DEPARTMENT OF MICROBIOLOGY				*CLASS: II B.Sc. Biotechnology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
III	Allied	20U3RAP1	Ancillary Practical I	1	2	40	60	100

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

Course Objectives:

1. To familiarize with general microbiology techniques.
2. To know the methods of sterilization of media and glassware.
3. To explain the methods of cultivation of microbes.
4. To identify the morphology of microbes by staining methods
5. To explore antibiogram of bacteria

Course Learning Outcomes:

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

1. Demonstrate the practical skills in the use of tools, technologies and methods common to microbiology.
2. Prepare various culture media, brief various physical and chemical means of sterilization.
3. Acquaint general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.
4. Identify bacteria, fungi and algae
5. Determine the antibiogram of bacteria

S.No.	Experiments
1.	Handling of Microscope
2.	Microscopic observation of bacteria –Simple and Differential staining (Gram and Acid Fast)
3.	Microscopic observation of bacterial structures – spore staining and capsule staining (positive and negative)
4.	Motility Test – Hanging drop method
5.	Microscopic observation of fungi–Lactophenol cotton blue staining
6.	Microscopic observation of algae
7.	Sterilization methods – moist heat, dry heat, filtration and radiation.
8.	Preparation of culture media –solid (selective and differential) and liquid
9.	Isolation of single colonies on solid media – Slant, Streak –Simple and Quadrant
10.	Antibiotic sensitivity test – Kirby –Bauer method

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 microscopic observation, differentiation and identification of various microbes
- Imparting hands-on skills related to basic microbiological and pure culture techniques

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes *On completion of this course the students will be able to*	Knowledge Level
CLO-1	Demonstrate the practical skills in the use of tools, technologies and methods common to microbiology.	Up to K2
CLO-2	Prepare various culture media, brief various physical and chemical means of sterilization.	Up to K3
CLO-3	Acquaint general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.	Up to K3
CLO-4	Identify bacteria, fungi and algae	Up to K1
CLO-5	Determine the antibiogram of bacteria	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	1	2
CLO2	2	1	2	1	2
CLO3	2	1	2	2	2
CLO4	3	2	2	1	2
CLO5	2	1	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	1	3
CLO2	2	3	2	1	2
CLO3	2	2	3	2	3
CLO4	3	3	2	1	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	Handling of Microscope		3	Practical demo and learning
2	**Staining methods: Simple and Gram's staining.** Differentiate bacteria based on shape and arrangements Observe minute cells under microscope. Understand the chemical and theoretical basics of differential staining procedures.		3	
3	**Staining methods: Negative, capsule and endospore staining.** Observe special structures of cells under microscope.		3	Group lab work
4	Motility Test – Hanging drop method		3	Joint productive activity
5	Microscopic observation of fungi–Lactophenol cotton blue staining		3	Lecturing and discussion
6	Microscopic observation of algae		3	Group lab work
7	**Principle, methods of sterilization and safety measures.** Discuss laboratory safety guidelines (Rules and Regulations) and basic instrumental requirements. Instructions for potential laboratory hazards (physical, chemical and microbiological) Idea about specific types of sterilization (dry heat, moist heat, cold sterilization)		3	Group lab work
8	**Preparation of media.** To understand media and its types. To become familiar with media preparation (agar plate, slant, broth) . To cultivate microorganisms.		3	Group lab work
9	**Pure culture techniques: streak plate, spread plate and pour plate.** To purify microorganisms from mixed culture. To learn different types of streaking techniques. Isolate mutagenic or converted microorganisms by using differential new procedures.		3	Group lab work
10	Antibiotic sensitivity test – Kirby –Bauer method		3	Group lab work
Total			**30 Hrs**	

Course designers

1. **Dr. S. Sree Gayathri**