

B.Sc.,MICROBIOLOGY

SYLLABUS

PROGRAMME CODE: 3USMIC

2026-2029



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

(Affiliated to Bharathidasan University, Tiruchirappalli)

(Accredited by NAAC)

**SUNDARAKKOTTAI, MANNARGUDI – 614 016
TAMIL NADU, INDIA.**



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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 2026-2027)

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 of 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 training 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: Ability Enhancement Course (Tamil / Hindi / French / Sanskrit)

Part-II: Ability Enhancement Course (English)

Part-III: Core Course (Theory, Practicals, Allied courses, Allied Practicals and Group Project)

Part-IV: Skill Enhancement Courses, Discipline Specific Elective Courses, Interdisciplinary Courses, Value Education, Health & Wellness, Introduction to Disaster Management, Summer Internship, Value Added Course, Environmental studies, Gender studies and Extension activity.

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

Section A1 (10x1=10 marks)

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

Two Questions from Each unit

Section A 2 (5x2=10 marks)

Short Answers / Match the following

One question from Each unit

Total Marks – 20

Section B: (5x4=20 marks)

Paragraph Answers

Either/ or type, One Question from each unit

Section C: (10x3=30)

Essay Type Answers

Answer 3 out of 5 Questions

One Question from each unit

Section A1 & A2: K1 Level

Section B: K2, K3 and K4 Level

Section 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	20			30		70
Continuous Internal Assessment (CIA)	20	20			30		70
QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment							
SECTION							MARKS
SECTION – A1 (No choice ,One Mark) TWO questions from each unit (10x1 =10)							20
SECTION –A2 (No choice ,Two Mark) ONE question from each unit (5x2 =10)							
SECTION - B (Either/ or type, 4-Marks) ONE questions from each unit (5x4 =20)							20
SECTION - C (3 out of 5) (10 Marks) ONE question from each unit (3x10 =30)							30
Total							70

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 70			
K- LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
SECTION							
SECTION –A1 (1 Mark, No choice) (10x1 =10)	10						10
SECTION –A2 (2-Marks, No choice) (5x2=10)	10						10
SECTION –B (4-Marks) (Either/or type) (5x4=20)		4	8	8			20
SECTION -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)					20	10	30
Total	20	04	08	08	20	10	70

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.



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**CHOICE BASED CREDIT SYSTEM-LEARNING OUTCOMES BASED
CURRICULUM FRAME WORK (CBCS – LOCF)**

(For the candidates admitted in the academic year 2026-2027)

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

Sem	Part	Courses	Course Code	Title	Ins. Hrs.	Credits	Exam. Hours	Maximum Marks		
								Int.	Ext.	Total
I	I	Ability Enhancement Course -I (AEC-I)	U26TAEC11	(Tamil\$ / Other Languages+, #)	6	3	3	30	70	100
	II	Ability Enhancement Course-II (AEC-II)	U26EAEC11	English Course – I	6	3	3	30	70	100
	III	Core Course -1 (CC-1)	U26MB101	Fundamentals of Microbiology	4	4	3	30	70	100
		Core Practical - I (CP-I)	U26MB102P	Fundamentals of Microbiology Practical	4	4	3	40	60	100
		Allied Course-1 (AC-1)	U26ABC101	Biochemistry I	3	3	3	30	70	100
		Allied Practical - I (AP-I)	U26ABC102P	Biochemistry I Practical	3	3	3	40	60	100
	IV	Value Education	26UGVED		2	2	3	30	70	100
		Interdisciplinary Course – I (IDC - I) #			2	2	3	30	70	100
Total					30	24	--	--	--	800
II	I	Ability Enhancement Course-III (AEC - III)	U26TAEC22	(Tamil\$ / Other Languages+, #)	6	3	3	30	70	100
	II	Ability Enhancement Course –IV (AEC - IV)	U26EAEC22	English Course – II	6	3	3	30	70	100
	III	Core Course- II (CC - II)	U26MB203	Microbial Physiology	4	4	3	30	70	100
		Core Practical – II (CP - II)	U26MB204P	Microbial Physiology Practical	4	4	3	40	60	100

		Allied Course-II (AC - II)	U26ABC203	Biochemistry II	3	3	3	30	70	100
		Allied Practical - II (AP-II)	U26ABC204P	Biochemistry II Practical	3	3	3	40	60	100
	IV	Skill Enhancement Course-I (SEC-I) ##	U26SEMB21	Microbiome	2	2	3	30	70	100
		Interdisciplinary Course – II (IDC-II) #			2	2	3	30	70	100
	Total				30	24	--	--	--	800
III	I	Ability Enhancement Course-V (AEC-V)		(Tamil\$ / Other Languages+, #)	6	3	3	30	70	100
	II	Ability Enhancement Course-VI (AEC - VI)		English Course – III	6	3	3	30	70	100
	III	Core Course- III (CC - III)		Molecular Biology	4	4	3	30	70	100
		Core Practical - III (CP - III)		Molecular Biology Practical	4	4	3	40	60	100
		Allied Course-III (AC - III)		Biostatistics	3	3	3	30	70	100
		Allied Practical - III (AP-III)		Biostatistics Practical	3	3	3	40	60	100
	IV	Skill Enhancement Course-II (SEC - II) ##		Artificial Intelligence in Microbiology	2	2	3	30	70	100
		Interdisciplinary Course- III (IDC - III)#			2	2	3	30	70	100
		Health & Wellness @			--	1	--	20	80	100
	Total				30	25	--	--	--	900
IV	I	Ability Enhancement Course-VII (AEC - VII)		(Tamil\$ / Other Languages+, #)	6	3	3	30	70	100
	II	Ability Enhancement Course-VIII (AEC - VIII)		English Course – IV	6	3	3	30	70	100
	III	Core Course- IV (CC-IV)		Immunology	4	4	3	30	70	100
		Core Practical -IV (CP - IV)		Immunology Practical	4	4	3	40	60	100
		Allied Course -IV (AC-IV)		Bioinformatics and Computational Biology	3	3	3	30	70	100
		Allied Practical -IV (AP-IV)		Bioinformatics and Computational Biology Practical	3	3	3	40	60	100
	IV	Skill Enhancement Course -III (SEC-III) ##		Microbial Quality Control and Testing	2	2	3	30	70	100

