

B.Sc., MICROBIOLOGY

SYLLABUS

PROGRAMME CODE: 3USMIC

2024-2027



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

(Affiliated to Harathidasan University, Tiruchirappalli)

(Accredited by NAAC)

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



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

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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 2024-2025)

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

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:

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

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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B.Sc., MICROBIOLOGY

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

(For the candidates admitted in the academic year 2024-2025)

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	S	Credit	Exam Hours	Marks		Total
												CIA	ESE	
I	I	Language Course-I	U24LC101	Pothu Tamil-I Tamil Illakiya Varalaru -1	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-I	U4ELC101	General English – I	6	5	1	-	-	3	3	25	75	100
	III	Core Course-I	U24MB101	Fundamentals of Microbiology	5	4	1	-	-	5	3	25	75	100
		Core Practical-I	U24MB102P	Fundamentals of Microbiology (P)	4	1	-	3	-	4	3	25	75	100
		Allied Course-I	U24ABC101	General Biochemistry	3	2	1	-	-	2	3	25	75	100
		Allied Practical-I	U24ABC102P	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	U24FCMB11	Introduction to Microbial World	2	2	-	-	-	2	3	25	75	100
		TOTAL			30	21	4	5		21	-	-	-	700
	I	Language Course-II	U24LC202	Pothu Tamil-II Tamil Illakiya Varalaru -2	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-II	U24ELC202	General English –II	6	5	1	-	-	3	3	25	75	100

II		Core Course-II	U24MB203	Microbial Physiology	5	4	1	-	-	5	3	25	75	100
		Core Practical –II	U24MB204P	Microbial Physiology (P)	4	1	-	3	-	4	3	25	75	100
	III	Allied Course-II	U24AMB201	Bioinstrumentation	3	2	1	-	-	2	3	25	75	100
		Allied Practical I	U24ABC102P	General Biochemistry (P)	2	-	-	2	-	2	3	25	75	100
	IV	Non Major Elective –II Those who choose Tamil in Part-I can choose a non –major elective course offered by 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. c) 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	U24SEMB1	Biofertilizer Technology	2	2	-	-	-	2	a3	25	75	100
		Total			30	21	4	5	-	23	-	-	-	800
	III	I Language Course-III	U24LC303	Pothu Tamil-III	6	5	1	-	-	3	3	25	75	100
		II English Language Course-III	U24ELC303	General English –III	6	5	1	-	-	3	3	25	75	100
		Core Course-III	U24MB305	Bacteriology and Mycology	4	3	1	-	-	4	3	25	75	100
		Core Practical –III	U24MB306P	Bacteriology and Mycology (P)	4	1	-	3	-	4	3	25	75	100
		III Allied Course-III	U24AMB302	Medical Laboratory Technology	2	2	-	-	-	2	3	25	75	100
		Allied Practical –II	U24AMB303P	Medical Laboratory Technology (P)	2	-	-	2	-	--	--	--	--	--
		IV Skill Enhancement Course –II	U24SEMB32	Organic farming Practices	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course –III	U24SEMB33	Algal Technology	2	2	-	-	-	2	3	25	75	100
		V Special Course	24UGSC	Health and Wellness	2	-	-	2	-	1	-	-	-	-
		TOTAL			30	20	3	7	-	21		-	-	700
	I	Language Course-IV	U24LC404	Pothu Tamil-IV	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-IV	U24ELC404	General English –IV	6	5	1	-	-	3	3	25	75	100

IV	III	Core Course- IV	U24MB407	Immunology	5	4	1	-	-	5	3	25	75	100
		Core Practical - IV	U24MB408P	Immunology (P)	4	1	-	3	-	4	3	25	75	100
		Allied Practical- II	U24AMB303P	Medical Laboratory Technology (P)	2	-	-	2	-	2	3	25	75	100
		Allied Course- IV	U24AMB404	Food Processing Technology	3	2	1	-	-	2	3	25	75	100
	IV	Skill Enhancement Course – IV	U24SEMB44	Biopesticides	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course – V	U24SEMB45	Vermitechnology	2	2	-	-	-	2	3	25	75	100
	TOTAL				30	21	4	5	-	23	-	-	-	800
V	III	Core Course –V	U24MB509	Virology and Parasitology	6	5	1	-	-	5	3	25	75	100
		Core Course –VI	U24MB510	Environmental and Agriculture Microbiology	5	4	1	-	-	4	3	25	75	100
		Core Course-VII	U24MB511	Molecular Biology and Microbial Genetics	5	4	1	-	-	5	3	25	75	100
		Core Practical- V	U24MB512P	Virology and Parasitology, Environmental and Agriculture Microbiology (P)	4	1	-	3	-	4	3	25	75	100
		Elective Course -I	U24MBE51A/ U24MBE51B/ U24MBE51C	Recombinant DNA Technology/ Biostatistics/Veterinary Microbiology	4	3	1	-	-	3	3	25	75	100
		Elective Course -II	U24MBE52A/ U24MBE52B/ U24MBE512C	Biosafety and Bioethics/ Research Methodology/ Bioinformatics	4	3	1	-	-	3	3	25	75	100
		Internship/ Industrial visit/ Field visit	U24MBI51	Internship/ Industrial visit/ Field visit	-	-	-	-	-	2	-	-	-	-
		EVS	24UGCES	Environmental Studies	2	2	-	-	-	2	3	25	75	100
	TOTAL				30	22	5	3	-	28	-	-	-	700
VI	III	Core Course -VIII	U24MB613	Food, Dairy and Probiotic Microbiology	6	5	1	-	-	4	3	25	75	100
		Core Practical –VI	U24MB614P	Molecular biology and Microbial Genetics, Food, Dairy and Probiotic Microbiology (P)	6	5	1	-	-	4	3	25	75	100
		Core Project	U24MBPW	Project with viva- voce/ Group Project	5	-	1	4	-	5	3	25	75	100
		Elective Course-III	U24MBE63A/ U24MBE63B/ U24MBE63C	Pharmaceutical Microbiology / Bioinoculants / Cell Biology	4	3	1	-	-	3	3	25	75	100
		Elective Course-IV	U24MBE64A/ U24MBE64B/ U24MBE64C	Entrepreneurship and Bio-Business/ Antimicrobial Agents/ Fermentation Technology	4	3	1	-	-	3	3	25	75	100
		Value Education	24UGVED	Value Education	2	2	-	-	-	2	3	25	75	100

	IV	Professional Competency skill	U24PCMB61	Microbial Quality Control and Testing	2	2	-	-	-	2	3	25	75	100
	V	Extension activity		Extension activity	-	-	-	-	-	1	-	-	-	-
		Gender Studies	24UGGS	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	Paper Name	Course Code
1	IV	I	Mushroom Technology	U24NMEMB11
e		II	Entrepreneurial Microbiology	U24NMEMB22

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



**ENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

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

Semester: V- CC-V: Virology and Parasitology

Ins. Hours / Week:6

Course Credit: 5

Course Code: U24MB509

UNIT- I

(18 Hours)

History of Virology, General characteristics, Properties, Structure, replication and Classification of viruses (Baltimore classification), Cultivation of viruses- in animals, embryonated eggs and tissue culture, Virus purification assays. Collection and transport of clinical specimens for viral infections.

UNIT-II:

(18 Hours)

Viral diseases with reference to symptoms, pathogenesis, transmission, prophylaxis and control – Arboviruses (Flavi virus), Picorna viruses (Polio virus and Rhinovirus), Hepatitis viruses (HAV, HBV, HCV, HDV, HEV), Rabies virus, Orthomyxoviruses (Influenza virus) and Paramyxoviruses (Mumps and Measles virus), Pox viruses (Variola, Vaccinia), Herpes viruses (Herpes simplex, Varicella zoster), Adeno viruses, Rota viruses and HIV viruses. Oncogenic viruses (Human Papilloma virus): Introduction, characteristics of transformed cells, mechanism of viral oncogenesis and clinical manifestations.

UNIT-III:

(18 Hours)

Viral diseases with reference to symptoms, pathogenesis, transmission, prophylaxis and control -Emerging and reemerging viral infections (SARS, Swine flu, Ebola, Dengue, Chikungunya- and Corona) – Detection of viruses in clinical specimens – Serological and Molecular diagnosis of virus infections – Antiviral agents, Interferons and Viral Vaccines, Immunization schedules.

UNIT-IV:

(18 Hours)

General introduction to Medical Parasitology, Classification of medically important parasites. Morphology, life cycle, pathogenesis, clinical features, laboratory diagnosis, prevention and treatment of diseases caused by the following organisms: *Entameoba histolytica*, flagellates (*Giardia lamblia*, *Leishmania donovani*), Sporozoa- *Plasmodium* spp.

UNIT-V:

(18 Hours)

Introduction to Helminthes, Platyhelminthes – *Taenia* – *Fasciola* – *Paragonimus* – *Schistosoma* spp. Nematelminthes – *Ascaris*– *Ankylostoma* – *Enterobius* – *Trichuris* – *Trichinella* – *Wuchereria* – *Dracanculus*. Collection, transport and examination of specimen, Laboratory techniques in parasitological examination of faeces for ova and cyst by direct wet mount and iodine wet mount, Concentration methods (Floatation and Sedimentation techniques), Examination of blood for parasites. Cultivation of parasites.

Total Lecture Hours – 90

COURSE OUTCOME

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

1. Understand the structure and properties of viruses, cultivation methods and diagnosis of viral diseases.
2. Knowledge of basic and general concepts of causation of disease by the pathogenic microorganisms and various parameters of assessment of their severity and the methods of diagnosis.
3. Acquire skills on emerging and reemerging viral diseases
4. Interpret the importance of protozoans in the intestine.
5. Analyze the Nematodes as infectious agent

TEXT BOOKS

1. S., Rajan 2007. Medical microbiology, MJP publisher, Chennai
2. Jeyaram Paniker, C.K. 2006. Text Book of Parasitology Jay Pee Brothers, New Delhi.
3. Arora D.R. and Arora B. 2002. Medical Parasitology, 1stEdition CBS Publishers & Distributors, New Delhi.
4. Chatterjee 1986. Medical Parasitology. Tata McGraw Hill, Calcutta.
5. Parija S. C. 1996. Text Book of Medical Parasitology.4th edition, Orient Longman, All India Publishers & Distributors.
6. Howley, P. M., and Knipe, D. M. (Eds.). 2023. *Fields Virology: Fundamentals* (7th ed.). Wolters Kluwer Health. ISBN: 978-1975112516

REFERENCE BOOK(S)

1. Jawetz, E., Melnick, J.L. and Adelberg, E.A. (2000). Review of Medical Microbiology, 19thEdition. Lange Medical Publications, U.S.A.
2. Ananthanarayan, R. and JeyaramPaniker, C.K. (2009). Text Book of Microbiology, 8thEdition. Orient Longman, Chennai.
3. Conrat HF, Kimball PC and Levy JA. (1988). Virology. II edition. Prentice Hall, Englewood Cliff, New Jersey.

4. Topley & Wilson's (1990). Principles of Bacteriology, Virology and Immunity, 8th Edition, Vol. III Bacterial Diseases, Edward Arnold, London.
5. Finegold, S.M. (2000). Diagnostic Microbiology, 10th Edition. C.V. Mosby Company, St. Louis.
6. Paniker's Textbook of Medical Parasitology, 9th Edition, Reprint, (2024), Parasitology Textbook, Jaypee Brothers Medical Publishers, Delhi, India, ISBN-13: 978-8194802884.

