



SOURASHTRA COLLEGE, MADURAI – 625004

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

B.Sc. MICROBIOLOGY – SYLLABUS

(Under CBCS based on OBE)

(For the students admitted from the academic year 2024 – 2025 onwards)

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives of the **B.Sc. Microbiology** programme at Sourashtra College, Madurai are given below and are numbered from PEO1 to PEO6.

PEO	To endow with the students the knowledge in microbiology and an outline of the processes that deal with microbes.
PEO	To train the students by teaching the skills to use technical developments related to current areas involving molecular biology, immunology, microbiology, molecular genetics and genetic engineering with the scope of versatility in all potential future technologies
PEO	To guide the students to prefer a decent career option both as Entrepreneur and with a high degree of employability or pursue higher education by empowering them with technical skills.
PEO	To impart a robust sense of communal accountability among the students with awareness of professional, societal and ethical values with leadership capabilities
PEO	To ascertain a milieu amidst the students that emphasizes the necessity to accomplish life – long learning for the general progress of self and society
PEO	To be aware of microbiological applications with progress of aptitude on par with global standards.

UNDERGRADUATE (UG) PROGRAMME OUTCOMES (POs)

Undergraduate **B.Sc. – Microbiology** 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.

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



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PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of **B.Sc. Microbiology** Programme, the students are expected / will be able to

PSO	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, bio control, biochemistry, food and industrial microbiology and systems biology
PSO	understand the microbial metabolism, concepts of molecular biology, microbial pathogenicity and the role of microorganisms in the human welfare and helps to address the specific solutions for the problems associated with human society
PSO	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.
PSO	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.
PSO	acquire skills, assess and approach with ethical principles in the current social health issues and the ability to participate in a team.
PSO	develop employability skills in the various fields of microbiology and ability to engage in life – long learning on life skills.



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

S. No.	Course Code	Part	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT31	I	Tamil – பொதுத் தமிழ் – III	6	3	25	75	100	3
	24UACH31		Hindi – General Hindi – III						
	24UACS31		Sanskrit – Drama Grammar and History of Sanskrit Literature						
2	24UACE31	II	English – General English – III	6	3	25	75	100	3
3	24UMBC31	III	Core – 4: Molecular Biology and Microbial Genetics	5	3	25	75	100	5
4	24UMBCP2		Core – 5: Core Practical – III: Lab in Molecular Biology	5	3	40	60	100	5
5	24UMBA31		Elective/Allied – 3: Bio Instrumentation	4	3	25	75	100	3
6	24UMBN31	IV	SEC: NME – 1: Organic Farming & Bio fertilizer Technology	2	3	25	75	100	2
7	24UMBS31		SEC: Aquaculture	2	3	25	75	100	2
			TOTAL	30				700	23



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SEMESTER – IV

S. No.	Course Code	Part	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT41	I	Tamil – பொதுத் தமிழ்- IV	6	3	25	75	100	3
	24UACH41		Hindi General Hindi – IV						
	24UACS41		Sanskrit – Alankara, Didactic & Modern Literature and Translation						
2	24UACE41	II	English – General English – IV	6	3	25	75	100	3
3	24UMBC41	III	Core – 6: Immunology and Immunotechnology	5	3	25	75	100	5
4	24UMBPC3		Core – 7: Core Practical – IV: Lab in Immunology and Immunotechnology	5	3	40	60	100	5
5	24UMBA41		Elective/Allied – 4: Food Processing Technology	4	3	25	75	100	4
6	24UMBN41	IV	SEC: NME – 2: Clinical Laboratory Technology	2	3	25	75	100	2
7	24UMBS41		SEC: Vaccine Technology	2	3	25	75	100	2
8		V	Extension Activity	–	–	–	–	100	1
			TOTAL	30				800	25

*All students will do internship after IV Semester. The evaluation will be done in the beginning of V Semester and marks will be included in the V Semester mark sheet.



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COURSE STRUCTURE – III SEMESTER

S. No.	Course Code	Part	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT31	I	Tamil – பொதுத் தமிழ் – III	6	3	25	75	100	3
	24UACH31		Hindi – General Hindi – III						
	24UACS31		Sanskrit – Drama Grammar and History of Sanskrit Literature						
2	24UACE31	II	English – General English – III	6	3	25	75	100	3
3	24UMBC31	III	Core – 4: Molecular Biology and Microbial Genetics	5	3	25	75	100	5
4	24UMBCP2		Core – 5: Core Practical – III: Lab in Molecular Biology	5	3	40	60	100	5
5	24UMBA31		Elective/Allied – 3: Bio Instrumentation	4	3	25	75	100	3
6	24UMBN31	IV	SEC: NME – Organic Farming & Bio fertilizer Technology	2	3	25	75	100	2
7	24UMBS31		SEC: DS: Aquaculture	2	3	25	75	100	2
			TOTAL	30				700	23

CA – Class Assessment (Internal)

SE – Summative Examination

SEC – Skill Enhancement Course

DS – Discipline Specific

NME – Non –Major Elective

T – Theory

P – Practical

Passed in the BoS Meeting held on 27/02/2025

Signature of the Chairman



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBC31	MOLECULAR BIOLOGY AND MICROBIAL GENETICS	CORE – 4	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability		Skill Oriented			Entrepreneurship			
	National	✓	Local	✓	Regional	Global			
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values		Other Values

COURSE DESCRIPTION:

Cell and Molecular Biology studies the structure and function of the cell, which is the basic unit of life. Cell biology is concerned with the physiological properties, metabolic processes, signaling pathways, life cycle, chemical composition and interactions of the cell with their environment.

