

SadakathullahAppa College

(Autonomous)

(Reaccredited by NAAC at an 'A' Grade. An ISO 9001:2015 Certified Institution)

Rahmath Nagar, Tirunelveli- 11.

Tamil Nadu.

DEPARTMENT OF MICROBIOLOGY



CBCS SYLLABUS

For

B.Sc. Microbiology

(Applicable for students admitted in June 2021 and onwards)

(As per the Resolutions of the Academic Council Meetings

held on 15.03.2021)

CBCS Syllabus – B.Sc. Microbiology
(2021-22 onwards)

SEM	Part	P	Title of the paper	S. Code	H/W	L*	T*	P*	C	Marks		
										I	E	T
I	I	I L-I	இக்காலத்தமிழ்	21ULTA11	6				3			
			Grammar and Translation - I	21ULAR11								
	II	II L-I	Communicative English - I	21ULEN11	4				4			
	III	DSC-I	Microbial world and Bacteriology	21UCMB11	4	3	1		4			
	III	DSC-II	Virology , Mycology, Phycology and Parasitology	21UCMB12	4				4			
	III	P-I	Techniques in Microbiology	21UCMB1P1	2				2			
	III	A-I/1	Aquatic Microbiology	21UAMB11	4				1			
	III	A-I/1P	Techniques in Aquatic Microbiology	21UAMB1P1	2				2			
IV	AECC-I	Value Education-I	21USVE1A	2				2				
		Value Education-II	21USVE1B									

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)
(REACCREDITED BY NAAC WITH 'A' GRADE AND ISO 9001:2008
CERTIFIED INSTITUTION)
RAHMATH NAGAR, TIRUNELVELI – 627 011.
DEPARTMENT OF MICROBIOLOGY
SYLLABUS (CBCS)
B.Sc. (MICROBIOLOGY) (2021-2024)
For those who join the course from June 2021 onwards.

1. Objectives of the Course

The objective of the course is to create awareness in the field of microbiology and cultivate scientific approach and research aptitude among the students in various subjects of microbiology and emerging extensions of research activities. The course involves the study of microorganisms with particular emphasis on the biology of bacteria, viruses, fungi and protozoan parasites. Group projects are included in the course so that the candidates know about the flavor of research methodology in science.

2. Eligibility for Admission

B.Sc. Microbiology is a 3-year full-time undergraduate course in Microbiology. Eligibility for the course is 10+2 or an equivalent examination in a science stream from a recognized board with a minimum aggregate of 55% of marks.

Knowledge

The candidate

- has substantial knowledge in biology.
- has advanced knowledge in relevant fields of microbiology
- familiar with contemporary research within various fields of microbiology.

Skills

The candidate

- has the background and experience required to model and analyze experimental methods in microbiology
- is able to apply advanced theoretical and/or experimental methods
- can combine and use knowledge from several disciplines.
- can critically and independently assess and evaluate research methods and results.
- has the ability to develop and renew scientific competence.

General competence

The candidate

- understands the role of microorganisms in environment and has the background to consider environmental problems.
- knows the historical development of microbiology, its possibilities and limitations, and understands the value of lifelong learning.
- is able to gather, assess, and make use of new information.
- has the ability to successfully carry out advanced tasks and projects, both independently and in collaboration with others, and also across disciplines.

Programme Learning Outcomes (PLO)
(Aligned with Graduate Attributes)
for
Bachelor of Science (B.Sc.)
in
**Mathematics, Physics, Chemistry, Zoology, Computer Science,
Information Technology, Microbiology, Nutrition and Dietetics,**
and
Bachelor of Computer Applications (B.C.A)

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The students graduating with the Degree B.Sc / B.C.A will be able to:

PLO 1: Disciplinary Knowledge

- Acquire scientific knowledge and the understanding of major concepts and theoretical principles.