E-RESOURCES

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4047123/>
2. <https://www.ncbi.nlm.nih.gov/pubmed/21722309>
3. <https://www.sciencedirect.com/science/article/pii/S2211753919300193>
4. <https://cmr.asm.org/content/30/3/811>
5. <https://www.nejm.org/doi/full/10.1056/NEJMoa1811400>

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

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



SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: V- CC-VI-Environmental and Agriculture Microbiology

Ins. Hours / Week: 5

Course Credit: 4

Course Code: U24MB510

UNIT- I

(15 Hours)

Microorganisms and their Habitats: Structure and function of ecosystems. Terrestrial Environment: Soil profile and soil microflora, Microbial succession in decomposition of soil organic matter. Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen, sulphur and Phosphorous cycle. Aquatic Environment: Microflora of fresh water and marine habitats, factors influencing microbial growth in the aquatic environments. Atmosphere: Aeromicroflora and dispersal of microbes, Assessment of air quality, Enumeration of microorganism in air, Air sanitation. Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. Predisposing factors for Environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases. Environmental Protection Agency (EPA) - role in environmental protection.

UNIT-II:

(15 Hours)

Water potability: Sources and types of water surface, ground, stored, distilled, mineral and de-mineralized water and their pollution, biological indicators of water Pollution, Eutrophication. Conventional Bacteriological standards of Water Quality, MPN index, coliform test, Membrane filtration. BOD, COD. Advanced molecular methods for water analysis. Water borne diseases. Central Pollution Control Board (CPCB) standards.

UNIT-III:

(15 Hours)

Microbial Interactions: Rhizosphere microflora. Concepts of Nitrogen fixation – Symbiotic and asymbiotic nitrogen fixers. Brief account of microbial interactions: Symbiosis, neutralism, commensalism, competition, Ammensalism, Synergism, parasitism, and predation. General account and Significance of Biofertilizers and biocontrol agents – Bacterial, cyanobacterial, VAM. Mass production of Rhizobial biofertilizer. Biocontrol agents – Bacterial, viral, fungal.

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

Waste treatment and bioremediation: Solid waste management: Sources and types of solid waste, composting, vermin composting, production of biogas. Liquid waste management: Primary, secondary, and tertiary sewage treatment. Bioremediation and waste management: Need and scope of bioremediation. Degradation of hydrocarbons, oil spills, heavy metals – Chromium, lead, and xenobiotics – PCB.

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

Plant pathology: Mode of entry of pathogens, Microbial enzymes, toxins, growth regulators and suppressor of plant defense in plant diseases. Plant defense mechanisms. Bacterial diseases – Citrus canker, Blight of paddy. Viral disease – TMV, CMV. Fungal disease- red rot of sugarcane, Tikka disease. Plant disease management.

Total Lecture Hours -75**COURSE OUTCOME**

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

1. Describe about the structure and function of ecosystems and understand the role of microbes in various environments
2. Identify the cause of water pollution, and perform methods to assess the quality of water.
3. Explain the production of biofertilizers and biopesticides.
4. Explain about waste treatment process and microbial decomposition and bio-remediation process.
5. Describe about plant diseases caused by microbes and acquire a clear idea on plant pathogenic interaction.

TEXT BOOKS

1. Joseph C. Daniel. 2006. Environmental aspects of Microbiology 2nd Edition. BrightSun Publications.
2. Pradipta. K.M. 2008. Textbook of Environmental Microbiology. I.K. Publishing. House.
3. Ramanathan, and Muthukaruppan SM. 2005. Environmental Microbiology. Om Sakthi Pathipagam, Annamalai Nagar.
4. K. Vijaya Ramesh. 2004. Environmental Microbiology. 1st Edition. MJP Publishers.
5. Subba Rao. N.S. 2017. Soil Microbiology. 4th Edition. Oxford and IBH Publishing Pvt. Ltd.

REFERENCE BOOK(S)

1. Dirk, J. Elsas, V., Trevors, J.T., Wellington, E.M.H. 1997. Modern Soil Microbiology, Marcel Dekker INC, New York, Hong Kong.
2. Eldowney S, Hardman D.J., Waite D.J., Waite S. 1993. Pollution: Ecology and Biotreatment – Longman Scientific Technical.
3. Mitchell, R. 1992. Environmental Microbiology. Wiley – John Wiley and Sons. Inc. Publications, New York.
4. Clesci, L.S., Greenberg, A.E. and Eaton, A.D. 1998. Standard Methods for Examination of Water and Wastewater, 20th Edition.
5. Atlas, R.M. and Bartha, R. 1992. Microbial Ecology: Fundamentals and Applications, 2nd Edition. The Benjamin / Cummings Publishing Co., Redwood City, CA.

E-RESOURCES

1. <https://nptel.ac.in/courses/126105016>

2. <https://www.classcentral.com/course/swayam-plant-pathology-and-soil-health-14236>
3. <https://www.wasteonline.org.uk/resources/InformationSheets/WasteDisposal.htm>
4. https://plantpath.cornell.edu/labs/enelson/PDFs/Hill_et_al_2000.pdf
5. <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2389.2005.00781.x>

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
(AUTONOMOUS)**



SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

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

Semester: V- CC-VII Molecular Biology and Microbial Genetics

Ins. Hours / Week:5

Course Credit: 5

Course Code: U245MB511

UNIT- I

(15 Hours)

DNA Structure - Salient features of double helix, forms of DNA. Denaturation and renaturation. DNA topology – Supercoiling, linking number, topoisomerases. DNA organization in prokaryotes, viruses, eukaryotes. Replication of DNA in prokaryotes and eukaryotes- Bidirectional and unidirectional replication, semi-conservative and semi-discontinuous replication. Mechanism of DNA replication – enzymes involved – DNA polymerases, DNA ligase and Primase. DNA replication modes - rolling circle, D-loop modes.

UNIT-II:

(15 Hours)

Transcription in Prokaryotes. Concept of transcription. RNA Polymerases - prokaryotic and eukaryotic. General transcription factors in eukaryotes. Distinction between transcription processes in prokaryotes versus and eukaryotes. Translation in prokaryotes and eukaryotic - Translational machinery - ribosome structure in prokaryotes and eukaryotes **ic**, tRNA structure and processing. Inhibitors of protein synthesis in prokaryotes and eukaryotes **ic**. Overview of regulation of gene expression - *lac*, *trp* and *ara* operons as examples. Regulation of gene expression by DNA methylation.

UNIT-III:

(15 Hours)

Mutation - Definition and types - base substitutions, frame shifts, deletions, insertions, duplications, inversions. Silent, conditional, and lethal mutations. Physical and chemical mutagens. Reversion and suppression. Uses of mutations. Repair Mechanisms - Photoreactivation, Nucleotide Repair, Base Excision Repair, Methyl Directed Mismatch Repair and SOS Repair.

UNIT-IV:

(15Hours)

Plasmid replication and partitioning, host range, plasmid incompatibility, plasmid amplification, regulation of plasmid copy number, curing of plasmids. Types of plasmids – R Plasmids, F plasmids, colicinogenic plasmids, metal resistance plasmids, Ti plasmid, linear plasmids, yeast 2μ plasmid. Bacteriophage-T4, Virulent Phage – Structure and lifecycle. Lambda phage-Structure,

Lytic and Lysogenic cycle. Applications of Phages in Microbial Genetics.

UNIT-V:

(18 Hours)

Gene Transfer Mechanisms- Conjugation and its uses. Transduction - Generalized and Specialized, Transformation - Natural Competence and Transformation. Transposition and Types of Transposition reactions. Mechanism of transposition: Replicative and non-replicative transposition. Transposable elements - Prokaryotic transposable elements – insertion sequences, composite, and non-composite transposons. Uses of transposons.

Total Lecture Hours - 75

COURSE OUTCOME

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

1. Analyze the significance of DNA and elucidate the replication mechanism.
2. Illustrate the types of RNA and protein synthesis machinery.
3. Infer the causes and types of DNA mutation and summarize the DNA repair mechanisms.
4. Evaluate the importance of plasmids and phages in genetics.
5. Analyze gene transfer and recombination methods.

TEXT BOOKS

1. Malacinski G.M. 2008. Freifelder's Essentials of Molecular Biology. 4th Edition. Narosa Publishing House, New Delhi.
2. Gardner E. J. Simmons M. J. and Snusted D.P. 2006. Principles of Genetics. 8th Edition. Wiley India Pvt. Ltd.
3. Trun N. and Trempey J. 2009. Fundamental Bacterial Genetics. 1st Edition. Blackwell Science Ltd.
4. Brown T. A. 2016. Gene Cloning and DNA Analysis- An Introduction. (7th Edition). John Wiley and Sons, Ltd.
5. Dale J. W., Schantz M.V. and Plant N. 2012. From Gene to Genomes – Concepts and Applications of DNA Technology. (3rd Edition). John Wileys and Sons Ltd.

REFERENCE BOOKS

1. Glick B. R. and Patten C.L. 2018. Molecular Biotechnology – Principles and Applications of Recombinant DNA. 5th Edition. ASM Press.
2. Russell P.J. 2010. iGenetics - A Molecular Approach, 3rd Edition., Pearson New International edn.
3. Nelson, D.L. and Cox, M.M. Lehninger, 2017. Principles of Biochemistry. 7th Edition, W.H. Freeman.
4. Synder L., Peters J. E., Henkin T.M. and Champness W. 2013. Molecular Genetics of Bacteria, 4th Edition, ASM Press Washington-D.C. ASM Press.
5. Primrose S.B. and Twyman R. M. 2006. Principles of Gene Manipulation and Genomics. (7th Edition). Blackwell Publishing.

E-RESOURCES

1. <https://kau.in/document/laboratory-manual-biochemistry>
2. <https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/>
3. <https://courses.lumenlearning.com/boundless-biology/chapter/dna-replication/>
4. Molecular Biology Notes - Microbe Notes
5. Molecular Biology Lecture Notes & Study Materials | Easy Biology Class

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

Strong -3; Medium -2; Low - 1



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V- CP-V-Virology and Parasitology, Environmental and Agriculture Microbiology (P)

Ins. Hours / Week: 4 Course Credit: 4

Course Code: U24MB512P

Virology and Parasitology

1. Collection and Transport of Clinical specimens.
2. Isolation of Bacteriophages from Sewage and other natural sources.
3. Identification of Viruses in Slides/Smears/Spotters. Demonstration of Negri bodies (Staining).
4. Cultivation of Viruses in Embryonated eggs – Amniotic, Allantoic, Yolk sac routes and Chorio-allantoic membrane.
5. Direct Examination of Faeces – wet mount and Iodine mount – Demonstration of Protozoan cysts and Helminthes eggs.
6. Concentration techniques of stool specimen – Floatation and Sedimentation methods.
7. Examination of blood for Malarial parasites – thin and thick smear preparations.
8. Identification of Medically important parasites in slides / specimens as spotters.

Environmental and Agriculture Microbiology

1. Physical, chemical, and microbiological assessment of water and potability test for water.
 - Physical -Color, pH,
 - Chemical - alkalinity, acidity, DO, BOD, COD
 - Microbiological – MPN index (Presumptive, Completed and Confirmatory test)
2. Study of air microflora by settle plate method.
3. Microbiological assay of antibiotics by cup plate method and other methods
4. Isolation of *Rhizobium*/ *Azotobacter*/ phosphate solubilizing organisms
5. Preparation of biofertilizers – Demonstration
6. Study of plant pathogens- Tikka Disease, Red rot of sugarcane, Citrus canker and Blight of paddy.
7. Study of fungi - *Mucor*, *Curvularia*, *Alternaria*, *Rhizopus* and *Aspergillus*

COURSE OUTCOMES

1. Demonstrate the ability to isolate and identify bacteriophages from environmental samples
2. Understand and perform the techniques for viral cultivation using embryonated eggs
3. Examine blood samples for hemoparasites, particularly Plasmodium species, through thin and thick smear preparation
4. Analyze the physical, chemical, and microbiological parameters of water to assess its quality
5. Perform microbiological assays for antibiotics using methods like the cup plate technique to

determine antimicrobial efficacy.

TEXT BOOKS

1. Rajan S. 2012. Manual for Medical Laboratory Technology. Anajanaa Book House, Chennai.
2. Rajan S and Selvi Christy R. 2011. Experimental Procedures in Life Sciences. Anajanaa Book House, Chennai
3. Monica Cheesbrough. 2011. District Laboratory Practice in Tropical Countries-Part I and II, 2nd edition, Cambridge University Press, New Delhi.

