

## Industrial Pollution Control

- 1.1 Course Number: CH402
- 1.2 Contact Hours: 2-0-0 Credits: 06
- 1.3 Semester-offered: 4<sup>th</sup> Year- odd
- 1.4 Prerequisite: Process calculations
- 1.5 Syllabus Committee Members: Dr Gunjan Kumar Agrahari and Dr Milan Kumar

### 2. Objective:

Industrial water and air pollution treatment is of great importance for the protection of the environment in the context of the modern world. The main objective of this subject is to provide the opportunity for students to understand the principles of industrial wastewater treatment and air pollution control in order to minimise pollution in a sustainable manner. To get an in-depth understanding of the treatment and abatement of industrial wastes and air parcels, this subject commences with the classification, characterization, and quantification of industrial wastes and air parcels. The subject focuses on the principles and mechanisms of pollutant removal and the processes and design of conventional and advanced technologies applied in treatment and control.

### 3. Course Content:

Unit wise distribution of content and number of lectures

Unit	Topics	Sub topics	Lectures
1	Industrial pollutions and Regulations	Different types of wastes generated in an industry, their effects on living and non-living things, Characterization of emission and effluents, Environmental regulatory legislations and standards.	4
2	Water Pollution and Abatement	Sources; Water quality modelling for streams; Characterization and classification of effluents; Pre-treatment and primary treatment methods; Physico-chemical methods of water pollution control; Design of a settling tank, Aerobic digestion and anaerobic digestion, Advanced treatment methods; Typical industrial and municipal applications, Solid waste Management	10
3	Air Pollution and Abatement	Sources; Types of air pollutants; Atmospheric dispersion: Micrometeorology; Lapse rate; Atmospheric classes; Plume and type of plume; Dispersion models; Ground and elevated sources with and without reflection; Calculation for plume rise and stack gas flow	10

		rates. Particulate pollutants: Major sources; Effects; Emission factor and emission limits; Air Pollution control equipment- Design and efficiency of mechanical separating apparatus and electrostatic precipitators; Fabric filters and scrubbers, Vehicular emission control. Odor Pollution: Causes, effects and control methods	
4	Case studies	Case studies: Wastewater treatment in petroleum refining industry; Wastewater treatment in fertilizer industry; Common effluent treatment plant (CETP); Choice of technology & summary	4
		<b>Total</b>	<b>28</b>

#### 4. Readings

##### 4.1 Text Books:

1. Eckenfelder, W. Wesley, Industrial water pollution control, 2<sup>nd</sup> ed.; McGraw-Hill (1989).
2. Henze, M, Wastewater treatment:biological and chemical processes, Springer-Verlag, 1995.

##### 4.2 Reference Books:

1. Masters, G.M. Introduction to Environmental Engineering and Science, Prentice Hall off India (2008).
2. De Nevers, N. Air Pollution Control Engineering, McGraw-Hill (2000).
3. Enger, E.D. and Smith, B. F. Environmental Science: A Study of Interrelationships, 4<sup>th</sup> ed., McGraw-Hill Education (2016).
4. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern (2010).

#### 5. Outcome of the Course:

After completing this course, students are able to:

- To understand strategies, legal requirements and appropriate mitigation and treatment technologies for industrial pollution control.
- To comprehend the process design of selected treatment technologies.
- To solve open-ended, multi-disciplinary problems typically found in industrial settings.
- To explain the principles of physical, chemical, and biological treatment processes.
- To apply such knowledge to perform engineering calculations for simple systems.