PLO 2: Creative Thinking and Practical Skills / Problem Solving Skills

- Enrich skills of observation / research related skills to draw logical inferences from scientific experiments/ programming and skills of creative thinking to develop novel ideas.
- Hone problem solving skills in theoretical, experimental and computational areas and to apply them in research fields and in real life situations.

PLO 3: Sense of inquiry and Skilled Communicator

- Develop the capability for raising appropriate questions relating to the current/emerging issues encountered in the scientific field and to plan, execute and express the results of experiments / investigations through technical writings as well as through oral presentations.

PLO 4: Ethical Awareness / Team Work / Environmental Conservation and Sustainability

- Equip them for conducting work as an individual / as a member, or as a leader in diverse teams upholding values such as honesty and precision and thus preventing unethical behaviours such as fabrication, falsification, misrepresentation of data, plagiarism etc. to ensure academic integrity.
- Realise that environment and humans are dependent on one another and to know about the responsible management of our ecosystem for survival, and for the well-being of the future generation as well.

PLO 5: Usage of ICT/ Lifelong Learning / Self-Directed Learning

- Inculcate the habit of learning continuously through the effective adoption of ICT to update knowledge in the emerging areas in Sciences for inventions/discoveries and also to engage in remote / independent learning.

Programme Specific Outcomes

PSO	Upon completion of B.Sc. Microbiology Degree Programmes, the students will be able to:	PLOs Mapped
PSO-1	Acquire sound knowledge in classification, taxonomy, structure, types of microorganisms and various fields of Applied Sciences.	PLO-1
PSO-2	Develop Experimental/Clinical/Problem solving skills to identify microorganisms in food, dairy, water and pharmaceuticals, microbial and molecular characterization, to diagnose and treat diseases.	PLO-2
PSO-3	Present the results of experiments/investigations effectively through technical writings as well as through oral presentations.	PLO-3
PSO-4	Utilize various bio-wastes, marine sources as raw material for the production of various fermented products to reduce accumulation of wastes in the environment. Educate the public about various diseases and preventive measures.	PLO-4
PSO-5	Use ICT for updation of knowledge in current/emerging areas and to become skilled professionals.	PLO-5

Semester – I

Course Title	MICROBIAL WORLD AND BACTERIOLOGY
Total Hrs.	60
Hrs./Week	4
Sub.Code	21UCMB11
Course Type	Discipline Specific Core
Credits	4
Marks	100

General Objective:

The course deals with the History and Scope of Microbiology, Microscope, Sterilization, Growth Media, Culture and Staining Techniques, Structure of the Cell Organelles, Bacterial Systematics and Assorted Characteristics of Prokaryotic Organisms.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Understand the development of microbiology.
CO-2	Illustrate the parts, working principles and applications of microscopes.
CO-3	Choose the methods of sterilization and culture techniques.
CO-4	Explain the structure, taxonomic order and classification of bacteria.
CO-5	Classify Archaeobacteria and Eubacteria based on general, cultural and biochemical characteristic features.

UNIT I: HISTORY AND MICROSCOPY (12 hours)

History and Scope of Microbiology – Spontaneous generation, Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Zobell, Alexander Fleming, Winogradsky – Recent contributions – Haeckel's three kingdom concept, Whittaker's five kingdom concept. Microscopy Principles and applications of simple, bright field, dark field, phase contrast, fluorescent and electron microscopy.

UNIT II: STERILIZATION AND CULTURE TECHNIQUES (12 hours)

Sterilization Instruments, Principles and methods – Physical moist heat, dry heat, filtration, Tyndallization, radiations and Chemical alcohols, aldehydes, phenols, halogens, metallic salts, gases and hypochlorite's. Culture techniques Serial dilution, Isolation and Purification - Spread, Pour, Streak technique. Preservation of microorganisms Slant, Lyophilization, Cryopreservation. Types of growth media Composition and purpose - General, Selective and differential media - Nutrient, MacConkey agar, Enrichment – blood agar. Transport media - Stuart's media.