REFERENCE BOOK(S)

1. Betty A Forbes, Daniel F Sahm and Alice S Weissfeld. Bailey and Scott's, 2007. Diagnostic Microbiology, Mosby Elsevier. 12th Edition.
2. Mackie and McCartney 2006. Practical Medical Microbiology, South Asia Edition. 14th edition.
3. James G Cappuccino and Natalie Sherman. 1996. Microbiology-A Laboratory Manual (4th edition). The Benjamin publishing company, New York.
4. Jeanne Dijkstra and Cees P. de Jager. 1998. Practical Plant Virology. Springer-Verlag Berlin Heidelberg, Germany.
5. Paul I A and Clark FE. 2000. Soil Microbiology and Biochemistry, 2nd Ed. Academic press. United States.
6. Russell F Bey. 2001. Microbiology Laboratory Manual, Brooks/Cole, Australia.
7. Schaechter M, Medoff G and Eisenstein BC. 1993. Mechanism of Microbial diseases. 2nd edition. Williams and Wilkins., Baltimore.

E - RESOURCES

1. <https://www.slideshare.net/amanullah9803150/biochemical-tests-for-gram-positive-cocci>
2. <https://www.slideshare.net/AshwiniGowda6/haemoparasites-in-blood-smear>
3. <https://www.slideshare.net/MariyaRaju/bacteriological-analysis-of-drinking-water>
4. <https://www.slideshare.net/AsmaAshraf7/dna-isolation-73144905>
5. <https://www.slideshare.net/TapeshwarYadav1/gel-electrophoresis-53828963>

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 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V- EC-I Recombinant DNA Technology (Choice 1)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE51A

UNIT- I: (12 Hours)

Milestones in rDNA Technology- Gene Manipulation-Steps involved in Gene Cloning. Isolation of Chromosomal and Plasmid DNA. Restriction endonuclease - Discovery, Types, Mode of action-Application of Ligase, DNA Polymerase, DNA Modifying enzymes and Topoisomerases. Use of Linkers and Adapters.

UNIT-II: (12 Hours)

Artificial Gene Transfer methods-Calcium Chloride Induction, Electroporation, Microinjection, Biolistic method, Liposome and Viral-mediated delivery. Cloning vectors –Properties and Applications - Plasmid Based Vectors- Natural Vectors-pSC101 and pMB1.Artificial Vectors- pBR322 and pUC. Phage Based Vectors- Lambda phage. Hybrid Vectors, Phagemid, Cosmid, BAC and YAC. Screening of Recombinants. Genomic DNA and cDNA library-Construction and Screening.

UNIT-III: (12 Hours)

Molecular Tools- PCR- Types. Gel Electrophoresis- AGE and PAGE, Blotting Techniques-Southern, Western & Northern. DNA sequencing methods- Sanger's and Automated method. Recent Trends in Genetic Engineering- Targeted Genome Editing- ZFNs, TALENs, CRISPRs. Gene Targeting- Knock- in & Knock- outs. DNA Finger Printing,

UNIT-IV: (12 Hours)

Plant Biotechnology – Media, Growth Regulators and Equipment for Plant Tissue Culture-Explant Culture- Micro propagation- Callus and Protoplast Culture-Production of Bio-Active Secondary Metabolites by Plant Tissue Culture -Agrobacterium and Crown Gall Tumors, Ti Plasmid and Ri Plasmid- Animal Biotechnology Principles of Animal Cell Culture, Media and Equipment for Animal Cell Culture – Primary and Secondary

Cultures- Cell Lines- Types, Establishment and Maintenance of Cell Lines.

UNIT-V:

(12 Hours)

Applications of Genetic Engineering - Transgenic Animals – Mice and Sheep- Recombinant Cytokines and their use in the Treatment of Animal infections- Monoclonal Antibodies in Therapy- Vaccines and their Applications in Animal Infections - Human Gene Therapy, Germ line and Somatic Cell Therapy- *Ex- vivo* Gene Therapy SCID (Severe Combined Immuno Deficiency) – *In-vivo* Gene Therapy- CFTR (Cystic Fibrosis Transmembrane Regulator) – Vectors in Gene Therapy- Viral and Non- Viral Vectors. Transgenic Plants– Bt Cotton, Bt Corn, Round Ready soy bean, Flavr Savr Tomato and Golden Rice.

Total Lecture Hours - 60

COURSE OUTCOME

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

1. Illustrate the steps involved in introduction and expression of foreign DNA into bacteria, animal and plants cells and their screening.
2. Discuss the various cloning vectors and their applications.
3. Assess the usage and advantages of molecular tools.
4. Demonstrate plant and animal tissue culture protocols and gene transfer mechanism.
5. Elucidate the application of genetic engineering and gene therapy.

TEXT BOOKS

1. Brown T.A.2016. Gene Cloning and DNA Analysis. 7thEdition . John Wiley and Jones, Ltd.
2. Dale J. W., Schantz M.V. and Plant N. 2012. From Gene to Genomes – Concepts and Applications of DNA Technology. 3rd Edition. John Wileys and Sons Ltd.
3. Keya Chaudhuri 2013. Recombinant DNA technology. The Energy and Resources Institute.
4. Siddra Ijaz, Imran UIHaq 2019. Recombinant DNA Technology. Cambridge Scholars Publishing.
5. Monika Jain 2012. Recombinant DNA Techniques: A Textbook, I Edition,Alpha Science International Ltd.
6. Sharma, A., Chahal, S., & Gakhar, A. 2025.*Textbook of recombinant DNA technology*. Parab Publications. ISBN: 978-9348959164

REFERENCE BOOK(S)

1. Maloy S. R., Cronan J.E. Jr. and Freifelder D. 2011. Microbial Genetics. 2nd Edition. Narosa Publishing Home Pvt Ltd. GN Prabhakara, 2010. Short Textbook of Preventive and Social Medicine. Second Edition. Jaypee publishers
2. Glick B. R. and Patten C.L. 2018. Molecular Biotechnology – Principles and Applications of Recombinant DNA. 5th Edition. ASM Press.
3. Russell P.J. 2010. iGenetics - A Molecular Approach, 3rd Edition. Pearson New International Edition.
4. Synder L., Peters J. E., Henkin T.M. and Champness W. 2013. Molecular Genetics of Bacteria, 4th Edition. ASM Press Washington-D.C. ASM Press.
5. James D. Watson, Michael Gilman, Jan Witkowski, Mark Zoller, 1992. Recombinant DNA. Scientific American Books, US.
6. Drummond, L. 2023. *Principles, concepts and applications of recombinant DNA technology*. American Academic Publisher. ISBN: 978-1666867039

E-RESOURCES

1. <https://www.britannica.com/recombinant-DNA-technology>
2. <https://www.byjus.com/recombinant-dna-technology>
3. <https://www.rpi.edu>
4. <https://www.conestogac.on.health-care-administration-and-service-management>
5. <https://www.le.ac.uk/recombinant-dna-and-genetic-techniques>

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

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V-EC-I Biostatistics (Choice 2)

Ins. Hours / Week: 4

Course Credit:3

Course Code: U24MBE51B

UNIT- I: (12 Hours)

Introduction to biostatistics – Definition, statistical methods, biological measurement, kinds of biological data, functions of statistics and limitation of statistics

UNIT-II: (12 Hours)

Collection of data, sampling and sampling design, classification and tabulation, types of representations, graphic – bar diagrams, pie diagrams and curves.

UNIT-III: (12 Hours)

Measures of central tendency, mean, median, mode (Direct and indirect method) and geometric mean.

UNIT-IV: (12 Hours)

Measures of dispersion and variability, changes. Deviation – mean deviation, standard deviation, coefficient of variation, Lorenzen's curve.

UNIT-V: (12 Hours)

Skewness, kurtosis, moments, meaning, test of skewness, characteristics of dispersion and skewness, measures of skewness, objectives, Karl Perarson's coefficient of skewness. Bocolley's coefficient of skewness.

Total Lecture Hours - 60

COURSE OUTCOME

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

1. Understand the fundamentals of biostatistics, its scope, and its importance
2. Identify appropriate methods for data collection and effectively organize data.
3. Compute and interpret measures of central tendency to summarize data sets
4. Analyze data variability using appropriate dispersion measures.
5. Assess the distribution shape of data using skewness and kurtosis

TEXT BOOKS

- 1.Senn, S. S. 2021. Statistical issues in drug development (3rd ed.). Hoboken, NJ: Wiley.
- 2.Galwey, N. W. 2024. The false discovery rate: Its meaning, interpretation and application in data science. Hoboken, NJ: Wiley.
- 3.Carpenter, J. R., Bartlett, J. W., Morris, T. P., Wood, A. M., Quartagno, M., & Kenward, M. G. 2023. Multiple imputation and its application (2nd ed.). Hoboken, NJ: Wiley.
- 4.Fay, M. P., & Brittain, E. 2022. Statistical hypothesis testing in context: Reproducibility, inference, and science. Cambridge, United Kingdom: Cambridge University Press.
- 5.Piantadosi, S. 2024. Clinical trials: A methodologic perspective (4th ed.). Hoboken, NJ: Wiley

REFERENCE BOOK(S)

1. Daniel, W. W., & Cross, C. L. (2018). Biostatistics: A foundation for analysis in the health sciences (11th ed.). Hoboken, NJ: Wiley.
2. Rossi, R. J. (2022). *Applied biostatistics for the health sciences* (2nd ed.). Hoboken, NJ: Wiley.
3. Sullivan, L. M. (2021). Biostatistics for population health: A primer. Burlington, MA: Jones & Bartlett Learning.
4. Wahi, M. (2019). Biostatistics for dummies. Hoboken, NJ: For Dummies (Wiley).
5. Sullivan, L. M. (2018). Essentials of biostatistics in public health (3rd ed.). Burlington, MA: Jones & Bartlett Learning.

E-RESOURCES

1. <https://pharmdbm.com/biostatistics-and-research-methodology-notes-bpharm/>
2. <https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture-notes/env-health-science-students/ln-biostat-hss-final.pdf>
3. <https://kamarajcollege.ac.in/wp-content/uploads/Elective-Biostatistics-VI-Sem.pdf>
4. https://www.osmosis.org/notes/Introductory_Biostatistics
5. <https://www.carewellpharma.in/bpharmacy/notes/8th-sem/biostatistics-and-research-methodology>

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	

1. 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 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V-EC-I Veterinary Microbiology (Choice-3)

Ins. Hours / Week:4

Course Credit: 3

Course Code: U24MBE51C

UNIT- I:

(12 Hours)

Veterinary Bacteriology- Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses. *Staphylococcus*, *Streptococcus*, *Mycobacterium*, *Clostridium*, *Vibrio*, *Campylobacter*, *Mycoplasma*, *Rickettsia*, *Chlamydia*. Emerging and re-emerging diseases.

UNIT-II:

Veterinary Mycology -*Candida* and *Cryptococcus*. *Aspergillus*, Dermatophytes and *Malassezia*. Mycetoma and Zygomycetes , Mycotic Mastitis and Mycotic Abortion.

Mycotoxicosis

UNIT-III:

(12 Hours)

Microbial Biotechnology- Basic concepts and scope of Recombinant DNA Technology – Transgenic animals- Applications. Ethical issues in Animal Biotechnology and Intellectual Property Rights (IPR)

UNIT-IV:

(12 Hours)

Veterinary Virology - Birnaviridae - Infectious Bursal Disease .Reoviridae - Blue Tongue and African Horse Sickness .Paramyxoviridae - Newcastle disease, Rinderpest, Canine Distemper and PPR virus. Rhabdoviridae - Rabies and Ephemeral fever . Coronaviridae - Infectious Bronchitis and Transmissible gastroenteritis Picornaviridae - FMD and Duck viral Hepatitis . Togaviridae - Equine Encephalomyelitis. Flaviviridae - Swine Fever and BVD

UNIT-V:

(12 Hours)

Pathogenesis and control of zoonotic diseases. Factors influencing transmission and survival of pathogenic microorganisms in the environment. Veterinary Immunology and Serology.