		Interdisciplinary Course-IV (IDC-IV)#			2	2	3	30	70	100
				Total	30	24	--	--	--	800
			Summer Internship / Industrial Activity during the Summer Vacation after II Year							
V	III	Core Course -V (CC - V)		Medical Microbiology	4	4	3	30	70	100
		Core Course -VI (CC - VI)		General Virology	5	4	3	30	70	100
		Core Course -VII (CC-VII)		Environmental and Agricultural Microbiology	5	4	3	30	70	100
		Core Course- VIII (CC-VIII)		Microbial Biotechnology & Bioethics	5	4	3	30	70	100
		Core Practical -V (CP-V)		Medical Microbiology, General Virology, Environmental and Agricultural Microbiology and Microbial Biotechnology & Bioethics Practical	5	4	3	40	60	100
	IV	Skill Enhancement Course-IV (SEC-IV)		Entrepreneurial Microbiology	2	2	3	30	70	100
		Discipline Specific Elective Course-I (DSEC-I)		Vaccinology /Research Methodology / Cell biology	2	2	3	30	70	100
		Introduction to Disaster Management			2	2	3	30	70	100
		Summer Internship / Industrial Activity @@		Summer Internship with Viva-Voce	--	2	--	20	80	100
				Total	30	28	--	--	--	900
VI	III	Core Course -IX (CC - IX)		Food and Dairy Microbiology	4	4	3	30	70	100
		Core Course- X (CC-X)		Industrial Microbiology	5	4	3	30	70	100
		Core Practical-VI (CP -VI)		Food and Dairy Microbiology, Industrial Microbiology Practical	5	4	3	40	60	100
		Core Project Work (CPW) @@		Project Work (with Viva-Voce)	6	4	3	20	80	100
	IV	Skill Enhancement Course -V (SEC-V)		Medical Laboratory Technology	2	2	3	30	70	100
		Discipline Specific Elective Course-II (DSEC-II)		Antimicrobial agents / Pharmaceutical Microbiology / Veterinary Microbiology	2	2	3	30	70	100

	Environmental Studies			2	2	3	30	70	100
	Gender Studies			2	1	3	30	70	100
	Value Added Course		General Studies for Competitive Examinations	2	2	-	30	70	100
	Extension Activities *			--	1	--	--	--	--
	Total			30	26	--	--	--	900
	Grand Total			180	151	--	--	--	5100

ALLIED COURSE

S.No	Semester	Title of the Course
1.	I	Biochemistry I
2.	I	Biochemistry I Practical
3.	II	Biochemistry II
4.	II	Biochemistry II Practical
5.	III	Biostatistics
6.	III	Biostatistics Practical
7.	IV	Bioinformatics and Computational Biology
8.	IV	Bioinformatics and Computational Biology Practical

SKILL ENHANCEMENT COURSE (SEC)

S.No	Semester	Title of the Course
1	II	SEC-I Microbiome
2	III	SEC-II Artificial Intelligence in Microbiology
3	IV	SEC-III Microbial Quality Control and Testing
	V	SEC-IV Entrepreneurial Microbiology
4	VI	SEC-V Medical Laboratory Technology

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSEC)

S.No	Semester	Title of the paper
1.	V	DSEC-I
		• Vaccinology • Research Methodology • Cell biology
2.	VI	DSEC-II
		• Antimicrobial agents • Pharmaceutical Microbiology • Veterinary Microbiology

INTERDISCIPLINARY COURSE (IDC)			
S.No	Semester	Course Code	Title of the Course
1.	I	U26IDMB11	Microbial cosmetics
2.	II	U26IDMB22	Biofertilizer Production Techniques
3.	III		Composting Techniques
4.	IV		Mushroom cultivation Techniques

VALUE ADDED COURSE ** (VAC)

Semester	Course	Course Code	Title of the Course
II	VAC - I	U26MBVA21	Indian Knowledge System in Traditional Agriculture and Organic Farming
IV	VAC - II		Data Science Using Python and R Programming

INTERDISCIPLINARY COURSE (IDC)# FOR WHO HAVE NOT OPT TAMIL AS PART – I		
Those who have studied Tamil upto 10 th +2 but opt for other languages in degree	I Semester	Special Tamil – I
	II Semester	Special Tamil – II
Those who have not studied Tamil in school level	I Semester	Basic Tamil – I
	II Semester	Basic Tamil – II

INTERDISCIPLINARY COURSE (IDC) \$\$ FOR NCC CADETS ONLY	
NCC Course is a Compulsory Course for the NCC Cadets in the 3rd Semester:	NCC Course is a Compulsory Course for the NCC Cadets in the 4th Semester:
Introduction to NCC	1. Special Subject Army (or) 2. Special Subject Navy (or) 3. Special Subject Air force

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES –SCIENCE

Sl. No.	Part	Types of the Courses	No. of Courses	Credits for each Course	Total Credits	Marks
1.	I	Ability Enhancement Course (AEC-Tamil)	4	3	12	400
2.	II	Ability Enhancement Course (AEC-English)	4	3	12	400
3.	III	Core Course (CC)	10	4	40	1000
4.		Core Practical (CP)	6	4	24	600
5.		Allied Course (MC)	4	3	12	400
6.		Allied Practical (MP)	4	3	12	400
7.		Core Project Work (CPW)	1	4	4	100
8.	IV	Skill Enhancement Course (SEC)	5	2	10	500
9.		Discipline specific Elective Course (DSEC)	2	2	4	200
10.		Interdisciplinary Course (IDC)	4	2	8	400
11.		Value Education	1	2	2	100
12.		Health and Wellness	1	1	1	100
13.		Introduction to Disaster Management	1	2	2	100
14.		Summer Internship / Industrial Activity	1	2	2	100
15.		Value Added Course	1	2	2	100
16.		Environmental Studies	1	2	2	100
17.		Gender Studies	1	1	1	100
18.		EXTENSIONACTIVITIES (NCC / NSS / SPORTS / ANTI DRUG CELL / YRC & Any Other Activities)	--	1	1	--
Total			51	-	151	5100
Additional Value Added Course in semester II and IV**			2**	2	4**	200
MOOC - SWAYAM/NPTEL Courses						