UNIT III: CELL ORGANELLES AND STAINING METHODS (12 hours)

Structure and function of Prokaryotic cell and its components - Slime and capsule, Cell wall of Gram-positive and negative bacteria, the cytoplasmic and plasma membrane (fluid mosaic), mesosomes, flagella, Pilus, fimbriae, ribosomes, carboxysomes, sulfur granules, glycogen, polyphosphate bodies, fat bodies, gas vesicles; capsules, spores-endospores, exospores, biofilm. Staining principles – Simple, Negative, Gram and Spore staining.

UNIT IV: TAXONOMY AND BACTERIAL SYSTEMATICS (12 hours)

Major Characteristics of bacteria Morphological, Cultural, chemical, Metabolic, Antigenic, Genetic, Pathogenicity - Ecological characteristics. Microbial Classification Nomenclature, Classification and Identification - Taxonomic order. Bacterial classification – Goals, General methods, - Intuitive, Numerical taxonomy and Genetic relatedness, Bergy's Classification, Phenotypic and genotypic.

UNIT V: ARCHAEBACTERIA AND EUBACTERIA (12 hours)

Archaeobacteria General characteristics, phylogenetic overview, genera belonging to Crenarchaeota (*Sulfolobus*) and Euryarchaeota Methanogens (*Methanobacterium*), Thermophiles (*Thermococcus*) and Halophiles (*Halobacterium*).

Eubacteria Cultural and Biochemical characters of aerobic Gram positive (cocci – *Streptococcus sp*, rod – *Bacillus sp*), Gram negative (cocci – *Neisseria sp*, rod – *Pseudomonas sp*). Anaerobic gram positive (Cocci – *Peptostreptococcus sp*, rod – *Clostridium sp*), Gram negative (Cocci – *Veillonella sp*, Rod – *Bacteroides sp*). Facultative – *Escherichia coli*, *Spirochetes*, *Mycoplasma*, *Rickettsia*. Difference between Archea and Eubacteria.

Textbooks:

1. Dubey, R.C. and Maheswari, S. *A Text Book of Microbiology*. S. Chand and Co, New Delhi. 2003.
2. Kanika, S. *Textbook of Microbiology – Tools and Techniques*. (1st edn), Ane Books Pvt. Ltd, New Delhi. 2011.
3. Pelczar, M.J. *et al., Microbiology*. McGraw- Hill Inc New York. 1993.
4. Power, C.B. Dagina, W. *General Microbiology Volume I*. (2ndedn), Himalaya Publishing House, Delhi.2010.

Reference Books:

1. Atlas, R. *Principles of Microbiology* (2ndedn), Wm.C. Brown publishers. 1997.
2. Prescott, L. M. *et al., Microbiology. 9th edition*. McGraw- Hill Inc, New York. 2013.
3. Salle, A.J. *Fundamental Principles of Bacteriology*. (7thedn), Tata McGraw-Hill Publications Ltd. 1984.
4. Stanier, Y. *et al., General Microbiology*. MacMillan Press LTD, Houndmills, Basingstoke, Hampshire, London. 1999.

Course Outcomes (CO)

CO No	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification
CO-1	Outline the historical events of microbiology.	1,2,3,5	Understanding
CO-2	Demonstrate the parts of microscope, types and its working principle of microscope.	1,2,5	Applying
CO-3	Choose the basic techniques including sterilization, staining and culturing microorganisms.	1,2,3,5	Applying
CO-4	Explain the structure, taxonomic order and classification of bacteria.	1,2,5	Analyzing
CO-5	Interpret the bacteria based on cultural and biochemical characteristic features.	1, 2,5	Evaluating

