

PRE-REQUISITES: ENSC-203**LEARNING OUTCOMES**

- The student is expected to have a basic understanding of water related issues and their solutions.
- This course will provide information on the basic concepts of water pollution and its effects on human and ecosystem health
- The students will learn how to assess and measure pollution load, stream flows, consequences of water pollution, treatment, disposal, and impacts.

CONTENTS

This course provides an introduction to the fundamental concepts of water pollution, its control, and management. The student will comprehend the scientific principles, analysis tools and operations involved in water pollution and control.

Unit-1: Introduction

- 1.1. Major Water pollutants
- 1.2. Polluted Rivers of the World
- 1.3. Chemical, Physical and Biological properties of polluted water
- 1.4. Acidity, alkalinity, electric conductivity (EC), Suspended Solids (TSS), Total Dissolved Solids (TDS), Dissolved Oxygen (DO)
- 1.5. Glossary of water pollution

Unit-2: Sources for water Pollution

- 2.1. Groundwater Pollution
- 2.2. Measure of water quality
- 2.3. Heavy metal pollution
- 2.4. Eutrophication
- 2.5. Characterization of polluted water

Unit-3: Flow measurement and essential calculations

- 3.1. Pollution load calculations
- 3.2. Chemical feed, dose, demand, residual, and chemical concentrations
- 3.3. Removal efficiency, detention time, and chemical blending
- 3.4. Surface loading rate, F/M and MCRT ratios

Unit-4: Water Pollution Control

- 4.1. NEQS
- 4.2. Testing methods (BOD, COD, TOC, etc)
- 4.3. Pollution reduction at source, effluent disposal
- 4.4. Preliminary treatment, Primary treatment, Secondary treatment, Advanced and tertiary treatment
- 4.5. Principle and types of aerobic and anaerobic treatment methods
- 4.6. Collection and transportation of wastes, Optimization, Recycling & Reuse

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weight age 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

2. SpringerLink (Online service), Singh, A., Agrawal, M., & Agrawal, S. B. (2021). *Water pollution and management practices*. Springer.
3. Filho, L., & Witschel. (2020). *Clean Water and Sanitation*. Springer International Publishing.
4. Pandit, A. B., & Kumar, J. K. (2019). *Drinking water treatment for developing countries: Physical, chemical and biological pollutants*. Royal Society of Chemistry.
5. Furia, E. W., Pierson, J., & Tourbier, J. (2016). *Biological Control of Water Pollution*. University of Pennsylvania Press.
6. PALCI EBSCO books & Allin, C. W. (2012). *Water and water pollution*. Salem Press.
7. Woodard & Curran, Inc., Books24x7, Inc., & Woodard, F. (2006). *Industrial waste treatment handbook, second edition* (2nd ed.). Elsevier/Butterworth-Heinemann.

PRE-REQUISITES: ENSC-**LEARNING OUTCOMES**

- This course will provide a demonstration about the different instrumentation used in the assessment of major water pollutants
- Students will learn about the practical aspects of domestic and industrial water pollution
- They will also get the working knowledge about standard testing protocols for evaluation of pollutants in water/wastewater

CONTENTS

This laboratory course is designed to provide practical aspects of water pollution and its control. It will also enable students to learn about the evaluation techniques and testing procedure for the assessment and remediation of major pollutions in water and wastewater. Student will know the sound knowledge about calculating pollution load in any given effluent.

Unit-1: Introduction of water pollution laboratory, instrumentation, treatment set-ups, and sampling techniques

Unit-2: Determination of drinking water parameters

Unit-3: Determination of Total Suspended Solids (TSS), Total Dissolved Solids (TDS) and Dissolved Oxygen (DO)

Unit-4: Determination of pH, acidity and alkalinity and Electric Conductivity (EC) in water/wastewater

Unit-5: Calculation of pollution load in industrial discharges

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