\$	For those who have studied Tamil upto10 th +2 (Regular Stream)															
+	Syllabus for other Languages should be on par with Tamil at degree level															
#	Those who have studied Tamil up to10 th +2 but opt for other languages in degree level under Part-I should study special Tamil and those who have not studied Tamil in the school level should study Basic Tamil in Part–IV under the Interdisciplinary Course.															
\$\$	NCC Course is one of the Choices in the Interdisciplinary Course. Only the NCC Cadets are eligible to choose this course. However, NCC Course is a Compulsory Course for the NCC Cadets.															
@	Health and Wellness: Assessments: • Use self-reflective worksheets to assess their understanding • submit the worksheets to internal audit / external audit • Every student’s activity report should be documented and the same have to be assessed by the Physical Director with Mentor. The evaluation should be for 100 marks. No examination is required. Scheme of Evaluation: <table><tr><th>Part</th><th>Description</th><th>Marks</th></tr><tr><td>A</td><td>Report</td><td>40</td></tr><tr><td>B</td><td>Attendance</td><td>20</td></tr><tr><td>C</td><td>Activities (Observation During Practice)</td><td>40</td></tr><tr><td colspan="2">Total</td><td>100</td></tr></table>	Part	Description	Marks	A	Report	40	B	Attendance	20	C	Activities (Observation During Practice)	40	Total		100
Part	Description	Marks														
A	Report	40														
B	Attendance	20														
C	Activities (Observation During Practice)	40														
Total		100														
@@	Summer Internship / Industrial Activity Internship will be carried our during the summer vacation after the second year. Viva-Voce will be conducted by the college and Marks shall be send to the University and the same will be included in the 5th semester Mark Statement. Summer Internship / Industrial Activity& Project Work Scheme of Evaluation: <table><tr><th>Description</th><th>Marks</th></tr><tr><td>Report</td><td>80</td></tr><tr><td>Viva-Voce</td><td>20</td></tr><tr><td>Total</td><td>100</td></tr></table>	Description	Marks	Report	80	Viva-Voce	20	Total	100							
Description	Marks															
Report	80															
Viva-Voce	20															
Total	100															
*	Extension Activities shall be outside instruction hours.															
**	Additional value added courses credit will not be included in the total CGPA. These courses are extra-credit courses. Instruction hours for these courses is 30 hours															

SEMESTER -I

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



SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: I- CC-I: Fundamentals of Microbiology

Ins. Hours / Week: 4

Course Credit: 4

Course Code: U26MB101

COURSE OBJECTIVES

- Understand the history, classification and diversity of microorganisms.
- Gain knowledge on microscopy, staining and sterilization techniques.
- Learn the general characteristics of major groups of microorganisms.
- Understand the ultrastructure and transport mechanisms of microbial cells.
- Acquire knowledge on microbial culture media and preservation techniques.

UNIT- I

(12 Hours)

Introduction – definition, scope and history of microbiology. Difference between the prokaryotic and eukaryotic microorganisms. Classification of microorganisms – general principles and nomenclature – Haeckel's three kingdom concept, Whittaker's five kingdom concept. Classification and characterization of bacteria according to Bergey's Manual of Systematic Bacteriology. Basic understanding of classification of viruses, algae, fungi and protozoa.

UNIT-II

(12 Hours)

Microbiology: Principles and applications of simple, compound, bright field, dark field, phase contrast, fluorescent and electron microscopy. Principles of staining: nature of dyes, types of staining – simple, differential, negative, and spore staining. Sterilization: Principles and methods – physical (moist heat, dry heat, filtration, pasteurization, tyndalization, radiation) and chemical (alcohol, aldehydes, phenols, halogens and hypochlorites).

UNIT-III

(12 Hours)

General characteristics and nature Archaeobacteria, Eubacteria, Cyanobacteria, Mycoplasma, Rickettsiae, Chlamydiae, Spirochaetes, Actinomycetes, Protozoa, Algae and fungi. Viruses.

UNIT-IV

(12 Hours)

Microbial cell: Ultrastructure of bacteria, subcellular structures and cell envelope – slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane-

biomembrane, liposomes – membrane transport – diffusion, active and passive transport and Osmoregulation.

UNIT-V

(12 Hours)

Culture techniques: Types of media simple, defined, enriched and transport media with specific examples for each type. Methods of maintenance and preservation of cultures.

UNIT-VI : Current Contours (Continuous Internal Assessment only – self study)

Microbial applications in agriculture, food and industry, Role of microorganisms in environmental management, Industrial production of antibiotics and enzymes, Microorganisms in biotechnology, Biofertilizers and biopesticides, Recent advances in microbiology and microbial technology.

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Study the historical events that led to the discoveries and inventions and understand the Classification of Microorganisms.
2. Gain Knowledge of detailed structure and functions of prokaryotic cell organelles.
3. Understand the various microbiological techniques, different types of media, and techniques involved in culturing microorganisms.
4. Explain the principles and working mechanism of different microscopes/Microscope, their function and scope of application.
5. Explain the principles and working mechanism of different microscopes/Microscope, their function and scope of application.
6. Understand the industrial, agricultural, environmental and biotechnological applications of microorganisms.

TEXT BOOKS

1. Boyd, R.F. 1998. General Microbiology, 2nd Edition., Times Mirror, Mosby College Publishing, St Louis, United States
2. Pelczar.M. J., Chan E.C.S. and Noel. R.K. 2007. Microbiology. 7th Edition., McGraw – Hill, New York.
3. Salle. A.J 1992. Fundamental Principles of Bacteriology. 7th Edition., McGraw Hill Inc. New York.
4. Tortora, G.J., Funke, B.R., Case, C.L. 2013. Microbiology. An Introduction 11th Edition., A La Carte Pearson, New Jersey
5. Willey J., Sherwood L., and Woolverton C. J., 2017. Prescott's Microbiology. 10th Edition., McGraw-Hill International edition, New York

6. Jeffrey C. Pommerville, 2023, Fundamental of Microbiology, 12th Edition, Jones and Bartlett Publisher, Inc, New Delhi.

REFERENCE BOOK(S)

1. Jeffrey C. Pommerville. 2010, Alcamo's Fundamentals of Microbiology (9th Edition). Jones and Bartlett learning , United States
2. Madigan M.T., Martinko J.M., Stahl D.A, and Clark D. P. 2010. Brock - Biology of Microorganisms, 13th Edition Benjamin-Cummings Pub Co, United States.
3. Nester E., Anderson D., Roberts C. E., and Nester M. 2006. Microbiology-A Human Perspective, 5th Edition., McGraw Hill Publications, New York
4. Stanier R.Y, Ingraham J. L., Wheelis M. L., and Painter R. R. 2010. General Microbiology, 5th Edition., MacMillan Press Ltd, United States
5. Tortora, G.J., Funke, B.R. and, Case, C.L 2013. Microbiology-An Introduction, 11th Edition., Benjamin Cummings, United States
6. Apurba S. Sastry and Sandhya Bhat. 2024. Essentials of Microbiology: Organism-Based (1st Edition, 2024) Paras Redkart Publisher, Hyderabad, India.