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit		
I	21UCMB11	Microbial World And Bacteriology					60	4		
Course Outcomes (COS)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO1	PLO2	PLO3	PLO4	PLO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO-1	✓	✓	✓	✓	✓	✓	✓			✓
CO-2	✓	✓	✓	✓	✓	✓	✓			✓
CO-3	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO-4	✓	✓	✓	✓	✓	✓	✓			✓
CO-5	✓	✓	✓	✓	✓	✓	✓			✓
	Number of matches (✓) = 41 Relationship = High Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by
Name : Dr.K.Chitra

Signature :

Checked by
Dr.R.Janet Rani
Head of the Department

Semester – I

Course Title	Virology, Mycology, Phycology and Parasitology
Total Hrs.	60
Hrs./Week	4
Sub.Code	21UCMB12
Course Type	Discipline Specific Core
Credits	4
Marks	100

General Objective:

The course focuses on the basic characteristics, Structure, Classification, Nomenclature, Properties and Life cycle of Viruses, Fungi, Algae and Parasites.

Course Objectives:

The learners will be able to:

CO	Course Objectives
CO-1	Understand the basic characters, structures, classification, properties and economic importance of viruses.
CO-2	Instruct the replication of bacterial viruses.
CO-3	Demonstrate the basic characters, structures and classification of algae.
CO-4	Categorise the basic characters, structures and the classification of fungi.
CO-5	Perform the diagnosis and treatment of parasitic diseases.

UNIT I: BASICS OF VIROLOGY (12 hours)

Virology Discovery of viruses, nature and definition of viruses, general properties, concept of virion, prions. Structure of viruses. Viral taxonomy – Casjens and Kings Classification and nomenclature of different groups of viruses. Isolation, purification and cultivation of Viruses.

UNIT II: PLANT, ANIMAL, INSECT AND BACTERIAL VIRUS (12 hours)

Salient features, Classification, nomenclature and properties of plant virus (Cauliflower mosaic virus, Potato spindle tuber virus), Animal virus (Adeno virus, SARS virus, Rhabdo virus) Insect virus (NPV, CPV). Bacteriophages - lytic and lysogenic phages (T4 and lambda phages).

UNIT III: PHYCOLOGY (12 hours)

Algae – General characteristics, structure, FRITCH classification, Blue Green Algae (*Nostoc*), Red algae (*Gracilaria*), Euglenophyta (*Euglena*), Chrysophyta (*Diatom*), Phaeophyta (*Sargassum wightii*), Rhodophyta (*Chondrus crispus*), Unicellular (*Chlorella*) Economic Importance.

UNIT IV: MYCOLOGY (12 hours)

Fungi – General Characters, Morphology, Alexopoulos classification and their general features - reproduction – filamentous fungi (Actinomycetes), molds(*Aspergillus*), macroscopic fungi (mushroom-*Agaricusbisporus*) – unicellular fungi (Yeast-*Saccharomyces cerevisiae*) Economic Importance.

UNIT V: PARASITOLOGY (12 hours)

Distinguishing characters, structure and classification, life cycle, lab diagnosis, treatment for the following: *Entamoeba* sp, *Leishmania* sp, *Giardia* sp and *Trichomonas* sp. *Helminthescestodes* (*Taenia solium*) Nematodes (*Ascaris lumbricoides*).

Textbooks:

1. Bilgrami, K.S.,and Sinha R.K.*Essentials of Microbiology*, CBS Publishers. 2010.
2. Pelczar Jr, M.J.,et al. *Microbiology*- McGraw- Hill Inc, New York. 1993.
3. Power CB, DaginaWala. *General Microbiology* Volume II, Himalaya Publishing House, Delhi. 2010.
4. Power CB,DaginaWala.*General Microbiology* Volume I, Himalaya Publishing House, Delhi. 2010.