COURSE OBJECTIVES:

To make the students

- understand the basic structure and functions of various cell organelles
- comprehend the central dogma of life
- appreciate the various cellular mechanisms involved in the control of transcription
- gain insights into the various processes involved in the replication of DNA.
- explore mechanism of translation.

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	explain the structure and functions of cell, cell organelles, biological membranes and intercellular communication	Upto K3
CO 2	appraise the concepts of cells in terms of growth, division and gather an extempore knowledge on different phases of cell cycle	Upto K3
CO 3	analyse the molecular basis of DNA replication and modes	Upto K3
CO 4	interpret the transcription process of prokaryotic genomes	Upto K3
CO 5	elaborate the process of translation in prokaryotes and eukaryotes	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING

Passed in the BoS Meeting held on 27/02/2025

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MOLECULAR BIOLOGY AND MICROBIAL GENETICS

UNIT – I:

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, primase. DNA replication modes – rolling circle, D-loop modes.

UNIT – II:

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

UNIT – III:

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:

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 2 μ plasmid. Bacteriophage–T4, Virulent Phage – Structure and lifecycle. Lambda phage–Structure, Lytic and Lysogenic cycle. Applications of Phages in Microbial Genetics

UNIT – V:

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



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TEXT BOOKS:

1. Powar, C.B. (2009). *Cell Biology*. Himalayan Publishing House, New Delhi.
2. Paul, A. (2009). *Cell and Molecular Biology*. Books and Allied (P) ltd, India.
3. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. (2008). *Molecular Cell Biology*. 6th Ed., W.H. Freeman & Co., New York.
4. Alberts B, Bray D, Johnson A et al. (1997) *Essential Cell Biology*. London: Garland Publishing.
5. Madigan MT, Martinko JM & Parker J (2000) *Brock's Biology of Microorganisms*, 9th edn. Englewood Cliffs, NJ: Prentice Hall.

REFERENCE BOOKS:

1. Alberts, B. Bray, D, Lewis, J, Raff, M, Roberts, K and Watson JD. (1994). *Molecular Biology of the Cell* (3rd edition). Garland Publishing, Inc., New York
2. Cooper, GM and Hawman RE. (2013). *Cell – A Molecular Approach* (6th Edition). Sinauer Associates Inc. US.
3. De Roberties E.D.P and E.M.F. De Roberties. (2011). *Cell and Molecular Biology*. 8th edition. B.I. Publications Pvt. Ltd., India
4. Karp G. (2013). *Cell and Molecular Biology – Concepts and Experiments*. John Wiley & Sons Inc. New Jersey.
5. Stephen R. B, Jeremy S. H, et.al., *Cell Biology – A short course*, 2nd Edition, John wiley & Sons Inc. New Jersey.

DIGITAL TOOLS:

<https://www.omicsonline.org/scholarly/microbial-genetics>.

<https://www.lamission.edu/lifesciences/Steven/Micro20>

<https://www.indiabix.com> Microbiology

<https://www.cellmolbiol.org>

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBCP2	LAB IN MOLECULAR BIOLOGY	CORE – 5 PRACTICAL– III	–	5	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	40	60	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	✓	Regional	✓	Global		
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability		Human Values		Other Values

COURSE DESCRIPTION:

The Laboratory of Molecular Biology studies fundamental processes to generate insight in molecular networks that modulate the development of different plant organs especially in relation to environmental interactions.

COURSE OBJECTIVES:

- To gain competence in the broad scientific theory and application of techniques associated with molecular biology and microbial genetics.
- To identify the basic microbial metabolism.
- To explore different stages of mitosis, meiosis and to isolate genomic DNA.
- To study bacterial taxonomy by using bacterial morphology and biochemical tests.
- To cultivate fungi by slide culture method

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	understand the basic techniques associated with microbial taxonomy	Upto K3
CO 2	develop and apply the protocols for basic experimental work in the field of cell and molecular biology	Upto K3
CO 3	outline the most significant molecular and cell based methods used today to extend their knowledge of biology	Upto K3
CO 4	illustrate the stages of mitosis and meiosis	Upto K3
CO 5	isolate the genomic and plasmid DNA from bacteria.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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LAB IN MOLECULAR BIOLOGY

UNIT – I:

Study of different types of DNA and RNA using micrographs and model / schematic representations. Study of semi-conservative replication of DNA through micrographs / schematic representations

UNIT – II:

Isolation of Genomic and Plasmid DNA from E. coli and Analysis by Agarose gel electrophoresis. Estimation of DNA using colorimeter (diphenylamine reagent), UV spectrophotometer (A260 measurement)

UNIT – III:

Resolution and visualization of proteins by polyacrylamide gel electrophoresis (SDS-PAGE) – Demonstration. UV induced auxotrophic mutant production and isolation of mutants by replica plating technique – Demonstration.

UNIT – IV:

Perform artificial Transformation in E. coli. Isolation of antibiotic resistant mutants by gradient plate method. – Demonstration

UNIT – V:

Screening and isolation of phages from sewage. Perform RNA isolation. Estimate RNA.

TEXT BOOKS:

1. Celis JE (ed) (1998) ***Cell Biology: A Laboratory Handbook***, 2nd edn. San Diego: Academic Press.
2. Lacey AJ (ed) (1999) ***Light Microscopy in Biology: A Practical Approach***, 2nd edn. Oxford: Oxford University Press.
3. Paddock SW (ed) (1999) ***Methods in Molecular Biology***, vol 122: Confocal Microscopy Methods and Protocols. Totowa, NJ: Humana Press.
4. Watt IM (1997) ***The Principles and Practice of Electron Microscopy***, 2nd edn, Cambridge: Cambridge University Press.
5. Hayat MA (2000) ***Principles and Techniques of Electron Microscopy***, 4th edn. Cambridge: Cambridge University Press.