E-RESOURCES

1. <https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology>
2. <https://www.keyence.com/ss/products/microscope/bz-x/study/principle/structure.jsp>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6604941/#>
4. <https://bio.libretexts.org/@go/page/9188>
5. <https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-nutrition>

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	2								3			3	3
CO2	1	2		3						3	2		3	
CO3	1		2	3		2			2	3		3	3	
CO4			2	3					2			3	3	
CO5			2	3		2				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 2026-2027)
DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: I- CP-I: Fundamentals of Microbiology (P)

Ins. Hours / Week: 4

Course Credit: 4

Course Code: U26MB102P

COURSE OBJECTIVES

- To impart practical knowledge on microbiological laboratory safety, sterilization techniques
- and handling of laboratory instruments.
- To develop skills in the use and maintenance of microscopes, glassware and microbiological equipment for laboratory applications.
- To train students in microbial staining, micrometry and enumeration techniques for
- identification and analysis of microorganisms.
- To provide hands-on experience in isolation, cultivation and pure culture techniques of
- bacteria, fungi, algae and cyanobacteria.
- To enable students to identify and study the structural and morphological characteristics
- of important microorganisms through laboratory observations.

Fundamentals of Microbiology

1. Safety practices in Microbiological laboratory
2. Handling and Maintenance of compound microscope.
3. Cleaning of Glassware, preparation of cleaning solutions and culture media
4. Handling of laboratory instruments – Autoclave, Hot Air Oven, Filtration, Laminar Air Flow, Incubators, Colony counter, Centrifuge, pH meter, Colorimeter and Spectrophotometer
5. Use of common laboratory glass wares: Test tubes, culture tubes, screw capped tubes, Petri plates, Pipettes, micropipettes, Erlenmeyer flask, glass spreader, Durham's tube and inoculating needles
6. Staining of bacteria by simple staining, Gram's staining and Negative staining.
7. Staining of fungi by Lactophenol cotton blue method
8. Measurement of size of microbes – Micrometry.
9. Enumeration of bacterial numbers by Viable count (Plate count) and Total count

(Haemocytometer count)

10. Pure culture techniques - Streak plate, Pour plate and Spread plate.
11. Test for motility of bacteria – Hanging drop method.
12. Isolation of bacteria, algae, fungi and cyanobacteria from natural sources
13. Observation of permanent slides to study the structural characteristics of algae
14. (*Anabaena*, *Nostoc*, *Spirulina*, *Oscillatoria*), fungi (*Pythium*, *Rhizopus*, *Saccharomyces*, *Penicillium*, *Aspergillus*, *Agaricus*) and protozoa (*Entamoeba histolytica* and *Plasmodium spp.*).

COURSE OUTCOME

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

1. Practice sterilization methods; learn to prepare media and their quality control.
2. Learn streak plate, pour plate and serial dilution and pigment production of microbes.
3. Understand Microscopy methods, Different Staining techniques and Motility test.
4. Observe culture characteristics of microorganisms.
5. Study on Microbial Diversity using Hay Infusion Broth-Wet mount

TEXT BOOKS

1. James G Cappucino and N. Sherman MB ,1996. A lab manual Benjamin Cummins, New York
2. Kannan. N , 1996. Laboratory manual in General Microbiology. Palani Publications, Chennai.
3. Sundararaj, T, 2005. Microbiology – laboratory manual. (1st edition). Pubinj. Sunciararaj. T, Chennai.
4. Gunasekaran, P, 1996. Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi.
5. R C Dubey and D K Maheswari, 2002. Practical Microbiology. S. Chand Publishing, Delhi.
6. Shukla Das and Rumpa Saha, 2024, Microbiology Practical Manual, CBS Publishers and Distributors Pvt. Ltd, Chennai.

REFERENCE BOOK(S)

1. Aneja KR , 2005. Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai.
2. Dubey RC and Maheswari DK, 2004. Practical Microbiology 1st Edition, S.Chand

and Company Ltd., New Delhi.

3. Kannan N, 2003. Handbook of Laboratory Culture Media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi.
4. Rajan S and Selvi Christy, 2011. Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai.
5. James G Cappuccino and Natalie Sherman , 2004. Microbiology: A laboratory manual. Sixth edition, Published by Pearson Education, New Delhi.
6. Kannan N, 1996. Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nadu.
7. Harold J Benson , 1998. Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Me Grew-Hill, Boston.

E-RESOURCES

1. <http://www.biologydiscussion.com/micro-biology/sterilisation-and-disinfection-methods-and-principles-microbiology/24403>.
2. <https://www.ebooks.cambridge.org/ebook.jsf?bid=CBO9781139170635>
3. https://www.grsmu.by/files/file/university/cafedry//files/essential_microbiology.pdf
4. <https://microbiologyinfo.com/top-and-best-microbiology-books/>
5. <https://www.cliffsnotes.com/studyguides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-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			2	3	2	2				3			3	3
CO2	1	2	2	3		2				3	2		3	3
CO3	1	2	2	3		2				3	2		3	3
CO4	1			3						3			3	3
CO5	1	2	2	3				2			2	3	3	3

Strong -3; Medium -2; Low - 1

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: I- Value Education

Ins. Hours / Week: 2

Course Credit: 2

Course Code:26UGVED

COURSE OBJECTIVES:

- To understand the philosophy of life and values through Thirukural
- To analyse the components of values education to attain the sense of citizenship
- To understand different types of values towards National Integration and international understanding
- To learn yoga as value education to promote mental and emotional health
- To understand human rights, women rights and other rights to promote peace and harmony

UNIT – I PHILOSOPHY OF LIFE AND SOCIAL VALUES: (6 Hours)

Human Life on Earth (Kural 629) -Purpose of Life (Kural 46) -Meaning and Philosophy of Life (Kural 131, 226) -Family (Kural 45), Peace in Family (Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) Five responsibilities / duties of Man (a) to himself (b) to his family (c) to his environment (d) to his society, (e) to the Universe in his lives (Kural 43, 981).

UNIT – II HUMAN VALUES AND CITIZENSHIP: (6 Hours)

Aim of education and value education: Evolution of value oriented education, Concept of Human values: types of Values- Character Formation – Components of Value education A P J Kalam's ten points for enlightened citizenship- The role of media in value building.

UNIT – III VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT: (6 Hours)

Constitutional or national values: Democracy, socialism, secularism, equality, Justice, liberty, freedom and fraternity - Social Values: Pity and probity, self-control, universal brotherhood - Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith - Religious Values: Tolerance, wisdom, character - Aesthetic Values- Love and appreciation of literature and fine arts and respect for the same- National Integration and International Understanding.

UNIT -IV YOGA AND HEALTH:**(6 Hours)**

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga - Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation.

UNIT-V HUMAN RIGHTS:**(6 Hours)**

Concept of Human Rights: Indian and international perspectives- Evolution of Human Rights- definitions under Indian and International documents -Broad classification of Human Rights and Relevant Constitutional Provisions: Right to Life, liberty and Dignity- Right to equality- Right against exploitation- Cultural and Educational Right- Economic Rights- Political Rights- Social Rights - Human Rights of Women and Children – Peace and harmony.

