

OPEN ELECTIVE-6 Water Pollution, Treatment and Management

Semester	III
Paper code	CHOE-VI
Paper title	Water pollution, treatment and management
Number of teaching hours per week	3
Total number of teaching hours per semester	42
Number of credits	3

1. WATER SOURCES AND POLLUTION**9 h**

Introduction – various sources of water and their contamination. Water Pollution: Types of pollutants, industrial effluents - pulp and paper mills, sugar, distillery, domestic wastes. Eutrophication, acid rain – causes, effects.

Case study- Minamata disease- neurological disease caused by severe mercury poisoning. **Case study-** water quality in Bengaluru city.

2. WATER QUALITY PARAMETERS**11 h**

Water quality standards - potable water standards, wastewater effluent standards. Principles of determination of water quality parameters like pH, alkalinity, BOD, COD, hardness. lethal doses of pollutants – sulphides, chlorides, Ca, Mg. Analysis of minerals in water. **Case study** - assessment of physico-chemical properties of river Ramganga water quality in Moradabad and Bareilly region of Uttar Pradesh, India.

3. WATER TREATMENT PROCESSES**13 h**

Primary, secondary and tertiary methods of treating: Chemical- coagulation and flocculation, water softening- ion-exchange process. Advanced treatment technologies: electrochemical – electrocoagulation, electrodialysis, desalination by reverse osmosis; biological methods- microbial treatment, degradation of high concentrated toxic pollutants – UV-irradiation (exposure), photocatalytic method.

Case study- investigating the effectiveness of ultraviolet (UV) water purification as replacement of chlorine disinfection in domestic water supply.

4. WATER MANAGEMENT IN INDIA**9 h**

Water resources and planning – water policy – Indian scenario. Main aspects of water management – hydrological cycle, hydrosphere, water transport, water exchange. Causes and problems in irrigation. Water conservation resource management – rain water harvesting.

Case study – effect of rain water harvesting on Chennai's water table.

References: Newspaper reference to be removed. Only text books or links of paper are allowed.

1. M.N. Rao, A. K. Datta, Wastewater Treatment 3rd edition, Oxford & IBH Publishing Co. New Delhi (2008).
2. G. S. Bridie and J. S. Bridie ‘Water Supply and Sanitary Engineering’, Dhanpat Raj Publishing company (P) Ltd., New Delhi, 7th Edition (2003).
3. Introduction To Water Treatment: Handbook Edition, 2019, Copyright: Joshua. Armstrong
4. Warren Viessman, Jr., Mark J. Hammer, Elizabeth M. Perez, Paul A. Chadik, Water Supply and Pollution Control, PHI Learning, New Delhi (2009).
5. P. C. Bansil ‘Water Management in India’, Concept Publishing company, New Delhi, First Edition, 2004.
6. Paul T Williams, Waste Treatment and Disposal, 2nd edition, Wiley, (2005).
7. Water Treatment Grade 1 WSO: AWWA Water System Operations WSO (2016), American Water Works Association.
8. <https://www.newindianexpress.com/cities/bengaluru/2021/feb/10/only-10-of-bengaluru-lakes-havegood-water-quality-study-2261985.html>.
9. N. Javed, D. K. Prajapati, J. Singh, R. K. Gangwar and R. Deval, International Journal of Pharmaceutical Sciences and Research, 2020, 11, 5741-5746.
10. Adegbola, Adedayo Ayodele and Olaoye, Rebecca Adepate, International Journal of Engineering Science and Technology, 2021, 4, 3891-3897.
11. Mark W LeChevallier and Kwok-Keung Au, Water Treatment and Pathogen Control, IWA Publishing, 2004.
12. C. M. Narayanan and Vikas Narayan, Sustainable Environment Research, 2019.
13. <https://timesofindia.indiatimes.com/city/chennai/rain-water-harvesting-helps-improve-city-water-table/articleshow/77474963.cms>.
14. Rain Water Harvesting – A Campus Study, Abhijeet Keskar, Satish Taji, Rushikesh Ambhore, Sonali Potdar, Prerana Ikhar, Regulwar D.G, 3rd National Conference on Sustainable Water Resources Development and Management (SWARDAM–2016). 2016, Vol 3.

Formative Assessment (Internal assessment) Theory	
Assessment Occasion/ type	Weightage in Marks
Continuous evaluation and class test	20
Seminars/Class work	10
Assignments/Discussions	10
Total	40