Total Lecture Hours - 60

COURSE OUTCOME

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

1. Understand the role of pathogenic bacteria in animal diseases and the significance of emerging and re-emerging bacterial infections.
2. Identify and describe medically important fungi causing diseases in animals, including their role in conditions like mycotic mastitis, mycotic abortion, and mycotoxicosis.
3. Demonstrate knowledge of microbial biotechnology and its applications in animal health, along with awareness of ethical concerns and intellectual property rights.
4. Explain the virology of economically important veterinary viruses, pathogenic mechanisms, and disease control strategies.
5. Analyze the pathogenesis, transmission, and control of major zoonotic diseases, including environmental and biological factors affecting disease dynamics

TEXT BOOKS

1. D. Scott McVey, Melissa Kennedy, M. M. Chengappa, Rebecca Wilkes, 2022. *Veterinary Microbiology* (4th Edition), John Wiley & Sons, USA.
2. P. J. Quinn, B. K. Markey, F. C. Leonard, E. S. Fitzpatrick, S. Fan, 2011. *Veterinary Microbiology and Microbial Disease* (2nd Edition), John Wiley & Sons, USA.
3. McVey, D. S., Kennedy, M., Chengappa, M. M., & Wilkes, R. (Eds.). 2022. *Veterinary microbiology* (4th ed.). Wiley-Blackwell. ISBN: 978-1-119-65075-1.
4. Blood D. C. *Veterinary Mycology*, 2018. CBS Publishers & Distributors Pvt. Ltd., New Delhi
5. Singh , B. D. *Textbook of Microbial Biotechnology*, Kalyani Publishers, New Delhi
6. Ananthanarayan, R. Jayaram Paniker, C. K. Ananthanarayan and Paniker's *Textbook of Microbiology*, University Press (India) Pvt. Ltd. 10th Edition or latest
7. Palmer, S.R. Soulsby, L. Simpson, D.I.H. *Zoonoses: Biology, Clinical Practice, and Public Health Control*, Oxford University Press, 2nd Edition, ISBN: 9780198508650

REFERENCE BOOK(S)

1. Quinn, P. J., Markey, B. K., Leonard, F. C., Hartigan, P., Fanning, S., & Fitzpatrick, E. S. (Eds.). (2011). *Veterinary microbiology and microbial disease* (2nd ed.). Wiley-Blackwell, USA.

2. Markey, B., Leonard, F., Archambault, M., Cullinane, A., & Maguire, D. (2013). *Clinical veterinary microbiology* (2nd ed.). Elsevier, London.
3. G. R. Carter, Darla J. 2004, Essentials of Veterinary Bacteriology and Mycology (6th Edition), Wiley-Blackwell, USA. ISBN: 978-0813811796.
4. Laura L. Hungerford, Charles L. Campbell, Arnold R. Smith, 1998. Veterinary Mycology Laboratory Manual, Iowa State University Press, US, **ISBN:** 978-0813828496.
5. Blood, D. C. Henderson, J. A. 2018. Textbook of Veterinary Microbiology, CBS Publishers & Distributors Pvt. Ltd., New Delhi
6. Quinn, P.J. Markey, B.K. Leonard, F.C. FitzPatrick, D.E. Fanning, S. Hartigan, E.S. 2011. Veterinary Microbiology and Microbial Disease Wiley-Blackwell, ISBN: 978-1405158237
7. Frederick A. Murphy, E. Paul J. Gibbs, Marian C. Horzinek, Michael J. Studdert, 2011. Veterinary Virology, Academic Press, 3rd Edition, ISBN: 978-0125113403
8. Scott McVey, D. Melissa Kennedy, M.M. Chengappa, Rebecca Wilkes. (2022). Veterinary Microbiology, 4th Edition, Wiley-Blackwell, ISBN: 9781119650751

E-RESOURCES

1. <https://wizape.com/English/Veterinary-Microbiology>
2. <https://www.veterinarymicrobiology.in/>
3. <https://www.sciencedirect.com/journal/veterinary-microbiology>
4. <https://vetbooks.ir/clinical-veterinary-microbiology/>
5. <https://vetbooks.ir/veterinary-microbiology-4th-edition>

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

Strong -3; Medium -2; Low - 1

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V- EC-II –Biosafety and Bioethics (Choice-I)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE512A

UNIT- I: (12 Hours)

Basics of Biosafety - Laboratory Hazards and Hazard symbols. Definitions on Biohazard, Biosafety and Biosecurity- Biohazard- LAI, BP. Biohazard Classification. Biological Risk Groups. Need and application of biosafety. Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP).

UNIT – II: (12 Hours)

Hazardous materials in Biotechnology - Categories of Waste in the Biotechnology Laboratories, Biohazardous waste and their disposal and treatments- issues in use of GMO's, risk for animal / human/ agriculture and environment owing to GMO. Hazardous materials, Emergency response/ first aids in Laboratories.

UNIT- III: (12 Hours)

Biological Safety Containment in Laboratory - Primary and secondary containments - Physical and biological containment. Types of biosafety containments (level I, II, III), PPE, Biosafety guidelines in India - Roles of Institutional Biosafety Committee, RCGM, GEAC.

UNIT- IV: (12 Hours)

Introduction and need of Bioethics - its relationship with other branches, Ethical implications of biotechnological products and techniques. Ethical Issues involving human cloning, human genome project, prenatal diagnosis, agriculture and animal rights, Social and ethical implications of biological weapons.

UNIT –V: (12 Hours)

IPR, Patents and Patent laws - Intellectual property rights-TRIP- GATT International conventions patents, Methods of application of patents, Legal implications. Biodiversity and farmer rights, Objectives of the patent system, Basic principles and general requirements of

patent law, Biotechnological inventions, and patent law. Legal development-Patentable subjects and protection in biotechnology. The patenting of living organisms.

Total Lecture Hours -60

COURSE OUTCOMES

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

1. Gain an understanding of control measures for laboratory hazards and practice safety strategies, including the proper use of personal protective equipment (PPE).
2. Compare the different types of microscopes, their functions and applications.
3. Develop strategies for the safe and ethical use of genetically modified organisms (GMOs)
4. Cultivate skills in critical ethical analysis of contemporary moral issues in medicine and healthcare.
5. Analyze and constructively respond to the philosophical comments and perspectives of peers.
6. Introduce students to Intellectual Property (IP) as a potential career path, covering role of Research & Development (R&D) IP Counsel, Government positions such as Patent Examiner.

TEXT BOOK(S)

1. Usharani .B, S Anbazhagi, C K Vidya, (2019). Biosafety in Microbiological Laboratories- 1st Edition, Notion Press, ISBN-101645878856
2. Satheesh. M.K., (2020). Bioethics and Biosafety- 1st Edition, J. K International Publishing House Pvt. Ltd: Delhi, ISBN :9788190675703.
3. DeepaGoel and ShominiParashar, (2013). IPR, Biosafety and Bioethics- 1st Edition, Pearson education: Chennai, ISBN-13: 978-8131774700.
4. Sateesh. M.K. (2013). Bioethics and Biosafety. i.K. International pvt,Ltd.
5. Jonathan Jaime Guerrero (2024). Biosafety and Biosecurity. CRC Press, USA, ISBN: 9781032544052.

REFERENCE BOOK(S)

1. Nithyananda, K V. (2020). Intellectual Property Rights: Protection and Management, India, IN: Cengage Learning India Private Limited, ISBN-10: 9386668572.
2. Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights, India, IN: PHI learning Private Limited, ISBN: 9788120349896.
3. Ahuja, V K. (2019). Law relating to Intellectual Property Rights, India, IN: Lexis Nexis, ISBN-10: 8131251659.

4. Edited by Sylvia Uzochukwu, Nwadiuto (Diuto) Esiobu, Arinze Stanley Okoli, Emeka Godfrey Nwoba, Ezebuirio Nwagbo Christpeace, Charles Oluwaseun Adetunji, Abdulrazak B. Ibrahim, Benjamin Ewa Ubi (2023). Biosafety and Bioethics in Biotechnology-Policy, Advocacy, and Capacity Building, 1st edition. CRC Press, USA.
5. Sree Krishna. V (2017). Bioethics and Biosafety in Biotechnology. New age international publishers.

E- RESOURCES

1. <https://www.slideshare.net/krish181958/types-of-microscope-70370614>
2. https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf.
3. <https://www.niehs.nih.gov/bioethics>
4. <https://www.sist.sathyabama.ac.in>
5. <https://www.longdom.org/bioethics-and-biosafety>

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

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

B.Sc., MICROBIOLOGY

Semester: V- EC-II –Research Methodology (Choice-2)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE512B

UNIT- I: Basics of Research (12 Hours)

Methodology Objectives – principles – types of research approaches – Research process – Criteria of good research – Research and Scientific method – Defining the Research problem – Selecting the problem – Techniques in defining the problem.

UNIT- II: Formulation of hypothesis (12 Hours)

Importance and need for research ethics and scientific research - Formulation of hypothesis – Types and characteristics – Hypothesis testing – Procedures.

UNIT- III: Designing of research work (12 Hours)

Designing a research work – Need of research design – Features of a good design – Concepts and different research design – Basic principles of experimental design.

UNIT- IV: Interpretation and report writing (12 Hours)

Techniques and significance of report writing – Steps - Types of report. Presentation of Result: Selection of Appropriate Statistical Techniques – Software tools- SPSS (IBM), R (R Foundation for statistical computing. Report Writing. Application of computer in research.

UNIT- V: Scientific writing (12 Hours)

Logical format for writing thesis and papers – Essential features of abstract, introduction, review of literature, materials and methods, results and discussion. Effective illustration – Tables and figures – Plates – Conclusion and Bibliography. Introduction to copyediting, objectives of copyediting (correctness, consistency, coherence and clarity), editing your own paper (fixing grammar and usage errors, basic punctuation, consistent style and clear sentences), creating and using a style sheet for effective copyediting, tools available (MS Editor, Grammarly, Quillbot). Plagiarism-Software tools to check the Plagiarism.

Total Lecture Hours – 60

COURSE OUTCOME

The students will be able to,

1. Understand the research process and techniques
2. Formulate and testing the hypothesis for research problem
3. Design the different type of research
4. Analyse and interpret data, writing of thesis, and preparation of manuscript for publication.
5. Identify the research ethics for publication

TEXT BOOKS

1. Anderson J.B. and Poole M. 2011. Assignment and Thesis Writing. Wiley India Private Limited. Noida.
2. Gupta, S.P. 2014. Statistical Methods -S. Chand publication, New Delhi
3. Gurumani, N. 2006. Research methodology for biological sciences. MJP Publishers. A unit of Tamil nadu Book House, Chennai.
4. Kothari C.R. and Garg , G. 2004. Research Methodology: Methods and Techniques. 2ndedn. New Age International Publishers, New Delhi.
5. Stanton A. Glantz., 2001. Primer of Biostatistics. McGraw-Hill, New York.
6. Wayne W. Daniel, 2006. Biostatistics- A foundation for analysis in the Health Sciences. 7th edition. Wiley India publication, Karnataka.
7. Shanti Bhushan Mishra and ShashiAlokEducreation, 2017. Hand Book of Research methodology, Publishing Rz 94, Sector - 6, Dwarka, New Delhi.
8. Ram Singh Kushwha, Sandip Kumar Mishra, Anjita Srivas Tiva Priya Tiwari, 2024, Research Methodology Lucknow, ISBN : 978-81-973571-7-6.

