BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21 COURSE HANDOUT

Date: 15.01.2021

In addition to part I (General Handout for all courses appended to the Timetable) this portion gives further specific details regarding the course.

Course No : **CE F342**
Course Title : **Water and Wastewater Treatment**
Instructor-in-Charge : **Anupam Singhal**
Instructor(s) : **Anupam Singhal**
Tutorial/Practical Instructors: R. Srinivas, Soumya Kar, Srishti Khare and Akshay Kumar

1. Course Description: In this course, the fundamental concepts involved in Water and Wastewater treatment will be discussed. The course coverage includes a wide range of topics such as sources of water, estimation of water requirements and wastewater generation, study of their characteristics, natural methods of purification, different unit operations for treatment of water and wastewater, sludge handling and disposal, advanced wastewater treatment, reuse of wastewater, and hydraulic design of sewer and water supply distribution system. The course has a lab component where the student gets involved in the testing of few physico-chemical parameters of water and wastewater.

2. Scope and Objective of the Course: The need of the hour in the world nowadays is "*provision of adequate and potable water supply*". The world is witnessing a war like situation for 'lack of water supply' at many places. The global need is for judicious use of available water and putting efforts to recycle/reuse the treated wastewater for beneficial purposes. This course aims to provide insight to the several technical aspects to be considered in the planning, design, and implementation of water supply and wastewater treatment schemes. Field application of the subject is illustrated through case studies reported in literature. In addition, students will be shown some videos to illustrate the field application of the experiments demonstrated in the laboratory sessions.

3. Textbooks:

T1. Punmia B.C, A. Jain and A. Jain. *Water Supply Engineering*, Laxmi Publications, New Delhi, 1995.

T2. Punmia B.C, A. Jain and A. Jain. *Wastewater Engineering*, Laxmi Publications, New Delhi, 1998.

T3. Moondra H.S. and R. Gupta, *Laboratory manual for Civil Engineering*, CBS Publishers & Distributors, Delhi, 1992.

4. Reference Books:

R1. Peavy H.S., D. R. Rowe and G. Tchobanoglous. *Environmental Engineering*, McGraw Hill Education (India) Private Limited, 2013.
R2. Garg S.K. ,*Water Supply Engineering*, Khanna Publishers, Delhi, 2008.
R3. Garg S.K., *Sewage Disposal & Air Pollution Engineering*, Khanna Publishers, Delhi, 2010.
R4. Relevant IS codes, National and International Journals pertaining to the subject.

5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1. Introduction to basics of Water Supply (WS) and	Introduction; Estimation of WS & WW; Characteristics (1-5)	Ch.1 of T1 & T2; Ch. 5 of T1;	Understanding the basic concepts of water and wastewater characteristics

wastewater (WW) Engineering		Ch. 6 of T1; Ch. 8 of T2	
2. Natural methods for water and wastewater treatment	Self-purification of rivers, Dilution method, Gas transfer(6-8)	Ch. 7 of T1; Ch.9 of T2	Idea about the self-purification capacity of streams and natural methods of treatment
3. Unit operations for water treatment	Preliminary treatment, Sedimentation, Filtration, Disinfection(9-19)	Ch 8-11 of T1	Different steps in water treatment
4. Unit operations for wastewater treatment	Preliminary treatment, Primary treatment, Secondary treatment (20-34)	Ch. 10-15 of T2	Students will get idea about the different methodologies of wastewater treatment
5. Treatment and disposal of sludge	Dewatering, Digestion and disposal(35-37)	Ch. 16 of T2	Remedies of solid waste disposal
6. Advanced methods of treatment for water and WW	Ion exchange, Reverse Osmosis, Adsorption, Water softening, Desalination (38-40)	Ch-18 of T2; Ch. 11 ,12,13of T1	Idea about the latest techniques of water and wastewater treatment
7. Application of Hydraulics and Case studies	Hydraulic design of sewers, WS distribution networks and Field case studies (41-44)	Ch. 4 of T2; Ch. 16 of T1	Understanding the design of sewers and water distribution system

6. List of Experiments

1	Determination of acidity and alkalinity in water.	1 Turn
2	Determination of Dissolved Oxygen (DO) in water	1 Turn
3	Determination of iron and residual chlorine in water	1 Turn
4	Determination of Chloride content in water	1 Turn
5	Determination of Hardness content in water	1 Turn
6	Determination of Calcium content in water	1 Turn
7	Determination of pH, turbidity and suspended solids of water	1 Turn
8	Determination of sulfate in water	1 Turn
9	Determination of Fluoride in water	1 Turn
10	Demonstration to determine the Optimum dose of a coagulant, COD and BOD	1 Turn

11	Demonstration of Primary Clarifier and Rapid Sand Filter Apparatus	1 Turn
12	Water quality monitoring and real time monitoring of river Ganges using remote sensing.	1 Turn
13	Usage of multiparameter sonde to measure water quality parameters and treatment of storm water runoff in urban setting.	1 Turn

7. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of component (Close Book/ Open Book)**
Mid-Semester Test	90 Min.	30	<TEST_1>	OB
Comprehensive Examination	3 h	40	<TEST_C>	CB
Tutorials	50 (5T)	10%	Continuous	CB/OB
Lab activity/ Quiz	---	15%	Regular lab class timings	OB
Assignments	---	5%	To be announced in the class from time to time(OB)	OB

8. Chamber Consultation Hour: 4 to 5 PM every Monday.

9. Notices: Concerning the course will be declared in the class or updated in Google classroom.

10. Make-up Policy:

a. Make-up will be granted only on genuine reasons. However, prior permission is must.
b. For medical cases, a certificate from the concerned physician of the Medical Centre must be produced.
c. NO make-up will be granted for lab quiz.

11. Note (if any): Academic honesty and academic integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
Course No. CE F342