REFERENCE BOOKS:

1. Cooper, G.M and Hausman, R.E. (2009). ***The Cell: A Molecular Approach***. 5th edition. ASM Press & Sunderland, Washington, D.C; Sinauer Associates, MA.
2. Karp, G. (2010). ***Cell and Molecular Biology: Concepts and Experiments***. 6th edition. John Wiley & Sons, Inc. New Jersey.
3. De Robertis, EDP and De Robertis, EMF. (2006). ***Cell and Molecular Biology***. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. Gunasekaran, P. (2008). ***Laboratory Manual in Microbiology***, New Age International (P) Ltd. Publishers, New Delhi.
5. Brown, T.A. (1998). ***Molecular Biology Lab; Gene Analysis***, Academic Press, London.



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DIGITAL TOOLS:

<https://www.biocourseware.com>

<https://www.microbiologyonline.com>

<https://www.ncbi.nlm.nih.gov/>

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBA31	BIO INSTRUMENTATION	ELECTIVE/ ALLIED – 3	4	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented			Entrepreneurship			✓
	National	✓	Local	✓	Regional	Global			✓
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability	✓	Human Values	✓	Other Values

COURSE DESCRIPTION:

The course focuses on the fundamentals of instrumentation, including the principles of operation, calibration and maintenance of biomedical instrumentation.

COURSE OBJECTIVES:

To make the students

- understand the analytical instruments and study the basic principles in the field of sciences.
- gain knowledge about principles of spectroscopy
- understand the analytical techniques of Chromatography and electrophoresis
- understand the principle of different types of scans used in medical diagnosis
- gain information about the principles of radioactivity and its measurements

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 the basics of instrumentation.	Upto K3
CO 2	exemplify the structure of atoms and molecules by using the principles of spectroscopy.	Upto K3
CO 3	evaluate by separating and purifying the components	Upto K3
CO 4	understand the need and applications of imaging techniques.	Upto K3
CO 5	categorize the working principle and applications of fluorescence and radiation.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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BIO-INSTRUMENTATION

UNIT – I:

Basic instruments: pH meter, Buffer of biological importance, Centrifuge– Preparative, Analytical and Ultra, Laminar Air Flow, Autoclave, Hot Air Oven and Incubator. Biochemical calculations– preparations of Molar solutions – Buffers– Phosphate, Acetate, TE, TAE– calculation of Normality ,PPM– Ammonium sulphate precipitation

UNIT – II:

Spectroscopic Techniques: Spectroscopic Techniques: Colorimeter, Ultraviolet and visible, Infra red and Mass Spectroscopy.

UNIT – III:

Chromatographic and Electrophoresis Techniques: Chromatographic Techniques: Paper, Thin Layer, Column, HPLC and GC. Electrophoresis Techniques: Starch Gel, AGE, PAGE

UNIT – IV:

Imaging techniques: Principle, Instrumentation and application of ECG, EEG, EMG, MRI, CT and PET scan radioisotopes

UNIT – V:

Fluorescence and radiation based techniques: Spectro fluorimeter, Flame photometer, Scintillation counter, Geiger Muller counter, Autoradiography

TEXT BOOKS:

1. Jayaraman J (2011). *Laboratory Manual in Biochemistry*, 2nd Edition. Wiley Eastern Ltd., New Delhi.
2. Ponmurugan. P and Gangathara PB (2012). *Biotechniques*.1st Edition. MJP Publishers
3. Veerakumari, L (2009). *Bioinstrumentation*– 5th Edition –.MJP publishers.
4. Upadhyay, Upadhyay and Nath (2002). *Biophysical Chemistry – Principles and Techniques* 3rd Edition. Himalaya Publishing Home.
5. Chatwal G and Anand (1989). *Instrumental Methods of Chemical Analysis*. S.Himalaya Publishing House, Mumbai.

REFERENCE BOOKS:

1. Rodney. F. Boyer (2000). *Modern Experimental Biochemistry*, 3rd Edition. Pearson Publication
2. Skoog A., West M (2014). *Principles of Instrumental Analysis* – 14th Edition W.B. Saunders Co., Philadelphia.
3. N.Gurumani. (2006). *Research Methodology for Biological Sciences*– 1st Edition – MJP Publishers.
4. Wilson K, and Walker J (2010). *Principles and Techniques of Biochemistry and Molecular Biology*.7th Edition. Cambridge University Press.

DIGITAL TOOLS:

<https://www.watelectrical.com/biosensors-types-its-working-andapplications/>
<http://www.wikiscales.com/articles/electronic-analytical-balance/>
<https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html>
<http://www.rsc.org/learn-chemistry/collections/spectroscopy/introduction>

Mapping CO with PSO CO with PSO

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

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBN31	ORGANIC FARMING & BIOFERTILISER TECHNOLOGY	SEC NME – 1	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability		✓	Skill Oriented		✓	Entrepreneurship		✓
	National		Local	✓	Regional		Global		
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values		Other Values

COURSE DESCRIPTION:

Organic farming as an integrated approach. Conversion to organic with national standards. Crop Management, Nutrient and water Management and Pest Management and inter– cropping system based farm planning. In–situ composting, mulching and recycling of organic matter in organic Agriculture.

