

<i>DEPARTMENT OF MICROBIOLOGY</i>				<i>CLASS: I B.Sc. Microbiology</i>				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core	20U1RMC2	Basic Techniques In Microbiology	3	3	25	75	100

Course Objectives:

1. To learn the basic principles and techniques involved in microbiology and related disciplines
2. To demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures
3. To know various Culture media and their applications and also understand various physical and chemical means of sterilization and cultivation of microbes
4. To know microbial culture media and pure culture techniques for aerobic and anaerobic cultivation methods for bacteria
5. To gain knowledge on principle and working of various laboratory equipments and can able to use them with theoretical knowledge

Unit-I: Bacteriological Techniques

Microscopy-working mechanism and applications of Light microscope, Bright field, Dark field, Phase Contrast, Fluorescent, Electron microscope (TEM and SEM). Confocal microscope. Staining techniques - Smear preparation, Simple staining, Gram's staining, Acid fast staining, Spore staining, Capsule staining and Metachromatic granule staining.

Unit-II: Sterilization and Disinfection

Sepsis, asepsis and contamination. Sterilization - principle and methods – moist heat, dry heat, filtration, radiation, pasteurization, tyndallization, ultrasonication and disinfection. Phenol co-efficient test.

Unit-III: Microbial Culture Media and Cultivation of Microbes

Culture media definition and types - basal, complex, enriched, enrichment, selective, indicator, differential, sugar and transport media. Pure culture techniques- Streak plate, Pour plate, Spread plate. Colony morphology of bacteria and fungi. Cultivation of bacteria, fungi algae and viruses.

Unit-IV: Microbial Growth

Methods of culturing anaerobes – Prereduced media and anaerobic jar. Measurement of microbial growth - cell number and cell mass. Batch culture, continuous culture, diauxic growth and synchronous culture. Factors affecting growth of microorganisms.

Unit-V: Instrumentation

Principle, working mechanism and applications of pH meter, Colorimeter, Ultra centrifuge- Chromatographic techniques – Paper, TLC and Column chromatography, Agarose gel Electrophoresis, UV Spectroscopy, Blotting techniques– Southern blotting, PCR.

Books for Study

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig. N.R (2006). Microbiology- 5th Edition, Mc Graw Hill Inc. New York.
2. Dubey, R.C. and Maheswari, D.K. (2010). A Text Book of Microbiology. 3rd edition, S. Chand, New Delhi.
3. Veerakumari, L. (2009). Bioinstrumentation. MJP Publishers, Chennai.
4. Palanivel, P. (2000). Laboratory manual for analytical biochemistry and separation techniques, Twenty first Century Publications, Chennai.

Books for Reference

1. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings, New York.
2. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education limited, New York.
3. Desai, JD. and Desai, AJ. (1995). Methods in Microbiology Microscopy and Staining, Emkay Publications, New Delhi.
4. Bensen, JR.(1996). Microbiological Applications: A Lab Manual in General Microbiology, Sixth Edition, WMC Brown Publication, U.S.A.
5. Gunasekaran, P. (2008). Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi.
6. Jeyaraman, J. (1985) Lab. Manual in Biochemistry, Wiley Eastern Ltd, New Delhi.

Web Resources

1. <https://www.periobasics.com/basic-microbiology>.
2. <https://www.microbiologynutsandbolts.co.basic-concepts>.
3. <https://www.microbiologyinfo.com/category/basic-microbiology>
4. [https://www.Microbiology - Overview -youtube.com](https://www.Microbiology-Overview-youtube.com)
5. [https://www.Introduction to microbiology. youtube.com](https://www.Introduction-to-microbiology.youtube.com)

Pedagogy

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

Course Learning Outcomes (CLO):

On the completion of the course the student will be able to

	Course Learning Outcome	Knowledge Level
CLO1	Explain the principles and types of microscopes and staining techniques	Up to K2
CLO2	Elaborate various physical and chemical means of sterilization	Up to K2
CLO3	Prepare various culture media and microbial techniques for isolation of pure cultures of microorganisms	K1, K3
CLO4	Determine the different growth phases, growth kinetics and physiological adaptations of bacteria	Up to K3
CLO5	Categorize the principles and applications of the various instruments used in biology	Up to K4

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	PSO6	PSO7
CLO1	1	2	2	1	3	1	2
CLO2	1	1	1	2	2	1	1
CLO3	2	1	1	1	3	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	3	2	1	2

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

Mapping of Course Outcome with Programme Outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	2	1	1	2	1
CLO2	1	2	1	1	2
CLO3	2	2	1	1	1
CLO4	3	2	2	1	1
CLO5	3	2	2	2	1

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

Lesson Plan:

Units	Description	Staff	Hours	Mode
I Bacteriological Techniques	a) Microscopy-working mechanism and applications of Light microscope		1	Chalk and Talk
	b) Bright field, Dark field, Phase Contrast, Fluorescent		2	PPT
	c) Electron microscope (TEM & SEM).		2	Lecture
	d) Staining techniques - Smear preparation, Simple staining, Gram's staining		2	Demonstration
	e) Acid fast staining, Spore staining, Capsule staining and Metachromatic granule staining.		2	Demonstration
II Sterilization and Disinfection	a) Sepsis, asepsis and contamination. Sterilization - principle and methods		2	Chalk and talk
	b) Moist heat, dry heat, filtration, radiation		3	PPT
	c) Pasteurization, tyndallization, ultrasonication		2	Discussion
	d) Disinfection. Phenol co-efficient test.		2	Demonstration
III Microbial Culture Media and Cultivation of Microbes	a) Culture media definition and types		2	Chalk and talk
	b) basal, complex, enriched, enrichment, selective, indicator		3	Discussion
	c) differential, sugar and transport media. Pure culture techniques		2	Discussion
	d) Streak plate, Pour plate, Spread plate. Colony morphology of bacteria and fungi. Cultivation of bacteria, fungi algae and viruses.		2	Demonstration
IV Microbial Growth	a) Methods of culturing anaerobes. Prereduced media and anaerobic jar.		3	Chalk and talk
	b) Measurement of microbial growth - cell number and cell mass.		2	Demonstration
	c) Batch culture, continuous culture, diauxic growth and synchronous culture.		3	Discussion
	d) Factors affecting growth of microorganisms.		1	Discussion
V Instrumentation	a) Principle, working mechanism and applications of pH meter		3	PPT
	b) Colorimeter, Ultra centrifuge-Chromatographic techniques Paper, TLC and Column chromatography		3	Demonstration
	c) Agarose gel Electrophoresis, UV Spectroscopy. Blotting techniques– Southern blotting. PCR		3	Demonstration
Total			45 Hours	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

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

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	50%
K2	5	6	10	20	41	34.16	
K3	-	-	20	20	40	33.33	34%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Course designers:

1. Dr. P.N. Rajarajan