REFERENCE BOOKS :

1. Atlas R. M. *Principles of Microbiology*, Mosby 2nd Edition. 1996.
2. Oarsman S.N.J., et al. *Virology Illustrated colour text*, 1st Edn. Elsevier Health Sciences. 2012.
3. Prescott L.M, et al. *Microbiology*, (11th edition) McGraw- Hill Inc, New York. 2008.
4. Stanier Y., et al. *General Microbiology*. Palgrave Macmillan; 5th edition. 1987.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Illustrate the structure and classification of virus.	1,2,3,4, 5	Understanding
CO-2	Order viruses depending on the ability to infect different living forms.	1,2,3,4, 5	Applying
CO-3	Classify algae based on the characters, structures and features.	1,2,3,4, 5	Analyzing
CO-4	Detect the economic importance of fungi.	1,2,3,4, 5	Analyzing
CO-5	Predict the parasitic diseases and adopt preventive measures.	1,2,3,4, 5	Evaluating

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit		
I	21UCMB12	Virology, Mycology, Phycology and Parasitology					60	4		
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO-4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (✓) = 50 Relationship = High										

Prepared by

Name :Dr.R.Janet Rani

Signature :

Checked by

Dr.R.Janet Rani

Head of the Department

Semester – I

Course Title	TECHNIQUES IN MICROBIOLOGY
Total Hrs.	30
Hrs./Week	2
Sub.Code	21UCMB1P1
Course Type	Discipline Specific Core Practical
Credits	1
Marks	50

General Objective:

The course offers hands on experience in learning the principle, working mechanism, handling of equipments in laboratory, microbial cultivation and about different staining techniques.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Describe the laboratory safety guidelines.
CO-2	Demonstrate the guidelines of handling instruments used in microbiology laboratory.
CO-3	Differentiate the media used for microbial cultivation.
CO-4	Formulate different plating techniques used in microbial isolation.
CO-5	Assess different straining techniques used to characterize the microorganisms.

Course outline:

1. Microbiology Laboratory Safety guidelines.
2. Instruments used in Microbiology (Compound Microscope, Autoclave, Laminar air flow, Incubator, Hot-air oven).
3. Preparation of Liquid and Solid media.
4. Serial Dilution Technique.
5. Plating techniques – Pour plate, Spread plate, Streak plate.
6. Haymount preparation to show different types of microbes.
7. Hanging drop technique.
8. Straining Techniques
 - a) Simple staining.
 - b) Gram's staining.
 - c) Spore Staining.
9. Microscopic observation of fungi – Yeast and Mold.
10. Iodine wet mount preparation – protozoa.
11. Cultivation of Algae (Demonstration).
12. Isolation of phage (Demonstration).

REFERENCE BOOKS:

1. Cappuccino, J.G., and Sherman N. *Microbiology: A Laboratory Manual*. 10th Edition. Pearson education Limited. 2014.
2. Kannan N. *Laboratory Manual in General Microbiology*. PANIMA. 2002.
3. Dubey, R.C, Maheshwari DK, *Practical Microbiology*, SChand Publications. 2012.
4. Rajan S, R., andSelvi Christy. *Experimental procedures in Life Sciences*, (3rd reprint) Anjanaa Book House, Chennai. 2010.
5. Aneja, K.R.*Experiments in Microbiology*, Plant Pathology and Biotechnology (4th edition), New age international. 2003.
6. Vos, P., et al. eds, 2011. *Bergey's manual of systematic bacteriology: Volume 3: The Firmicutes (Vol. 3)*. Springer Science & Business MediaDon J. Brenner, Noel R. Krieg, James T. Staley (eds). *Bergey's Manual of Systematic Bacteriology Second Edition*. Springer. 2005.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain the basic principles of microbiological techniques.	1, 2,3,4,5	Understanding
CO-2	Demonstrate the safety guidelines of Microbiological laboratory.	1.2,4,5	Applying
CO-3	Differentiate various sterilization techniques.	1, 2,4,5	Analyzing
CO-4	Design different isolation methods	1, 2,3,4,5	Evaluating
CO-5	Assess different types of bacteria using staining techniques.	1, 2,3,4,5	Creating