COURSE OBJECTIVES:

- To impart knowledge about the significance of organic farming and strategies to increase the yield to conserve environment.
- To encourage organic farming in urban areas.
- To give comprehensive knowledge about bacterial biofertilizers, its advantages and future perspective and structure and characteristic features of Cyanobacteria and fungal biofertilizers.
- To develop the knowledge and skill to produce, analyze the quality of packaging, storage and assess the shelf life and bio efficacy of biofertilizers

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	become an entrepreneur with wide knowledge about farming and sustainable resources.	Upto K3
CO 2	implement organic farming in urban areas with knowledge on compost.	Upto K3
CO 3	gain knowledge about the bacterial biofertilizers and its advantages	Upto K3
CO 4	understand the significance about cyanobacterial and fungal biofertilizers	Upto K3
CO 5	understand and implement the use of bio fertilizers.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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ORGANIC FARMING & BIOFERTILISER TECHNOLOGY

UNIT – I:

Principle of organic farming: principles of health, fairness, ecological balance, and care. Environmental benefits of organic farming: sustainability– reduces non-renewable energy by decreasing agrochemical need. Biodiversity–crop rotation, intercropping. Ecological services – biological control, soil formation and nutrient cycling.

UNIT – II:

Organic farming for urban space; Create a Sustainable Organic Garden (Backyard– Square Foot Gardening, Small Space Gardening, Mini Farming) Composting, Vermicomposting

UNIT – III:

Biofertilizers: Introduction, advantages and future perspective. Structure and characteristic features of bacterial biofertilizers Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia

UNIT – IV:

Structure and characteristic features of Cyanobacteria biofertilizers– Anabaena, Nostoc; Structure and characteristic features of fungal biofertilizers– AM mycorrhiza

UNIT – V:

Production of Rhizobium, Azotobacter, Anabena; Biofertilizers – Storage, shelf life, quality control and marketing

TEXT BOOKS:

1. A.K. Sharma (2006). *Hand book of Organic Farming*
2. A.C. Gaur (2017). *Hand book of Organic Farming and Biofertilizers*
3. N.S. Subbarao (2017). *Bio-fertilizers in Agriculture and Forestry* (4th Edition) Med tech publisher
4. Subba Rao, N. S. (2002). *Soil Microbiology. Soil Microorganisms and Plant Growth.* (4th Edition), Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Dubey, R. C. (2008). *A Textbook of Biotechnology.* S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. Masanobu Fukuoka, Frances Moore Lappe Wendell Berry (2009). *The One–Straw Revolution: An Introduction to Natural Farming*, 1st edition, YRB Classics.
2. Sujit Chakrabarty (2018). *Organic Home Gardening Made Easy*, 1st Edition,
3. Singh and Purohit (2008). *Biofertilizer technology.* Agrobios, India.
4. Bansal M (2019). *Basics of Organic Farming* CBS Publisher.
5. Hurst, C.J., Crawford R.L., Garland J.L., Lipson D.A., Mills A.L. and Stetzenbach L.D. (2007). *Manual of Environmental Microbiology.* (3rd Edition). American Society for Microbiology.

DIGITAL TOOLS:

https://agritech.tnau.ac.in/org_farm/orgfarm_introduction.html.
<https://www.fao.org/organicag/oa-faq/oa-faq6/en/>
<https://www.india.gov.in/topics/agriculture/organic-farming>.
<https://agriculture.nagaland.gov.in/bio-fertilizer/>
<https://vlab.amrita.edu/index.php?sub=3&brch=272>

Mapping CO with PSO CO with PSO

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

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



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(For the students admitted from the academic year 2024 – 2025 onwards)

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBS31	AQUACULTURE	SEC	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		✓
	National		Local	✓	Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability	✓	Human Values	Other Values

COURSE DESCRIPTION:

This course aims to turn students into professionals in Aquaculture.

COURSE OBJECTIVES:

- To provide a deeper knowledge in aquaculture systems and methods.
- To explain the significance and functions of design, types and construction of aquaculture ponds
- To demonstrate the biological characteristics of various aquaculture species.
- To discuss the methods involved in post stocking management.
- To illustrate major cultivatable species for aquaculture.

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	analyze the significance and importance of aquaculture	Upto K3
CO 2	illustrate the types and construction of aquaculture ponds	Upto K3
CO 3	analyze the biological characteristics of species and choose the best species for aquaculture.	Upto K3
CO 4	follow methods involved for optimal growth of aquaculture species	Upto K3
CO 5	summarize major species suitable for aquaculture in a particular environment	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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AQUACULTURE

UNIT – I:

Aquaculture Systems and Methods – Scope and definition. Traditional, extensive, semi – intensive and intensive culture. Monoculture, polyculture, composite culture, mixed culture, mono–sex culture, cage culture, pen culture, raft culture, race way culture.

UNIT – II:

Aquaculture Engineering – Design and construction of pond, layout and design of aquaculture farm, construction, water intake system, drainage system – aeration and aerators. Ponds – Types of ponds.

UNIT – III:

Selection of Species – Biological characteristics of aquaculture species; economic and market considerations; seed resources, collection and transportation. Pre–Stocking Management–Sun drying, ploughing / tilling, desilting, liming and fertilization. eradication of weed fishes. Stocking – Acclimatization of seed and release – species combinations – stocking density and ratio.

UNIT – IV:

Post Stocking Management – Water and soil quality parameters required for optimum production, control of aquatic weeds and aquatic insects, algal blooms and microorganisms. Food conversion ratio (FCR). Growth – Measurement of growth, length – weight relationship.

