INDUSTRIAL WASTE AND WASTEWATER ENGINEERING
(Professional Elective - V)

Course Code: 20CE1172 **L T P C**
3 0 0 3

Pre-requisites: Chemistry

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Assess the characteristics of industrial effluents and their effects on the environment including their tolerance limits.

CO2: Describe the basic principles of industrial waste water treatment by physical methods.

CO3: Discuss the sources, characteristics and treatment of food industrial wastes.

CO4: Identify the sources, characteristics and treatment of major industrial waste of Thermal Power Plants, Oil Refineries, Steel mills and Cement industries.

CO5: Identify the sources, characteristics and treatment of Chemical industrial wastes.

UNIT-I **(10 Lectures)**

INTRODUCTION:

General Characteristics of Industrial effluents, Effects on Environment – ISI tolerance limits for discharging industrial effluents into surface water, into public sewers and on to land for irrigation.

Learning outcomes:

1. Explain general characteristics and effects of industrial effluents(L2)
2. Summarize the effluent standards discharged into surface water(L2)
3. Discuss the effluent standards discharged into public sewers(L2)

UNIT-II **(10 Lectures)**

TREATMENT OF INDUSTRIAL WASTE WATER:

Necessity of treatment –Segregation – Process changes – Salvaging–Byproduct Recovery – Ion Exchange, Electro dialysis, Solvent Extraction, Floatation – Removal of Nitrogen and Phosphorus – Boiler water treatment methods and cooling water treatment methods.

Learning outcomes:

1. Describe necessity of treatment(L2)
2. Explain different treatment methods of industrial wastewater(L2)
3. Discuss about boiler water treatment methods(L2)

UNIT-III **(10 Lectures)**

FOOD INDUSTRIES:

Sources, characteristics treatment and recycling of waste water from Sugar, Dairy and Distilleries.

Learning outcomes:

1. Summaries sources and characteristics of food industries(L2)
2. Explain recycling of wastewater from sugar industries(L2)
3. Describe treatment and recycling of dairy industry(L2)

UNIT-IV **(10Lectures)**

MAJOR INDUSTRIAL EFFLUENTS:

Sources, characteristics, treatment and recycling of waste water from Power plants, Oil refineries, Cement and Steel factories.

Learning outcomes:

1. Describe sources of major industrial effluents(L2)
2. Discuss about the characteristics of power plant effluents(L2)
3. Explain recycling of effluents from steel factory(L2)

UNIT-V **(10 Lectures)**

CHEMICAL INDUSTRIES:

Sources, characteristics, treatment and recycling of waste water from Paper and pulp, Tanneries,Textiles, Fertilizers and Pharmaceutical industries.

Learning outcomes:

1. Explain Sources and characteristics of chemical industries(L2)
2. Discuss about treatment of chemical industrial wastewaters(L2)
3. Describe the recycling of chemical industrial wastewaters(L2)

TEXT BOOKS:

1. Rao, M.N. and Dutta, A.K., "Wastewater Treatment", 3rd Edition, IBH Publishers, 1982.
2. Patwardhan,"Industrial Wastewater Treatment"- PHI learning Pvt. Ltd, 2009.

REFERENCES:

1. Nemerow. N.L., "Liquid Waste from industry – Theories, Practice and Treatment" Addison wisely, 1996.
2. Benefield L.D. and Randall C.D, "Biological Process Designs for Wastewater Advanced Waste Treatment Methods "Removal Suspended solids – Dissolved solid Treatment", Prentice Hall Pub. Co., 1980.
3. Metcalf and Eddy. "Wastewater Engineering – Collection, Treatment, Disposal and Reuse",McGraw Hill Pub. Co., 1995.
4. C. Fred Gurnham" Industrial Waste Water Control", (Revised for publication January 28, 1977) 31 May, 2007.
5. Gurnham, C.F., "Principles of Industrial Waste Water: Wiley; New York, 1955.
6. Gurnham CF (Ed) "Industrial Waste Water Control"; Academic Press; New York, NY, 1965.