



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. MICROBIOLOGY – SYLLABUS**

**(Under CBCS based on OBE) (with effect from 2021 – 2022)**

435

### **GRADUATE ATTRIBUTES**

1. **(KB) A knowledge base for Microbiology:** Demonstrated competence in university level chemistry, chemical sciences, microbiology fundamentals, and specialized technical knowledge appropriate to the program.
2. **(Team) Individual and teamwork:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
3. **(Comm.) Communication skills:** An ability to communicate complex scientific concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
4. **(Prof.) Professionalism:** An understanding of the roles and responsibilities of the professional microbiologist in society, especially the primary role of protection of the public and the public interest.
5. **(Impacts) Impact of microbiology on society and the environment:** An ability to analyze social and environmental aspects of microbiology. Such ability includes an understanding of the interactions that microbiology has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
6. **(LL) Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

436

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives of the **B.Sc. in Microbiology Programme** at Sourashtra college, Madurai are given below and are numbered from PEO1 to PEO5.

<b>PEO1</b>	To endow with the graduates the knowledge in microbiology and an outline of the processes that deal with microbes that facilitate them to handle the secure and capable use of microbiological applications with progress of aptitude on par with global standards.
<b>PEO2</b>	To train the graduates by teaching the skills to use technical developments related to current areas involving molecular biology, immuno technology, microbiology, molecular genetics and genetic engineering with the scope of versatility in all potential future technologies.
<b>PEO3</b>	To guide the graduates to prefer a decent career option either as Entrepreneur or with a high degree of employability; or pursue higher education – by empowering them with technical and basic soft skills.
<b>PEO4</b>	To impart a robust sense of communal accountability among the graduates with awareness of professional and societal ethical values with leadership capabilities.
<b>PEO5</b>	To ascertain a milieu amidst the graduates that emphasizes the necessity to accomplish life-long learning for the general progress of self and society.

### UNDERGRADUATE (UG) PROGRAMME OUTCOMES (POs)

Undergraduate (B.A., **B.Sc.**, B.Com., B.C.A., B.B.A., etc.) is a 3-year degree Programme with 6 semesters consisting the following Programme Outcomes (POs) under various criteria including critical thinking, problem solving, effective communication, societal/ citizenship/ ethical credibility, sustainable growth and employable abilities.

<b>PO 1</b>	<b>Critical Thinking:</b> Intellectual exploration of knowledge towards actions in clear and rational manner by understanding the logical connections between ideas and decisions.
<b>PO 2</b>	<b>Problem Solving:</b> Understanding the task/ problem followed by planning and narrow execution strategy that effectively provides the solution.
<b>PO 3</b>	<b>Effective Communication:</b> Knowledge dissemination by oral and verbal mechanisms to the various components of our society.
<b>PO 4</b>	<b>Societal/ Citizenship/ Ethical Credibility:</b> Realization of various value systems/ moral dimensions and demonstrate the empathetic social concern as well as equity in all the decisions, executions and actions.
<b>PO 5</b>	<b>Environmental Concern and Sustainable Growth:</b> Understanding the emerging environmental challenges and provide the possible contribution in sustainable development that integrates environment, economy and employment.
<b>PO 6</b>	<b>Skill Development and Employable Abilities:</b> Adequate training in relevant skill sector and creating employable abilities among the under graduates.



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. MICROBIOLOGY – SYLLABUS**

**(Under CBCS based on OBE) (with effect from 2021 – 2022)**

437

### **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

On completion of **B.Sc. Microbiology Programme**, the students are expected to

<b>PSO 1</b>	explore the biological diversity of microbial forms and various aspects of basic microbiology and able to address broad range of fields such as microbial taxonomy, microbial genetics, molecular biology, biocontrol, biochemistry, food and industrial microbiology and systems biology.
<b>PSO 2</b>	understand the microbial metabolism, concepts of molecular biology, microbial pathogenicity, the role of microorganisms in the human welfare and helps to address the specific solutions for the problems associated with human society.
<b>PSO 3</b>	develop high proficiency in good laboratory practices in microbiological laboratory and able to explain the theoretical basis and practical skills of the tools and techniques common to microbiology.
<b>PSO 4</b>	able to innovate and develop the skills necessary for effective communication of experimental results and scientific principles with the community related to microbiology field and non-microbiology fields.
<b>PSO 5</b>	acquire skills, assess and approach with ethical principles in the current social health issues and the ability to participate in a team.
<b>PSO 6</b>	able to develop employability skills in the various fields of microbiology and ability to engage in life-long learning on life skills.



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

438

### B.Sc. MICROBIOLOGY-II YEAR COURSE STRUCTURE –III SEMESTER

S. No.	Subject Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT31	<b>Part – I: Tamil</b> – காப்பியமும் நாடகமும்	6	3	25	75	100	3
	21UACH31	<b>Hindi</b> – Hindi – III						
	21UACS31	<b>Sanskrit</b> – Sanskrit – III						
2.	21UACE31	<b>Part – II: English</b> – English For Enrichment – III	6	3	25	75	100	3
3.	21UMBC31	<b>Part – III: Core – 3:</b> Molecular Microbiology	5	3	25	75	100	5
4.	21UMBCP2	<b>Part – III: Core – 4:</b> Practical – II: Core Practical – II*	3	–	–	–	–	–
5.	21UMBA31	<b>Part – III: Allied – 3 T:</b> Cell Biology	4	3	25	75	100	4
6.	21UMBAP2	<b>Part – III: Allied – 3 Practical:</b> Allied Biology Practical *	2	–	–	–	–	–
7.	21UMBS31	<b>Part – III: SBS–3:</b> Mushroom Technology	2	3	25	75	100	2
8.	21UMBN31	<b>Part – IV: NME–1:</b> Food and Dairy Technology	2	3	25	75	100	2
<b>TOTAL</b>			<b>30</b>				<b>600</b>	<b>19</b>