UNIT – V:

Major cultivable species for aquaculture –Culture of Indian Major Carps. Culture of Giant fresh water prawn, *Macrobrachium rosenbergii* – seed collection formation sources. Hatchery management. Culture of tiger shrimp, *Penaeus monodon* and *Litopenaeus Vannamei*. Culture of pearl oysters. Culture of sea weeds. Methods of Crab culture. Culture of ornamental fishes. Culture of Molluscs

TEXT BOOKS:

1. Santhanam, R. Velayutham, P. Jegatheesan, G. A (2019). ***Manual of Freshwater Ecology: An Aspect of Fishery Environment***. Daya Publishing House, New Delhi.
2. Stickney, R.R. (2016). ***Aquaculture: An Introductory Text***. 3rd Edition. Centre for Agriculture and Bioscience International Publishing.
3. Ackefors H., Huner J and Konikoff M. (2009). ***Introduction to the General Principles of Aquaculture***. CRC Press.
4. Mushlisin Z. A. (2012). ***Aquaculture***. In Tech.
5. Akpaniteaku R.C. (2018). ***Basic Handbook of Fisheries and Aquaculture***. AkiNik Publications

REFERENCE BOOKS:

1. Arumugam N. (2014). ***Aquaculture***. Saras Publication.
2. Pillay T. V. R. and Kutty M.N. (2005). ***Aquaculture: Principles and Practices***. 2nd Edition. Wiley India Pvt. Ltd.
3. Tripathi S. D., Lakra W.S. and Chadha N.K. (2018). ***Aquaculture in India***. Narendra Publishing House.
4. Rath R.K.(2011). ***Fresh Water Aquaculture***. 3rd Edition. Scientific Publishers.
5. Lucas J. S., Southgate P.C. and Tucker C.S. (2019). ***Aquaculture: Farming Aquatic Animals and Plants***. Wiley Blackwell



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DIGITAL TOOLS:

Aquaculture: Types, Benefits and Importance (Fish Farming) – Conserve Energy Future (conserve-energy-future.com)

Fisheries Department – Tamil Nadu (tn.gov.in)

Aquaculture – Google Books

aquaculture | Definition, Industry, Farming, Benefits, Types, Facts, & Methods | Britannica

Fisheries & Aquaculture (investindia.gov.in)

Mapping CO with PSO

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

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



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COURSE STRUCTURE – IV SEMESTER

S. No.	Course Code	Part	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT41	I	Tamil – பொதுத் தமிழ் – IV	6	3	25	75	100	3
	24UACH41		Hindi – General Hindi – IV						
	24UACS41		Sanskrit – Alankara, Didactic & Modern Literature and Translation						
2	24UACE41	II	English – General English – IV	6	3	25	75	100	3
3	24UMBC41	III	Core – 6: Immunology and Immunotechnology	5	3	25	75	100	5
4	24UMBCP3		Core – 7: Core Practical – IV: Lab in Immunology and Immunotechnology	5	3	40	60	100	5
5	24UMBA41		Elective/Allied – 4: Food Processing Technology	4	3	25	75	100	4
6	24UMBN41	IV	SEC: NME – 2: Clinical Laboratory Technology	2	3	25	75	100	2
7	24UMBS41		SEC: Vaccine Technology	2	3	25	75	100	2
8		V	Extension Activity	–	–	–	–	100	1
			TOTAL	30				800	25

*All students will do internship after IV Semester. The evaluation will be done in the beginning of V Semester and marks will be included in the V Semester mark sheet.

CA – Class Assessment (Internal)

SE – Summative Examination

SEC – Skill Enhancement Course

DS – Discipline Specific

NME – Non –Major Elective

T – Theory

P – Practical

Passed in the BoS Meeting held on 27/02/2025

Signature of the Chairman



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBC41	IMMUNOLOGY AND IMMUNOTECHNOLOGY	CORE – 6	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability			Skill Oriented		✓	Entrepreneurship				
	National		Local	✓	Regional		Global				
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values		Other Values		

COURSE DESCRIPTION:

The course introduces students to a wide range of topics in immunology starting from cells of immune system, innate and adaptive immune systems, humoral immunity, antibody structure and function, basic immunological techniques, autoimmunity, hypersensitivity and vaccine production

COURSE OBJECTIVES:

- To give knowledge about immune system, organs of immunity and cells involved.
- To distinguish the types of antigens and antibodies; their properties.
- To provide in–depth knowledge on immuno–techniques.
- To discuss the role of MHC system in transplantation; functions of Tumor specific antigens.
- To impart knowledge on immunological disorders.

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	assess the fundamental concepts of immunity, contributions of the organs and cells in immune responses.	Upto K3
CO 2	investigate the structures of ag and ab; immunization.	Upto K3
CO 3	justify the immunoassay and immuno techniques.	Upto K3
CO 4	explain about the immunologic processes governing graft rejection and therapeutic modalities for immunosuppression in transplantation	Upto K3
CO 5	analyze the overreaction by our immune system leading to hypersensitive conditions and its consequences	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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IMMUNOLOGY AND IMMUNOTECHNOLOGY

UNIT – I:

Organs and Cells in Immune System and Immune Response: Primary lymphoid organs, secondary lymphoid organs, and lymphoid tissues; T – cell and B –cell membrane bound receptors – apoptosis; T – cell processing, presentation and regulation; T –cell subpopulation, properties, functions and T – cell suppression; Physiology of immune response– innate, humoral and cell mediated immunity; Immunohematology.

UNIT – II:

Antigen and Antibody:Antigens – Properties of haptens, epitopes, adjuvants, and cross reactivity; Antibodies– structure, properties, classes; Antigen and Antibody Reactions: precipitation, agglutination, complement fixation, opsonization, neutralization; Vaccines – active and passive immunization; Classification of vaccines; Other approaches to new vaccines; Types of vaccine – antibacterial, antiviral; Vaccination schedule.