Total Lecture Hours- 30**BOOKS FOR REFERENCES:**

1. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004
2. Leah Levin, Human Rights, NBT, 1998
3. V.R. Krishna Iyer, Dialectics and Dynamics of Human Rights in India, Tagore Law Lectures. 4. Yogic Therapy - Swami Kuvalayananda and Dr.S.L.Vinekar, Government of India, Ministry of Health, New Delhi.
4. SOUND HEALTH THROUGH YOGA - Dr.K.Chandrasekaran, Prem Publications, Sedapatti, 1999.
5. Grose. D. N – “A text book of Value Education’ New Delhi (2005)
6. Gawande . EN – “Value Oriented Education” – Vision for better living. New Delhi (2002) Saruptsons.
2. Brain Trust Aliyar- “Value Education for Health, Happiness and Harmony” Erode (2004) Vethathiri publications

COURSE OUTCOMES:**After completion of the course, the student will be able to:**

- Apply the values in thirukural to be peaceful, dutiful and responsible in family and society
- Develop character formation and sense of citizenship
- Be secular, self-control, sincere, respectful and moral.
- Master yoga, asana and meditation to promote mental health
- Be attitudinal to follow the constitutional rights



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: I- Interdisciplinary Course – I: Microbial Cosmetics

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U26IDMB11

OBJECTIVE

- To introduce the fundamental concepts, scope and significance of cosmetic microbiology.
- To understand the sources, types and factors responsible for microbial contamination in cosmetic products and raw materials.
- To impart knowledge on plant sanitation, sterilization methods for contamination control.
- To study the importance, types and effectiveness of preservatives used in cosmetic formulations.
- To familiarize students with microbial testing methods, preservative efficacy testing, cosmetic regulations and product safety standards.

UNIT- I:

(6 Hours)

Introduction to Cosmetic Microbiology: Definition and scope of cosmetic microbiology, Importance in cosmetic and pharmaceutical industries, Role of microorganisms in cosmetics, Sources of contamination, Basic types of microorganisms (bacteria, fungi, yeast).

UNIT- II:

(6 Hours)

Microbial Contamination of Cosmetic Products: Microbial contamination in raw materials, Types of contaminants (bacteria, molds, yeast), Water as a major source of contamination, Factors affecting microbial growth (pH, moisture, nutrients), Risk assessment of raw materials.

UNIT- III:

(6 Hours)

Plant Sanitation and Good Manufacturing Practices (GMP): Plant sanitation methods, Cleaning and sterilization techniques, Good Manufacturing Practices (GMP), Process validation, Concept of house organisms and contamination control.

UNIT- IV:

(6 Hours)

Preservatives and Preservative Systems: Need for preservatives in cosmetics, Types of preservatives (parabens, alcohols, etc.), Preservative system concept, Factors affecting preservative effectiveness, Mild and self-preserving systems.

UNIT- V:

(6 Hours)

Testing, Regulations and Product Safety: Preservative efficacy (challenge) testing, Microbial limit testing of finished products, Regulatory guidelines for cosmetics, Safety standards and quality

control, Global harmonization of test methods.

UNIT – VI Current Contours (Continuous Internal Assessment only – self study)

Cosmetic product quality assurance, Microbial safety evaluation of cosmetics, Natural and herbal cosmetic microbiology, Cosmetic spoilage and contamination control, Recent advances in cosmetic preservation systems, Role of microbiology in cosmetic product development and consumer safety.

Total Lecture Hours - 30

COURSE OUTCOMES:

At the end of the course, learners will be able to:

1. Understand the basic concepts of cosmetic microbiology.
2. Analyze factors affecting microbial growth in cosmetic products.
3. Apply contamination control measures in cosmetic production
4. Evaluate preservative systems used in cosmetic products.
5. Perform and interpret preservative efficacy tests.
6. Demonstrate knowledge of cosmetic microbiology, quality assurance and microbial safety practices.

TEXT BOOKS

1. Panda H. (2004). Handbook on herbal medicines. Asia Pacific Business Press Inc, New Delhi. ISBN: 8178330911.
2. Mehra P. S. (2019). A Textbook of Pharmaceutical Microbiology. Dreamtech Press, Darya Ganj ISBN 13:9789389307344.
3. Geis P. A. (2020). Cosmetic microbiology: A Practical Approach. (3rd Edition). CRC Press, Boca Raton, Florida ISBN:9780429113697
4. Brannan D. K. (1997). Cosmetic microbiology: A Practical Handbook. CRC Press, Boca Raton, Florida ISBN-10:0849337135.
5. Pattanayak, S., and Mishra, P. 2022. *Herbal Cosmetics: Science and Applications*. CRC Press, Boca Raton. ISBN: 978-1-032-12212-5.
6. André O. Barel, Marc Paye, Howard I. Maibach, 2021. Handbook of Cosmetic Science and Technology, 4th edition, CRC Press, Boca Raton, USA.
7. Amar H. Deshpande, Jagdish Baheti, 2024. Practical Book in Cosmetic Microbiology, Pritam Publications, India.

REFERENCE BOOK(S):

1. Verpoorte R. and Mukherjee, P. K. (2010). GMP for Botanicals: Regulatory and Quality issues on Phytomedicines. In GMP for botanicals: regulatory and quality issues on phytomedicines. (2nd edition). Saujanya Books, Delhi. ISBN-10:81-900788-5-2/8190078852. ISBN-13:978-81-900788-5-6/9788190078856.
2. Turner R. (2013). Screening methods in Pharmacology. Elsevier, Amsterdam ISBN:9781483264233.
3. Cupp M. J. (2010). Toxicology and Clinical Pharmacology of Herbal Products (pp. 85- 93). M. J. Cupp. Humana Press. Totowa, NJ, USA. ISBN-10:1617371904.
4. Goyal, M. R. 2023. *Herbal Medicine for Healthcare: Evolution and Research Trends*. Apple Academic Press, New Jersey. ISBN: 978-1-77188-899-5.
5. Sivamani, R. K., Maibach, H. I., and Nasir, A. 2023. *Cosmetic Microbiology: Understanding and Controlling Microbial Contamination in Cosmetics*. Springer, Cham. ISBN: 978-3-031-22801-2.
6. Soumya Ghosh, Helen N. Onyeaka, 2026, Fungal-Based Cosmetics: Formulation and Usage, Springer Nature Switzerland AG, Cham, Switzerland.
7. Philip A. Geis, 2020, Cosmetic Microbiology: A Practical Approach, CRC Press / Taylor & Francis, London, UK.
8. Nikunj B. Patel, 2022. Microbiological Examination of Cosmetic Products, OmniScriptum Publishing, Germany.

