GENERIC ELECTIVES (GE-7): Water-borne Diseases: Understanding and Management
Zoo-GE-7

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Water-borne Diseases: Understanding and Management Zoo-GE-7	**04**	**02**	**00**	**02**	Passed 12th Class	**NIL**

Learning Objectives

The learning objectives of this course are as follows:

- It deals with interactions between microbial water quality and human health.
- It includes appreciating how the quality of water can be affected by natural, seasonal, accidental, intentional, and man-made activities,
- It will help the students learn how the contaminated water increases the burden of human diseases with particular emphasis on infectious diseases,
- It will help understand the environmental pressures caused by contaminated water and how it drives the emergence and re-emergence of infectious diseases with increased/altered virulence, antibiotic resistance.
- It will motivate students to pursue a career in Health Management

Learning Outcomes

By studying this course, students will be able to

- know the sources of microbial water contamination and its impact on human health.
- understand the relationship between human behaviour and water quality.
- learn remediation strategies for several types of microbial water quality contamination.
- understand epidemiological studies related to water quality and public health.
- be able to grasp the concepts of various water sources and transmission mechanisms of infectious agents from those sources to humans.
- organize and present well-synthesized scientific discussions on topics relevant to waterborne disease and public health.
- develop a critical understanding of the contribution of organisms tothe welfare of society.

- examine the multiple water-borne pathogens, their modes of transport and transmission, their public health effects, and existing methods for disease prevention and remediation.

SYLLABUS OF GE-7

UNIT-1: Introduction to Public Health 4 hrs

Definition, scope, concept, and importance of public health microbiology; Roles of microbiologists in public health; Concept of health and disease; Indicators of health; Basic concept of water pollution and public health hazard in the community.

UNIT- 2: Introduction to Water Quality 8 hrs

Common terms and definitions in water quality, aquatic resources of the world and sources of drinking water; Water, sanitation, and hygiene (WASH) – fact sheets, WHO guidelines and resolutions; common contaminants of drinking water and linkages to disease; Water pollution (water quality properties, types of water pollution, point and non-point sources of water pollution); Types of contaminants influencing water quality; Water Treatment, Control of Water Borne Diseases.

UNIT- 3: Microbiology of Water 3 hrs

Microbiological quality of drinking; water as a causing factor of infectious diseases; water-borne pathogens (types, sources, and transmission); microbial testing of Water; monitoring and surveillance of water quality.

UNIT- 4: Water-Borne Diseases 10 hrs

Source of infection, transmission, symptoms, mitigation, prevention and treatment (with reference to the role of agencies/NGO).

-Bacterial infections- Cholera, Typhoid fever, Botulism, *E. coli* infection, Campylobacteriosis, Dysentery, Typhoid fever.

-Viral infections: Rotavirus, Hepatitis A and E, Poliomyelitis, Polyomavirus infection.

-Protozoal infections: Acanthamoeba keratitis, Amoebiasis, Cryptosporidiosis, Cyclosporiasis, Giardiasis.

- Parasitic worms: Schistosomiasis, Fascioliasis, Strongyloidiasis, Hookworm infections, Giardiasis.

-Vector-borne infections: Malaria, Dengue, Chikungunya, Onchocerciasis, Leishmaniasis, Japanese encephalitis, Dracunculiasis, Lymphatic filariasis,

UNIT- 5: Waterborne Pathogens: Detection Methods 5 hrs

Polymerase chain reaction (PCR) -Multiplex PCR; Quantitative PCR (qPCR), Real-time PCR; Microarrays; Pyro-sequencing; Biosensors; Fluorescence *in situ* hybridization

(FISH); Immunology-based methods.

Practical **(60 hrs)**

(Laboratory periods: 15 classes of 4 hours each)

1. To determine dissolved oxygen in water samples collected from different water bodies by Winkler's Method.
2. To determine temperature, pH, conductivity, total solids, and total dissolved solids in water samples from different locations.
3. To measure the COD of water samples from various sources.
4. Isolation and identification of microorganisms from different water samples.
5. Project report on water quality monitoring system.
6. Visit to WASH Institute (Water Sanitation and Hygiene Institute)/ Shri Ram Institute for Industrial Research.

Essential/recommended readings

1. Aquatic Pollution: An Introductory Text, 3rd Edition, Edward A. Laws, ISBN 9780471348757.
2. Waterborne Disease, 1st edition (January 15, 1997), Paul Hunter, ISBN 0125515707.

Suggestive readings

1. Microbiology of Waterborne Diseases, Steven Percival, Rachel Chalmers, Martha Embrey, Paul Hunter, Jane Sellwood and Peter Wyn-Jones, ISBN 978012551570-2.