University of Kerala

Discipline	**Zoology**				
Course Code	**UK5DSCZOO303**				
Course Title	**Microbiology and Immunology**				
Type of Course	**DSC**				
Semester	V				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Pass in Class 12				
Course Summary	Microbiology and Immunology is a comprehensive course that delves into the intricate realm of microorganisms and the body's defence mechanisms against pathogens. In Microbiology, students explore historical aspects, virus and bacteria classification, microalgae, fungi characteristics, diseases, economic importance, microbial interactions, and the human microbiome. Through hands-on experiences, students gain practical insights into microbiological concepts. In Immunology, students study the immune system overview, immune responses, viral and bacterial diseases in humans, zoonotic diseases, and immunological techniques for infectious disease diagnosis. Overall, the course equips students with a profound understanding of the microbial world, host-pathogen interactions, and immune responses, preparing them for careers in research, healthcare, and biotechnology.				

Detailed Syllabus

Module	Unit	Contents	45 Hrs
I		**Introduction to Microbiology**	**11**
	1.1	Contributions of Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Paul Ehrlich and Edward Jenner for the development of Microbiology as a discipline.	1
	1.2	Classification of viruses: Baltimore system (Brief account only). Bacteriophages: Structure and reproduction (lytic and lysogenic cycles). Mention viroids, prions and virusoids.	2
	1.3	Classification of bacteria: Bergey's Manual of Systematic Bacteriology (Brief account only). Ultrastructure of a typical bacterium. Differentiate gram-positive and gram-negative bacteria according to cell wall. Classification of bacteria based on nutrition (autotrophs and heterotrophs, photosynthetic and chemosynthetic bacteria, saprophytes and parasites). Culture media: Types, bacterial growth curve. Application of bacteria in medicine, industry, agriculture and environment.	6

	1.4	Microbial interactions: Beneficial interactions and harmful interactions. Microbial associations: Brief accounts on symbiosis, mutualism, commensalism, and parasitism with examples.	2
II	**Microbes and Man**		**7**
	2.1	Normal human microbiome: Examples and their importance in well-being. Mention prebiotics (Yogurt, Kefir, Sauerkraut, Kimchi and Kombucha) and probiotics (*Bacillus subtilis*, *Bifidobacterium bifidum, Lactobacillus acidophilus, L. rhamnosus*). Types of microbial toxins: Cholera toxin, Botulinum neurotoxin	2
	2.2	Microbial diseases in man: Viral diseases (e.g. Chicken pox, measles, common cold, Herpes, hepatitis, poliomyelitis), Bacterial diseases (Diphtheria, pneumonia, leprosy, ornithosis. Multi-drug-resistant bacteria (MRSA, Carbapenem-resistant Enterobacterales)	3
	2.3	Concept of zoonotic diseases: Bacterial zoonoses (brief description of Anthrax and Leptospirosis), Viral zoonoses (Brief description of Rabies, Ebola virus disease and Nipah virus).	2
III	**Overview of Immune System**		**8**
	3.1	Types of immunity: Innate and acquired immunity, Active immunity and passive immunity, cell-mediated immunity and humoral immunity (brief account)	1
	3.2	Cells involved in immunity (B cell and T cells): Types and functions.	2
	3.3	Interferons and MHCs: Organisation of MHC locus in mice and humans.	1
	3.4	Lymphoid organs: Primary and secondary.	2
	3.5	Immunoglobulins: Structure, types and functions.	2
IV	**Immune responses**		**10**
	4.1	Complement system: Classical, alternate and lectin pathways. (Brief account)	2
	4.2	Active and passive immunisation: Types of vaccines (inactivated vaccines, attenuated vaccines, DNA vaccines, mRNA vaccines, and conjugate vaccines).	2
	4.3	Types of hypersensitivity: Gell and Coombs classification.	1
	4.4	Autoimmunity (Brief account). Eg: Rheumatoid arthritis	1
	4.5	Immunodeficiency diseases: Types of immunodeficiency diseases (Eg: DiGeorge syndrome, Selective IgA deficiency and AIDS).	2
	4.6	Transplantation immunity: Types of grafts, immunological basis of transplantation reactions and immunosuppression.	2
V	**Microbial toxins and Immunodiagnostics**		**9**
	5.1	Microalgae (mention Diatoms and Dinoflagellates) - Brief account. Harmful Algal Blooms: Mention red tide and ciguatera toxicity.	3
	5.2	General characteristics of fungi. Fungal diseases (Mention Aspergillosis and Candidiasis). Economic importance of fungi.	3
	5.3	Immunological techniques for infectious disease diagnosis: Widal test, ELISA, FISH and GISH	3

