DEPARTMENT OF MICROBIOLOGY				*CLASS: I M.Sc. Microbiology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
II	Major Practical-II	21P2RMP2	Lab in Immunology and Research Methodology	4	4	40	60	100

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

Course Objectives

1. Immunological techniques help to understand and acquire a wide knowledge on immunity and immune system.
2. Brief about different immunological techniques.
3. Employ laboratory techniques that basically develop the preanalytical, analytical and post analytical skills for the performance of the tests.
4. Analyze the suitable statistical program for research experiments
5. Evaluate the significance of difference using statistical tools

Course Learning Outcomes

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

1. Describe an understanding of the key concepts in immunology
2. Illustrate the salient features of antigen antibody reaction and its uses in diagnostics and various other studies
3. Apply scientific principles in the interpretation of immunological responses and data
4. Demonstrate suitable statistical program for research experiments
5. Explain the significance of difference using statistical tools

S.No.	Experiments
1.	Identification of blood cells and Differential Count
2.	Total RBC and WBC Count
3.	Separation of plasma and serum from the blood sample (demonstration).
4.	Identification of human blood groups. (ABO and Rh)
5.	Widal test for typhoid fever
6.	Immunodiffusion by Ouchterlony, Radial method.
7.	Immunoelectrophoresis.
8.	Student' t' test using suitable statistical method
9.	Identification of significance of difference and analysis of data using ANOVA
10.	Plagiarism checker (demonstration).

Books for study

1. Carpenter, D.L. (1975). Immunology and Serology. 3rd Edition. W.B. Saunders Company, London.
2. Garvey, J.S., Cremer, N.E. and Sussdorf, D.H. (1977). Methods in Immunology. A Laboratory Text for Instruction and Research. 3rd Edition. The Benjamin Cummings Publishing Company Advanced Book Program, London.
3. Banerjee, P.K. (2007). Introduction to Biostatistics. S.Chand and Company Publications, New Delhi.

Books for Reference

1. Hudson, L. and Hay, F.C. (1989). Practical Immunology. 3rd Edition, Blackwell scientific Publications, Oxford.
2. Myers, R.L. (1989). Immunology: A Laboratory Manual. Wm. C.Brown Publishers. Dubuque, Lowa.
3. Rastogi, S.C. (1996). Immunodiagnostics Principles and Practice. New Age International (P) Ltd., New Delhi.
4. Talwar, G.P. (1983). A Hand Book of Practical Immunology. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Talwar, G.P. and Gupta, S.K. (1992). A Hand Book of Practical and Clinical Immunology. Vol. 1 -2. CBS Publishers & Distributors, Delhi.
6. Turgeon, M.L. (1990). Immunology and Serology in Laboratory Medicine. The C.V. Mosby Company, Baltimore.
7. Pillai, R.S.N. and Bagavathi, V. (2010). Statistics theory and practice. S. Chand and Company Publications, New Delhi.

Web Resources

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2581910/
2. https://www.ebi.ac.uk/interpro/potm/2005_2/Page2.html/
3. https://www.nejm.org/medical-research/autoimmune-disease%20Course%20Learning%20Outcomes/
4. https://onlinelibrary.wiley.com/journal/13652567

Rationale for Nature of the course

The effective treatment of any ailments depends on degree of accuracy in the disease diagnosis. Immunological techniques play a critical role in the field of medical diagnosis and immunotherapy. A clear insight on the understanding the immunological background is mandatory for analysis and interpretation of serological assay. Statistical evaluation of post analytical data helps to authenticate the reliability of the results.

Activities having direct impact on Skill development/Employability / Entrepreneurship

Hands on experience in various serological test.
Performing haemogram test and blood group identification.
Testing the significance of experimental results using statistical analysis.

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	Describe an understanding of the key concepts in immunology	Up to K2
CLO2	Illustrate the salient features of antigen antibody reaction and its uses in diagnostics and various other studies	Up to K2
CLO3	Apply scientific principles in the interpretation of immunological responses and data	Up to K3
CLO4	Demonstrate suitable statistical program for research experiments	Up to K4
CLO5	Explain the significance of difference using statistical tools	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:
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2. Dr. K. Kannan