UNIT – III:

Immunoassay and Immunotechniques – Preparation and standardization of bacterial antigens; Raising of monoclonal and polyclonal antibodies; Purification of antibodies. Immunotechniques – RIA, RAST, ELISA, Immuno fluorescence techniques and Flow cytometry

UNIT – IV:

Transplantation and TumorImmunology – MHC Antigens – structure and function; HLA system – Regulation and response to immune system; Transplantation immunology – tissue transplantation and grafting; Mechanism of graft acceptance and rejection; HLA typing; Tumor specific antigens; Immune response to tumors; Immune diagnosis; cancer immune therapy.

UNIT – V:

Immunological disorders and diseases – Hypersensitivity reactions (Type I, II, III and IV); acquired immunodeficiency syndrome; Auto immune disorders and diseases: organ specific and non–organ specific.

TEXT BOOKS:

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



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REFERENCE BOOKS:

1. Janeway Travers. (1997). *Immunobiology – The Immune System in Health and Disease*. Current Biology Ltd. London, New York. 3rd Edition.
2. Peter J. Delves, Seamus Martin, Dennis R. Burton, Ivan M. Roitt. (2006). *Roitt's Essential Immunology*, 11th Edition., Wiley–Blackwell.
3. William R Clark. (1991). *The Experimental Foundations of Modern Immunology*. 3rd Edition. John Wiley and Sons Inc. New York.
4. Frank C. Hay, Olwyn M. R. Westwood. (2002). *Practical Immunology*, 4th Edition., Wiley–Blackwell.
5. Noel R. Rose, Herman Friedman, John L. Fahey. (1986). *Manual of Clinical Laboratory Immunology*. ASM. 3rd Edition.

DIGITAL TOOLS:

<https://www.ncbi.nlm.nih.gov/books/NBK279395/>

<https://med.stanford.edu/immunol/phd-program/ebook.html>

<https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall2005/pages/lecture-notes/>

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBPC3	LAB IN IMMUNOLOGY AND IMMUNOTECHNOLOGY	CORE – 7 PRACTICAL – IV	-	5	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	✓	Regional		Global		
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values	✓	Other Values

COURSE DESCRIPTION:

The theoretical and practical application of identify Blood group and typing, antigen & antibody reactions in electrophoresis and separation of lymphocytes

COURSE OBJECTIVES:

- To give hands-on knowledge to identify Blood group and typing.
- To make the students acquire adequate skill to perform latex agglutination reactions.
- To analyze precipitation reactions in gels.
- To investigate the antigen & antibody reactions in electrophoresis.
- To familiarize with Separation of Lymphocytes.

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	assess the blood groups and types	Upto K3
CO 2	competently perform serological diagnostic tests such as RF, ASO, CRP	Upto K3
CO 3	Illustrate the antigen antibody reactions in gel	Upto K3
CO 4	compare & contrast antigens and antibodies in electrophoresis	Upto K3
CO 5	examine the concept of ELISA	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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LAB IN IMMUNOLOGY AND IMMUNOTECHNOLOGY

UNIT – I:

Identification of blood group and typing. Coomb's test. TPHA

UNIT – II:

T cell identification (Demonstration) Latex Agglutination reactions– RF, ASO, CRP

UNIT – III:

Ouchterlony's Double Diffusion Method (antigen pattern). Single Radial Immuno Diffusion Method.

UNIT – IV:

Electrophoresis – Serum, Counter and Immuno.

UNIT – V:

Separation of Lymphocytes by gradient centrifugation method. ELISA: Hepatitis/ HIV

TEXT BOOKS:

1. Talwar. (2006). *Hand Book of Practical and Clinical Immunology*, Vol. I, 2nd edition, CBS.
2. Asim Kumar Roy. (2019). *Immunology Theory and Practical*, Kalyani Publications.
3. Richard Coico, Geoffrey Sunshine, Eli Benjamini. (2003). *Immunology – A Short Course*. 5th Edition., Wiley–Blackwell, New York.
4. Judith A.Owen, Jenni Punt, Sharon A. Stranford, Janis Kuby. (2013). *Immunology*, 7th Edition., W. H. Freeman and Company, New York.
5. Pravash Sen. Gupta. (2003). *Clinical Immunology*. Oxford University Press.

REFERENCE BOOKS:

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

DIGITAL TOOLS:

https://www.researchgate.net/publication/275045725_Practical_Immunology_A_Laboratory_Manual

[https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelingerlab/documents/Immunology-Lab-](https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelingerlab/documents/Immunology-Lab-Manual.pdf)

[Manual.pdfhttps://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab_manual.pdf](https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab_manual.pdf)

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBA41	FOOD PROCESSING TECHNOLOGY	ELECTIVE/ ALLIED – 4	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneur ship		✓
	National	✓	Local	✓	Regional	✓	Global	✓
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values	Other Values

COURSE DESCRIPTION:

This course aims to provide Knowledge in food preservation. Methods for the microbiological examination of foods and Importance of fats and oils in Food

COURSE OBJECTIVES:

- To provide knowledge on objectives of food preservation.
- To explain the freshness criteria and quality assessment of meat and fish.
- To outline the methods of milk processing and fermented milk products.
- To explain the importance of fat and oil processing.
- To discuss the methods of microbiological examination of foods.

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	assess the fundamental concepts of food preservation	Upto K3
CO 2	investigate the quality assessment of meat and fish.	Upto K3
CO 3	design the processing of milk and milk quality assessment.	Upto K3
CO 4	explain about the importance of fats and oils.	Upto K3
CO 5	plan the food safety and adulteration detection.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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FOOD PROCESSING TECHNOLOGY

UNIT– I:

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

UNIT– II:

Freshness criteria and quality assessment of meat and fish –spoilage and methods of preservation. Production of byproducts after processing waste and their utilization. Role of packaging material, types of packaging material.

