Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ESC356	Wastewater Engineering	3	0	0	9

Course Objective
To understand various physico-chemical and biological parameters used in design and operation of wastewater treatment plants.
Learning Outcomes
Hands on experience on various methods used for analysis of wastewater.

Sl. No.	Name of the Experiment	Lecture hr	Learning Outcome
1.	Determination of acidity, alkalinity & CO2 (free) of wastewater sample	2	Student will learn on the concept behind acidic /alkaline characteristics and types of acidity/ alkalinity present in wastewater
2.	Determination of BOD & COD in municipal wastewater and confer on the biodegradability of wastewater	2	The student will learn and understand the biodegradability and organic strength of the wastewater.
3.	Demonstration of Nitrate-nitrogen (NO3-N) Ammonical Nitrogen (NH4-N) & TKN of given wastewater sample	2	The student will learn on various forms of nitrogen, i.e. TKN, Ammonia Nitrogen & Nitrate present in wastewater.
4.	Determine TSS, TDS, TVS & TS of given wastewater sample. Also determine the settleable solids & non-settleable SS in given wastewater sample	2	The student will learn on various types of solids and their significance in design of ETP.
5.	Determination of Phenol & SO4 in municipal wastewater	2	The student will learn on the impact of Phenol & Sulphate present in wastewater.
6.	Determine MLSS, MLVSS concentration, sludge volume index (SVI) of sludge sample	2	The student will learn on concepts of sludge characterization and their role in design of biological treatment system
7.	Determination of TOC, DOC, UV254& SUVA of given wastewater sample	2	The student will learn on concepts of Natural organic Matter (NOM) and their analysis protocol through TOC analyzer.
8.	Determination of heavy metals such as Zn, Ni, Fe, by Atomic absorption spectroscopy (AAS) in municipal wastewater	2	The student will learn on concepts of determination of heavy metals by atomic absorption spectrophotometry (AAS).
9.	Determination of Pb and Cr by Atomic absorption spectroscopy (AAS) in municipal wastewater	2	The student will learn on concepts of determination of heavy metals by atomic absorption spectrophotometry (AAS).
10.	Determination of organic pollutant by High Performance Liquid Chromatography (HPLC)	2	The student will learn on principle and operation of HPLC.
11.	Determination of VFA using of given wastewater sample by Gas Chromatography (GC)	2	The student will learn chromatographic separation and isolation of individual VFAsby Gas Chromatography (GC)
12.	Determination of dye concentration in given wastewater sample	2	The student will learn spectrophotometric determination of dyes present in wastewater.

Reference book:

APHA, 2012. Standard Methods for the Examination of Water and Wastewater. 22nd edition. (Washington D.C.).