fungi and yeasts- Food poisoning and food infections- Common foodborne pathogens: *Salmonella*, *Staphylococcus aureus*, *Escherichia coli*, *Clostridium botulinum*, *Listeria monocytogenes*- Symptoms, transmission and prevention of foodborne diseases.

UNIT – III: (6 Hours)

Principles of food preservation- Physical methods: Heat treatment, Refrigeration and freezing, Drying, Pasteurization- Chemical preservatives and natural preservatives- Role of packaging in food safety- Safe storage and transportation of food materials.

UNIT – IV: (6 Hours)

Sampling methods for food analysis- Sterilization and aseptic techniques- Culture media used in food microbiology- Enumeration of microorganisms in food- Detection of coliforms and indicator organisms- Rapid methods in food microbiology- Good Laboratory Practices (GLP) in food testing laboratories.

UNIT – V: (6 Hours)

Food safety standards and regulations- Introduction to HACCP (Hazard Analysis and Critical Control Point)- Good Manufacturing Practices (GMP)- Good Hygienic Practices (GHP)- Role of food safety agencies: FSSAI, WHO, Codex Alimentarius- Consumer awareness and food labeling.

Total Lecture Hours -30

COURSE OUTCOME

After the completion of the course, students should be able to,

1. Understand the basics of food microbiology and food safety.
2. Explain food spoilage and foodborne diseases.
3. Identify foodborne pathogens and contamination sources.
4. Apply food preservation and microbial testing methods.
5. Evaluate food safety regulations and quality control systems.

TEXT BOOKS

1. Frazier, W.C. and Westhoff, D.C. 2017. Food Microbiology. Tata McGraw Hill Publishing Co., New Delhi, India. ISBN: 9780070663305.
2. Jay, J.M., Loessner, M.J. and Golden, D.A. 2005. Modern Food Microbiology. Springer Science & Business Media, New York, USA. ISBN: 9780387231808.
3. Adams, M.R. and Moss, M.O. 2016. Food Microbiology. Royal Society of Chemistry Publishing, Cambridge, UK. ISBN: 9781782627616.
4. Ray, B. and Bhunia, A. 2013. Fundamental Food Microbiology. CRC Press, Boca Raton, USA. ISBN: 9781466564435.

REFERENCE BOOK(S)

1. Davidson, P.M., Sofos, J.N. and Branen, A.L. 2006. Foodborne Microbial Pathogens: Mechanisms and Pathogenesis. CRC Press, USA. ISBN: 9780824726447.
2. Garbutt, J. 2014. Essentials of Food Microbiology. Hodder Arnold Publication, London, UK. ISBN: 9780340809723.
3. Motarjemi, Y. and Lelieveld, H. 2014. Food Safety Management: A Practical Guide for the Food Industry. Academic Press, London, UK. ISBN: 9780123815040.
4. Doyle, M.P. and Buchanan, R.L. 2013. Food Microbiology: Fundamentals and Frontiers. ASM Press, Washington DC, USA. ISBN: 9781555816254.
5. Marriott, N.G. and Gravani, R.B. 2006. Principles of Food Sanitation. Springer USA. ISBN: 9780387233666.

E-RESOURCES

1. <https://www.coursera.org/courses?query=food%20safety>
2. <https://www.who.int/health-topics/food-safety>
3. <https://www.fssai.gov.in>
4. <https://www.fao.org/food-safety/en>
5. <https://www.nature.com/subjects/food-microbiology>

MAPPING WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO	POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	2	3	3		3	2	2	3	3	3	3	2	3
CO2	3	2	3	3		3	2	2	3	3	3	3	3	3
CO3	3	2	3	3		3	2	2	3	3	3	3	2	3
CO4	3	2	3	3		3	2	2	3	3	3	3	3	3
CO5	3	2	3	3		3	2	2	3	3	3	3	2	3

Strong -3; Medium -2; Low - 1