\*Practical examinations at the end of the IV semester

### COURSE STRUCTURE –IV SEMESTER

S. No.	Subject Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT41	<b>Part – I: Tamil</b> – சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
	21UACH41	<b>Hindi</b> – Hindi – IV						
	21UACS41	<b>Sanskrit</b> – Sanskrit – IV						
2.	21UACE41	<b>Part – II: English</b> – English For Enrichment – IV	6	3	25	75	100	3
3.	21UMBC41	<b>Part – III: Core – 5 :</b> Microbial Genetics	5	3	25	75	100	5
4.	21UMBCP2	<b>Part – III: Core – 4:</b> Practical – II: Core Practical – II	3	3	40	60	100	2
5.	21UMBA41	<b>Part – III: Allied – 4 T :</b> Biodiversity and Biostatistics	4	3	25	75	100	4
6.	21UMBAP2	<b>Part – III: Allied – 4 Practical:</b> Allied Biology Practical	2	3	40	60	100	2
7.	21UMBS41	<b>Part – IV: SBS – 4 :</b> Cosmetic Microbiology	2	3	25	75	100	2
8.	21UMBN41	<b>Part – IV: NME – 2:</b> Microbes in Human Health	2	3	25	75	100	2
9.		<b>Part – V: Extension Activities</b>	–	–	–	–	100	1
<b>TOTAL</b>			<b>30</b>				<b>900</b>	<b>24</b>



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

439

### COURSE STRUCTURE – III SEMESTER

S. No.	Subject Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT31	<b>Part – I:</b> <b>Tamil</b> – காப்பியமும் நாடகமும்	6	3	25	75	100	3
	21UACH31	<b>Hindi</b> – Hindi – III						
	21UACS31	<b>Sanskrit</b> – Sanskrit – III						
2.	21UACE31	<b>Part – II:</b> <b>English</b> – English For Enrichment – III	6	3	25	75	100	3
3.	21UMBC31	<b>Part – III: Core – 3:</b> Molecular Microbiology	5	3	25	75	100	5
4.	21UMBCP2	<b>Part – III: Core – 4:</b> <b>Practical – II:</b> Core Practical – II*	3	–	–	–	–	–
5.	21UMBA31	<b>Part – III: Allied – 3 T:</b> Cell Biology	4	3	25	75	100	4
6.	21UMBAP2	<b>Part – III: Allied – 3</b> <b>Practical:</b> Allied Biology Practical *	2	–	–	–	–	–
7.	21UMBS31	<b>Part – III: SBS–3:</b> Mushroom Technology	2	3	25	75	100	2
8.	21UMBN31	<b>Part – IV: NME–1:</b> Food and Dairy Technology	2	3	25	75	100	2
		<b>TOTAL</b>	<b>30</b>				<b>600</b>	<b>19</b>

\*Practical examinations at the end of the IV semester

**CA** – Class Assessment (Internal)

**SE** – Summative Examination

**SBS** – Skill Based Subject

**NME** – Non –Major Elective

**T** – Theory

**P** – Practical



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

440

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBC31	MOLECULAR MICROBIOLOGY	CORE – 3	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course covers a detailed analysis of the biochemical mechanisms that control the maintenance, expression, and evolution of prokaryotic and eukaryotic genomes.

### COURSE OBJECTIVES:

- To provide ample background of salient features of nucleic acids and DNA models.
- To impart detailed understanding of key events of molecular biology comprising of mechanism of DNA replication, transcription and translation in prokaryotes and eukaryotes.
- To give comprehensive description of transcriptional regulation with the illustration of operon models.
- To develop inclusive perception regarding DNA repair mechanisms.
- To provide glimpse of types of transposable genetic elements

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	obtain the knowledge on biological features of nucleic acids and their different forms.	Upto K3
CO 2	recognise the mechanism of DNA replication and associated enzymes.	Upto K3
CO 3	acquire a comprehensive outlook on the process of transcription.	Upto K3
CO 4	recognize the significance of genetic code in protein synthesis.	Upto K3
CO 5	accomplish familiarity on the concepts of operon and transposable genetic elements.	Upto K3

UPTO K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

441

### MOLECULAR MICROBIOLOGY

#### UNIT – I:

Importance of molecular biology– Central dogma of molecular biology – Biological aspect of nucleic acids – Genetic material – Different forms of DNA – A, B, & Z – melting curve analysis –Types of RNA – mRNA, tRNA, rRNA and their Functions.

#### UNIT – II:

DNA Replication – Features of Replication – Types of Replication – Roles of enzymes – Prokaryotes and Eukaryotes. Mechanisms of bidirectional method.

#### UNIT – III:

Transcription – RNA polymerases in prokaryotes and eukaryotes – their functions – process of transcription in prokaryotes: initiation, elongation and termination – Roles of RNA polymerase – SIGMA and other factors involved in transcription.

#### UNIT – IV:

Properties of genetic code – Wobble hypothesis – Translation – process of translation in prokaryotes and eukaryotes – initiation, elongation and termination post transactional modifications.

#### UNIT – V:

Transposable genetic elements – IS elements – transposons – Tn10, Tn5, Tn3 Operon concepts – lac & trp. –DNA damage – Photo deactivation, Deamination, Depurination – DNA Repair Mechanisms – Photo reactivation, base excision repair, SOS .

#### TEXT BOOKS:

1. Turner, P. C., McLennan, A. G., Bates, A. D and White, M. R. H. 1998. *Instant Notes in Molecular Biology*, Viva Books Pvt. Ltd.
2. David Freifelder. 2006. *Essentials of Molecular Biology*, 4nd Ed. Narosa Publishing House.

#### REFERENCE BOOKS:

1. Twyman, R. M. 1999. *Advanced Molecular Biology*. 1st Ed., Viva Books Pvt Ltd.,
2. Harvey Lodish, Arnold Berk, Lawrence Zipursky S., Paul Matsudaira, David Baltimore and James Darnell. 2000. *Molecular Cell Biology*, 4th Ed., W. H. Freeman & Co.
3. David Freifelder. 1993. *Essentials of Molecular Biology*, 2nd Ed., Panima Publishing Co.

#### DIGITAL TOOLS:

- <https://www.thesciencenotes.com/the-lac-operon/>
- [https://www.osmosis.org/notes/Transcription\\_Translation\\_and\\_Replication](https://www.osmosis.org/notes/Transcription_Translation_and_Replication)
- <https://microbenotes.com/characteristic-of-genetic-code/>

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	2	3
CO3	3	3	2	2	1	2
CO4	3	3	2	1	2	1
CO5	3	3	2	2	1	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level

COURSE DESIGNERS: Dr. V. SELVI and Prof. N. B. SHARMILA

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

442

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBCP2	CORE PRACTICAL – II	CORE – 4	–	3	–

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	–	–	–

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course provides an overview and hands-on exploration of the methods employed in classical microbial genetics. The course is designed to provide opportunities for students to gain knowledge and insight into the scientific developments of today's front-line research.