E-RESOURCES

1. [https://www.academia.edu/50236711/Modern_Extraction_Methods_for_Preparation_of](https://www.academia.edu/50236711/Modern_Extraction_Methods_for_Preparation_of_Bioactive_Plant_Extracts)
2. [_Bioactive_Plant_Extracts](#)
3. https://www.nhp.gov.in/introduction-and-importance-of-medicinal-plants-and-herbs_mtl
4. <https://pubmed.ncbi.nlm.nih.gov/17004305/>
5. <https://www.fda.gov/cosmetics/potential-contaminants-cosmetics/microbiological-safety-and-cosmetics>
6. <https://pubmed.ncbi.nlm.nih.gov/15156038/>

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		2	3				2	2			3	3	3
CO2		2	2	3			2	2	2	3			3	3
CO3		2	2	3				2	2	3		3	3	3
CO4	1	2	2	3					2	3		3	3	3
CO5		2	2	3				2	2	3	2	3	3	

Strong -3; Medium -2; Low - 1

SEMESTER -II

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: II: CC-II – Microbial Physiology

Ins. Hours / Week: 4

Course Credit: 4 Course Code: U26MB203

COURSE OBJECTIVE

- To understand microbial growth patterns, growth measurement methods and factors involved in the control of microbial growth.
- To acquire knowledge on microbial nutritional requirements, transport mechanisms and environmental factors influencing microbial growth.
- To understand microbial metabolism, energy production pathways and different types of fermentation processes.
- To study the mechanism of photosynthesis, photosynthetic pigments and light and dark reactions in microorganisms and plants.
- To gain knowledge on the various modes of reproduction in bacteria, fungi, microalgae and protozoa.

UNIT- I

(12 Hours)

Physiology of Microbial growth: Batch – Continuous - Synchronous cultures. Growth Curve and measurement method (Turbidity, Biomass and Cell count). Control of microbial growth.

UNIT-II

(12 Hours)

Nutrition requirements - Photoautotrophs, Photoorganotrophs, Chemolithotrophs (Ammonia, Nitrite, Sulfur, Hydrogen, Iron oxidizing Bacteria), Chemoorganotrophs. Nutrition transport mechanisms – Passive diffusion and Active transport. Factors affecting microbial growth.

UNIT-III

(12 Hours)

An overview of Metabolism - Embden Meyerhoff Pathway, Entner-Doudoroff Pathway, Pentose Phosphate Pathway, Tricarboxylic Acid Cycle. Electron Transport Chain and Oxidative Phosphorylation. ATP synthesis. Fermentation-Homolactic Fermentation,

Heterolactic Fermentation, Mixed Acid Fermentation, Butanediol Fermentation.

UNIT-IV (12 Hours)

Photosynthesis - An Overview of chloroplast structure. Photosynthetic Pigments, Light Reaction- Cyclic and non-cyclic Photophosphorylation. Dark Reaction - Calvin Cycle.

UNIT-V (12 Hours)

Bacterial reproduction - Binary fission, Budding, Reproduction through conidia, cyst formation, endospore formation. Fungi asexual and sexual reproduction, Microalgae reproduction. Asexual and sexual reproduction of protozoa.

UNIT-VI Current Contours (Continuous Internal Assessment only – self study)

Applications of microbial growth and metabolism in industry, Industrial fermentation processes, Microbial production of enzymes, organic acids and antibiotics, Role of microorganisms in biotechnology and environmental management, Applications of photosynthetic microorganisms, Recent advances in microbial physiology and metabolic engineering.

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Describe microorganisms based on nutrition
2. Know the concept of microbial growth and identify the factors affecting bacterial growth.
3. Explain the methods of nutrient uptake.
4. Explore about the anaerobic and aerobic energy production.
5. Elaborate on the process of bacterial photosynthesis and reproduction
6. Demonstrate understanding of industrial and environmental applications of microbial growth, metabolism and recent advances in microbial physiology and metabolic engineering.

TEXT BOOKS

1. Schlegel, H.G. 1993. General Microbiology., 7th Edition, Press syndicate of the University of Cambridge, London
2. Rajapandian K. 2010. Microbial Physiology, PBS Book Enterprises, Chennai India.
3. Meena Kumari. S. 2006. Microbial Physiology, Chennai 1st Edition MJ Publishers, Chennai.
4. Dubey R.C. and Maheswari, S. 2003. A textbook of Microbiology, S. Chand & Co. New Delhi
5. S. Ram Reddy, S.M. Reddy, 2008. Microbial Physiology. Anmol Publications Pvt Ltd, Delhi.
6. Ram Reddy. S and Reddy S.M, 2022, Microbial Physiology, 2nd Edition,

Scientific Publishers, New Delhi.

7. Stevens, A. M., Ditty, J. L., Parales, R. E., & Merkel, S. M. 2024. *Microbial physiology: Unity and diversity*. ASM Press.

REFERENCE BOOK(S)

1. Robert K. Poole 2004. *Advances in Microbial Physiology*, Elsevier Academic Press, New York, Volume 49.
2. Kim B.H., Gadd G.M. 2008. *Bacterial Physiology and Metabolism*. Cambridge University Press, Cambridge.
3. Daniel R. Caldwell. 1995. *Microbial Physiology and Metabolism* Wm.C. Brown Communications, Inc. USA.
4. Moat, A.G and J.W Foaster, 1995. *Microbial Physiology*, 3rd edition. Wiley – LISS, A John Wiley and Sons. Inc. Publications.
5. Bhanu Shrivastava. 2011. *Microbial Physiology and Metabolism: Study of Microbial Physiology and Metabolism*. Lambert academic Publication, Maldova.
6. Poole, R. K., and Kelly, D. J. (Eds.). 2024. *Advances in microbial physiology (Vol. 85)*. Elsevier.

E-RESOURCES

1. <https://sites.google.com/site/microbialphysiologyoddsem/teaching-content>
2. <https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-nutrition/>
https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
3. http://web.iitd.ac.in/~amittal/2007_Addy_Enzymes_Chapter.pdf
4. <https://www.frontiersin.org/microbial-physiology-and-metabolism>

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								2	3			3	3
CO2	1	2	2	3									3	3
CO3	1	2	2	3				2	2				3	3
CO4		2			2	2	2		2			3	3	
CO5	1		2	3						3	2		3	

Strong -3; Medium -2; Low - 1

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: II- CP-II: Microbial Physiology (P)

Ins. Hours / Week: 4

Course Credit: 4

Course Code:U26MB204P

COURSE OBJECTIVE

- To develop practical skills in studying the effect of physical and nutritional factors on microbial growth.
- To train students in methods for measuring microbial growth using turbidometric and microscopic techniques.
- To provide hands-on experience in the identification and analysis of microbial metabolic activities and biochemical reactions.
- To understand microbial fermentation processes and enzymatic activities through laboratory experiments.
- To impart knowledge on the isolation, cultivation and characterization of microorganisms including photosynthetic bacteria.

