PENNSTATE

The Department of Civil and Environmental Engineering

CE 472W, WATER POLLUTION CONTROL PROCESSES

Description:

- Principles and design of unit operations for water; domestic and industrial wastewater treatment, equipment selection and application.

Text:

- Veissman, W. and M. J. Hammer. *Water Supply and Pollution Control*, 4th edition, Harper & Row, 1985.
- *Notes and References*, by James C. Young and David A. Long (Supplement).

Topics:

- [L] Introduction/The Design Process 4-44
- [L] Water Quality Management/Regulations 1,2,3 69-96
- [P] Project Description/Writing Requirements
- [2L] Water Demand/Wastewater Production 4:27-37; 50-54 45-68
- [P] Project/Problem/Writing Review
- [2L] Flow Measurement/Plant Hydraulics 6:108-112; 159-165;7:171-179; 10:281-295 166-185; 778-826
- [P] Projects/Problems/Writing Review
- [L] Water Quality/Pollution Control Measures 8:237-250
- [L] Water Pollution Control Processes 8:254-269 97-165
- [P] Projects/Problems/Report Review
- [2L] Flow Equalization/Pretreatment 10:285-286; 320-322;14:664-666 186-212
- [P] Projects/Problems/Report Review
- [2L] Sedimentation Theory/Design 10:301-319 213-249
- [P] EXAM #1
- [2L] Biological Treatment Fundamentals 12:428-464
- [P] Projects/Problems/Exam #1 Review
- [2L] Trickling Filters 12:465-490 250-275
- [P] Projects/Problems/Report Review
- [2L] Activated Sludge Processes 12:497-519 276-336
- [P] Projects/Problems/Report Review
- [2L] Other Aeorbic Processes 12:463-497; 546-554 336-397
- [P] Projects/Problems/Report Review
- [2L] Anaerobic Process Design 13:569-583; 600-610 583-604
- [P] EXAM #2
- [2L] Sludge Processing 13:583-600; 610-642 187-557
- [P] Projects/Problems/Exam #2 Review
- [2L] Advanced Waste Treatment 14:662-714 680-682

- [P] Projects/Problems/Report Review
- [2L] Water Treatment Processes 9:270-280; 10:287-301 639-679
- [P] Projects/Problems/Report Review
- [2L] Filtration 10:322-345 398-434
- [P] Projects/Problems/Course Review

EXAM #3 (on material covered since 31L)

L=Lecture;P=Practicum

Notes

1. The prerequisites for this course are CE 270, CE 261, and ENGL 202C (ENGL 202C may be taken concurrently). Students who have not completed these prerequisites should not schedule this course without written permission from the instructor.
2. Some assignments will require that students work together in groups. These assignments will involve specific design projects or elements of a larger design project. Students are expected to prepare written reports for each design element for subsequent inclusion in a final report.
3. This course is a "writing-intensive" course. Students should be prepared to spend a significant amount of time in planning and executing the writing of their interim and final project reports. The report sections will be reviewed by the instructor and/or teaching assistant. Corrections of writing and technical errors will be made prior to the preparation of the final report.
4. The 2-hour practicum session will be used for the completion of assignments from previous periods, work on group projects, questions and answers, and review of materials previously covered, including writing practices.
5. Homework assignments must be completed on the assigned date. Usually, only one assigned problem will be selected for grading. Late submissions will be discounted and will not be accepted after the assignment has been graded and returned to the other students.
6. Attendance is expected during every scheduled class period. Students who need to miss class should inform the instructor prior to the class period to be missed.
7. The above schedule and supporting statements are subject to changes, corrections, or updates at any time to accomplish the course objectives.

Expectations

Upon completion of this course, you are expected to have:

1. Gained an awareness of the State and Federal regulations governing the decision-making processes related to facility plans and to the design and operation of water pollution control and water treatment systems.
2. Become familiar with the terminology and procedures used for the characterization of water and wastewater for the purpose of treatment and quality control.
3. Learned the basic procedures for conducting studies of water demand and wastewater flows that would be used as a basis for the design of water and wastewater treatment facilities.
4. Become familiar with the devices used for the pretreatment of water and wastewater prior to chemical or biological treatment.