### COURSE OBJECTIVES:

- To focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics.
- To study the effect of chemical and physical mutagens on prokaryotic cell.
- To identify the mutant strains using appropriate techniques.
- To comprehend the technique of chromosomal DNA isolation from bacterial cell.
- To understand the process of genetic transformation in bacteria.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	illustrate the key concepts in the basic Microbial Genetics	Upto K3
CO 2	understand the implication of mutation and its characteristics in prokaryotes.	Upto K3
CO 3	become familiar with the gene transfer techniques in prokaryotes.	Upto K3
CO 4	understand the concept of prokaryotic chromosomal DNA isolation.	Upto K3
CO 5	acquire knowledge in the identification of recombinant bacterial colonies.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY





# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

443

### CORE PRACTICAL – II

1. Mutagenesis of *E. coli* using selected Mutagen.
2. Isolation of spontaneous mutants – Gradient plate technique.
3. Isolation of auxotrophic and drug-resistant mutants.
4. Induction of *Lac Operon*.
5. Transformation – Selection of blue / white colonies.
6. Isolation of bacteriophage.
7. Isolation and Separation of chromosomal DNA by AGE.

### TEXT BOOKS:

1. Sambrook, J., and Russell, D.W. 2001. *Molecular Cloning: A Laboratory Manual*. 4th edition, Cold Spring Harbour Laboratory press.
2. David Freifelder, 2004. *Microbial Genetics*. 10th edition, Narosa Publishing House, New Delhi, India.

### REFERENCE BOOKS:

1. Janarthanan S and Vincent S., 2007. *Practical Biotechnology Methods & Protocols*, University Press.
2. P. Palanivelu, 2004. *Analytical Biochemistry and Separation Techniques*, 3<sup>rd</sup> Ed., Twenty first Century Publications, Palkalainagar, Madurai, 2004.
3. Jeffrey H. Miller, 1992. *A Short Course in Bacterial Genetics*, Cold Spring Harbour Laboratory Press.

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	1	3
CO2	3	3	2	2	1	2
CO3	2	3	3	2	2	3
CO4	1	2	3	2	1	2
CO5	2	2	1	3	3	2

3. Advanced Application      2. Intermediate Development      1. Introductory Level

**COURSE DESIGNER: Dr. V. SELVI**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

444

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBA31	CELL BIOLOGY	ALLIED – 3 T	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course helps to give basic knowledge about the structure and function of cells and cellular components, cell division and basic techniques used in cell biology.

### COURSE OBJECTIVES:

- To make the students understand the basic components of prokaryotic and eukaryotic cells, plant and animal cells.
- To help the students understand the structural organisation and functions of cellular organelles and how it relates to cell functions.
- To make the students understand the events in cell cycle, mitosis and meiosis.
- To make the students familiar with the basic principles of microscopy and centrifugation and the cytochemical staining methods.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire the knowledge on the structure of plant and animal cells, compare prokaryotic and eukaryotic cells, structure and functions of unit membrane and cytoskeletons.	Upto K3
CO 2	understand the structure and functions of cellular components.	Upto K3
CO 3	accomplish familiarity on the mechanism of photosynthesis and generation of ATP, organization of nuclear components.	Upto K3
CO 4	understand the events occurring in cell division and how it is accomplished.	Upto K3
CO 5	become familiar with basic principles of working of Microscopy, centrifugation and acquire skills in cytochemical staining techniques.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

445

### CELL BIOLOGY

#### UNIT – I:

Cell Structure – prokaryotic and eukaryotic (comparison) – plant and animal cells – structural features. Plasma membrane – Chemistry and ultra – structure – Fluid Mosaic model – functions. Protoplasm – Chemistry and organization – microtubules and microfilaments.

#### UNIT – II:

Membrane systems in eukaryotes: Endoplasmic reticulum and Golgi complex – structure, chemistry, origin and functions. Organelles in Eukaryotes: Lysosomes – ultra structure and functions, types. Ribosomes – ultra structure and functions.

#### UNIT – III:

Chloroplast – ultra structure and function – mechanism of photosynthesis and generation of ATP to be explained briefly. Mitochondria – ultra structure and functions – semi autonomy of cell organelles. Nucleus – Nuclear envelop – nucleolus – structure and function. Chromosomes – structure – euchromatin & heterochromatin – nucleosomes.

#### UNIT – IV:

Cell Cycle – G1, S & G2 phases, Cell division: Mitosis and Meiosis – stages and their significance.

#### UNIT – V:

Microscopy: Light and Electron microscopy – principle – resolving power. Centrifugation – principle – Sub cellular fractionations, differential and density centrifugation. Cytochemical staining methods: Lipids (Sudan Black), Polysaccharides – (Periodic Acid Schiff's reagent), DNA (Feulgen), Nucleic acids – (Methyl Green Pyronin).

#### TEXT BOOKS:

1. Arumugam (2010) *Cell and Molecular Biology*, Saras Publications
2. P.S. Verma and V.K. Agarwal (1995) *Cell Biology, Genetics and Evolution*. S. Chand & Co., New Delhi.
3. V.K. Agarwal (2000) *Cell Biology*. S.Chand & Company Ltd.

#### REFERENCE BOOKS:

1. B. Albert, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson (1983) *Molecular Biology of Cell*. Garland Publishing Co., Inc., New York, USA.
2. E.D.P. De Robertis, F.A. Saez and E.M.F. De Robertis (1990) *Cell and Molecular Biology* 3rd edition, McGraw – Hill Publications.
3. Cooper (1997). *The Cell – A Molecular Approach*. ASM, 1997.

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	3	3	3	3
CO2	1	2	1	3	1	1
CO3	2	2	1	3	1	1
CO4	1	3	1	3	1	1
CO5	1	1	3	3	1	3

3. Advanced Application      2. Intermediate Development      1. Introductory Level

**COURSE DESIGNER: Prof. N. B. SHARMILA**

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

446

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBAP2	ALLIED BIOLOGY PRACTICAL	ALLIED – 3 P	–	2	–

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	–	–	–

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course gives more hands-on experience with topics related to cell biology, biodiversity and biostatistics.