UNIT– III:

Composition of milk; assessment of milk, thermal processing of fluid milk–pasteurization (LTH, HTST&UHT techniques). Fermented milk products–cheese, Butter milk, Yogurt, Kumis, Kefir and Acidophilus milk. Hygiene and sanitation requirement in food processing and fermentation industries.

UNIT– IV:

Importance of fats and oils in Food–Extraction of fats and Oils–Rendering, pressing, solvent extraction, pressing of oil– degumming, refining, bleaching, deodorization, fractionation, pyrolysis of fats, toxicity of frying oil.

UNIT– V:

Methods for the microbiological examination of foods. Food borne illness and diseases. Microbial cultures for food fermentation. Indian Factories Act on safety, HACCP, Safety from adulteration of food.

TEXT BOOKS:

1. Vantina Sharma. (2006). *Text Book of Food Science and Technology*, International Book Distributing Co, Lucknow, UP.
2. Sivasankar. (2005). *Food Processing and Preservation*, 3rd Edition., Prentice hall of India Pvt Ltd, New Delhi.
3. Ramaswamy .H & Marcotte M. (2006). *Food Processing: Principles & Applications*. Taylor & Francis.
4. NIIR Board of Food and Technologist. (2005). *Modern Technology of Food Processing and Agro based Industries*, National Institute of Industrial Research, Delhi.
5. Adams M.R. and Moss M. O (2007). *Food Microbiology*. New Age International



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REFERENCE BOOKS:

1. Fellos PJ. (2005). *Food Processing Technology: Principle & Practice* 2nd Edition. CRC
2. Peter Zeuthen and Leif Bogh-Sorenson. (2005). *Food Preservation Techniques*, Woodland Publishing Ltd, Cambridge, England.
3. Gustavo V. Barbosa-Canovas, Maria S. Tapia, M. Pilar Cano. (2004). *Novel Food Processing Technologies*, CRC.
4. Suman Bhatti, Uma Varma. (1995). *Fruit and Vegetable Processing Organizations And Institutions*, 1st Edition., CBS Publishing, New Delhi.
5. Mirdula Mirajkar, Sreelatha Menon. (2002). *Food Science and Processing Technology* Vol-2, Commercial processing and packaging, Kanishka publishers, New Delhi.

DIGITAL TOOLS:

- <https://sites.google.com/a/uasd.in/ecourse/food-processing-technology>
- <https://nptel.ac.in/courses/126105015>
- <https://engineeringinterviewquestions.com/biology-notes-on-food-adulteration/>

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBN41	CLINICAL LABORATORY TECHNOLOGY	SEC NME	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented			✓	Entrepreneurship		
	National	✓	Local	✓	Regional	✓	Global		
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values	✓	Other Values

COURSE DESCRIPTION:

This course provides practical and theoretical knowledge on diagnosing, treating, and preventing various diseases and health problems using clinical laboratory tests.

COURSE OBJECTIVES:

To make the students

- demonstrate ethical and professional conduct with patients, laboratory personnel, health– care professionals, and the public.
- explain how accurate and reliable information might be obtained about proper procurement, storage, and handling of laboratory specimens.
- develop a sound scientific knowledge foundation that prepares them to interpret, analyze and evaluate scientific knowledge in clinical practice
- perform a full range of laboratory tests with accuracy and precision.
- establish quality assurance principles and practices to ensure the accuracy and reliability of laboratory information



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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	describe characteristics of laboratory organizations and demonstrate professionalism by displaying professional conduct, model ethical behavior and operate as a vital member of the medical lab team. Practice safety or infection control procedures in the clinical laboratory, properly use safety equipment and maintain a clean, safe work environment	Upto K3
CO 2	accurately collect specimens for various purposes. Determine appropriate tests based on test request, Maintain standard and transmission-based precautions, Engage in the scientific process by understanding the principles and practices of clinical study design, implementation, and dissemination of results.	Upto K3
CO 3	identify the basic structure of cells, tissues and organs and describe their contribution to normal function. Interpret light and electron microscopic histological images and identify the tissue source and structures. Relate and recognize the histological appearance of affected tissues to the underlying pathology	Upto K3
CO 4	recognize the pathologies behind benign and malignant disorders of erythrocytes, leucocytes, thrombocytes and familiar with the diagnosis, evaluation, and management of hematologic malignancies.	Upto K3
CO 5	interpret, implement, and complying with laws, regulations and accrediting standards and guidelines of relevant governmental and non-governmental agencies.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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CLINICAL LABORATORY TECHNOLOGY

UNIT – I:

Introduction to Clinical Laboratory Science: Basic laboratory principles – Code of conduct for medical laboratory personnel – Organization of clinical laboratory and role of medical laboratory technician – Safety measures. Assessment of a patient and brief history of collection. Maintenance of Hygiene & Infection Control Practices.

UNIT – II:

Specimen collection and processing – Blood, urine, stool, sputum CSF, amniotic fluid and bile. Separation of serum and plasma, Handling of specimens for testing, preservation of specimens, transport of specimens and factors affecting the clinical results.