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit		
I	21UCMB1P1	TECHNIQUES IN MICROBIOLOGY					30	1		
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓			✓	✓	✓	✓	✓	✓
CO-2	✓	✓	✓	✓	✓	✓	✓		✓	✓
CO-3	✓	✓			✓	✓	✓		✓	✓
CO-4	✓	✓			✓	✓	✓	✓	✓	✓
CO-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (✓) = 42 Relationship = High										

Prepared by
Name:Dr.M.Senthil @ Sankar
Signature:

Checked by
Dr.R.Janet Rani
Head of the Department

Semester – I

Course Title	AQUATIC MICROBIOLOGY
Total Hrs.	60
Hrs./Week	4
Sub.Code	21UAMB11
Course Type	Allied
Credits	1
Marks	100

General Objective:

The course deals with the basics of aquatic ecosystem, importance of microbial analysis of water and methods of studying aquatic microorganisms.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Explain the types of aquatic ecosystems and the associated microorganisms.
CO-2	Demonstrate the importance of microbiological analysis of water and the methods used in characterizing the organisms.
CO-3	Examine the microbes associated with water borne diseases and that affect the aquatic environment.
CO-4	Assess the microorganisms involved in bioluminescence and also the treatment of pollutants.
CO-5	Prepare the importance of microorganisms in aquatic environment and its economic importance.

UNIT I: AQUATIC ECOSYSTEMS (12 hours)

Freshwater Ecosystem - Microorganisms of the freshwater habitat – Lentic and Lotic Structure, Habitat and Biota. Marine Ecosystem-Physical and chemical characteristics of marine ecosystem-Structure of the sea - Upwelling-Down welling - Biota of the sea, General characteristics-Functions of marine flora, Estuarine Ecosystem - Biota of Estuarine, Mangrove Ecosystem - Biota of mangroves. Hydrothermal vents.

Unit II: MICROBES AND HYDROSPHERE (12 hours)

Microbiology of Water- Bacteriological analysis of water- Methods of studying marine microorganisms- Collection, enumeration, isolation and identification based on morphological, physiological and biochemical characteristics- Preservation of marine microbes (Halophilic, Psychrophilic, Barophilic) Microbial nutrition- Influence of environmental factors on microbial growth and activity.

UNIT III: EUTROPHICATION AND WATER BORNE DISEASES (12 hours)

Eutrophication- Biofilm formation- biofouling. Water borne diseases- viral (jaundice), bacterial (cholera) and protozoan, (amoebic dysentery). Purification of water- Recycling of water.

UNIT IV: MARINE BIOLUMINESCENCE (12 hours)

Microorganisms responsible for bioluminescence in marine environment. Uses of bioluminescence. Mechanism of quorum sensing in *Vibrio fischeri*. Microbial indicators of marine pollution and control, Biodegradation- bioremediation of marine pollutants.

UNIT V: APPLICATION OF AQUATIC MICROBES (12 hours)

Probiotic bacteria and their importance in aquaculture- Aquatic Microbes of Biotechnological importance- Primary and secondary metabolites- Bioactive compounds from marine microbes.

TEXTBOOKS:

1. Karl, D., and Buckley M. *Marine Microbial Diversity* 2005.
2. Munn, C.B. *Marine Microbiology Ecology and applications* 2003.
3. Ramesh, K.V. *Environmental Microbiology*. MJP Publishers, Chennai 2004.