### COURSE OBJECTIVES:

- To understand the basic techniques to work with the cells.
- To explore the various cell organelles using electron micrographs.
- To understand the various stages of mitosis and meiosis.
- To measure biodiversity and analyse the study of vegetation.
- To gain experience in data collection and analyse them using basic statistical techniques.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify the different parts of microscope, cell organelles and various stages of mitosis.	Upto K3
CO 2	appreciate the biodiversity rich regions and able to map them.	Upto K3
CO 3	know the importance of endemic plants and animals by collecting the information from various sources.	Upto K3
CO 4	become familiar with the techniques to measure biodiversity and vegetation.	Upto K3
CO 5	analyse the data using different statistical techniques.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

447

### ALLIED BIOLOGY PRACTICAL

1. Study of parts and functions of compound microscope
2. Study of Cell inclusions: Starch grains – smear of potato, banana or rice, Cystolith– Sections of *Ficus* leaves,
3. Study of cell organelles by photomicrographs
4. Study of various stages of mitosis and meiosis using *Allium cepa* roots and *Rheo* flower buds
5. By using world and Indian map mark important Biodiversity Regions.
6. Collection of endemic plants and animals photos with information by using websites, journals, newspapers etc.
7. Measuring Biodiversity – Species diversity index (Simpson's Index) of vegetation.
8. Analysis of the vegetation for frequency, density and abundance using quadrat method.
9. Problems in measures of Central tendency– Mean, median and mode
10. Problems in measures of Dispersion– Standard Deviation & Variance.

### REFERENCE BOOKS:

1. N. Arumugam (2010). *Cell and Molecular Biology*. Saras Publications
2. V.K. Agarwal (2000). *Cell Biology*. S. Chand & Co., New Delhi.
3. K.V. Krishnamurthy, (2003) – *An Advanced book on Biodiversity. Principles and Practice* – Oxford SIBH publishing Co. Pvt. Ltd., New Delhi.
4. D.K.Belsare (2007). *Introduction to Biodiversity*. APH Publishing Corporation, New Delhi.
5. Gupta S., *Elementary Statistical Methods* 11<sup>th</sup> Ed., (1995), Sultan chand and sons educational publishers, New Delhi.
6. S.Palanichamy and Manoharan (1990). *Statistical Methods for Biologists*. Palani Paramount Publications.

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	2
CO2	3	3	2	2	2	1
CO3	3	3	2	2	2	1
CO4	3	2	2	2	3	2
CO5	3	2	2	2	1	2

3. Advanced Application      2. Intermediate Development      1. Introductory Level

**COURSE DESIGNER: Prof. N. B. SHARMILA**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

448

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBS31	MUSHROOM TECHNOLOGY	SBS – 3	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	--	--	---

### COURSE DESCRIPTION:

This course helps to educate the students the basic concepts in Mushroom Cultivation and their economics.

### COURSE OBJECTIVES:

- To make the students self-reliant to identify several kind of mushrooms.
- To help the students endow with detailed knowledge on mushroom cultivation, packaging and marketing.
- To make the students comprehend the nutritional importance of mushrooms.
- To help the students practice a means of self-employment and income generation.
- To make the students appreciate the economics of mushroom cultivation in India.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire the knowledge on the History of mushroom cultivation, classification of mushrooms and nutritive components of mushrooms.	Upto K3
CO 2	understand the morphology and lifecycle of mushrooms, techniques employed in isolation of mushroom cultures and spawn production.	Upto K3
CO 3	accomplish familiarity on the cultivation strategies of different types of mushrooms.	Upto K3
CO 4	gain awareness on the novel mushroom recipes, medicinal value of mushrooms, pests and pathogens infecting mushrooms.	Upto K3
CO 5	appreciate the research activities, economics and environmental impact of mushroom cultivation in India.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

449

### MUSHROOM TECHNOLOGY

#### UNIT-I:

History of mushroom cultivation, Classification of Mushrooms, Nutritional importance of Mushrooms.

#### UNIT – II:

Morphology, life cycle of mushroom– Isolation methods and maintenance of mushroom cultures – Spawn production.

#### UNIT – III:

Methods of mushroom cultivation – Composting – Cultivation of white button mushroom, oyster mushroom, shittake and wood ear mushroom.

#### UNIT – IV:

Mushroom recipes – Value added products – Storage and Preservation Medicinal value of mushrooms – Mushroom diseases – Insect and Pests of Mushroom. – Control measures.

#### UNIT – V:

Mushroom Research Stations in India – Economics of mushroom production – Requisites for mushroom unit setup – Environmental impact – Solid waste management.

#### TEXT BOOKS:

1. Gogoi R., Rathaiah Y., Borah T.R (2019). *Mushroom Cultivation Technology*. Scientific Publishers.
2. Rajan S., Sivakumar N (2020). *Mushroom technology*, 2<sup>nd</sup> edn. CBS Publishers & Distributors.

#### REFERENCE BOOKS:

1. Sivakumar N., Kumaresan V., Satheesh S (2009). *Principles of Mushroom Cultivation*, 1<sup>st</sup>edn. Chandra Publications.
2. *Cultivation of Edible Mushroom* –ICAR Publications.

#### DIGITAL TOOLS:

- <http://ecoursesonline.iasri.res.in/course/view.php?id=596>
- <http://www.agrilearner.com/history-mushroom-cultivation-india/>
- <https://www.biologydiscussion.com/fungi/mushrooms-meaning-values-and-cultivation-procedure/46635>
- [https://nios.ac.in/media/documents/vocational/mushroom\\_production\\_\(revised\)\(618\)/Lesson-01.pdf](https://nios.ac.in/media/documents/vocational/mushroom_production_(revised)(618)/Lesson-01.pdf)

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1	2	2
CO2	3	2	3	3	1	3
CO3	3	2	3	2	2	3
CO4	3	3	2	1	2	3
CO5	2	2	3	2	3	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level

**COURSE DESIGNER: Prof A. R. SARANYADEVI**

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

450

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBN31	FOOD AND DAIRY TECHNOLOGY	NME – 1	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course aids to edify the students the general principles of food & dairy microbiology and inculcates the importance of various microorganisms in the spoilage of food and their implications on human health.

