

SYLLABUS OF ELECTIVE SUBJECTS

Course Code	Course Title	Course Type	Credits	Contact Hours		
				L	P	T
CE-585	Environmental Policies and Impact Analysis	DE	3	3	0	0

Unit 1

Environmental Impact Assessment- Definitions and Concepts, Rationale and Historical Development of EIA, Organization, Scope and Methodologies of EIA, Basic Steps in EIA Process, Public Participation in Environmental Decision Making and Management Dimensions

Unit 2

Project Screening and Scoping for EIA, Use of Risk Analysis in EIA, Environmental Risk Management, Health Risk Assessment, Risk Characterization, Socioeconomic Impact Assessment, Environmental Setting, Disposal of pollutants in the environment and their effects, Socioeconomic environment, Methods of impact analysis, EIA techniques for industrial facility construction and operation, Legal aspects- Legislation in the Indian context, Acts related to air and water, Case Studies.

Unit 3

Prediction and Assessment of Impacts on the Air Environment, Prediction and Assessment of Impacts on the Surface Water Environment, Prediction and Assessment of Impact on the Groundwater Environment and Land Environment, Air and water quality criteria, standards, a framework for environmental assessment, Prediction, and assessment of the impact on air water and biological environment.

Unit 4

Environmental Management- Principles, Problems, and Strategies, Environmental Appraisal, Environmental Impact Factors and Areas of Consideration, Environmental Audit- Definitions and Concepts, Life Cycle Assessment, Environmental Impact Statement, Environmental Impact Factors and Areas of Consideration.

Text Books and Reference Materials

1. Canter, L. Environmental Impact Assessment, McGraw Hill 1977
2. Rau, GJ. And Wooten, C.D., Environmental Impact Analysis Handbook, McGraw Hill 1980
3. Ministry of Environment and Forests, GoI, Current Documents on Guidelines for EIA.

Course No.	Course Title	Course Type	Credits	Contact Hours		
				L	P	T
CE-586	Industrial Wastewater Treatment	DE	3	3	0	0
Unit 1 Industrial Waste Survey, Waste Characterization, Treated Effluent Disposal Standards, Effects of Industrial Wastewater on Receiving Water Bodies and Municipal Sewage Treatment Plants, Wastewater Sampling techniques, Flow Measurement, Waste Management Strategies and Programs, Waste Reduction-Volume and Strength Reduction, Flow Equalization, and Proportioning.						
Unit 2 pH control and Neutralization, Zero Discharge Concepts, Removal of Specific Pollutants in Industrial Effluents, Oil and Grease Removal, Removal of Inorganic and Organic Constituents, Overview of Wastewater Treatment Processes, Removal of Cyanides and Chromium.						
Unit 3 Characteristics and Treatment of Various Industrial Effluents, Pollution Control and Case Studies in Selected Process Industries-Chlor Alkali Industry, Electroplating Industry, Fertilizer, and Tannery.						
Unit 4 Identification of treatment flowsheets and wastewater treatment for selected industries- Sugar Industry, Distillery, Brewery, Paper and Pulp, Dairy, Slaughterhouse and Petroleum Refinery.						
Text Books and Reference Materials						
1. Patwardhan, A.D., Industrial Waste Water Treatment, Prentice Hall of India Learning,2009 2. Rao, M.N., and Dutta, A.K., Wastewater Treatment, IBH Publ.,1995 3. Nemerow, N.L. Industrial Water Pollution, Addison Wesley Publishing Company,1978 4. Mahajan S.P. Pollution Control in Process Industries, Tata McGraw Hill Publishing Company,1998 5. Eckenfelder, W.W. Jr. Industrial Water Pollution Control, McGraw Hill Book Co. International edition 6. Central Pollution Control Board, India, Comprehensive Industry Document Series.						

Course Code	Course Title	Course Type	Credits	Contact Hours		
				L	P	T
CE-583	Wastewater Treatment Plant Design	DE	3	2	0	1
Unit 1 Wastewater treatment flowsheets, Bar Screens- Design and Hydraulics, Fine Screens and Micro screens, Grit Chamber, Proportional Weir. Unit 2 Sedimentation Tanks- Inlet and Outlet Design, Flow Distribution, Biological Waste Treatment- Activated Sludge Process, Extended Aeration. Unit 3 Biofilter, UASB Reactor, Fluidized/Expanded Bed System, Ponds and Lagoon Design, Design of Nitrogen and Phosphorus Removal System, Disinfection Systems, Sludge Thickening, Sludge Drying Beds. Aerobic and Anaerobic digestion of Sludges. Unit 4 Hydraulics of treatment plants; flow measurement and hydraulic control points, Wastewater Plant Residual Management, Hydraulic Analysis of Unit Operations, and Hydraulic Profile through the Treatment Plant.						
Text Books and Reference Materials						
1. Qasim S.R Wastewater Treatment Plant Planning, Design and Operation Holt Rinehart & Winston, N.Y1990. 2. Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, 3. McGraw Hill, FourthEdition,2002						