REFERENCES

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2. Chakraborty, P. (2013). A Textbook of Microbiology. New Central Book Agency, Kolkotta.

3. Helen Chapel, Mansel Haeney, Siraj Misbah and Neil Snowden (2006). Essentials of Clinical Immunology. 5th ed., Ane Books, India.
4. Gandhi. Microbiology and Immunology notes and cases – Blackwell Publishing.
5. Heritage, J. *et al.* Introductory Microbiology. Cambridge University Press.
6. Prescott L. M., Harley, J. P., and Klein D. A.: Microbiology (7th Ed)- Mc Graw Hill, New York.
7. Pelczar, M. J., Reid, R. D. and Chan, E. C. S.: Microbiology. TMH.
8. Kumar, D.D. and S Kumar: Modern concept of Microbiology. Vikas Pub House Pvt. Ltd. New Delhi
9. Heritage J, E.G.V Evans, R.A. Killington. Introduction to Microbiology. Cambridge University Press.
10. Tewari J.P, T.N. Lakhanpal, I Singh, R Gupta and B.P. Chanola. Advances in Microbiology. APH Publishing Corporation, New Delhi.
11. Jacquelyn G. Black. Microbiology: Principles and Explorations. Prentice Hall, New Jersey.
12. Patel A.H. Industrial Microbiology. Panama Publishing House New Delhi.
13. Krieg, N.R. & Holt, J.G. Bergey's Manual of Systematic Bacteriology. Vols 1 – 4. (1984-89).
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15. Johnson, T.R. & Case, C.L. Lab (2003). Experiments in Microbiology.Addison Wesley.
16. Goldsby *et al*. (2003). Immunology. 5 ed., W.H. Freeman.
17. Joshi, K.R. Immunology. Agro Bios.
18. Kuby, J. Immunology. W. H. Freeman.
19. Lydyard, P.M. *et al.* Instant Notes in Immunology. Viva Books.
20. Playfair, J.H.L. *et al.* Medical Immunology for Students. Churchill Livingstone, UK.
21. Rajeshwar Reddy, K. (2007). Text Book of Immunology. AITBS Publishers, India.
22. Rao C.V. An Introduction to Immunology. Narosa Publishing House, New Delhi.
23. Roitt, I.M. Essential Immunology. Blackwell Scientific.
24. Talwar, G.P.A Handbook of Practical Immunology. Vikas, New Delhi.
25. Todd. Lecture notes on Immunology. Lowa State Uty. Press. Ane Books India.

Web resources:

1. Zoonotic diseases https://ncdc.mohfw.gov.in/wp-content/uploads/2024/02/Zoonotic-Diseases-of-Public-Health-Importance.pdf
2. Zoonotic disease and diagnosis https://www.cdc.gov/
3. Beneficial microbes: The pharmacy in the gut – Link : https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4878258/
4. Prebiotics- https://www.healthline.com/nutrition/8-fermented-foods
5. Carbapenem-resistant Enterobacterales https://www.cdc.gov/hai/organisms/cre/index.html
6. Immunology https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==
7. Environmental Microbiology, Fermentation Technology and Bioremediation https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=0Xvq9yUM2ILDrJ07FvlArQ==