### COURSE OBJECTIVES:

- To make the students aware of the common standards of food and dairy microbiology, food preservation, fermented and microbial foods.
- To make them become familiar with various sterilization techniques used in food and dairy microbiology
- To impart the basic knowledge on the characteristics of food–borne microorganisms and spoilage microorganisms and preventive measures.
- To help them understand the methodology of microbiological examination of foods, microbiological quality Control and quality schemes.
- To help the students to apply their microbiological knowledge in various dairy and food preparation processes to improve the quality and taste of the product.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	gain knowledge about food as a substrate for various microbes, the role of factors and its importance.	Upto K3
CO 2	comprehend the principles and application of different types of food preservation technique	Upto K3
CO 3	realize the significance of microbial fermentation in foods.	Upto K3
CO 4	get equipped with pragmatic understanding of food spoilage and food borne infections.	Upto K3
CO 5	recognize the microbiological techniques and government regulatory practices employed to ensure food safety.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLICATION





# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

451

### FOOD AND DAIRY TECHNOLOGY

#### UNIT – I:

Importance of Food and Dairy Microbiology – Food as substrate for microbial growth – intrinsic and extrinsic factors affecting growth and survival of microorganism in foods (a brief account only) – General principles of Microbial spoilage – chemical changes caused by microorganisms.

#### UNIT – II

Food Preservation – Physical Methods – Asepsis, drying, heat processing, Filtration, chilling and freezing, Radiation, Pasteurization. Chemical Preservatives – Salt, Sugar, Organic acid (Benzoic acid, Acetic acid & Lactic acid), Nitrites, Ethylene oxide.

#### UNIT – III

Microbes in Fermented Food Production – Cheese and Yoghurt, Beer, Wine, Bread and Sauerkraut. Microbial spoilage of Milk and Milk Products, Microbial Fermented Foods– Beer, Wine, Bread and Sauerkraut.

#### UNIT – IV

Contamination and Spoilage of different groups of Foods–Cereals Vegetables and fruits, Meat, Eggs and Poultry, Fish, Canned Food. **Food borne diseases**– Food borne intoxications: *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins; Foodborne infections: *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis.

#### UNIT – V

**Food sanitation** –Microbiological examination of foods and water potability (**MPN test**). Quality assurance: Microbiological quality standards of food. Government regulatory practices and policies. FDA, EPA, HACCP, FSSAI (Brief account).

#### TEXT BOOKS:

1. Adams. MR and Moss, MO. 2005. Food Microbiology, New age International Pvt, Ltd publication.
2. Frazier, WC and West off DC. 2003. Food Microbiology, 4<sup>th</sup> edition, McGrawHill, New York

#### REFERENCE BOOKS:

1. Hobbs B. C and Roberts D., 1993, Food Poisoning and Food Hygiene. Edwards Arnold, London.
2. Yousef A. E and Carlstrom C., 2003, Food Microbiology – A Laboratory manual, Wiley Interscience.
3. Jay J. M., 2000. Modern Food Microbiology, Aspen Publishers. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.

#### DIGITAL TOOLS:

- <https://www.delightedcooking.com/what-is-food-sanitation.htm>
- <https://www.onlinebiologynotes.com/food-preservation-from-microbial-spoilage-principle-and-methods/>
- <https://www.biologydiscussion.com/foods/microbial-production-of-fermented-foods/10402>
- <https://www.onlinebiologynotes.com/food-borne-disease-food-poisoning-and-food-infection-with-example/>

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1	2	2
CO2	3	2	3	3	1	3
CO3	3	2	3	2	2	3
CO4	3	3	2	1	2	3
CO5	2	2	3	2	3	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level

**COURSE DESIGNERS: Prof. N. B. SHARMILA AND Prof. A. R. SARANYADEVI**

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

452

### COURSE STRUCTURE – IV SEMESTER

S. No.	Subject Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT41	<b>Part – I: Tamil</b> – சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
	21UACH41	<b>Hindi</b> – Hindi – IV						
	21UACS41	<b>Sanskrit</b> – Sanskrit – IV						
2.	21UACE41	<b>Part – II: English</b> – English For Enrichment – IV	6	3	25	75	100	3
3.	21UMBC41	<b>Part – III: Core – 5 :</b> Microbial Genetics	5	3	25	75	100	5
4.	21UMBCP2	<b>Part – III: Core – 4:</b> Practical – II: Core Practical – II	3	3	40	60	100	2
5.	21UMBA41	<b>Part – III: Allied – 4 T :</b> Biodiversity and Biostatistics	4	3	25	75	100	4
6.	21UMBAP2	<b>Part – III: Allied – 4 Practical:</b> Allied Biology Practical	2	3	40	60	100	2
7.	21UMBS41	<b>Part – IV: SBS – 4 :</b> Cosmetic Microbiology	2	3	25	75	100	2
8.	21UMBN41	<b>Part – IV: NME – 2:</b> Microbes in Human Health	2	3	25	75	100	2
9.		<b>Part – V:</b> Extension Activities	–	–	–	–	100	1
		<b>TOTAL</b>	<b>30</b>				<b>900</b>	<b>24</b>

**CA** – Class Assessment (Internal)

**SE** – Summative Examination

**SBS** – Skill Based Subject

**NME** – Non –Major Elective

**T** – Theory

**P** – Practical

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

453

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBC41	MICROBIAL GENETICS	CORE – 5	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course helps to enlighten the students by educating the basic concepts of Genetics at the Microbial level.

### COURSE OBJECTIVES:

- To understand the fundamental concepts in microbial genetics.
- To appreciate the processes of heredity in bacteria, gene structure and evolution, gene expression and its control.
- To demonstrate knowledge of the biochemistry behind gene transfer mechanisms in bacteria.
- To acquire the rudimentary familiarity on plasmids and gene mapping.
- To become familiar with the basic concepts of phage genetics and transduction.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	get an insight into the history of Bacterial genetics and conceptualization of gene theory.	Upto K3
CO 2	gain knowledge about the processes behind mutations and impact of mutagens.	Upto K3
CO 3	attain the conception on the means of genetic exchange in bacteria role in gene mapping.	Upto K3
CO 4	examine the properties of plasmids and its types.	Upto K3
CO 5	outline the biology of phages and their role in gene transfer.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

454

### MICROBIAL GENETICS

#### UNIT – I:

Genetics – Bacterial Genetics – History–Experimental Evidences – DNA as genetic material – modern concept on gene.

#### UNIT – II:

Mutation – Phenotypes in bacteria–Inheritance experiments – Types of mutation – Mutagens – Physical (UV) and chemical (NTG and Hydroxylamine) – mode of action – Isolation of auxotroph and drug resistance mutants – fluctuation & complementation test.

