DEPARTMENT OF MICROBIOLOGY				*CLASS: II B.Sc. Biotechnology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
IV	Allied	20U4RAP1	Ancillary Practical II	1	2	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To familiarize with milk and water quality techniques
2. To know the isolation and identification of nitrogen fixing bacteria from root nodules
3. To explain the methods of enumeration of microbes
4. To identify the bacterial and fungal plant pathogens
5. To explore wine production

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Demonstrate the milk and water quality techniques
2. Isolate and identify nitrogen fixing bacteria from root nodules
3. Experiment with microbial ecology and its interaction
4. Isolate and identify bacteria, fungi and algae
5. Determine the role of bacteria in environment and industrial processes

S.No.	Experiments
1.	Methylene Blue Reductase Test
2.	Resazurin dye reduction test
3.	Isolation of Nitrogen fixing bacteria from root nodules of legumes
4.	Enumeration of bacteria from soil
5.	Enumeration of fungi from soil
6.	Examination of plant diseases – Bacterial diseases of Plants – bacterial blight of rice and citrus canker
7.	Examination of plant diseases –Fungal diseases of Plants –leaf spot of rice and rust of sorghum
8.	MPN test
9.	Antiobiosis – Plate method using soil
10.	Production of wine (demo)

Books for Study

1. Aneja, K.R. (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai.
2. James G Cappuccino and Natalie Sherman. (2004). Microbiology: A Laboratory Manual. 6th Edition, Pearson Education, USA.

Books for Reference

1. Ashok, R. (2000). Antimicrobials in Laboratory Medicine, B.I. Churchill Livingstone, New Delhi.
2. Collee, J.G., Fraser, A.G., Marmion B.P. and Simmons. A. (2007). Mackie and McCartney Practical Medical Microbiology. Elsiever, New York.
3. Ranjan Kumar De, (2007). Diagnostic Microbiology (For DMLT Students). Jaypee Brothers publishing, New Delhi.
4. Gunasekaran, P. (2008). Laboratory Manual in Microbiology. New Age International (P) Ltd., New Delhi.

Web Resources

1. https://www.biocourseware.com/iphone/ghistory/index.htm
2. https://www.microbiologynutsandbolts.co.uk/normal-flora.html
3. https://www.microbiologyinfo.com/category/basic-microbiology

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Rationale for nature of the course

Practical skills on various microbiological techniques form the basis of biotechnological experiments. Isolation, screening, identification and characterization of various types of microorganisms and its significance in clinical, environmental, industrial processes paved the way for novel biotechnological inventions. Understanding the nature, growth requirements and characteristics of microorganisms helps to explore its economic importance in the field of biotechnology.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Providing practical insight on quality of milk and water.
- Characterization of microbes present in environmental samples and exploring its ecological consequences.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcomes *On completion of this course the students will be able to*	Knowledge Level
CLO-1	Demonstrate the milk and water quality techniques.	Up to K2
CLO-2	Isolate and identify nitrogen fixing bacteria from root nodules.	Up to K3
CLO-3	Experiment with microbial ecology and its interaction	Up to K3
CLO-4	Isolate and identify bacteria, fungi and algae	Up to K1
CLO-5	Determine the role of bacteria in environment and industrial processes.	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	2	2	3	2
CLO2	2	2	3	2	2
CLO3	2	3	2	3	2
CLO4	3	3	2	3	2
CLO5	2	3	2	3	2

Advance application–3 Intermediate level –2 Basic level –1

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	3	2	3
CLO2	2	3	2	2	2
CLO3	2	2	3	2	3
CLO4	3	3	2	2	2
CLO5	2	2	3	3	3

Advance application – 3, Intermediate level – 2, Basic level – 1.

LESSON PLAN

Experiment Number	Description	Staff	Hours	Mode
1	**Methylene Blue Reductase Test** Add Sample and Dye Incubate and Observe results		3	Practical demo and learning
2	**Resazurin dye reduction test** Add Sample and Dye Incubate and Observe results		3	Practical demo learning
3	**Isolation of Nitrogen fixing bacteria from root nodules of legumes** Isolate bacteria from root nodules. Identify morphology.		3	Group lab work
4	**Enumeration of bacteria from soil** Isolate soil bacteria Enumerate and Identify morphology.		3	Joint productive activity
5	**Enumeration of fungi from soil** Isolate soil fungi Enumerate and Identify morphology.		3	Lecturing and discussion
6	Examination of plant diseases – Bacterial diseases of Plants – bacterial blight of rice and citrus canker		3	Group lab work
7	Examination of plant diseases –Fungal diseases of Plants –leaf spot of rice and rust of sorghum		3	Group lab work
8	**MPN test.** Prepare media and Sterilize Inoculate and Incubate Observe the results		3	Group lab work
9	Antiobiosis – Plate method using soil		3	Group lab work
10	Production of wine (demo)		3	Group lab work
Total			**30 Hrs**	

Course designers

1. Mr. P. Sasikumar