

CEL212 Environmental Engineering

Second Semester 2011-2012

Lecture: TWF 10:00-10:55AM (WS 101-Workshop Block)

Laboratory: M-F (Group-wise) (Block 4, Room 313: Environmental Engineering Lab)

Course Coordinator:

Asst. Prof. Arun Kumar

Contact: Block V, Room 204 (Civil Engineering), Email: arunku@civil.iitd.ac.in

Office Hours: 2:30PM-3:00PM (or email me to get an appointment)

Study Materials:

- Peavy, HS, Rowe D.R., Tchobanoglous G., 2000, "Environmental Engineering", McGraw Hill Int.

You need to come to the class for detailed lecture and daily check IITD generated class mailing list. Further, some power point slides and handouts will be available on the website (<http://web.iitd.ac.in/~arunku/>) (in "Teaching Activity" section).

Course Overview:

Water supply: Sources, Water demand and forecasting; Quality of water, water borne diseases, standards, water quality index; Unit Processes: Systems and unit processes of water purification; Water distribution networks; Wastewater Engineering: Systems of sanitation, wastewater flows, collection and conveyance of wastewater, layout systems; Characteristics and microbiology of wastewater. BOD kinetics; Disposal of treated wastewater on land and in water; Unit processes for wastewater treatment; Sludge management; Introduction to solids and hazardous waste management; Air and noise pollution and control.

Course Policy

Distribution of Marks (total =100):

Minor Examinations	30
Laboratory	30 (10 = Lab quiz; 5 = Attendance; 10= Reports; 5 = Viva voce)
Attendance	5 (75% attendance rule; see note below)
Assignments	(self-grading)
Unannounced Quizzes	10
Major Examination	25

Attendance Rule: If a student's attendance is **less than 75% (individually in laboratory and lectures)**, the student will be awarded **one grade less than the actual grade** that he (she) has earned. Students needing special accommodations for exams or coursework must submit letters in accordance with institute's policy **one day in advance**. Students are responsible for checking LMS, email mailing list daily for getting course information.

Homeworks: Questions and Solutions will be uploaded on the website every Friday and students are expected to work on these problems. Variations of some of the questions might come in quizzes and examinations.

Quizzes: At least 4 quizzes will be conducted and best of three quizzes will be counted.

Class: Read the assigned sections and work problems before the class and **bring calculator daily** in the class.

Tentative Schedule

Date	No.	Topic
Jan 3 (T)	1	Introduction-Environmental Engineering
Jan 4 (W)	2	Water pollution, water-borne diseases and quality parameters
Jan 6 (F)	3	Water purification processes
Jan 10 (T)	4	Water purification processes
Jan 11(W)	5	Dissolved oxygen balance and model
Jan 12(F)	6	Dissolved oxygen balance and model
Jan 17 (T)	7	Dissolved oxygen balance and model
Jan 18(W)	8	Dissolved oxygen balance and model
Jan 20(F)	9	Water purification-Introduction, treatment processes
Jan 24 (T)	10	Solids separation (Type 1 settling)
Jan 25(W)	11	Solids separation (Type 1 settling)
Jan 27 (F)	12	Solids separation (Type 1 settling)
Jan 31 (T)	13	Type 2 settling
Feb 1 (W)	14	Exam Review
		Minor exam 1 (Feb 3rd -7th)
Feb 8 (W)	15	Type 2 settling
Feb 10 (F)	16	Other settling types
Feb 14 (T)	17	Coagulation-Flocculation
Feb 15(W)	18	Coagulation-Flocculation
Feb 17 (F)	19	Coagulation-Flocculation
Feb 22(W)	20	Softening
Feb 24 (F)	21	Softening
Feb 28 (T)	22	Ion exchange
Feb 29 (W)	23	Ion exchange
Mar 2 (F)	24	Adsorption
Mar 13 (T)	25	Filtration
Mar 14 (W)	26	Filtration
Mar 16 (F)	27	Disinfection
Mar 20 (T)	28	Disinfection
Mar 21 (W)	29	Exam Review
		Minor Exam 2 (Mar 22nd -Mar 25th)
Mar 27 (T)	30	Wastewater characteristics, effluent standards and terminology
Mar 28(W)	31	Primary and Secondary treatment
Mar 30 (F)	32	Advanced wastewater treatment
Apr 3 (T)	33	Sludge characteristics and digestion
Apr 4 (W)	34	Sludge thickening, digestion and disposal
Apr 10 (T)	35	Water distribution system
Apr 11 (W)	36	Water distribution system
Apr 17 (T)	37	Air pollution-Introduction and pollution sources
Apr 18 (W)	38	Outdoor/Indoor Air pollutants
Apr 20 (F)	39	Air quality modeling/Noise pollution
Apr 24 (T)	40	Hazardous waste management
Apr 25 (W)	41	Hazardous waste management
Apr 27 (F)	42	Hazardous waste management
		Major exam (May 2nd -May 8th)