#### UNIT – III:

Methods of Genetic exchange in bacteria – Transformation – Natural – Discovery – Competence – Methods of uptake of DNA – Natural – Induced–Calcium ion induction – Electroporation – Role of transformation in gene mapping.

#### UNIT – IV:

Plasmid–Properties – types – F, R, Col–Gene transfer – Conjugation.–  $F^+ \times F^-$ ,  $HFR \times F^-$ ,  $F'X \times F^-$  –Role of conjugation in gene mapping.

#### UNIT – V:

Phage genetics – Lytic and Lysogenic examples – Gene transfer – Transduction – Methods – Generalized – specialized – Role in genetic mapping.

#### TEXT BOOKS:

1. Maloy, S. R., Cronan J. E. and Freifelder D (1994). *Microbial Genetics*. 2<sup>nd</sup>edn, Jones and Bartlett publication.
2. Gardner, E. J., Simmons MJ and Snustad DP (1991). *Principles of Genetics*. 8<sup>th</sup>edn. John Wiley & Sons. New York.

#### REFERENCE BOOKS:

1. Nancy Trun and Janine Trempey (2004). *Fundamentals of Bacterial Genetics*. 1<sup>st</sup>edn. Blackwell Publishing Company.
2. Anthony JF Griffiths, Jeffrey H Miller, David T Suzuki, Richard C Lewontin, and William M Gelbart (2000). *An Introduction to Genetic Analysis*, 6<sup>th</sup>edn. W.H Freeman and Company, New York.

#### DIGITAL TOOLS:

- [https://archivesspace.cshl.edu/repositories/2/archival\\_objects/68234](https://archivesspace.cshl.edu/repositories/2/archival_objects/68234)
- <https://microbenotes.com/bacterial-conjugation/>
- <https://www.microrao.com/micronotes/bacteriophage.pdf>
- <https://www.onlinebiologynotes.com/plasmid-characteristics-types-functions-and-host-range/>
- <https://www.ncbi.nlm.nih.gov/books/NBK459274/>

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	2	2
CO2	3	3	2	1	3	2
CO3	3	3	3	2	2	3
CO4	2	3	3	2	1	2
CO5	3	3	2	2	1	3

3. Advanced Application    2. Intermediate Development    1. Introductory Level

COURSE DESIGNER: Prof. A. R. SARANYADEVI

Passed in the BOS Meeting held on 19/03/2022

Signature of the Chairman



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

455

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBCP2	CORE PRACTICAL – II	CORE – 4 PRACTICAL	–	3	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course provides an overview and hands-on exploration of the methods employed in classical microbial genetics. The course is designed to provide opportunities for students to gain knowledge and insight into the scientific developments of today's front-line research.

### COURSE OBJECTIVES:

- To focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics.
- To study the effect of chemical and physical mutagens on prokaryotic cell.
- To identify the mutant strains using appropriate techniques.
- To comprehend the technique of chromosomal DNA isolation from bacterial cell.
- To understand the process of genetic transformation in bacteria.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	illustrate the key concepts in the basic Microbial Genetics	Upto K3
CO 2	understand the implication of mutation and its characteristics in prokaryotes.	Upto K3
CO 3	become familiar with the gene transfer techniques in prokaryotes.	Upto K3
CO 4	understand the concept of prokaryotic chromosomal DNA isolation.	Upto K3
CO 5	acquire knowledge in the identification of recombinant bacterial colonies.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

456

### CORE PRACTICAL – II

1. Mutagenesis of *E. coli* using selected mutagens.
2. Isolation of spontaneous mutants – Gradient plate technique.
3. Isolation of auxotrophic and drug-resistant mutants.
4. Induction of *Lac Operon*.
5. Transformation – Selection of blue / white colonies.
6. Isolation of bacteriophage.
7. Isolation and Separation of chromosomal DNA by AGE.

### TEXT BOOKS:

1. Sambrook, J., and Russell, D.W. 2001. *Molecular Cloning: A Laboratory Manual*. 4th edition, Cold Spring Harbour Laboratory Press.
2. David Freifelder, 2004. *Microbial Genetics*. 10th edition, Narosa Publishing House, New Delhi, India.

### REFERENCE BOOKS:

1. Janarthanan S and Vincent S., 2007. *Practical Biotechnology Methods & Protocols*, University Press.
2. P. Palanivelu, 2004. *Analytical Biochemistry and Separation Techniques*, 3<sup>rd</sup> Ed., Twenty first Century Publications, Palkalainagar, Madurai, 2004.
3. Jeffrey H. Miller, 1992. *A Short Course in Bacterial Genetics*, Cold Spring Harbour Laboratory Press.

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	1	3
CO2	3	3	2	2	1	2
CO3	2	3	3	2	2	3
CO4	1	2	3	2	1	2
CO5	2	2	1	3	3	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level

**COURSE DESIGNER: Dr. V. SELVI**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

457

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBA41	BIODIVERSITY AND BIOSTATISTICS	ALLIED – 4 T	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course introduces the students to biodiversity and conservation biology and also helps to provide an introduction to selected important topics in bio statistical concepts.

### COURSE OBJECTIVES:

- To understand the definition, concept and scope of biodiversity.
- To appreciate the methods of conservation for the protection of biodiversity.
- To acquire the knowledge on the introduction to Biostatistics.
- To familiarise with the different methods to present the data.
- To appreciate the different basic tools to analyse the data.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	receive an insight into the learning about the meaning of biodiversity, concept and its scope and presenting the diversity at three levels and knowledge on Mega diversity Centres and Hotspots.	Upto K3
CO 2	understand the threats to biodiversity and appreciate the role and operation of protected areas in conservation practices and scientific methods to conserve biodiversity and human dependence on biodiversity	Upto K3
CO 3	understand the role of biostatistics in various biological fields, types and methods for collecting data.	Upto K3
CO 4	apply the basic techniques to present the data in classification, tabular, diagrammatic and graphic form.	Upto K3
CO 5	explore the statistical techniques to measure central tendency, dispersion and correlation.	Upto K3

UPTO K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

458

### BIODIVERSITY AND BIostatISTICS

#### UNIT – I:

Biodiversity – Introduction, Concept and Scope of Biodiversity. Levels of Biodiversity – Genetic, species & Ecosystem diversity. Megadiversity Centres & Hotspots of Biodiversity (a brief account). Values of Biodiversity.

