DEPARTMENT OF MICROBIOLOGY				*CLASS: I M.Sc. Microbiology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours /week**	**CIA**	**Ext**	**Total**
I	Major Practical-II	21P1RMP2	Lab in Microbial Physiology and Bioinstrumentation	4	4	40	60	100

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

Course Objectives

1. To provide a basic knowledge on the core principles of microbial Physiology.
2. To understand the microbial growth kinetics and understanding different physiological phenomenon.
3. To apply and handle the various instruments for their routine laboratory work.
4. To demonstrate the methods of algal measurements
5. To verify the Beer's Law using colorimeter

Course Learning Outcomes

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

1. Illustrate bacterial growth by turbidity method
2. Calculate glucose uptake by microbes
3. Apply oxidation and fermentation techniques
4. Demonstrate photosynthetic pigments and their estimation
5. Standardize Beer-Lambert's law

S.No.	Experiments
1.	Measurement of microbial growth- turbidity method
2.	Isolation of Photosynthetic bacteria
3.	Glucose uptake by *E. coli* / *Saccharomyces cerevisiae* [Active and Passive diffusion]
4.	Demonstration of utilization of sugars by oxidation and fermentation techniques.
5.	Extraction and estimation of photosynthetic pigments (bacterial and blue green algae)
6.	Separation of molecules using density gradient centrifugation technique
7.	Measurement of pH of various biological samples using pH meter
8.	Counting of microbial colonies with Quebec colony counter
9.	Measurement of algal cell using micrometry technique
10.	Verification of Beer's Law using colorimeter

Books for study

1. Kannan, N. (1996). Laboratory Manual in General Microbiology. 1st Edition. Palani Paramount Publications, Tamil Nadu.
2. Benson, H.J. (1998). Microbiological Applications- Laboratory Manual in General Microbiology. 7th International Edition, McGraw-Hill, Boston.
3. Jayaraman, J. (2011). Laboratory Manual in Biochemistry. 2nd Edition. New Age International (P) Ltd. Publishers, New Delhi.

Books for Reference

1. Madigan, M.T. and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14th Edition. Prentice Hall International Inc., USA.
2. Moat, A.G. and Foster, J.W. (2009). Microbial Physiology. 4th Edition. John Wiley & Sons, New York.
3. Reddy, S.R. and Reddy, S.M. (2005). Microbial Physiology. Scientific Publishers, India.
4. Gottschalk, G. (1986). Bacterial metabolism. 2nd Edition. Springer, Verlag.
5. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. (2005). General Microbiology. 5th Edition. McMillan, London.
6. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw-Hill, Boston.
7. Plummer, D.T. (1987). An Introduction to Practical Biochemistry. 3rd Edition. Tata McGraw Hill, New Delhi.
8. Switzer, R.L. and Garrity, L.F. (1999). Experimental Biochemistry. 3rd Edition. WH Freeman and Co., New York.

Web Resources

1. http://science.umd.edu/classroom/bsci424/BSCI223WebSiteFiles/LectureList.htm
2. https://microbiologysociety.org/why-microbiology-matters.html
3. https://open.umn.edu/opentextbooks/textbooks/404
4. https://microbiologyinfo.com/top-and-best-microbiology-books/
5. https://en.wikipedia.org/wiki/Blue%E2%80%93white_screen
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC169282/

Rationale for nature of the course

Hands on training on microbial physiology have greater application in industry, developing medicine and even in agriculture. Technical skills related to bioinstrumentation are essential for its application in the laboratory. It is useful for handling, analyzing and interpreting various biological samples. Hands-on experience pertaining to biological equipments is mandatory in the field of quality control, testing, diagnosis and research.

Activities having direct bearing on skill development/employability/entrepreneurship:

Experiments related to Microbial physiology have traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.

It is Possible to optimize industrial fermentations through introduction of directed genetic modification - an approach referred to as metabolic engineering.

Applying the techniques related to quality control in various industrial sectors and research units.

Fabricating minor equipments, marketing and servicing of laboratory equipments.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

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

CLOs	Course Learning Outcomes	Knowledge Level
CLO1	Illustrate bacterial growth by turbidity method	Up to K2
CLO2	Calculate glucose uptake by microbes	Up to K3
CLO3	Apply oxidation and fermentation techniques	Up to K3
CLO4	Demonstrate photosynthetic pigments and their estimation	Up to K4
CLO5	Standardize Beer-Lambert's law	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
CLO1	2	2	2	1	2
CLO2	3	2	2	1	1
CLO3	1	1	2	2	1
CLO4	1	2	1	1	1
CLO5	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	2	1	1	2
CLO2	3	2	1	2	2
CLO3	1	1	2	1	1
CLO4	2	1	1	2	2
CLO5	3	2	3	2	1

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

Course designers:

1. Dr. P.N.Rajarajan

2. Dr. P.Kiruthika Lakshmi