Laboratory Guidelines

1. The class will be divided into small groups that will be working together in the lab and in writing the laboratory reports. Each group will submit only one lab report.
2. Always bring lab manual, calculator and lab note book.
3. **All lab data will be entered on a sheet of a paper and checked with a Teaching Assistant before attaching it with the lab report.** The lab report should include **task distribution of each group member** for lab and report writing activity (i.e., Name-Task conducted). Each group will analyze their own data and prepare a lab report **not more than 5 pages long (typed with lab data sheet attached).**
4. All reports should **strictly follow** this outline (Name/Entry no./Group no.) **(50 points/report):**
 - **Title:** Include course title, experiment title, date of experiment, date of report submission, and names of group members **(2 points)**.
 - **Summary:** A one paragraph statement covering the important objectives, background materials, procedures, results, and conclusions. It is considered to be the most influential parts of reports and it need to be written clearly and concisely **(4 points)**.
 - **Objectives:** Make a clear statement of experimental objectives **(4 points)**.
 - **Background:** In one paragraph explain the importance of the experiment in environmental engineering **(4 points)**.
 - **Methods:** Briefly explain the methodology used **(6 points)**.
 - **Results and Discussion:** This section should include a presentation of reduced data (i.e. quantities calculated from raw data) in tabular or graphical format. Refer Tables and Graphs in text and include a title (Table 1, Table 2 or so; Figure 1, Figure 2, or so). Graph axes should **be labeled always with units (10+5 =15 points)**.
 - **Conclusions and Recommendations:** Briefly list the results and recommendations for improving the experiments **(3+2=5 points)**.
 - **Answers to Questions (8 points)**
 - **References and Appendices:** Any citations, raw data and statistical methods should be included here **(2 points)**.

Grading:

All lab reports will be **due next week and graded in 50 points. For late submission, 25% of 50 points will be deducted for each date late.**

Attendance:

Attendance is **compulsory in all labs**. If a student's attendance is **less than 75% in laboratory**, the student will be awarded **one grade less than the actual grade** that he (she) has earned. Only in the case of emergency, the make-up lab will be scheduled well in advance with the consent of the faculty. **No other exceptions will be entered for lab rescheduling.**

Lab Safety:

Students **without shoes will not be allowed in the lab**. Bring lab coat and a permanent marker to lab. Always wear full sleeves clothes. Wear safety glasses and gloves when recommended. Leave bags and coats in designated areas. Bring only the essentials to the lab bench. No eating, drinking, playing, or applying cosmetics (including hand lotion, etc.). Never use broken or chipped glassware. Place broken glassware in specially marked containers. Mouth pipetting is forbidden. Hands should be washed after contact with hazardous materials and before leaving the lab.

Lab Etiquette:

Return all chemicals and supplies to the proper location after use. It is necessary to take chemicals from reagent bottles, pour out slightly more than the amount of chemical needed into a clean beaker. Never pour a chemical back into a reagent bottle. Clean up for the next person. At the conclusion of each work period, all used **glassware must be cleaned and set to drain**. Remove label tape, scrub inside of glassware with water and laboratory detergent, rinse with tap water, rinse with distilled water, and place cleaned glassware on a rack to dry. No experiment is complete until the laboratory is cleaned.

Tentative Lab Experiments Schedule

DATE	Lab	TOPIC
Jan 9-Jan 13	1	Lab introduction, pH and conductivity, turbidity
Jan 16-Jan 20	2	Alkalinity and acidity
Jan23-Jan27	3	Hardness
Feb 13-Feb17	4	Dissolved Oxygen (chemical method and demo of probe)
Feb 21-Feb 25	5	Chemical oxygen demand (Demo)
Mar 26-Mar 30	6	Chlorine-titration method
Apr 2-Apr 6	7	Ions (Fluoride)
Apr 9-Apr 13	8	Fecal coliforms (Demo)
Apr 16-Apr 20	9	Back-up lab
Apr 23-Apr 27	10	Lab viva/exam