UNIT – III:

Introduction to histopathology–Methods of examination of tissues and cells, Fixation of tissues: Classification and properties of fixatives. Tissue processing – Collection of specimens, Labeling and fixation, Dehydration, Clearing, Impregnation, Embedding – Paraffin block making, Section Cutting, Microtomes – types and mounting of sections

UNIT – IV:

Introduction to Haematology– Laboratory methods used in the investigation of coagulation disorders – coagulation tests , Routine coagulation tests, (prothrombin time , plasma recalcification time, partial thromboplastic time , activated partial thromboplastin time, thrombin time), Laboratory diagnosis of bleeding disorders. Estimation of fibrinogen, Assay of coagulation factors

UNIT – V:

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

TEXT BOOKS:

1. Mukharji,K.L. (2000).**Medical Laboratory Techniques**, Vol – I, II & III, 5th Edition. Tata McGrawHill, Delhi.
2. Ochei,A., Kolhatkar.A. (2000).**Medical Laboratory Science: Theory and Practice**, McGraw Hill Education.
3. RamnikSood (2015). **Concise Book of Medical Laboratory Technology: Methods and Interpretation**, 2nd Edition, Jaypee Brothers Medical Publishers, New Delhi.
4. S.Ramakrishnan, K. N Sulochana (2012)., **Manual of Medical Laboratory Techniques** Jaypee Brothers Medical Publishers Pvt. Ltd
5. Talib V.H. (2019).**Handbook Medical Laboratory Technology**, 2nd Edition, Directorate of health services, Government of India.



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REFERENCE BOOKS:

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

DIGITAL TOOLS:

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

Mapping CO with PSO

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

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



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UMBS41	VACCINE TECHNOLOGY	SEC	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local	✓	Regional	✓	Global	
Curriculum Enrichment	Professional Ethics	✓	Gender		Environment and Sustainability	✓	Human Values	✓ Other Values

COURSE DESCRIPTION:

This course introduces the basic principles of vaccination and manufacturing of viral vaccines. Also, the course will provide an overview of the advanced strategies to respond to the challenges of new and established viral infection diseases.

COURSE OBJECTIVES:

- To provide knowledge on the basics of immunization and induction of immunity
- To teach the types of vaccines, its immunological effects and regulatory guidelines.
- To teach the role of rDNA in vaccine technology
- To provide the knowledge on conventional to recent technology of vaccine production
- To teach about ethical issues and regulations in vaccine production and clinical trials

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	explain the significance of critical antigens, immunogens and adjuvants in developing effective vaccines	Upto K3
CO 2	understand the types of vaccines.	Upto K3
CO 3	construct vaccine applying rDNA technology.	Upto K3
CO 4	formulate the strategies for developing an innovative vaccine technology with different mode of vaccine delivery.	Upto K3
CO 5	evaluate the regulatory issues and guidelines for the management of vaccine production.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLYING



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VACCINE TECHNOLOGY

UNIT – I:

History of vaccination, Active and passive immunization; requirements for induction of immunity, Epitopes, linear and conformational epitopes, characterization and location of APC, MHC and immunogenicity,

UNIT – II:

Viral/bacterial/parasite vaccine differences, methods of vaccine preparation – Live, killed, attenuated, sub unit vaccines; Licensed vaccines, Viral Vaccine – Poliovirus vaccine– inactivated & Live, Rabies vaccines, Hepatitis A & B vaccines, Bacterial Vaccine – Anthrax vaccines, Cholera vaccines, Diphtheria toxoid, Parasitic vaccine – Malaria Vaccine.

UNIT – III:

Vaccine technology– Role and properties of adjuvants, recombinant DNA and protein–based vaccines, plant based vaccines, reverse vaccinology; Peptide vaccines, conjugate vaccines. Recent advances in Malaria, Tuberculosis, HIV

UNIT – IV:

Fundamental research to rational vaccine design. Antigen identification and delivery, T–Cell expression cloning for identification of vaccine targets for intracellular pathogens, Rationale vaccine design based on clinical requirements: Scope of future vaccine strategies.

UNIT – V:

Vaccine additives and manufacturing residuals, Regulation and testing of vaccines, Regulation of vaccines in developing countries, Quality control and regulations in vaccine research, Animal testing, Rational design to clinical trials, Large scale production, Commercialization. Vaccine safety ethics and Legal issues

TEXT BOOKS:

1. Ronald W. Ellis.(2001). *New Vaccine Technologies*. Landes Bioscience.
2. Cheryl Barton. (2009). *Advances in Vaccine Technology and Delivery*. Espicom Business Intelligence.
3. Male, David. Ed. (2007). *Immunology*. 7th Edition. Mosby Publication.
4. Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. Osborne. (2002). *Immunology*. 6th Edition, Freeman.
5. Brostoff J, Seaddin JK, Male D, Roitt IM. (2002). *Clinical Immunology*. 6th Edition, Gower Medical Publishing.



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REFERENCE BOOKS:

1. Stanley A. Plotkin, Walter Orenstein & Paul A. Offit. (2013). *Vaccines*, 6th Edition. BMA Medical Book Awards Highly Commended in Public Health. Elsevier Publication.
2. Coico, R. et al. (2003). *Immunology: A Short Course*. 5th Edition, Wiley – Liss.
3. Parham, Peter. (2005). *The Immune System*. 2nd Edition, Garland Science.
4. Abbas, A.K. et al. (2007). *The Cellular and Molecular Immunology*. 6th Edition, Sanders / Elsevier.
5. Weir, D.M. and Stewart, John (2000). *Immunology*. 8th Edition, Churchill Pvt. Ltd.

DIGITAL TOOLS:

<https://www.slideshare.net/adammbbs/pathogenesis-3-rd-internal-updated-43458567>
<https://www.bio.fiocruz.br/en/images/stories/pdfs/mpti/2013/selecao/vaccineprocessstechnology.pdf>
https://www.dcvmn.org/IMG/pdf/ge_healthcare_dcvmn_introduction_to_pd_for_vaccine_production_29256323aa_10mar2017.pdf
<https://www.sciencedirect.com/science/article/pii/B9780128021743000059>

Mapping CO with PSO

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

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