REFERENCE BOOKS:

1. Colwell R, and Belkin. *Ocean & health: Pathogens of the Marine Environment*. Springer 2010.
2. Miller, C., Wheeler, P.A. *Biological Oceanography* Wiley-Blackwell, 2012.
3. Mitchel, R., and Ji D.G. *Environmental Microbiology*. Wiley-John Black well Publishers, New York. 2010.
4. Mitchell, R. *Microbial Ecology of the Oceans*. Wiley 2008.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Summarize fresh water and marine water ecosystem.	1,4,5	Understanding
CO-2	Demonstrate the biota of Mangrove Ecosystem.	1,5	Applying
CO-3	Analyze the various bacteriological tests to check water quality.	1, 2,3,4,5	Analyzing
CO-4	Plan the methods for isolation, identification and preservation of marine microorganisms.	1,5	Evaluating
CO-5	Propose modern techniques used to check the quality of water.	1, 2,3,4,5	Evaluating

Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit						
I	21UAMB11	AQUATIC MICROBIOLOGY	60	1						
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓	✓	✓	✓			✓	✓
CO-2	✓	✓	✓	✓	✓	✓				✓
CO-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO-4	✓	✓	✓	✓		✓				✓
CO-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (✓) =41 Relationship = High										

Prepared by
 Name: Mr. S. Hameedullah Sherief
 Signature

Checked by
 Dr. R. Janet Rani
 Head of the Department

Semester – I

Course Title	TECHNIQUES IN AQUATIC MICROBIOLOGY
Total Hrs	30
Hrs/Week	2
Sub.Code	21UAMB1P1
Course Type	Allied Practical
Credits	2
Marks	50

General Objective:

The course provides the practical knowledge on isolation and identification of organisms, indicator and water borne pathogenic organisms from aquatic habitats and water quality analysis.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Practise the isolation of fresh and marine habitat microbes using standard methods.
CO-2	Experiment with the isolation and characterization of the faecal coliform using standard technique.
CO-3	Detect the water borne pathogens.
CO-4	Plan the isolation of fungal population from water.
CO-5	Measure the total Alkalinity of water.

Course Outline

1. Water analysis for total bacterial population by standard plate count method from fresh and marine water.
2. Isolation and identification of faecal coliforms using MPN Technique.
3. Isolation and identification of Halophilic bacteria.
4. Isolation and identification of water borne pathogen from water sample.
5. Isolation of Yeast / mould from water sample.
6. Determination of total alkalinity of water.
7. Determination of Chlorine in water.
8. ISI (Indian Standard Institute) specification for drinking water.

REFERENCE BOOKS:

1. Aneja, K.R. *Experiments in Microbiology*, Plant Pathology and Biotechnology (4th edition), New age international. 2003.
2. Cappuccino, J.G., and Sherman N. *Microbiology: A Laboratory Manual*. 10th Edition. Pearson education Limited. 2014.
3. Dubey, R.C., Maheshwari DK, *Practical Microbiology*, S Chand Publications. 2012.
4. Kannan, N. *Laboratory Manual in General Microbiology*. PANIMA. 2002.

5. Parsons, T.R., et al, *Manual of chemical and biological methods for seawater analysis*. Pergamon press. 1984.
6. Rajan, S, R. and Christy S. *Experimental procedures in Life Sciences*, (3rd reprint) Anjanaa Book House, Chennai. 2010.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Practise the bacteria in fresh and marine habitats by isolation process.	1, 2,3,4,5	Applying
CO-2	Analyze the fungi from fresh and marine habitats by using selective media.	1, 2,3,4,5	Analyzing
CO-3	Examine the halophilic bacteria using selective media.	1, 2,3,4,5	Analyzing
CO-4	Plan the water quality analysis using MPN.	1, 2,3,4,5	Evaluating
CO-5	Assess the waterborne pathogen from water samples.	1, 2,3,4,5	Creating

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit		
I	21UAMB1P1	TECHNIQUES IN AQUATIC MICROBIOLOGY					30	2		
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO-2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO-3	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO-4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO-5	✓	✓		✓	✓	✓	✓	✓	✓	✓
Number of matches (✓) = 45 Relationship = High										

Prepared by
Name: Dr.M.Senthil @ Sankar

Signature:

Checked by
Dr.R.Janet Rani
Head of the Department