#### UNIT – II:

Threats to Biodiversity. – causes & consequences – IUCN categories of threat. Conservation of Biodiversity – Methods of conservation – *in situ* conservation – National parks, Sanctuaries, Biosphere Reserves, Sacred Groves and *ex situ* conservation – Cryopreservation and Germplasm conservation.

#### UNIT – III:

Biostatistics: Introduction – definition – Collection of Data – primary & secondary data – explanation and comparison. Methods of collecting primary data. Sampling design – random and non – random.

#### UNIT – IV:

Classification of data – objectives – types. Tabulation of data–objectives – components of a table – Representation of Data– Diagrammatic (simple bar diagram and pie diagram) & graphic (Histogram, frequency polygon frequency curve and cumulative frequency curve) representation.

#### UNIT – V:

Measures of Central Tendency – Explanation– types of averages – 1. Arithmetic Mean. 2. Median. 3. Mode (problems related to individual, discrete and continuous series). Measures of Dispersion – Explanation and definition – Types. 1. Range. 2. Mean deviation. 3. Standard deviation and variance (problems related to individual and discrete series). Correlation: Explanation – types – methods of studying correlation using Karl Pearson's coefficient of correlation (simple problems related to correlation).

#### **Note: Question Paper Pattern:**

Section A	Section B	Section C
Q. No. 9) & 10): Theory or Problem	Q. No. 15 a) Theory or Problem 15 b) Problem	Q. No. 20) Problem





# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

459

### TEXT BOOKS:

1. *CPR Manual of Biodiversity* (2003). Environmental Education Centre 2003, Chennai
2. K.V. Krishnamurthy, (2003) – *An Advanced book on Biodiversity: Principles and Practice* – Oxford SIBH publishing Co. Pvt. Ltd., New Delhi.
3. S.Palanichamy and Manoharan (1990). *Statistical Methods for Biologists*. Palani Paramount Publications

### REFERENCES:

1. D. K. Belsare (2007). *Introduction to Biodiversity*. APH Publishing Corporation, New Delhi.
2. Gupta S., *Elementary Statistical Methods* 11<sup>th</sup> Ed., (1995), Sultan Chand and Sons educational publishers, New Delhi.

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	1	1	2
CO2	3	3	2	3	3	3
CO3	1	1	1	3	2	2
CO4	1	1	1	3	1	2
CO5	1	1	2	3	1	2

3. Advanced Application      2. Intermediate Development      1. Introductory Level

**COURSE DESIGNER: Prof. N. B. SHARMILA**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

460

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBAP2	ALLIED BIOLOGY PRACTICAL	ALLIED – 4 PRACTICAL	–	2	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course gives more hands-on experience with topics related to cell biology, biodiversity and biostatistics.

### COURSE OBJECTIVES:

- To understand the basic techniques to work with the cells.
- To explore the various cell organelles using electron micrographs.
- To understand the various stages of mitosis and meiosis.
- To measure biodiversity and analyse the study of vegetation.
- To gain experience in data collection and analyse them using basic statistical techniques.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify the different parts of microscope, cell organelles and various stages of mitosis.	Upto K3
CO 2	appreciate the biodiversity rich regions and able to map them.	Upto K3
CO 3	know the importance of endemic plants and animals by collecting the information from various sources.	Upto K3
CO 4	become familiar with the techniques to measure biodiversity and vegetation.	Upto K3
CO 5	analyse the data using different statistical techniques.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

461

### ALLIED BIOLOGY PRACTICAL

1. Study of parts and functions of compound microscope
2. Study of Cell inclusions: Starch grains – smear of potato, banana or rice, Cystolith– Sections of *Ficus* leaves,
3. Study of cell organelles by photomicrographs
4. Study of various stages of mitosis and meiosis using *Allium cepa* roots and *Rheo* flower buds
5. By using world and Indian map mark important Biodiversity Regions.
6. Collection of endemic plants and animals photos with information by using websites, journals, newspapers etc.
7. Measuring Biodiversity – Species diversity index (Simpson's Index) of vegetation.
8. Analysis of the vegetation for frequency, density and abundance using quadrat method.
9. Problems in measures of Central tendency– Mean, median and mode
10. Problems in measures of Dispersion– Standard Deviation & Variance.

### REFERENCE BOOKS:

1. N. Arumugam (2010). *Cell and Molecular Biology*.Saras Publications
2. V.K. Agarwal (2000). *Cell Biology*. S. Chand & Co., New Delhi.
3. K.V. Krishnamurthy, (2003) – *An Advanced book on Biodiversity.Principles and Practice* – Oxford SIBH publishing Co. Pvt. Ltd., New Delhi.
4. D.K.Belsare (2007). *Introduction to Biodiversity*. APH Publishing Corporation, New Delhi.
5. Gupta S., *Elementary Statistical Methods* 11<sup>th</sup> Ed., (1995), Sultan chand and sons educational publishers, New Delhi.
6. S.Palanichamy and Manoharan (1990). *Statistical Methods for Biologists*. Palani Paramount Publications.

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	2
CO2	3	3	2	2	2	1
CO3	3	3	2	2	2	1
CO4	3	2	2	2	3	2
CO5	3	2	2	2	1	2

3. Advanced Application      2. Intermediate Development      1. Introductory Level

**COURSE DESIGNER: Prof. N. B. SHARMILA**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

462

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBS41	COSMETIC MICROBIOLOGY	SBS – 4	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	--	--	---

### COURSE DESCRIPTION:

This course helps the students to understand the significance of applied microbiology in the production of secure and stable cosmetics.

### COURSE OBJECTIVES:

- To determine the role of microbes in cosmetics production.
- To describe the sources and prevention of microbial contamination by microorganisms in cosmetics.
- To be aware of the quality control measures and microbial resistance in cosmetics preparation.
- To gain knowledge on the validation protocols employed in cosmetic microbiology.
- To become familiar with the regulations employed in cosmetic formulations.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire knowledge on history of cosmetic microbiology and role of microbes in cosmetic preparation.	Upto K3
CO 2	explore the microorganisms in cosmetic formulations.	Upto K3
CO 3	become familiar with the cosmetic product development and the quality control strategies.	Upto K3
CO 4	exemplify the validation of methodologies employed in cosmetic preparations.	Upto K3
CO 5	Explicate the cosmetic product regulations.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

463

### COSMETIC MICROBIOLOGY

#### UNIT – I:

History of cosmetic Microbiology – Need for cosmetic microbiology, Scope of cosmetic microbiology global and Indian Scenario– Role of microbes in cosmetics preparation.