REFERENCE BOOK(S)

1. Anderson J.B. and Poole M. 2011. Assignment and Thesis Writing. 4thedn. Wiley India Private Ltd., Karnataka.
2. Attwood, T.K. and Parry-Smith, D.J. 2001. Introduction to Bioinformatics, Pearson Education Asia.
3. Beth Dawson Robert, G. and Trapp Beth Dawson Robert Trapp. 2004. Basic and Clinical Biostatistics (LANGE Basic Science), McGraw-Hill, Uttar Pradesh.
4. Claverie, J.M. and Notredame, C. 2003. Bioinformatics for Dummies, Wiley Publishing, Inc., Karnataka.

5. David W. M., 2001. Sequence and Genome Analysis, Bioinformatics. Cold Spring Harbor Laboratory Press.
6. Jeffrey A. Witmer and Myra L. Samuels, 2002. Statistics for the Life Sciences (3rd Edition). Prentice Hall.
7. Kothari, C.R., 2013. Research methodology Methods and Techniques, New Age International Pvt Ltd Publishers., New Delhi
8. Ramadass, P. and Wilson Aruni, A. 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai.
9. [Willie Tan](#), 2017. Research Methods: A Practical Guide For Students And Researchers 1st Edition, World Scientific Publishers, London.
10. Vivek Kumar, 2023, DISCOVER the EDITOR in YOU, Saurabh Printers, Greater Noda, Uttar Pradesh, ISBN: 978-9394887-31-2

E -RESOURCES

1. <http://www.math.yorku.ca/scs/statResource.html#> General
2. <http://www.anest.ufl.edu/computer/index.html>
3. <http://www.jegsworks.com/Lessons/index.html>
4. <http://www.bettycjung.net/statsites.html>
5. <http://www.biostat.harvard.edu/links/>
6. <http://www.ped.mod.utah.edu/genpedscrr/Epibio.html/>

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
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SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V- EC-II -Bioinformatics (Choice-3)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE52C

UNIT- I: (12 Hours)

Introduction to informatics, Bioinformatics- its history and its development- biological database- NCBL, EMBL, DDBJ, PDB.

UNIT – II: (12 Hours)

Working of internet- LAN, WAN and MAN- Types of files- HTML, TXT, PDF- Search engines and its types and applications.

UNIT- III: (12 Hours)

Computational approaches to biological questions. Basics of computers – servers, workstations, operating systems, Unix, Linux, World Wide Web. Search engines, finding scientific articles- Pubmed- public biological databases.

UNIT- IV: (12 Hours)

Sequence analysis- Sequencing genomes- Pairwise sequence comparison. Genbank, BLAST and FASTA-multifunctional tools for sequence analysis. Phylogenetic alignment- profiles and motifs. Protein Data Bank (PDB), Swiss- Prot.

UNIT –V: (12 Hours)

Cheminformatics- its history and its development- applications. Drug designing, applications of bioinformatics, patenting rights.

Total Lecture Hours -60

COURSE OUTCOMES

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

1. Understand the concepts of bioinformatics
2. Compare the different networks of computer and its applications
3. Develop skills of operating systems and databases.
4. Analyze and compare the sequences in genomics and proteomics.
5. Summarize the applications of cheminformatics and its applications

TEXT BOOKS

1. Cynthia Gibas and Per Jambeck, 2001, Developing bioinformatics computer skills, Shroff and Publishers and distributors Pvt. Ltd., Mumbai
2. Rashidi HH and Buehler LK, 2002, Bioinformatics Basis: Applications in Biological science and medicine CRC Press, London.
3. Sundararajan S and Balaji R, 2020, Bioinformatics, Himalaya Publishing House, Mumbai.
4. Sudheer Menon, 2021, Advancement in Bioinformatics, Notion Press, Chennai.
5. Sharma A.K and Sharma V 2023, Bioinformatics, Indie Publishers, India.

REFERENCE BOOK(S)

1. Baxevis, A. D., & Ouellette, B. F. F. (2020). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins (4th ed.). Wiley-Blackwell, Hoboken, New Jersey, USA.
2. Pevsner, J. (2022). Bioinformatics and Functional Genomics (3rd ed.). Wiley-Blackwell, Hoboken, New Jersey, USA.
3. Mount, D. W. (2021). Bioinformatics: Sequence and Genome Analysis (2nd ed., reprint). Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York, USA.
4. Singh, G. B. (2022). Fundamentals of Bioinformatics and Computational Biology. Springer, Cham, Switzerland.
5. Dandekar, T. (2022). Bioinformatics: An Introductory Textbook. Springer, Cham, Switzerland.
6. Maulik, U. (2024). Multiobjective Optimization Algorithms for Bioinformatics. Springer, Germany.

E- RESOURCES

1. <https://uou.ac.in/sites/default/files/slm/CGIS-501.pdf>
2. <https://www.geeksforgeeks.org/how-does-the-internet-work/>
3. <https://www.embo.org/people/a-computational-approach-to-biological-questions/>
4. <https://www.ncbi.nlm.nih.gov/books/NBK20261/>
5. <https://pubmed.ncbi.nlm.nih.gov/18428788/>

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	
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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
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DEPARTMENT OF MICROBIOLOGY

B.Sc., MICROBIOLOGY

Semester: V- Environmental Studies

Ins. Hours / Week: 2

Course Credit: 2

Course Code: 24UGCES

COURSE OBJECTIVES:

- To appreciate the scope of Environmental Studies, Community ecology and the interdisciplinary nature of environmental issues
- To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India. The course designed to gain knowledge on values of biodiversity and conservation on global, national, and local scales
- To study about sources and effects of environmental pollution like air, water, soil, thermal, marine, nuclear and noise
- To understand the concerns related to Sustainable Development on environment and health
- To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.

UNIT: I

(6 Hours)

The Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness.

UNIT: II

(6 Hours)

Natural Resources:

- Renewable and non-renewable resources.
- Natural resources and associated problems.
- a) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- f) Land resources: Land as a resources, land degradation, man induced Landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

UNIT: III:**(6 Hours)****Ecosystems**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession.
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT: VI**(6 Hours)****Biodiversity and its conservation**

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Biological Diversity Act 2002/ BD Rules, 2004

UNIT – VI**(6 Hours)****Social Issues and the Environment**

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation
- Public awareness.

UNIT -VII**(6 Hours)****Human Population and the Environment**

- Population growth, variation among nations.
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights - Value Education
- HIV/ AIDS - Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case studies.

UNIT -VIII

(6 Hours)

Field Work

- Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

REFERENCES

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt Ltd, Ahamedabad – 380013, India, E-mail: [mapin@icenet.net\(R\)](mailto:mapin@icenet.net(R))
3. Brunner R.C. 1989, Hazardous Waste Incineration, McGraw Hill Inc 480 p
4. Clark R.S. Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani E & Hepworth, M.T. 2001.
6. De A.K. Environmental Chemistry, Wiley Eastern Ltd
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford University, Press 473p.
9. Hawkins, R.E. Encyclopedia of India Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press 1140 p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & Schoch R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition 639 p.
13. Mhaskar A.K. Matter Hazardous, Techno-Science Publications (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p
16. Rao MN & Datta, A.K. 1987 Waste Water treatment, Oxford & IBH Publication Co. Pvt Ltd 345 p.
17. Sharma B.K. 2001 Environmental chemistry Goel Publ House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C. Harper, J and Michael Begon, Essentials of Ecology, Blackwell science (TB)
20. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R).
21. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB).
22. Wagner K.D. 1998 Environmental Management. W.B. Saunders Co. Philadelphia USA 499 p
(M) Magazine (R) Reference (TB) Textbook
23. <http://nbaindia.org/uploaded/Biodiversityindia/Legal/33%20Biological%20Diversity%20Rules,%202004.pdf>.

COURSE OUTCOMES:

- Understand the environmental importance including interactions across local to global scales.
- The learners to update and analyze environmental relationships and interactions of environmental components
- The student to gain knowledge on importance of natural resources in a systematic way.
- The course content is introduce the concept of renewable and non-renewable energy resources and its scenario in India and at global level
- The students will know the relationship between biodiversity and ecosystem functions, direct and indirect values of biodiversity resources and their bioprospecting opportunities.
- The learners can gain awareness related on environmental pollution, causes and pollution control with case studies.
- Student to obtain the environmental ethics and gain knowledge about the sustainable development.
- Learners should realize the environmental legislation and policies of national and international regime and know the regulations applicable to industries and other organizations with significant Environmental aspects

SEMESTER - VI

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)



SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- CC—VIII Food, Dairy and Probiotic Microbiology

Ins. Hours / Week: 6

Course Credit: 4

Course Code: U24MB613

UNIT- I

(18 Hours)

Food as a substrate for microorganisms- Microorganisms important in food microbiology; Molds, yeasts and bacteria -General Characteristics - Classification and importance. Principles of food preservation - Asepsis - Removal of microorganisms, - High temperature - Low temperature - Drying - Food additives. Nanoscience in food preservation; microencapsulation.

UNIT-II:

(18 Hours)

Contamination and spoilage of food products -Food borne infections (*Bacillus cereus*, *Salmonella*, *Shigella*, *Listeria monocytogenes* and *Campylobacter jejuni*) and intoxications – (*Staphylococcus aureus*, *Clostridium botulinum*, *Clostridium perfringens* and mycotoxins) Food borne disease outbreaks - newly emerging pathogens. Conventional and Novel technology in control of food borne pathogens and preventive measures - Food sanitation - plant sanitation - Employees' health standards. Regulatory Agencies and criteria for food safety.

UNIT-III:

(18 Hours)

Microflora of raw milk - sources of contamination. Spoilage and preservation of milk and milk products. -antimicrobial systems in raw milk. Importance of biofilms, their role in transmission of pathogens in dairy products and preventive strategies.

UNIT-IV:

(18 Hours)

Food fermentations: Indian Pickles Bread, Vinegar, Fermented Vegetables (Sauerkraut), Fermented Dairy Products (Yoghurt, Cheese, Acidophilus Milk, Kefir, Koumiss). Oriental fermented foods-Miso –Tempeh, Ontjom, Natto, Idli Spoilage and defects of fermented dairy products -. Functional fermented foods and nutraceuticals, bioactive proteins and bioactive peptides, genetically modified foods.

UNIT-V:

(18 Hours)

Probiotic microorganisms, concept, definition safety of probiotic microorganisms, legal status of

probiotics Characteristics of Probiotics for selection: stability maintenance of probiotic microorganisms. Role of probiotics in health and disease: Mechanism of probiotics. Application of bacteriocins in foods. Biopreservation. Prebiotics: concept, definition, criteria, types and sources of prebiotics, prebiotics and gut microflora - Prebiotics and health benefits: mineral absorption, immune response, cancer prevention, elderly health and infant health, prebiotics in foods.

Total Lecture Hours – 90

COURSE OUTCOME

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

1. Gain knowledge about food as a substrate for various microbes, Understand about the principles and application of different types of food spoilage and preservation technique,
2. Acquire a thorough understanding of food borne diseases, testing methods, and preventive technique
3. Gain information about spoilage of milk and its products and its antimicrobial properties
4. Learn about the various fermented product and its various stage spoilage
5. Impart current knowledge of probiotics and prebiotics for the health benefits

TEXT BOOKS

1. Frazier, W.C., and Westhoff, D.C. (2017). Food microbiology. 5th Edition TATA McGraw Hill Publishing Company Ltd. New Delhi.
2. Adams, M.R., and Moss, M.O. (2018). Food Microbiology 1st edition. New Age Publishers by New Age International (P) Ltd., Publishers.
3. Dubey, R.C. (2014). Advanced Biotechnology. S. Chand publishers.
4. Banwart, G.J. (1989). Basic food microbiology, Chapman & Hall, New York.
5. Sugumar, D. (1997). Outlines of dairy technology, Oxford University press. 1997.

REFERENCE BOOK(S)

1. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th Edition CBS Publishers and Distributors, Delhi, India.
2. Prescott, Harley and Klein Wim. (2008). Microbiology, 7th Edition McGraw Hill Publications.
3. Robinson, RK.(2002). Dairy Microbiology Handbook - The Microbiology of Milk and Milk Products (Third Edition), A John Wiley & Sons, Inc., New York.
4. Yuankunlee and Sepposalminen. (2008). Handbook of probiotics and prebiotics. Second Edition. A John Wiley & Sons publication Inc.
5. Dharumaurai Dhansekaran and AlwarappanSankaranarayanan. (2021). Advances in Probiotics

Microorganisms in Food and Health. 1st Edition. eBook ISBN:9780128230916.

