

## **HWRM-302 HYDROCHEMISTRY AND POLLUTION CONTROL (THEORY) (02 Credit hrs)**

**PRE-REQUISITE:** F.Sc/Intermediate

### **LEARNING OUTCOMES:**

- This course will provide an introduction to the hydrochemistry and pollution control techniques particularly about water pollution.
- The students will learn about the different sources of pollutants.
- They will have the knowledge about the phenomena of Contaminant Transport.
- The students will get used to various water quality standards.
- They will become conversant with latest techniques used in water pollution and control processes.

### **CONTENTS**

#### **Unit-1 Introduction:**

- 1.1. Physical properties of water/wastewater
- 1.2. Chemistry properties of water/wastewater
- 1.3. Biology of inorganic, organic and microbial contaminants in groundwater
- 1.4. And surface water systems.

#### **Unit-II Sources of Pollutants**

- 2.1. Mechanism by which contaminants are introduced in water
- 2.2. Transport and transformation of contaminants in surface waters
- 2.3. The vadose zone and its correlation with water quality
- 2.4. The saturated zone and its significance in water quality.

#### **Unit-III: Contaminant Transport**

- 3.1. Movement and capillary trapping
- 3.2. And solubility of relatively immiscible organic liquids.
- 3.3. Contaminant isolation and remediation techniques.
- 3.4. Water Quality Models.

#### **Unit-IV: WQ Standards.**

- 4.1. Water quality standards: Organizations
- 4.2. Effluent types and standardization
- 4.3. Surface, streams and their water quality status
- 4.4. Irrigation with waste water its implications
- 4.5. US- EPA, NEQS ETC.

### **ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR**

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,

- hands-on-activities,
- short tests, quizzes etc.

### ASSESSMENT AND EXAMINATIONS

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

### RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Bui. E. (2019). *Water and Wastewater Treatment Technologies*. Springer publishers.
2. Geol, P.K. (2011). *Water Pollution: Causes, Effects and Control*. New Age International (P) Limited Publishers. IBN (10): 81-224-1839-2.
3. Salpekar, A. (2008). *Water Pollution*. Jnanada Prakashan (P&D), ISBN: 978-81-7139-23-5
4. Agarwal, S.K. (2005). *Water pollution*. Kul Bhushan Nangla APH Publishing Corporation. ISBN: 81-7648-832-1.
5. Viessman. J. W (2014). *Water Supply & Pollution Control*. Pearson Education Limited.

## **HWRM-302 HYDROCHEMISTRY AND POLLUTION CONTROL (LAB) (01 Credit hr)**

**PRE-REQUISITE:** HYD-210 Integrated Water Resources Management

### **LEARNING OUTCOMES**

- The students will work on drinking water quality standards. Monitoring and control of pollution in Lakes, Rivers and coastal water.
- The students will learn about the water sampling techniques, sites and sample frequencies.
- They will have the knowledge about how to determine water quality parameter analysis on spot.
- They will learn how to determination of Biochemical oxygen demand, chemical oxygen demand in the lab.
- The students will get used to different physiochemical parameters analysis techniques.
- The students will be equipped with the bacteriological parameters analysis of water samples.
- They will become conversant with water quality analysis by utilizing DO sag curve.

### **CONTENTS**

#### **Unit-1**

- 1.1. Drinking water quality standards. Monitoring and control of pollution in Lakes, Rivers and coastal water.

#### **Unit-II**

- 2.1. Water sampling techniques, sites and sample frequencies.

#### **Unit-III:**

- 1.1. Water quality parameter analysis on spot: Hydrogen-ion-concentration, Dissolve oxygen, Electrical conductivity and turbidity,

#### **Unit-IV**

- 1.1. Physiochemical parameters analysis: Total dissolve solids, Alkalinity, Hardness, Calcium, magnesium, chlorides, fluorides, Iodine, Nitrogen,

#### **Unit-V:**

- 1.1. Determination of Biochemical oxygen demand, chemical oxygen demand.

#### **Unit-6**

- 6.1. Bacteriological parameters analysis of water samples.

#### **Unit-VII:**

- 7.1. Water quality analysis by DO sag curve, controlling hardness in natural waters.

#### **Unit-VIII:**

- 1.1 Detection of metals and their ions

### **ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR**

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- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

#### ASSESSMENT AND EXAMINATIONS:

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