

Course code	Course Name	L-T-P-Credits	Year of Introduction
CH464	WATER AND WASTEWATER ENGINEERING	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives			
<ul style="list-style-type: none"> To have an increased awareness among students on issues in areas of water pollution. To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on water pollution 			
Syllabus			
<p>Water Engineering- water sources, water demand, water quality standards, water conservation methods.</p> <p>Water Engineering- wastewater Treatment analysis- Preliminary and Primary Treatment Methods, Biological and Advanced Treatment Methods, Wastewater Engineering -Sludge Treatment and Disposal.</p> <p>Case studies on Wastewater Treatment Methods in various industries.</p>			
Expected Outcome			
<p>The student will be able to</p> <ol style="list-style-type: none"> Understand the different types of water pollution problems and their solutions Work in the area of water and wastewater engineering for research and education 			
Text Books:			
<ol style="list-style-type: none"> Eckenfelder W.W, “Industrial Water Pollution Control”, Mc Graw Hill, 2000 M. N Rao &A.K Dutta, “ Wastewater treatment”, PHI Publication Mark.J.Hammer & Mark.J.Hammer Jr ., Water and Wastewater Technology, Prentice Hall of India. Ltd. Metcalf and Eddy Inc: “Wastewater engineering”, Tata Mc Graw Hill, New Delhi Qasim S, “Water Works Engineering”, Prentice Hall Publication, New Delhi S.K Garg ,”Wastewater engineering” , Khanna publication 			
Reference Books:			
<ol style="list-style-type: none"> Areadio P Sincen & Gregoria A Sincen, Environmental Engineering- A Design Approach, Prentce Hall of India Ltd. Duggal, K.N.,Elements of Public Health Engineering, S.Chand & Co.,New Delhi. Mackenzie L Davis & David A Cornwell, Introduction to Environmental Engineering, Mc Graw Hill. Peavy,Rowe & Tchobanoglous “Environmental Engineering”, Mc Graw Hill, New Delhi. Ragwala, Water supply and sanitary Engineering, Charotar Publishing House,Anand,India W.Wesley Eckenfelder,Jr, Principles of water quality management, CBI Publishing Company,Inc. 			

Course Plan			
Mod ule	Contents	Hours	Sem. exam marks
I	Water resources- Rainfall and runoff, ground water and surface waters. Quantity of water-Domestic water needs, Industrial demand, Institutional demand and Fire fighting demand. Quality of water- Impurities in water and their importance, water borne diseases. Water Analysis-Physical, Chemical and Biological analysis.	7	15%
II	Water quality standards for drinking water, mineral water, boiler feed water and swimming pools. Water recycling and reuse, rain water harvesting. Water pollution control and water management.	6	15%
FIRST INTERNAL EXAM			
III	Wastewater flows and characteristics, wastewater collection systems, estimation and variation of wastewater flows. Treated wastewater reclamation and reuse, wastewater preliminary, primary, secondary and tertiary treatment processes. Screens, grit chamber & their design, sedimentation, coagulation, flocculation.	6	15%
IV	Theory of activated sludge process, extended aeration systems, trickling filters, aerated lagoons, stabilization ponds, oxidation ditches etc. concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor. Disinfections ,chlorinating and ozonation , sand filters, activated carbon, adsorption, ion exchange , reverse osmosis	8	15%
SECOND INTERNAL EXAM			
V	Sludge treatment and disposal: Design of sludge management facilities, sludge thickening, sludge digestion, biogas generation, sludge dewatering. Upgrading existing plants, ultimate residue disposal, and recent advances.	6	20%
VI	Case studies: Study on process flow sheets, wastewater characteristics, waste generation points, treatment scheme suggested for the following industries: Distillery, Paper/pulp industry, Tanneries, Sugar, Textile, Steel and Oil refinery.	9	20%
END SEMESTER EXAM			

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 one 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 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together.

(2 x15= 30 Marks)

Part C: There shall be **Three questions** uniformly covering Modules 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 20 marks for all the subdivisions put together.

(2 x20= 40 Marks)