E-RESOURCES

1. https://www.researchgate.net/publication/15326559_A_Dynamic_Approach_to_Predicting_BacterialGrowth_in_Food/link/5a1d2e02aca2726120b28eba/download
2. <https://www.fda.gov/food/laboratory-methods-food/bam-foodsamplingpreparation-sample-homogenate>
3. https://www.researchgate.net/publication/243462186_Foodborne_diseases_in_India_-_A_review
4. https://www.researchgate.net/publication/228662659_Fermented_Dairy_Products_Starter_Cultures_and_Potential_Nutritional_Benefits/link/000084160cf23f86393d5764/
5. <https://www.fda.gov/food>

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

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



SUNDARAKKOTTAI, MANNARGUDI-614016.
(For the Candidates admitted in the academic year 2024-2025)

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

**Semester: VI- CP-VI -Molecular Biology and Microbial Genetics, Food, Dairy and
Probiotic Microbiology (P)**

Ins. Hours / Week: 6

Course Credit: 4

Course Code: U24MB614P

Molecular Biology and Microbial Genetics

1. Isolation of chromosomal DNA from bacteria
2. Isolation of plasmid DNA from bacteria
3. Isolation of Auxotrophic mutants.
4. Demonstration of bacterial transformation technique.
5. Demonstration of Agarose gel electrophoresis (to study DNA/RNA) and SDS–PAGE (to study proteins.).

Food, Dairy and Probiotic Microbiology

1. Isolation and identification of bacteria and fungi from fruits and vegetables
2. Direct microscopic count of milk.
3. Methylene blue reductase test and Resazurin test
4. Microbiological examination of milk by Standard Plate Count.
5. Isolation of extracellular enzyme producers –Amylase, protease, lipase
6. Isolation of constituent flora of fermented milk.
7. Growth of probiotic LAB in broth, milk and whey.
8. Preparation of probiotic fermented milks like dahi, yoghurt, lassi and whey drink.
9. Effect of prebiotics on the growth of LAB in milk and broth.
10. Survivability of probiotic organisms in fermented milks.
11. Antimicrobial potential of the functional dairy products

COURSE OUTCOMES

1. Isolate and analyze chromosomal and plasmid DNA from bacteria
2. Demonstrate bacterial transformation techniques to understand gene transfer mechanisms and genetic engineering principles.

3. Perform agarose gel electrophoresis for the separation and analysis of nucleic acids (DNA/RNA) and interpret the results accurately
4. Isolate and identify bacteria and fungi from fruits, vegetables, and milk, including the enumeration of microorganisms using techniques
5. Evaluate the microbial quality of milk using tests such as the Methylene Blue Reductase Test and the Resazurin Test to assess bacterial load and freshness.

TEXT BOOKS

1. Rajan S. 2012. Manual for Medical Laboratory Technology. Anajanaa Book House, Chennai.
2. Rajan S and Selvi Christy R. 2011. Experimental Procedures in Life Sciences. Anjanaa Book House, Chennai
3. Monica Cheesbrough. 2011. District Laboratory Practice in Tropical Countries-Part I and II, 2nd edition, Cambridge University Press, New Delhi.
4. Aneja KR. 2005. Experiments in Microbiology, Plant pathology and Biotechnology. 4th edition, New Age International Publishers, Chennai.
5. James G Cappuccino and Natalie Sherman 2004. Microbiology: A laboratory manual. 6th edition, Published by Pearson Education.
6. Jay JM. 2000. Modern Food Microbiology, 4th edition, CBS Publishers and distributors, New Delhi.
7. Mathur N, 2007. Industrial Microbiology: A Laboratory Manual. 1st Edition, Aavishkar Publishers, Distributor, Rajasthan.

REFERENCE BOOK(S)

1. Betty A Forbes, Daniel F Sahm and Alice S Weissfeld. Bailey and Scott's, 2007. Diagnostic Microbiology, Mosby Elsevier. 12th Edition.
2. Mackie and McCartney 2006. Practical Medical Microbiology, South Asia Edition. 14th edition.
3. James G Cappuccino and Natalie Sherman. 1996. Microbiology-A Laboratory Manual (4th edition). The Benjamin publishing company, New York.
4. Jeanne Dijkstra and Cees P. de Jager. 1998. Practical Plant Virology. Springer-Verlag Berlin Heidelberg, Germany.
5. Paul I A and Clark FE. 2000. Soil Microbiology and Biochemistry, 2nd Ed. Academic press. United States.
6. Russell F Bey. 2001. Microbiology Laboratory Manual, Brooks/Cole, Australia.

7. Schaechter M, Medoff G and Eisenstein BC.1993.
Mechanism of Microbial diseases. 2nd edition. Williams and Wilkins., Baltimore.

E - RESOURCES

1. <https://www.slideshare.net/amanullah9803150/biochemical-tests-for-gram-positive-cocci>
2. <https://www.slideshare.net/AshwiniGowda6/haemoparasites-in-blood-smear>
3. <https://www.slideshare.net/MariyaRaju/bacteriological-analysis-of-drinking-water>
4. <https://www.slideshare.net/AsmaAshraf7/dna-isolation-73144905>
5. <https://www.slideshare.net/TapeshwarYadav1/gel-electrophoresis-53828963>

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

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Ins. Hours / Week: 4 Course Credit: 3 Course Code: U24MBE63A
UNIT- I (12 Hours)

UNIT-II: (12 Hours)**UNIT-III: (12 Hours)****UNIT-IV: (12 Hours)****UNIT-V: (12 Hours)**

Total Lecture Hours – 60

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

1. Understand the fundamentals of chemotherapy and the mechanisms of antibiotic action.
2. Perform microbiological assays for the evaluation of antibiotic potency.

3. Analyze the microbiological standardization of pharmaceuticals and conduct sterility testing of pharmaceutical products; apply sterilization techniques in the pharmaceutical industry.
4. Evaluate existing processes and develop innovative strategies for rational drug design.
5. Gain knowledge of regulatory guidelines governing pharmaceutical products.

TEXT BOOKS

1. Chand Pasha Kedernath. (2021). Text book of Pharmaceutical Microbiology. Ramnath Publisher, Kolkata
2. Hugo WB and Russell AD. (2004). Pharmaceutical Microbiology VII edition. Blackwell Scientific Publication, Oxford, Netherland.
3. Franklin, DJ. and Snow, GA. (2013). Biochemistry of antimicrobial action. Chapman & Hall, London.
4. Kuntal Das (2019). Pharmaceutical Microbiology, second edition, Nirali Prakashan, Pune.
5. Priyatama Powar, Shital Nimbargi, Vaijayanti Sapre (2020). Pharmaceutical Microbiology, I edition, Technical publications, Pune.
6. Chand Pasha Kedernath. (2021). Text book of Pharmaceutical Microbiology. Ramnath Publisher, Kolkata.
7. Hugo WB and Russell AD. (2024). Pharmaceutical Microbiology VII edition. Blackwell Scientific Publication, Oxford, Netherland.
8. Franklin, DJ. and Snow, GA. (2013). Biochemistry of antimicrobial action. Chapman & Hall.
9. Kuntal Das (2019). Pharmaceutical Microbiology, second edition, Nirali Prakashan, Pune.
10. Priyatama Powar, Shital Nimbargi, Vaijayanti Sapre (2021). Pharmaceutical Microbiology, I edition, Technical publications, Pune.

REFERENCE BOOK(S)

1. Handa, S.S. and Kapoor, V.K. (2022). Pharmacognosy. 4th Edition. Vallabh Prakashan Publishers, New Delhi.
2. Kokate, C.K., Durohit, A.P. and Gokhale, S.R., (2002). Pharmacognosy. 12th edition Nirali Prakashan Publishers, Pune.
3. S. P. Vyas & V. K. Dixit. (2003). Pharmaceutical Biotechnology. CBS Publishers & Distributors, New Delhi.
4. Wallis, T.E. (2005). Text book of Pharmacognosy. 5th edition. CBS publishers and distributors, New Delhi.
5. Garrod, L.P., Lambert, HP. And C'Grady, F. (1973). Antibiotics and Chemotherapy. (eds). Churchill Livingstone, London.

E-RESOURCES

1. <https://www.pharmapproach.com/introduction-to-pharmaceutical-microbiology/>
2. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP303T_PMB_UNIT_I.pdf
3. <https://www.pharmanotes.org/2021/11/pharmaceutical-microbiology-b-pharma.html>
4. https://snsourseware.org/snscphs/notes.php?cw=CW_604b15c6313c5
5. <https://www.thermofisher.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
C01	1		2	3				2	2			3	3	3
C02		2	2	3			2	2	2	3			3	3
C03		2	2	3				2	2	3		3	3	3
C04	1	2	2	3					2	3		3	3	3
C05		2	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 2024-2025)

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- EC—III Bioinoculants (Choice 2)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE63B

UNIT- I

(12 Hours)

General account of the microbes used as biofertilizers for crop plants and their advantages. Symbiotic N₂ fixers- Rhizobium Isolation characterization, identification, Classification, inoculum production and field application.

UNIT-II:

(12 Hours)

Non-Symbiotic N₂ fixers -*Azospirillum*-Free living-*Azotobacter*-free isolation, characterization, mass inoculum production and field application

UNIT-III:

(12 Hours)

Symbiotic N₂ fixers-Cyanobacteria, Azolla-isolation, characterization mass multiplication-Role in rice cultivation-Crop response-field application-immobilization

UNIT-IV:

(12 Hours)

Phosphate solubilizers - Phosphate solubilizing microbes-Isolation, characterization mass inoculum production, field application-Phosphate solubilization mechanism

UNIT-V:

(12 Hours)

Mycorrhizal bioinoculants classification-importance of mycorrhizae, Ectomycorrhizae - Endomycorrhizae-Ectendo mycorrhizae. Isolation of VA mycorrhizae and Mass inoculum production of VAM-field applications.

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Understand the concept, types, and significance of bioinoculants in sustainable agriculture.
2. Demonstrate knowledge about the isolation, identification, and mass production of microbial inoculants.
3. Evaluate the mechanisms of plant growth promotion by microbial inoculants.
4. Assess the role of bioinoculants in enhancing soil fertility and plant health.

5. Analyze the regulatory guidelines, formulation methods, and quality control aspects of bioinoculants.
6. Apply knowledge of bioinoculants in field-level application and integrated nutrient management systems.

TEXT BOOKS

1. Subba Rao, N.S. (2001). Soil Microorganisms and Plant Growth. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Dubey, R.C. and Maheshwari, D.K. (2014). A Textbook of Microbiology. S. Chand & Company Ltd., New Delhi.
3. Kannaiyan, S. (2002). Biofertilizers for Sustainable Agriculture. Scientific Publishers, Jodhpur.
4. Vyas, S.C. and Vyas, S. (1995). Biofertilizers and Organic Farming. Akta Prakashan, Nainital.
5. Gaur, A.C. (2006). Biofertilizers in Sustainable Agriculture. ICAR, New Delhi.

REFERENCE BOOK(S)

1. Smith, S.E. and Read, D.J. (2008). Mycorrhizal Symbiosis. Academic Press, London.
2. Sylvia, D.M., Fuhrmann, J.J., Hartel, P.G., and Zuberer, D.A. (2005). Principles and Applications of Soil Microbiology. Pearson Prentice Hall, New Jersey.
3. Bashan, Y. and de-Bashan, L.E. (2010). How the Plant Growth-Promoting Bacterium Azospirillum Promotes Plant Growth — A Review. Springer, Berlin.
4. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology: Fundamentals and Applications. Benjamin Cummings, San Francisco.
5. Timmusk, S. and Behers, L. (2009). Plant-Associated Bacteria. Springer Science & Business Media, Dordrecht.