Microbial Physiology

1. Effect of temperature and pH on growth of microorganisms.
2. Effect of carbon and nitrogen sources on growth of *E.coli*
3. Effect of salt on growth of *E. coli*
4. Study and plot the growth curve of *E. coli* by turbidometric method
5. Measurement of growth by cell number using Haemocytometer.
6. Detection of amino acids by paper chromatography.
7. Acid and gas production from carbohydrates
8. Demonstration of fermentation of lactose
9. Starch hydrolysis.
10. Gelatin hydrolysis.
11. Catalase test, Oxidase and Urease test.

12. Isolation and culturing of photosynthetic bacteria
13. Demonstration of fermentation of glucose using Kuhne's fermentation vessel.

COURSE OUTCOME

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

1. Describe growth of bacteria based on the suitable environmental conditions
2. Demonstrate motility of bacteria by hanging drop method
3. Explain Starch and gelatin hydrolysis methods
4. Describe isolation of photosynthetic bacteria
5. Elaborate fermentation of glucose using Kuhne's fermentation vessel

TEXT BOOKS

1. James G Cappucino and N. Sherman MB 1996. A lab manual Benjamin Cummins, New York
2. Kannan. N 1996. Laboratory manual in General Microbiology. Palani Publications, Chennai
3. Sundararaj, T. 2005. Microbiology – laboratory manual. (1st edition). Pubin. Sunciararaj. T, Chennai.
4. Gunasekaran. P 2007. Laboratory manual in Microbiology. New age international publisher, Darya Ganj
5. Elsa Cooper 2018. Microbial Physiology: A Practical Approach. Callisto Reference publisher, Berkeley, California
6. Ram Reddy S.M and Reddy S.M, 2023, Microbiology a Laboratory Manual, 4th Edition, Scientific Publishers, Tamil Nadu.

REFERENCE BOOK(S)

1. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP, 2009. The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco
2. Brock T. D. and Madigan M.T., 2017. Biology of Microorganisms, Prentice hall of India Pvt. Ltd, New Delhi.
3. De Robertis EDP and De Robertis EMF, 2006. Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia
4. Gardner EJ, Simmons MJ, Snustad DP 2008. Principles of Genetics. 8th Ed. Wiley- India
5. Karp G 2010. Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc, US.
6. Lansing M. Prescott, John P. Harley, Donald A. Klein, 2002. Microbiology, 5th

- edition. WCB Mc Graw Hill, New york.
7. Madigan MT, and Martinko JM, 2014. Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
 8. Moat AG and Foster JW. 2002. Microbial Physiology. 4th edition. John Wiley & Sons Press, Worth Publishers, New Delhi.
 9. Reddy SR and Reddy SM. 2005. Microbial Physiology. Scientific Publishers India
 10. Sambrook J and Russell DW. 2001. Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
 11. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. 1987. General Microbiology. 5th edition, McMillan Press.
 12. Willey JM, Sherwood LM, and Woolverton CJ. 2013. Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

E-RESOURCES

1. <https://sites.google.com/site/microbialphysiologyoddsem/teaching-contents>
2. <https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-Nutrition>
3. https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
4. <https://www.studocu.com/microbial-physiology-practicals>
5. <https://www.agr.hokudai.ac.jp/microbial-physiology>

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		2	3				2	2	3			3	3
CO2	1	2	2	3					2	3			3	3
CO3	1	2	2	3									3	
CO4	1	2	2	3					2	3			3	3
CO5		2	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 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: II SEC-I- Microbiome

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U26SEMB21

COURSE OBJECTIVE

- To understand the concept, scope and diversity of microbiomes
- To study the composition and functions of the normal human microbiota
- To explain the role of microbiome in nutrition, metabolism and immunity and lifestyle-related disorders.
- To introduce basic microbiome analysis techniques.
- To familiarize students with the role of microbiome in human health and diseases

UNIT-I: (6 Hours)

Definition and scope of microbiome, Evolution of microbial life on Earth, Types of microbial associations: symbiotic, commensal, parasitic, Overview of microbiomes in different environments (soil, water, human body) and Basic concepts of host-microbe interactions.

UNIT-II: (6 Hours)

Normal human microbiota (gut, skin, oral, respiratory, urogenital), Role in digestion, metabolism, and immunity, Factors affecting microbiome composition (diet, age, antibiotics, lifestyle), Introduction to dysbiosis and its consequences

UNIT-III: (6 Hours)

Establishment of microbiome in infants, Role of diet in shaping gut microbiome, Microbiome in obesity and Type 2 Diabetes, Probiotics, prebiotics, and synbiotics (basic concepts), Functional foods and their benefits.

UNIT-IV: (6 Hours)

Culturing techniques (basic overview), Molecular approaches: DNA extraction, PCR, sequencing, Introduction to metagenomics, Studying microbial diversity (bacteria, fungi, viruses), Basic data interpretation (simple concepts only)

UNIT-V:**(6 Hours)**

Role of microbiome in human diseases, Gut microbiome and immunity, Microbiome in infections and chronic conditions, Use of probiotics and microbiome-based therapies, Future applications in medicine and nutrition.

UNIT -VI Current Contours (Continuous Internal Assessment only – self study)

Role of microbiome in personalized nutrition and medicine, Recent advances in probiotics and microbiome therapy.

Total Lecture Hours –30**COURSE OUTCOME**

After successful completion of the course, the students will learn about:

1. Explain the basic concepts of microbiome, evolution of microbes, and different types of host–microbial associations.
2. Describe the composition and functions of the human microbiome and its role in health and immunity.
3. Discuss the influence of diet and early-life factors on the microbiome.
4. Outline basic techniques used to study microbiomes.
5. Analyze the relationship between microbiome imbalance and diseases.
6. Explain the role of the microbiome in personalized nutrition, medicine and recent advances in probiotics and microbiome-based therapeutic applications.

TEXT BOOKS

1. Rob DeSalle & Susan L. Perkins, 2016, Welcome to the Microbiome: Getting to Know the Trillions of Bacteria and Other Microbes In, On, and Around You, Yale University Press New Haven, USA.
2. Julian R. Marchesi, 2014, The Human Microbiota and Microbiome, CABI, Wallingford, UK.
3. Gunjan Goel, Teresa Requena & Saurabh Bansal, 2022, Human-Gut Microbiome: Establishment and Interactions, Academic Press (Elsevier), London, UK.
4. Dirk Haller, 2026, The Gut Microbiome in Health and Disease: A Textbook, Springer, Berlin, Germany
5. Mohsin Khurshid and Muhammad Sajid Hamid Akash, 2024, Human Microbiome: Techniques, Strategies, and Therapeutic Potential, Springer Nature, Singapore.