Course Code	Course Title	Course Type	Credits	Contact Hours		
				L	P	T
CE-481	Groundwater Management	DE	3	3	0	0
Unit 1: Planning and Analysis of Water Resource Systems: Introduction to water resource planning, water resource planning, water resource systems, characteristics of systems, analysis, and application. Unit 2: Identification and Evaluation of Water Management plans: Introduction, plan formulation, planning models, and solution procedure: objective functions and constraint equations, Lagrange multipliers, slack and surplus variables, Dynamic programming, Recursive equations. Linear programming - General approach; Geometrical approach and interpretation, simulation - Definition, types of simulation models. Unit 3: Management of Ground Water: Introduction, concepts of basin management, equation of hydrologic equilibrium, groundwater basin Investigations, data collection and fieldwork, alternative basin yield evaluation of perennial yield, salt balance, Basin management and conjugative use, an example of groundwater management. Salinity and waterlogging problems. Unit 4: Artificial Recharge of Ground Water: Introduction, concept artificial recharge, recharge methods, wastewater recharge for reuse, Recharge mounds, induced recharge. Unit 5: Modelling Techniques and Application: Introduction, porous media models - Sand tank model, Analog models - Viscous fluid model, membrane models. Thermal models, blotting paper models. Dynamic models.						
Text Books and Reference Materials						
1. Daniel P. Loucks. Jerry R. Stedinger. Douglas A. Haith, Water Resource Planning and Analysis, Prentice Hall, Inc. Eaglewood Cliffs, NY. 2. David Keith Todd, Ground Water Hydrology, John Wiley & Sons, NY. 3. Singiresu S Rao, Engineering Optimization - Theory and Practice, New Age International (P) Ltd. Hall. W.A., Dracup, J.4., Water Resource Systems Engineering, McGrawhill Book Co.						

Course Code	Course Title	Course Type	Credits	Contact Hours		
				L	P	T
CE-584	Solid Waste Management	DE	3	3	0	0
Unit 1 Types and Sources of solid waste, the need for solid waste management, Elements of integrated waste management and roles of stakeholders, Salient features of SWM Rules 2016, Roles and responsibilities of different stakeholders, initiatives taken by the government for solid waste management.						
Unit 2 Municipal solid waste generation rates and variation on a global and local level, the composition of solid waste, properties of solid waste, Municipal Solid Waste sampling and characterization, Proximate and Ultimate analysis, 3 R's concept.						
Unit 3 Handling and segregation of wastes at source -storage and collection of municipal solid wastes, Analysis of Collection System, transfer and transportation.						
Unit 4 Processing and Material Separation Techniques, Conveyors, Shredders, Screening, Magnetic Separation, Recycling, and Resource Recovery. SWM rules 2016 criteria for Refuse Derived Fuel (RDF) production, Composting, Anaerobic Digestion, SWM Rules 2016 criteria for waste to energy conversion options, Incineration, Pyrolysis, and Gasification. Treatment of waste: composting, RDF palletization, incineration, gasification, pyrolysis, biomethanation.						
Unit 5 Municipal Solid Waste Disposal- Sanitary Landfills- Criteria for selecting the location of a landfill as per SWM rules 2016, Landfill Cover and Liner, Design of Leachate Collection System, Leachate Treatment, Landfill Gas Collection and Recovery, Bioreactor Landfill,						
Text Books and Reference Materials						
1. Tchobanoglous, G., H. Theisen and S. Vigil, 1993, Integrated Solid Waste Management, McGraw-Hill Inc.Singapore. 2. George Tchobanoglous(Author),Frank Kreith, Handbook of Solid Waste Management, McGraw-Hill Professional; 2 edition(2002) 3. Vesilind P.A., Worrell W. and Reinhart D.R., "Solid Waste Engineering", ThomsonBooks. 4. Manual on Solid Waste Management (CPHEEO), Ministry of Urban Development, Government of India 5. Solid Waste Management rules 2016, Ministry of Environment, Forest and Climate Change.						

Course Code	Course Title	Course Type	Credits	Contact Hours		
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CE-588	Sludge Treatment and Disposal	DE	3	3	0	0
Unit 1 Sources of Sludge, Sludge Characteristics, Sludge Digestion- Aerobic and Anaerobic. Unit 2 Sludge Dewatering, Sand Bed Drying, Sludge Treatment, and Stabilization. Unit 3 Sludge Conditioning, Gravity Thickening, Centrifugation, Vacuum Filtration, Pressure Filtration. Unit 4 Thermal Drying/Heat treatment, Composting, Wet Oxidation, Ultimate Disposal, Biosolids Processing, Resource Recovery, and Beneficial Uses.						
1. Metcalf and Eddy, M.C., “Wastewater Engineering: Treatment, Disposal and Reuse”, Tata McGraw-Hill Publications, New Delhi,2003. 2. Fair G. M., Geyer J. C. &Okun D. A., Water & Wastewater Engg. Vol. I & II, John-Wiley & Sons, NewYork. 3. <i>Environmental Engineering</i> By Howard S. Peavy, Donald R. Rowe, George Tchobanoglous published by Tata McGraw-Hill Education.						

Course Code	Course Title	Course Type	Credits	Contact Hours		
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CE-587	Water Treatment Plant Design	DE	3	2	0	1

Unit 1

Treatment flowsheets, Mass balance calculations, Treatment Plant Hydraulics, Head Loss Types and Calculations, Manifold Hydraulics, Flow measurement.

Unit 2

Population Forecasting, Water Use, and Demand, Intake Facilities, Design of Aeration Systems.

Unit 3

Design of Chemical Mixing, Flocculation Process Design, Filter Design, Ion Exchange Process, and Equipment Design.

Unit 4

Sedimentation Tank Design, Membrane Unit Design, Chemical Precipitation, Disinfection and Sludge Handling.

1. *Environmental Engineering* By Howard S. Peavy, Donald R. Rowe, George Tchobanoglous published by Tata McGraw-Hill Education.
2. W.J.Weber Physiochemical process for water quality control, John Wiley & Sons.
3. CPHEEO, Manual on Water supply and Treatment, Govt. of India Publication.