E-RESOURCES

1. <https://www.slideshare.net/slideshow/bioinoculants-ss/151045590>
2. <https://justagriculture.in/files/newsletter/2021/feb/024.%20Biofertilizers%20%28Microbia%20Inoculants%29.pdf>
3. <https://www.frontiersin.org/articles/10.3389/fsufs.2022.1002797/full>
4. <https://www.sciencedirect.com/science/article/abs/pii/B9780323953320000077>
5. [https://www.uou.ac.in/sites/default/files/slm/BOT\(N\)-121.pdf](https://www.uou.ac.in/sites/default/files/slm/BOT(N)-121.pdf)

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
C01			2	3	2	2				3			3	3
C02	1	2	2	3		2				3	2		3	3
C03	1	2	2	3		2				3	2		3	3
C04	1			3						3			3	3
C05	1	2	2	3				2			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 2024-2025)

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

Semester: VI- EC—III Cell Biology (Choice 3)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE63C

Unit – I

(12 Hours)

Cells, Prokaryotic and Eukaryotic cells, Plant and animal cells, Chemical components of biological membranes. Organization and Fluid Mosaic Model, Extracellular Structures, Cytosol, Enzymes.

Unit – II

(12 Hours)

Cytoskeletons and Cell Membrane, Membrane Transport, Protein Trafficking, Eukaryotic Cell organelles, Mitochondria, Chloroplast, ribosomes and nucleus, Endoplasmic Reticulum, Golgi apparatus, Lysosomes and Peroxisomes, Membrane Vacuolar system. Cytoskeletons and Cell Membrane, Membrane Transport, Protein Trafficking.

Unit – III

(12 Hours)

Nucleus: Structure and Function, Chromosomes and their structure Cell division: Comparison between Mitosis and Meiosis and crossing over, Symmetric and asymmetric cell divisions.

Unit – IV

(12 Hours)

Cell Cycle and its regulation, Regulation of DNA replication, Cell differentiation and stem cells, Tumor Suppressor Genes and Oncogenes.

Unit – V

(12 Hours)

Brief outline of Cancer Biochemistry and Cancer Phase of Cell Cycle, Cell Migration and Cancer Metastasis, Brief Treatment on cell culturing: Apoptosis and ageing, Agents promoting carcinogenesis.

Total Lecture Hours – 60

TEXTBOOKS

1. Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2022). *Molecular biology of the cell* (7th ed.). [Garland Science](#)
2. De Robertis, E. D. P., & De Robertis, E. M. F. (2021). *Cell and molecular biology* (9th ed.). [Lippincott Williams & Wilkins](#)
3. Karp, G. (2023). *Karp's cell and molecular biology: Concepts and experiments* (9th ed.). [Wiley](#)
4. Alberts, B., Hopkin, K., Johnson, A., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2024). *Essential cell biology* (6th ed.). [Garland Science](#)
5. Cassimeris, L., Lingappa, V. R., & Plopper, G. (2022). *Lewin's cells* (4th ed.). [Jones & Bartlett Learning](#)

REFERENCE BOOKS

1. Cooper, G. M., & Hausman, R. E. (2023). *The cell: A molecular approach* (9th ed.). [Oxford University Press](#)
2. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., & Scott, M. P. (2021). *Molecular cell biology* (9th ed.). [W.H. Freeman](#)
3. Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J., & Johnson, G. (2022). *Cell biology* (4th ed.). [Elsevier](#)
4. Weinberg, R. A. (2024). *The biology of cancer* (3rd ed.). [Garland Science](#)
5. Freshney, R. I. (2021). *Culture of animal cells: A manual of basic technique and specialized applications* (8th ed.). [Wiley](#)

E -RESOURCES

- [NCBI Bookshelf – Molecular Biology of the Cell](#)
- [Khan Academy – Cell Structure and Function](#)
- [HHMI BioInteractive](#)
- [Nature Education – Scitable Cell Biology](#)
- [BioChemWeb – Cell Biology Resources](#)

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 2024-2025)

DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- EC—IV Entrepreneurship and Bio-Business (Choice -1)

Ins. Hours / Week: 4

Course Credit: 3

Course Code:U24MBE64A

UNIT- I

(12 Hours)

Bio Entrepreneurship: Introduction to bio-business, SWOT analysis of bio-business. Ownership, Development of Entrepreneurship; Stages in entrepreneurial process; Government schemes and funding. Small scale industries: Definition; Characteristics; Need and rationale.

UNIT-II:

(12 Hours)

Entrepreneurship Opportunity in Agricultural Biotechnology: Business opportunity, Essential requirement, marketing, strategies, schemes, challenges and scope-with case study on Plant cell and tissue culture technique, polyhouse culture. Herbal bulk drug production, Nutraceuticals, value added herbal products. Bioethanol production using Agricultural waste, Algal source. Integration of system biology for agricultural applications. Biosensor development in Agriculture management.

UNIT-III:

(12 Hours)

Entrepreneurship Opportunity in Industrial Biotechnology: Business opportunity, Essential requirement, marketing strategies, schemes, challenges, and scope- Pollution monitoring and Bioremediation for Industrial pollutants. Integrated compost production- microbe enriched compost. Bio pesticide/ insecticide production. Biofertilizer. Single cell protein.

.UNIT-IV:

(12 Hours)

Therapeutic and Fermented products: Stem cell production, stem cell bank, production of monoclonal/polyclonal antibodies, secondary metabolite production – antibiotics, probiotic and prebiotics.

UNIT-V:

(12 Hours)

Project Management, Technology Management and Startup Schemes: Building Biotech business challenges in Indian context-biotech partners (BIRAC, DBT, Incubation centers. etc.), operational biotech parks in India. Indian Company act for Bio business-schemes and subsidies.

Project proposal preparation, Successful start-ups-case study.

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Describe and apply several entrepreneurial ideas and business theories in practical framework.
2. Analyse the business environment in order to identify business opportunities.
3. Express the mass production of microbial inoculants used as Biofertilizers and Bioinsecticides.
4. Analyze the application and commercial production of Monoclonal antibodies, Cytokines. TPH and teaching kits.
5. Integrate and apply knowledge of the regulation of biotechnology industries, utilize effective team work skills

TEXT BOOKS

1. Craig Shimasaki. (2014). Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies. Academic Press.
2. Ashton Acton, O. (2012). Biological Pigments– Advances in Research and Application Scholarly Editions: Atlanta, Georgia.
3. Jennifer Merritt, Jason Feifer (2018). Start Your Own Business, 7th edition, Entrepreneur Press publisher.
4. Peter F. Drucker (2006). Innovation and Entrepreneurship. Harper Business publisher.
5. Leah Cannon (2017). How to Start a Life Science Company: A Comprehensive Guide for First-Time Entrepreneurs. International Kindle paperwhite.

REFERENCE BOOK(S)

1. rueger, W, and Crueger. A.(2000). Biotechnology: A Text Book of Industrialmicrobiology, 2nd Edition, Sinauer Associates: Sunderland.Mass.
2. aul S Teng. (2008). Bioscience Entrepreneurship in AsiaWorld Scientific Publishing Company.
3. harles E. Bamford, Garry D. Bruton (2015). ENTREPRENEURSHIP: The Art, Science, and Process for Success, 2nd Edition, McGraw Hill publisher.
4. ali Friedman (2014). Building Biotechnology: Biotechnology Business, Regulations, Patents, Law, Policy and Science 4th Edition, Logos press publication.
5. tephanie A. Wisner (2022). Building Backwards to Biotech: The Power of Entrepreneurship to Drive Cutting-Edge Science to Market, International Kindle paperwhite.

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1. <https://www.bio-rad.com/webroot/web/pdf/lse/literature/Biobusiness.pdf>

2. <https://www.crg.eu/biobusiness-entrepreneurship>
3. <https://www.entrepreneur.com>
4. <https://www.birac.nic.in>

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



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024-2025)

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

Semester: VI- EC—IV Antimicrobial Agents (Choice -2)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE64B

UNIT- I

(12 Hours)

Antimicrobial Agents- Definition – disinfection – antiseptics – antibiotics – chemical agents (antibacterial, antifungal, antiviral and antiparasitic) – non pharmaceutical agents (essential oils) – physical agent (Ozone, heat, radiation).

UNIT-II:

(12 Hours)

Antibacterial agent - mechanism of action- cell wall synthesis inhibitor (penicillin, arabinoglycan), protein synthesis inhibitor (Tetracycline, Chloramphenicol), nucleic acid synthesis inhibitor (metronidazole, rifampin), alteration of cell membranes (gramicidin, polymyxin, antimetabolite (sulfanilamide).

UNIT-III:

(12 Hours)

Antiviral agents - interferon – types- mechanism of action - amantadine, rimantadine, zanamivir, and oseltamivir - viral vaccines.

UNIT-IV:

(12 Hours)

t-mode of action- amphotericin, nystatin and fluorocytosine. Antiprotozoal agents – mechanism of action – (Metronidazole – chloroquine, Paromomycin sulfate,– quinolines).

UNIT-V:

(12 Hours)

Emergence of drug resistance – bacteria, fungi and viruses. Alternative drugsantimicrobial peptides. Novel Antimicrobial Agents: Discovery, Design and New Therapeutic Strategies

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Explain the mechanism of action of antimicrobial agents.
2. Understand the production of antimicrobial drug from various sources.
3. Investigate interesting biological problems.
4. Have an insight of current topics in microbial genetics and related fields.

5. Relate pharmaceutical microbiology to biotechnology.

TEXT BOOKS

1. Alan R Hauser. Antibiotics basics for clinicians: choosing the right antibacterial agent. Wolter Kluwer / Lipponcott Williams and Wilkins Publisher, New York. 2018, 3rd edition.
2. Anthony J Trevor, Bertram G Katzung, Susan B Masters. Katzung and Trevor's. Pharmacology: examination and board review. McGraw-Hill Professional, New York. 2021, 13th edition.
3. Erika J Ernst. Antifungal agent (methods in molecular medicine). Humana Press, New York. 2015, 2005th edition.
4. Hellen Geiband, Molly Miller, Petrie, Suraj Pant, Sumanth Gandra, Jordan lewinson, Devra Barter, Andrea White and Ramanan Laxminarayanan. The state of the Worlds antibiotic. CDDEP publisher, Washington, DC. 2021.

REFERENCE BOOK(S)

1. Sanford, J. P., and Gilbert, D. N. (2024).The Sanford Guide to Antimicrobial Therapy (54th ed.). Antimicrobial Therapy, Inc. USA.
2. Nelson, W. E., and Behrman, R. E. (Eds.). (2024). Nelson's Pediatric Antimicrobial Therapy. (30th ed.) American Academy of Pediatrics, Itasca.
3. Wolfson, J.S. and Hooper, D.C. (1993), Quinolone Antimicrobial Agents. 2nd edition. American Society for Microbiology, Washington.
4. Jeffries, D.J. and De Clercq, E. (1995). Antiviral Chemotherapy. John Wiley and Sons, Ltd., Chichester, Sussex, England.
5. Kucers, A. and Bennett, N. 1985. The Use of Antibiotics. 4th edition. JB Lippincott, Philadelphia, Williams and Wilkins, New York.

E-RESOURCES

1. [https://www.mdpi.com/topics/anti_agent_12.](https://www.mdpi.com/topics/anti_agent_12)
2. <https://www.frontiersin.org/articles/10.3389/fmicb.2020.01669/full>
3. <https://microbiologynotes.org/overview-of-an-antimicrobial-agents/>
4. https://ksumsc.com/download_center/Archive/1st/441/1.Foundation%20Block/Female/Microbiology/3-%20ANTIBIOTICS.pdf
5. <https://www.slideshare.net/RESHMASOMAN3/mechanism-of-action-of-antimicrobial-agents>

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
C01	1		2	3				2	2			3	3	3
C02		2	2	3			2	2	2	3			3	3
C03		2	2	3				2	2	3		3	3	3
C04	1	2	2	3					2	3		3	3	3
C05		2	2	3				2	2	3	2	3	3	

Strong -3; Medium -2; Low - 1



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DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- EC—IV Fermentation Technology (Choice -3)

Ins. Hours / Week: 4

Course Credit: 3

Course Code: U24MBE64C

UNIT- I

(12 Hours)

Fermentation, principle of fermentation, Fermentation –Types, batch ,fed batch , continuous fermentation. Factors that influences fermentation process, advantage and disadvantage of fermentation.