5. Acquired an understanding of the basic parameters used for sizing the major process units for water pollution control systems including clarification, biological treatment, sludge production, and sludge treatment and disposal.
6. Become able to calculate the hydraulic profiles for a water or wastewater treatment plant.
7. Become aware of the basic chemistry of water and wastewater treatment including neutralization, chlorination, corrosion control.
8. Acquired a basic understanding of the biological mechanisms responsible for the biological wastewater treatment, including biological growth, oxygen uptake, methane generation.
9. Gained an awareness of the need for advanced waste treatment and the processes used to accomplish specific goals such as phosphorus and nitrogen removal.
10. Become familiar with the problems and expectations when disposing of wastewater or sludges on land.
11. Gain an understanding of the design process whereby environmental engineers interface with local and municipal officials, state and federal agency personnel, and manufacturing firms to accomplish a design objective.
12. Become able to prepare a well-organized and well-written engineering report describing the elements of a project design to a client.

LIF #12

THE PENNSYLVANIA STATE UNIVERSITY

Department of Independent Learning
128 Mitchell Building
University Park, Pennsylvania 16802

Second Examination in CE 297B 01PA Social Security # 890 04 3764

Name of Student MARTIN BALESTIE Time Limit: 3 hours

Street MIRANDA 7471 City MONTEVIDEO State MINNESOTA Zip 11600

Time Started 6:30 PM Time Finished 9:00 PM Date 12/13/99

EXAMINATION CERTIFICATE

NOTE: This certificate must be dated and signed by both student and proctor at the end of the examination period in order for the examination paper to be valid. This certification sheet must accompany the examination questions or problems and the student's examination paper and be returned to the Independent Learning office only by the proctor, before the examination paper will be evaluated.

STUDENT CERTIFICATION

I hereby certify that I have received no help from anyone in writing this examination paper, and have followed the rules given for this examination by the Department of Independent Learning, The Pennsylvania State University.

Date Dec 13 1999 Student Signature

PROCTOR CERTIFICATION

I hereby certify that I have proctored the examination for the above student, and have followed the rules given for this examination by the Department of Independent Learning, The Pennsylvania State University.

Date 12/13/99 Proctor Signature

Environmental Scientist / Teacher
Official Title

B

THE PENNSYLVANIA STATE UNIVERSITY
OFFICE OF THE UNIVERSITY REGISTRAR
112 SHIELDS BUILDING
UNIVERSITY PARK, PA 16802-1292

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PENNSTATE

FORWARDING SERVICE REQUESTED

MARTIN BALESTIE
COMPANIA TECNICO INDUSTRIAL SA
AVELINO MIRANDA 2471 11 FLOOR
MONTEVIDEO 11600 URY

... grades of A, A-, B+, B, B- ... credits. Courses graded with symbols which have no grade ... of grade point averages. The semester average includes only work taken during the current ... cumulative average includes all applicable work completed at The Pennsylvania State University. Total credits earned represents all credits accumulated from all sources including Penn State. W symbols indicate withdrawal from the University. WP, WF, WN symbols indicate course dropped after regular drop deadline.

WARNING – UNDERGRADUATES ONLY (APPLIES ONLY IF WARNING APPEARS IN ACTION AREA ON GRADE REPORT) – An official notification of unsatisfactory progress towards degree requirements due to failure to maintain the minimum 2.00 cumulative average required for graduation as evidenced by a grade point deficiency. A grade point deficiency exists when total grade points for courses graded A through F are less than cumulative credits times 2. Any grade point deficiency will result in a WARNING unless drop action is taken under other policies.
Example: A student with 34 cumulative credits who has earned 66 grade points would have a grade point deficiency of 2 and would receive an academic warning calculated as follows:
(34 x 2 = 68 then 68 – 66 = 2 grade points deficient).
See Section 51 – 00 and 54 – 00 of Undergraduate Policies and Procedures. Students subject to warning action should consult with their adviser or Dean of their College.