#### UNIT – II:

Microorganisms in cosmetics – Preservation of cosmetics – Mechanisms of action of Cosmetic preservatives – Enzymes in cosmetics.

#### UNIT – III:

Cosmetic product development – Defining the product, selection & sources of ingredients– Quality control measures in cosmetics preparation – Microbial resistance – Critical Control point.

#### UNIT – IV:

Validation of Method – Equipment Cleansing and Sanitization – Validation in Microbiology Laboratory – Media, microbial Content Test, Identification, Sterilizers, Decontamination.

#### UNIT – V:

Cosmetic Product Regulation– Ingredients, Safety assessment, Efficacy data and Labeling requirements for cosmetic products. Environmental and safety concerns of cosmetic ingredients.

#### TEXT BOOKS:

1. Philip, A.G. 2006. *Cosmetic Microbiology. A Practical approach*. 2nd Ed., Taylor & Francis group.
2. Daniel K. Brannan. 1997, *Cosmetic Microbiology: A practical handbook*, CRC Press.

#### REFERENCE BOOKS:

1. Wilkinson J.B and Moore R.J. 2011. *Harry's Cosmetology*.7th Ed., Chemical Publishing, New York,.
2. P.P. Sharma. 2014. *Cosmetics – Formulation, Manufacturing and Quality Control*, 4th Ed., Vandana Publications Pvt. Ltd., Delhi.

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	1	2
CO2	3	3	2	2	1	2
CO3	2	3	3	2	2	3
CO4	1	2	3	2	2	2
CO5	2	1	2	3	3	3

3. Advanced Application    2. Intermediate Development    1. Introductory Level

**COURSE DESIGNER: Dr. V. SELVI**



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

464

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UMBN41	MICROBES IN HUMAN HEALTH	NME – 2	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
------------------	---	---	---

### COURSE DESCRIPTION:

This course helps to educate the students the general principles of medical microbiology and infectious diseases.

### COURSE OBJECTIVES:

- To make the students aware of the pathogenicity of microbes associated with human infections.
- To help the students recognize the various sterilization techniques employed in medical microbiology.
- To impart the conceptual basis for understanding pathogenic microorganisms and particularly address the fundamental mechanisms of their pathogenicity.
- To explicate the clinical significance of diagnostic microbiology tests.
- To realize the role of antimicrobial chemotherapy in disease control and prevention.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	be familiar with the history of medical microbiology and methods of sterilization.	Upto K3
CO 2	understand the etiology of microbial & protozoan infections and its control.	Upto K3
CO 3	apprehend the significance of diagnostic microbiological assays.	Upto K3
CO 4	appreciate the efficacy of vaccines in prophylaxis of infectious disease.	Upto K3
CO 5	recognize the importance of antimicrobial chemotherapy in disease control.	Upto K3

K3– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLICATION



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

465

### MICROBES IN HUMAN HEALTH

#### UNIT – I:

History of Microbiology – Robert Koch, Louis Pasteur, Alexander Fleming, Edward Jenner. Definition – Sterilization, Disinfection, Disinfectant, Antisepsis, Asepsis, Antiseptics, Sanitization, Microbicidal agents. Sterilization – Moist heat – Pressure cooker, Autoclave–Dry heat – Incineration, Hot air oven – Chemical sterilants – Phenolics, Alcohol, Halogen, Iodine Quaternary ammonium compounds, Aldehydes, Collection and transport of samples ( A brief account only).

#### UNIT – II:

Bacterial diseases – Pneumonia, Diphtheria, Whooping cough, Tuberculosis, Cholera, Typhoid – Causative agent, Symptoms, Pathogenesis, Lab diagnosis and control.

#### UNIT – III:

Viral diseases – Mumps, Measles, Dengue, Rubella, Chicken pox, HIV, SARS, COVID-19 – Causative agent, Symptoms, Pathogenesis, Lab diagnosis and control.

#### UNIT – IV:

Fungal diseases – Candidiasis, Mycetoma and Dandruff Protozoan diseases – Amoebiasis, Malaria, Trypanosoma and Filariasis– Causative agent, Symptoms, Pathogenesis, Lab diagnosis and control.

#### UNIT – V:

Prevention of infectious diseases – Vaccines – types and examples only. Antimicrobial drugs – Penicillin, Cephalosporin, Chloramphenicol, Sulphonamides, Vancomycin. Antifungal drugs – Griseofulvin, Amphotericin B, Clotrimazole. Antiviral drugs – Acyclovir, Amantadine, Ritonavir, Azidothymidine. Antiprotozoal agents – Chloroquine, Metronidazole ( A Brief account).

#### TEXT BOOKS:

1. Vasanthakumari R. 2007. Textbook of Microbiology, BI publications Pvt. Ltd, Delhi.
2. Rajan S. 2007. Medical Microbiology, MJB Publishers, Chennai.

#### REFERENCE BOOKS:

1. Kenneth J. Ryan and George Ray C., Sherris Medical Microbiology, 4<sup>th</sup> Ed., McGraw Hill Publications.
2. Paniker C. K. J., Ananthanarayanan and Paniker's Textbook of Microbiology, 7<sup>th</sup> Ed., Orient Longman Publications.

#### DIGITAL TOOLS:

- <https://microbenotes.com/history-of-microbiology/>
- <https://nios.ac.in/media/documents/dmlt/Microbiology/Lesson-08.pdf>
- [https://www.osmosis.org/notes/Opportunistic\\_Fungal\\_Infections](https://www.osmosis.org/notes/Opportunistic_Fungal_Infections)
- <https://courses.lumenlearning.com/microbiology/chapter/fundamentals-of-antimicrobial-chemotherapy/>

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	2	1	3
CO2	3	3	3	2	3	1
CO3	2	3	2	3	2	2
CO4	2	2	3	3	2	1
CO5	3	2	3	1	2	3

3. Advanced Application    2. Intermediate Development    1. Introductory Level  
**COURSE DESIGNER: Prof. N. B. SHARMILA and Prof. A. R. SARANYADEVI**