REFERENCE BOOK(S)

1. Pallaval Veera Bramhachari, 2023, Human Microbiome in Health, Disease, and Therapy, Springer, Singapore.

2. Mohsin Khurshid & Muhammad Sajid Hamid Akash, 2024, Human Microbiome: Techniques, Strategies, and Therapeutic Potential, Springer Nature, Singapore
3. Julian R. Marchesi, 2014, The Human Microbiota and Microbiome, 2nd Edition, CABI, Boston, USA
4. Nirmal Kumar Ganguly, 2023, Gut Microbiome, Probiotics, and Good Health, Jaypee Brothers Medical Publishers, New Delhi, India.

E-RESOURCES

1. <http://educapes.capes.gov.br/handle/capes/737852>
2. <https://www.atlas.org/documents/cel-s191-l31-the-human-microbiomepdf-dkZEpmWc3jGCZKDjLSwMSs>
3. https://commons.wikimedia.org/wiki/File:The_Gut_Microbiome.pdf
4. <https://open.icm.edu.pl/handle/123456789/21785>
5. <https://open.umn.edu/opentextbooks/textbooks/1220>

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	2	2	3						3	2	3	3	
CO2		2	2	3				2	2				3	3
CO3		2	2	3		2		2		3	2		3	3
CO4		2	2	3						3	2	3	3	
CO5	1		2	3				2	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 2026-2027)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: II- Interdisciplinary Course – II: Bio-Fertilizer Production Techniques

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U26IDMB22

COURSE OBJECTIVES

- To understand the principles of soil microbiology, plant-microbe interactions and the role of biofertilizers in sustainable agriculture.
- To acquire knowledge on the isolation, production and application techniques of different biofertilizers for agricultural use.
- To study downstream processing methods, formulation technologies and shelf-life enhancement of biofertilizer products.
- To understand quality control measures, certification standards and regulatory requirements for biofertilizer commercialization.
- To gain practical knowledge on field application methods, crop-specific recommendations and performance monitoring of biofertilizers.

UNIT – I

(6 Hours)

Introduction to Biofertilizers - Introduction to soil microbiology - Concept of plant-microbe interactions - Types of biofertilizers (Nitrogen fixers, Phosphate solubilizers, Potash mobilizers, Mycorrhizae, etc.) - Role in sustainable agriculture.

UNIT -II

(6 Hours)

Production Techniques for Biofertilizers - Isolation and screening of efficient strains. Culture media and growth conditions - Lab-scale biofertilizer manufacturing - Storage, packaging and distribution - Biofertilizer application in crops.

UNIT -III

(6 Hours)

Downstream Processing and Formulation - Biomass harvesting, drying, and blending - Carrier materials (peat, lignite, vermiculite, liquid formulations) - Formulation technology - Shelf-life enhancement.

UNIT – IV

(6 Hours)

Quality Control and Certification - BIS/ISO/ICAR standards for biofertilizers - Viability tests, contamination checks, CFU count - Labelling and packaging norms - Regulatory requirements for commercialization.

UNIT – V

(6 Hours)

Field Application Techniques - Application methods (seed treatment, soil, drip irrigation) - Crop-specific recommendations - Biofertilizer compatibility with chemical inputs - Performance monitoring.

UNIT – VI Current Contours (Continuous Internal Assessment only – self study)

Entrepreneurship and Marketing - Setting up a biofertilizer production unit - Raw material sourcing - Business models, funding, licensing.

(Total Lecture Hour-30)

COURSE OUTCOME

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

1. Explain the principles of biofertilizers, soil microbiology, plant–microbe interactions, and their role in sustainable agriculture.
2. Demonstrate the isolation, screening, cultivation, production, storage, and application techniques of different biofertilizer microorganisms.
3. Apply downstream processing methods, carrier-based and liquid formulation technologies, and shelf-life enhancement techniques in biofertilizer production.
4. Analyze quality control measures, BIS/ISO/ICAR standards, viability testing, contamination checks, and regulatory requirements for commercialization of biofertilizers.
5. Evaluate different field application methods, crop-specific recommendations, compatibility with agrochemicals, and performance monitoring of biofertilizers.
6. Develop entrepreneurial skills for establishing and managing a biofertilizer production unit including business planning, licensing, marketing, and funding strategies.

REFERENCES BOOKS

1. S. Kannaiyan, 2017. Biofertilizers: Technology and Application Scientific Publishers, Jodhpur, India
2. Eldor A. Paul, 2015. (4th Edition, Reprint 2018). Soil Microbiology Ecology and Biochemistry. Academic Press, USA
3. J. Kevin Vessey, 2020. Biofertilizers for Sustainable Agriculture CRC Press, USA
4. D.K. Maheshwari, 2016 (Reprint 2019) Microbial Inoculants in Sustainable Agricultural Productivity, Springer, India
5. D.P. Singh, 2017 (Reprint 2021) Plant Growth Promoting Rhizobacteria, Springer, Singapore

6. Sally E. Smith & David J. Read, 2018 (3rd Edition Reprint) Mycorrhizal Symbiosis, Academic Press, UK .

TEXTBOOKS

1. N.S. Subba Rao, 2019. Biofertilizers and Biopesticides, Oxford & IBH Publishing Co., New Delhi, India
2. Ben Lugtenberg (Ed.) 2015. (Updated Reprint 2020). Principles of Plant-Microbe Interactions, Springer, Switzerland.
3. G. Rangaswami and D.J. Bagyaraj, 2021 (Revised Edition) Agricultural Microbiology PHI Learning Pvt. Ltd., New Delhi, India
4. B. Giri *et al.* 2019. Biofertilizers in Sustainable Agriculture and Environment. Springer, Cham, Switzerland
5. Alexander N. Glazer & Hiroshi Nikaido, 2018 (2nd Edition Reprint) Microbial Biotechnology, Cambridge University Press, UK
6. A. Varma and R. Prasad, 2020 (Updated Edition) Handbook of Soil Microbiology, Springer, Switzerland.

E-Resources

1. <https://icar.org.in>
2. <https://www.fao.org>
3. <https://ncof.dacnet.nic.in>
4. <https://www.iari.res.in>
5. <https://www.researchgate.net>

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	2	2	2		3		3		3
CO2		2	2	3				2		3		3	3	
CO3	1	2	2	3			2	2	2	3		3	3	3
CO4	1	2	2					2	2	3		3	3	3
CO5	1					2	2		2	3		3	3	

Strong -3; Medium -2; Low - 1