GRADUATE STUDENTS – A cumulative grade point average below 3.00 may be considered evidence of failure to maintain satisfactory scholarship and may result in drop action at the program level. DEGREE SOUGHT - PROV printed in action area on grade report indicates provisional admission. Regulations regarding this temporary classification should be reviewed in the Graduate School Catalog.

LAW STUDENTS - REFER TO THE DICKINSON SCHOOL OF LAW STUDENT HANDBOOK FOR EXPLANATION OF GRADES.

GRADING SYSTEM

A	– 4.00 Grade PTS / CR	C+	– 2.33 Grade PTS / CR				
A-	– 3.67 Grade PTS / CR	C	– 2.00 Grade PTS / CR				
B+	– 3.33 Grade PTS / CR	D	– 1.00 Grade PTS / CR				
B	– 3.00 Grade PTS / CR	F	– 0.00 Grade PTS / CR				
B-	– 2.67 Grade PTS / CR						

NO GRADE POINTS INVOLVED

NG	- NO GRADE REPORTED	PS or P	- PASS
DF	- DEFERRED	W	- WITHDREW
AU	- AUDIT	WP	- WITHDREW (PASSING)
R	- RESEARCH	WF	- WITHDREW (FAILING)
S	- SATISFACTORY	WN	- WITHDREW (NO GRADE)
FL	- FAIL		

GRADE PTS (PS & FL GRADES EXCLUDED) DIVIDED BY APPLICABLE CREDITS = SEMESTER OR CUMULATIVE AVERAGE. INCP = AVERAGE CALCULATED WITH INCOMPLETE GRADES.

RG 0063 REV 5/98

Distance Education Grade Report DATE PREPARED:07/21/00 SEMSP99

COURSE	TITLE	CREDITS	GRADE	GRADE POINTS
C E 297	SPECIAL TOPICS	3.0	A	12.00

	AVERAGE	CREDITS ATTEMPTED	GRADE POINTS
SEMESTER	4.00	3.0	12.00
CUMULATIVE	4.00	3.0	12.00

TOTAL CREDITS EARNED	GRADE POINT DEFICIENCY
3.0	

ACTION

MARTIN BALESTIE

890-04-3764

MAJOR	CAMPUS	SEM CLS	COLL	
NDEGR	UP	NR	UN	

Treatability Test Assessment



Used together, batch and continuous reactor tests assess wastewater treatability more accurately

James C. Young and Thomas J. Irwin

Treatability assessments are an essential, inexpensive method for illustrating whether a proposed treatment system will handle a particular wastewater effectively. However, if assessment results are based solely on batch reactor test measurements, the picture they present may be distorted or incomplete.

Treatability assessments often involve batch respirometric tests, in which a known amount of industrial wastewater is added to a microorganism culture from a laboratory reactor, full-scale treatment plant, or commercial source. The response — measured by oxygen uptake in aerobic reactions and gas production in anaerobic reactions — indicates potential biodegradability or toxicity.

Batch tests produce results within hours or a few days, are good indicators of biodegradability, and can provide reasonable estimates of the kinetic parameters that predict full-scale process performance. However, they merely represent a seed culture's short-term response to the test wastewater and only are reliable if the wastewater contains nothing toxic to the test culture, the culture is acclimated to the wastewater constituents, and no toxic byproducts accumulate during treatment. Batch tests also may produce misleading information if a toxic wastewater is diluted to below-toxic levels during testing.

These shortcomings can be offset significantly by using repetitive batch or continuous reactors to simulate the wastewater's long-term effects on a biological process. Although continuous reactor tests require more time, they provide more realistic measures of treatability, allow sufficient time for culture acclimation, and simulate full-scale operation more closely than batch tests. Therefore, treatability assessments should include both batch and continuous reactor tests to ensure that the resulting estimates of kinetic and process parameters are reliable.

Batch and Continuous Reactors

Batch tests typically fall into two classifications: high-rate and low-rate.

High-rate batch tests. A high-rate batch test is a transient, nonsteady-state reaction in which a substrate is

FIGURE 1

Relationship of Substrate Conversion Rate to Substrate Concentration as Related to Kinetic Modeling