UNIT-II:

(12 Hours)

Definition of fermentor or bioreactors – Design and construction of fermentor , sterilization of fermentor, Types of fermentors- Air lift fermentor, Continuous stirred tank fermentors, Packed bed fermentors, Bubble column fermentors and Fluidized bed fermenters

UNIT-III:

(12 Hours)

Microorganisms used in fermentation technology , medium used in fermentation technology, Medium formulation,(carbon sources ,energy sources, nitrogen sources, PH, buffers, minerals, water, oxygen requirements, antifoams).

UNIT-IV:

(12 Hours)

Definition of food fermentation – microbes used in food fermentation – fermented food products – bread , vinegar, wine , fermented milk products and fermented meat products.

UNIT-V:

(12 Hours)

Uses and Application of fermentation technology, Current development of fermentation technology, Fermentation economics.

Total Lecture Hours – 60

COURSE OUTCOME

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

1. Analyse the Fermentation process and principles.
2. Infer the design and construction of fermentor.
3. Determine the various parameter require for fermentation process..
4. Classify the different fermented food products..
5. Develop the knowledge in Fermentation economics.

TEXT BOOKS

1. Dubey, R. C. A. Text Book of Biotechnology.2007. (4 th Edition) S. Chand &Company Limited, New Delhi.
2. Gupta, P.K.2003. Elements of Biotechnology. Rastogi Publications, Meerut.
3. Jogdand, S. N. 2000. Gene Biotechnology; (5 th Edition) Himalaya Publishing House, Nagpur.
4. Reed. G. 1982. Prescott and Dunn. Industrial Microbiology. Macmillian Publication, London.
5. Li, Y., & Srivastava, A. (2020). *Bioprocessing technology for production of biopharmaceuticals and bioproducts*. Hoboken, NJ: John Wiley & Sons.

REFERENCE BOOK(S)

1. Hugo W. B and Russell A.D. P1998. pharmaceutical Microbiology. Sixth Edition, The Black well Science Ltd., UK.
2. Stanbury., P.F.A. 2002. Whitaker and Hall. Principles of Fermentation Technology, The Black well Science Ltd., UK.
3. Patel, A. K., Singhanian, R. R., & Pandey, A. (2021). *Advances in fermentation technology: Volume 1*. Singapore: Springer Nature.
4. Patel, A. K., Singhanian, R. R., & Pandey, A. (2021). *Advances in fermentation technology: Volume 2*. Singapore: Springer Nature.
5. Pandey, A., Negi, S., & Soccol, C. R. (Eds.). (2021). *Biorefineries: Integrated biochemical processes for biomass conversion to chemicals, fuels, and materials* (2nd ed.). Amsterdam, Netherlands: Elsevier.

E-RESOURCES

1. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000014ER/P000284/M025601/ET/1513594624Paper15EMB_Module21__etext.pdf
2. <https://www.biologydiscussion.com/fermentation/fermentation-technology-meaning-methodology-types-and-procedure/17492>
3. <https://ebooks.inflibnet.ac.in/esp15/chapter/fermentation-technology/>
4. <https://egyankosh.ac.in/bitstream/123456789/99621/1/Unit-3.pdf>
5. <https://microbenotes.com/fermentation/>

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
C01	1		2	3				2	2			3	3	3
C02		2	2	3			2	2	2	3			3	3
C03		2	2	3				2	2	3		3	3	3
C04	1	2	2	3					2	3		3	3	3
C05		2	2	3				2	2	3	2	3	3	

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

Semester: VI- Value Education

Ins. Hours / Week: 2

Course Credit: 2

Course Code: 24UGVED

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



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DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- PCC- Microbial Quality Control and Testing

Ins. Hours / Week: 2

Course Credit: 2

Course Code: U24PCMB61

UNIT- I

(6 Hours)

Microbial quality control: definition, history and introduction. Standard Methods involved in assessment of microbial quality control. Q.A and Q.C definitions and importance. Traditional Microbiological Quality Controlling methods: Sampling methods, TVC, APC and serial dilution techniques. Good laboratory practices, Good microbiological practices.

UNIT-II:

(6 Hours)

Instruments associated in QC & QA: Principle involved, working conditions, uses and precautions of Laminar Air Flow (LAF), Autoclave, Incubator, pH meter, Colony counter, Hot air oven, Centrifuges, colorimeter/ spectrophotometer, ELISA and storage devices. Methodology of Disinfection, Autoclaving & Incineration.

UNIT-III:

(6 Hours)

Culture media used in QC and QA: Design of specialized media for identification of pathogens. Good laboratory practices in culture media preparation: raw material, water, pH. Uses of media. Enrichment culture technique, Detection of specific microorganisms - on XLD agar, Salmonella Shigella Agar, Mannitol salt agar, EMB agar, McConkey Agar, Saboraud Agar.

UNIT-IV:

(6 Hours)

Determining Microbes in Pharmaceutical Samples: Sterility testing for pharmaceutical products, Bioburden, pyrogen test, in process and final process control, safety and sterility test.

UNIT-V:

(6 Hours)

HACCP for Food Safety and Microbial Standards: Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations. Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water. Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centers.

Total Lecture Hours – 30

COURSE OUTCOME

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

1. Understand the theoretical assessment of microbial quality methods and its good laboratory practices.

2. Describe the microbiological aspects of quality control of food and pharmaceutical products.
3. Explain the identification of pathogenic microorganisms and good laboratory practices.
4. Acquire the knowledge of different sterility test for the pharmaceutical products.
5. Illustrate the safety concern management and regulations of food and pharmaceutical industry and learn the basic standard methods and procedures for the microbiological analysis of food.

TEXT BOOKS

1. W.B.Hugo&A.D.Russell. (1998). Pharmaceutical Microbiology.6thEdition. Blackwell scientific Publications.
2. Kulkarni A. K. Bewoor V. A. ()Quality Control,Wiley India Pvt. Ltd,
3. Chandrakant Kokare (2016). Pharmaceutical Microbiology, 1st Edition, Nirali Publication.
4. Brown.M.R.W. (2017). Microbiological Quality Assurance A Guide Towards Relevance and Reproducibility of Inocula,1st Edition. CRC press.
5. Dev Raj Rakesh Sharma And V K Joshi (2011).Quality Control For Value Addition In Food Processing, New India Publishing Agency.

REFERENCE BOOK(S)

1. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyer. (2000). Handbook of Microbiological Quality Control in Pharmaceuticals and Medical Devices. 1st Edition, CRC Press.
2. Konieczka, (2012). Quality Assurance and Quality Control in the Analytical Chemical Laboratory A Practical Approach (Hb), Routledge, Taylor and Francis group.
3. Singh Gajjar, Budhrani, Usman. (2021). Quality Control And Quality Assurance (M.Pharm)SVikas And Company.
4. David Roesti, Marcel Goverde (2019). Pharmaceutical Microbiological Quality Assurance and Control: Practical Guide for Non-Sterile Manufacturing, Wiley publication.
5. Amihud Kramer Bernard A. Twigg (2017). Quality Control For The Food Industry Fundamentals & Applications (Vol.1) 3rd Edition, MEDTEC publication.

E-RESOURCES

1. <https://www.study.com/microbiology-quality-control-testing-definition-procedures>.
2. <https://www.sigmaaldrich.com>
3. <https://www.coursera.org>
4. <https://www.atcc.org>
5. <https://www.fao.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
C01	1		2	3		2		2	2	3	2	3	3	3
C02	1		2	3		2		2	2	3	2	3	3	3
C03	1		2	3		2		2	2	3	2	3	3	3
C04	1		2	3		2		2	2	3	2	3	3	3
C05	1		2	3		2		2	2	3	2	3	3	3

Strong -3; Medium -2; Low - 1



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DEPARTMENT OF MICROBIOLOGY
B.Sc., MICROBIOLOGY

Semester: VI- Gender Studies

Ins. Hours / Week: 2

Course Credit: 2 Course Code: 24UGGS

COURSE OBJECTIVES:

- To make students to aware of Gender constructions and gendering Process.
- To explore existing gender biases in the society and to understand the need to work towards the inclusive society.
- To inculcate sensitivity and build gender perspectives.
- To use the course to bring attitudinal cum behavioral changes towards gender neutral ambience and promote the humanistic values

UNIT – I: INTRODUCTION TO GENDER STUDIES CONCEPTS

Gender Spectrum.-Sex – Gender distinction – Biological Determinism – Patriarchy – Feminism –Gender Socialization and Stereotyping-Gender Discrimination – Gender Division of labour and roles– Gender Sensitivity and awareness – Gender Equity – Equality – Gender Main streaming and Gender Analysis.

UNIT-II UGC INITIATIVES ON WOMEN'S STUDIES

Definition of Women's Studies –Gender Studies –UGC Initiatives and guidelines on Women's Studies - Beijing Conference, UN Initiatives – Convention on Elimination of All forms of Discrimination Against Women (CEDAW)- Sustainable Development Goals on Gender Equality (SDG 5) and targets

UNIT -III AREAS OF GENDER DISCRIMINATION

Gender Socialization- Sex Ratio– Health and Nutrition– – Literacy and Education Employment- Governance – participation in decision making- politics- property rights and access to credit- gender based violence- Social institutions –Family, Caste, Class, religion, gender, State. Market – Media – Politics – Judiciary.

UNIT -IV WOMEN DEVELOPMENT AND GENDER EMPOWERMENT

Towards Equality Report of Status of Women in India 1974 – International Women's Decade – International Women's Year – National Policy for Empowerment of Women 2001

UNIT -V WOMEN'S MOVEMENTS AND SAFEGUARDING MECHANISM :

In India National /State Commission for Women(NCW) – All Women Police Station – Family Court Legislations safeguarding women –Transgender Policy—Constitutional amendments for women’s political participation.

UNIT-VI CURRENT CONTOURS: (for continuous internal assessment only):

Tamil Nadu State Policy for Women 2021- National Policy for Women 2015 – Prevention of Sexual Harassment at Work places Act 2013- Protection of Children from Sexual Offences Act, 2012 - Analysis of regressive and progressive High court and supreme court judgments- women proactive policies, programmes, interventions.

REFERENCES

1. Bhasin Kamala, Understanding Gender : Gender Basics , New Delhi : Women Unlimited , 2004
2. Bhasin Kamala, Exploring Masculinity: Gender Basics , New Delhi: Women Unlimited ,2004
3. Bhasin Kamala , What is Patriarchy? : Gender Basics, New Delhi :Women Unlimited ,1993
4. Arya Sadhna Women ,Gender Equality and the State ,New Delhi :Deep &Deep Publication ,2000
5. Mishra .O.P, Law Relating to Women &Child ,Allahabad :Central Law Agency ,2001
6. Uma Chakravarti, Gendering Caste Through a Feminist Lens, Sage Publication 2003.
7. Bhattacharya Malini , Sexual Violence and Law ,Kolkata; West Bengala Commission for Women ,2002.
8. Sexual Harassment at the Workplace – A Guide , New Delhi ;Sakshi,1999.
9. <https://www.schooloflegaleducation.com/women-and-law-in-india-e-book/>

COURSE OUTCOMES:

- Students would have gained a perspective and understood the social reality of gender society understood the differences of gender and sex and may resort to building alternative perspectives and critical thinking.
- Gained knowledge on the various social institutions governing gender and the intersectionality.
- Exposed to the kind of initiatives of the State towards gender equality