

Course code	Course Name	L-T-P-Credits	Year of Introduction
CH301	ENVIRONMENTAL ENGINEERING	3-1-0-4	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• To impart basic concepts of environmental engineering</li> <li>• To understand about different types of pollution and its treatment</li> </ul>			
<b>Syllabus</b>			
Introduction to environmental engineering. Water treatment methods. Classification and characteristics of wastewater. Wastewater sampling and its analysis. Wastewater treatment methods. Sludge treatment and disposal. Sewage - characteristics - treatment and disposal. Air pollution - sources and classification of air pollutants. Sampling and analysis of air pollutants.Noise pollution. Noise control methods			
<b>Expected Outcomes</b>			
The students will be able to			
<ol style="list-style-type: none"> <li>i. Recognize the environmental legislation and regulation aimed at protecting the environment from harmful actions.</li> <li>ii. Know the different types of treatment processes for drinking water, municipal water and boiler feed water.</li> <li>iii. Know the primary, secondary &amp; tertiary treatment methods used for the waste water treatment.</li> <li>iv. Design waste water treatment equipment such as activated sludge process and trickling filters.</li> <li>v. Predict suitable treatment and disposal methods for industrial and hazardous wastes.</li> <li>vi. Identify air and noise pollution sources and select control methods.</li> </ol>			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>1. Metcalf &amp; Eddy, Wastewater Engg., Disposal &amp; Reuse, McGraw Hill</li> <li>2. Peavy H.S., Rose D.R.&amp; Tchobanoglous G., Environmental Engineering, McGraw Hill</li> <li>3. Rao C.S., Environmental Pollution Control Engineering, New age International Pub.</li> <li>4. Rao M.N. &amp; Rao H., Air Pollution, Tata McGraw Hill</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>1. Austin G.T. (Ed.), Shreve's Chemical Process Industries, McGraw Hill</li> <li>2. Babbitt H.E., Sewage &amp; Sewage Treatment, John Willey</li> <li>3. Chemtech I, Chem. Eng. Curriculum Dev. Centre, IIT-Madras</li> <li>4. Gopal Rao M. &amp; Sittig M. (Eds.), Dryden's Outlines of Chemical Technology, Affiliated East West Press.</li> <li>5. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw Hill</li> <li>6. Perkins H.C., Air Pollution, McGraw Hill</li> <li>7. Sincero A.P. &amp; Sincero G.A., Environmental Engineering-A Design Approach, Prentice Hall of India.</li> </ol>			

<b>Course Plan</b>			
<b>Module</b>	<b>Contents</b>	<b>Hours</b>	<b>Sem. exam marks</b>
I	Introduction to environmental engineering –environmental legislation and regulation. Water treatment - precipitation processes - alum treatment and lime soda softening. Municipal water conditioning - ion exchange processes Boiler feed water treatment - desalting	8	15%
II	Sources and classification of wastewater. Physical, chemical and biological characteristics of wastewater Types of water pollutants and their effects - water quality standards - Wastewater sampling and analysis - determination of organic matter - dissolved oxygen - biochemical oxygen demand - chemical oxygen demand - wastewater microbiology	8	15%
<b>FIRST INTERNAL EXAMINATION</b>			
III	Wastewater treatment methods - pretreatment - primary treatment - secondary treatment - tertiary treatment Screening, grit removal, oil removal and equalization - neutralization, coagulation, flocculation and sedimentation - clarifiers and clariflocculation Aerobic and anaerobic biological processes - activated sludge process - trickling filters - oxidation ditch - aeration lagoon - rotating biological contactors - aerobic fluidized bed bioreactors - Anaerobic digestion process - anaerobic filter - anaerobic contact process - anaerobic fluidized bed bioreactors - up flow anaerobic sludge blanket (UASB) - disinfections - chlorinating and ozonation - sand filters.	12	20%
IV	Sludge treatment and disposal - sludge thickening - sludge conditioning - sludge dewatering - sludge digestion and composting. Solid waste treatment - sources and classification - collection and disposal methods - open dumping - sanitary landfill - incineration – composting. Treatment of industrial waste - pulp and paper mill - textile mill - distillery - dairy - petroleum refinery - fertilizer industry Hazardous waste -types of hazardous waste - health effects - treatment methods.	12	20%

<b>SECOND INTERNAL EXAMINATION</b>			
V	Air pollution - sources and classification of air pollution. Effects of air pollution - global effects of air pollution - global warming and ozone depletion. - air pollution meteorology - atmospheric dispersion - air pollution Sewage - characteristics - treatment and disposal from automobiles - sampling and analysis of air pollutants	8	15%
VI	Air pollution control methods and equipment - settling chambers - cyclone separators - fabric filters - electrostatic precipitators - wet scrubbers - control of gaseous emission - absorption by liquid and adsorption by solids Noise pollution - effects of noise on people. Noise control methods.	8	15%
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern:

Maximum Marks: 100

Exam Duration: 3 Hours

**Part A:** There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

**Part B:** There shall be **Three questions** uniformly covering Modules 3 and 4, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 20 marks for all the subdivisions put together. (2 x20= 40 Marks)

**Part C:** There shall be **Three questions** uniformly covering Modules 5 and 6, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)