Doc. 69

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title; ADVANCED WASTEWATER TREATMENT

Code No.: WTR 327-5

Program: WATER RESOURCES ENGINEERING TECHNOLOGY

Semester: SIX

Date: APRIL, 1989

Author: SUBHASH C. VERMA

New: Revision; X

APPROVED: _____ '27€^ ^Z/fd> •

Chairperson Date

CALENDAR DESCRIPTION

ADVANCED WASTEWATER TREATMENT	WTR 327-5
Course Name	Course Number

PHILOSOPHY/GOALS;

To present basic knowledge and practices, theories, and applications relevant to the wastewater treatment of wastewaters. The course work will involve biological, physical and chemical processes, and sludge treatment and disposal methods. The objectives of the course and the course outline are given on the attached.

METHOD OF ASSESSMENT (GRADING METHOD);

Laboratory & Field Exercises	25%
Three Unit Tests	75%

GRADING:

A+- 85-100%.
A - 80-84%
B - 70- 79%
C - 60- 69%
D - 50- 59%

A passing grade will be based on a minimum composite grading of 60%. Students obtaining a composite grading of 55 to 59% may be allowed to complete a supplementary examination.

TEXTBOOK;

Water Supply &_ Pollution Control, by Warren Viesman, Jr. and Mark J. Hammer, 4th Edition, Harper and Row Publishers, New York. (1984).

REFERENCES;

Wastewater Treatment, by Donald W. Sundstrom and Herbert E. Klei, Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. (1979).

Water and Wastewater Technology (SI Version) by Mark J. Hammer. John Wiley & Sons, (1987), 2nd edition.

Industrial Water Pollution ^ Origins, Characteristics and Treatment, by Nelson L. Nemerson. Addison-Wesley Publishing Company, Don Mills, Ont. (1978).

Water Quality, by George Tachobanoglous and Edward D. Schoreder. Addison-Wesley Publishing Company, Don Mills, Ontario. (1985).

OBJECTIVES

The student will be able to:

1. Identify the physical, chemical and biological characteristics of wastewater.
2. Classify treatment processes with respect to the method and degree of treatment, and sludge handling.
3. Determine sludge characteristics and estimate the quantities of sludges.
4. Classify the sludge treatment process and to estimate the volume of sludge digesters.
5. Determine the capacity of equilization basins.
6. Calculate the nutrient loading due to waste discharges from municipal and industrial plants.
7. Perform calculations related to deoxygenation of stream water.
8. Calculate assimilative capacity of a given water system using an elementary water quality model.
9. Describe the various physical, chemical and biological processes for phosphorous and nitrogen removal.
10. Perform design calculations for physical treatment processes, including sedimentation, thickening, flotation, filtration, centrifugation, adsorption and membrane separation.
11. Perform design calculations for chemical treatment processes, including neutralization, coagulation, ion exchange, oxidation and disinfection.
12. List and describe the treatment methods for industrial wastes including food, pulp and paper, steel and chemical industries.

COURSE OUTLINE

1 Review of Secondary Treatment Processes (Chapter 12)

1.1 Definition and classification

1.2 Activated Sludge Process variations

1.3 Factors affecting Activated Sludge Process

1.4 Process control and Operational parameters

2 Processing of Sludges (Chapter 13)

2.1 Sources, Characteristics and Quantities of Waste Sludges

2.2 Arrangement of Unit Processes in Sludge Disposal

2.3 Sludge Digestion

2.4 Vacuum and Pressure Filtration

3 Water Quality and Pollution (Chapters 15, 8)

3.1 Stream Loading

3.2 Types and Sources of Stream Pollution

3.3 Aeration and Deoxygenation of Stream Waters

3.4 An Elementary Water Quality Model

4 Advanced Wastewater Treatment Processes (Chapter 14)

4.1 Effluent Standards and Flow Equilization

4.2 Selection of Advanced Wastewater Treatment Processes

4.3 Grannular Media Filtration

4.4 Carbon Adsorption

4.5 Phosphorus Removal

4.6 Nitrogen Removal

4.7 Wastewater Reclamation

COURSE OUTLINE...continued

5 **Industrial Waste Treatment Process (Reference)**

5.1 Food Industry

5.2 Pulp & Paper

5.3 Steel and Mining

5.4 Chemical

LABORATORY EXERCISES AND PROBLEMS

1. Process evaluation of control of an activated sludge process.

2. Study the characteristics and quantities of primary, secondary and processed sludges.

3. Study the design and selection of sludge thickening units.

4. Study the design and operation of sludge digesters.

5. Study the ultimate BOD for a given water sample.

6. Determine the BOD curve for a given sample using a respiroraeter, and hence calculate the reaction rate constant.

7. Compute the maximum oxygen deficit (critical) in a stream receiving wastewater using simple water quality model.

8. Study the phosphorus removal efficiency with and without chemical treatment.

9. Trace nitrogen in a secondary plant with and without significant nitrification.