

K L UNIVERSITY

INDUSTRIAL WASTEWATER ENGINEERING (09 – CE E54)

SYLLABUS

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UNIT – 1 Introduction to industrial wastewater, Categories of water pollution and its environmental effects. Physical and chemical characteristics of wastewater such as biological oxygen demand (BOD), chemical oxygen demand (COD), Total organic carbon (TOC), Total oxygen demand (TOD), Alkalinity, Hardness, Suspended solid, Dissolved solids, MLSS, MLVSS, Toxic substances, Biological characteristics.

Unit –II Unit operation and unit process. Rack, Screening, Grit chamber, Activated sludge process (ASP) modeling: Substrate and biomass balance in ASP, Biomass recycle, Biomass generation, Oxygen requirement in ASP, Modified ASP: high rate ASP, Food and microorganism ratio, Oxygen supply in ASP, Type of aerators, Factor affecting performance of ASP, Secondary sedimentation tank (settling tank, SST), Design of SST. Operational problem in ASP. Attach growth process: trickling filter (TF), Mechanism of TF and types of packing media, Multi-stage trickling filter, NRC equation (National Research Council Canada), Eckenfelders equation. Aerobic attach growth submerged type system: Rotating biological contractors (RBC), Design of RBC. Anaerobic wastewater treatments and its mechanism. COD balance for biogas production and biomass growth. Upflow anaerobic sludge blanket reactor and its design principle.

Unit –III Fundamental of reaction kinetics, Reactor analysis and design: Completely mixed batch reactor, Continuous flow stirred tank reactor, Plug flow reactor, Common wastewater treatment process such as Solid separation, Coagulation, Softening, Filtration, Disinfections. Sedimentation, Type of sedimentation tank and its design criteria, Comminutors, Incineration. Advanced oxidation, Adsorption: Mechanism of adsorption, Break through curve, Adsorption isotherms.

Unit- IV Textile wastewater characteristics and its effect on environments, Treatment of wool, rayon, nylon, polyester and synthetic fibers waste. Pulp and paper mill waste: Manufacturing process and sources of waste, Characteristic of pulp and paper mill waste and its treatment methodology. Corn starch waste and its treatment process. Petroleum refinery industries: Basic and auxiliary refinery operations, Characteristics of petroleum raw wastewater and various treatment methodologies.

Unit- V Fertilization and pesticides industries: Manufacturing process of Ammonia, Urea, Phosphoric acids, Ammonium sulphate, Pesticides, various treatment methodology associated with it. Characteristic and treatment methodology of pharmaceutical plant wastewater such as Antibiotics and Synthetic Drugs. Acid mine drainage conversion of coal into coke, Treatment of coke oven waste water, Blast furnace, Cooling mills.

TEXT BOOKS:

1. Wastewater Engineering (Environmental Engineering -2) by B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain; Laxmi publications (P) LTD, Delhi.
2. Industrial Wastewater Treatment (third edition) , by A. D. Patwardhan, Published by Asoke K. Ghosh, PHI Learning private limited, New Delhi.

REFERENCE BOOKS:

1. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, George Tchobanoglous McGRAW-Hill International Editions
2. Wastewater treatment (third edition) by M.N. Rao, A.K. Datta Oxford & IBH Publishing Co.PVT. LTD, New Delhi
3. Wastewater Engineering, (4th edition) by Metcalf Eddy, Tata McGRAW-Hill Publication