Re-done Feb '86

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: WATER CHEMISTRY

Code No.: CHM 230-4

Program: PULP & PAPER/WATER RESOURCES ENGINEERING TECHNOLOGY

Semester: THREE

Date: JULY, 1985

Author: D. HEGGART

New: _____ Revision: X

APPROVED: _____ July 1985
Chairperson Date

CALENDAR DESCRIPTION

WATER CHEMISTRY	CHM 230-4
COURSE NAME	COURSE NUMBER

PREREQUISITE: CHM 218-4

PHILOSOPHY/GOALS: This course is an introduction to the chemistry of natural and polluted waters. The concepts taught in CHM 230 will be applied in later courses dealing with water and wastewater treatment. The purpose of such a course is to provide students with a knowledge of what pollutants are likely to be found in the water and some of the typical analyses that are done on a routine basis.

The student will develop his/her ability to communicate effectively by completing a formal laboratory report on each analysis performed.

In addition to the compulsory labs, additional topics include the following: Phosphate, Flouride, Kjeldahl Nitrogen Gas Solubility, etc.

GRADING METHOD (EVALUATION):

Theory	- Mid Term Test - Final Exam - Assignment(s)	50%
Lab	- 6 labs	50%

All assignments and labs must be submitted the day they are due. Late assignments will not be marked, while late lab assignments lose 10% per week for lateness.

The following rule applies to attendance: **ALL STUDENTS ARE REQUIRED TO ATTEND 80% OF THEORY CLASSES AND 100% OF LAB CLASSES UNLESS A PRIOR ARRANGEMENT WITH THE INSTRUCTOR HAS BEEN OBTAINED.**

TEXTBOOK(S):

Braun, Introduction to Chemical Analysis. McGraw-Hill, 1982.

W/W 80 Procedures and Test Equipment for Water/Wastewater Analyses.

Sampling for Water Quality Environmental Control. Fisher Scientific, 1983.

Water Quality Sourcebook. Environment Canada. 1979.

INTRODUCTION:

CHM 230 is a continuation of the Analytical Concepts begun in CHM 218 (Semester 2). However, CHM 230 focuses on water quality parameter in both theory and lab parts of the course. The course involves two hours of theory per week and a lab each week. A total of five labs are required for the course. These include the following: Acidity, Alkalinity, pH, D.O., B.O.D., C.O.D., Hardness, Conductivity, and Turbidity, plus an experiment of the student's choice.

UPON COMPLETION OF THIS COURSE, THE STUDENT WILL BE ABLE TO:

1. Using the production of SO_2 as a by-product from smelting and/or electrical generation, be able to calculate the amount of SO_2 produced from burning of coal containing X% S, - write equation and make calculations regarding control methods such as scrubbing (limestone, magnesium oxide), Cat-ox, etc.

2. Using typical data from a water analysis, calculate the hardness and alkalinity and express the result in mg/L as $CaCO_3$.

3. Draw mEq./L bar graphs, list the hypothetical combinations, and determine concentrations of these combinations, given typical water analysis data.

4. Discuss water hardness, its two types, the difference between each, the cause of each and the method by which each can be reduced.

5. Calculate T-AlK, P-AlK, M-AlK.

6. Explain the key points regarding alkalinity.

7. Make calculations involved in determining water acidity and pH.

8. Calculate the pH of a $NaHCO_3$ solution.

9. Graph the data from a potentiometric titration, including first and second derivative plot to determine the cell emf at the end point.

10. Collect water samples in the approved manner and treat these samples for later laboratory analysis.

11. Discuss and explain the rationale for the presence of various controversial chemicals (Kepone; Mirex; 2-, 4-D; 2-, 4-, 5-T; Dioxin; Radionuclides, etc.) and explain the concern for their use, their affect on the environment, etc.

12. Make calculations involved with the determination of D.O. (Azide method), $B.O.D._5$, and C.O.D. in samples collected from the area.

    D.O. - Root River
    $B.O.D._5$ - Sewage Plant Effluent (Primary)
    C.O.D. - Algoma Steel (Settling Pond)

13. Explain the various types of analytical instrumentation that are used in Water Analyses and what they are for:

    A.A. - Metallic ions
    G.C. - Organics
    H.P.L.C. - Organics
    etc.

14. Discuss the various water quality parameters according to the following classifications:

    a) Physical characteristics
    b) Dissolved gases
    c) Metals
    d) Organics
    e) Radionuclides

15. Discuss the chemistry of Iron and Manganese as it relates to water chemistry.

16. Explain the effect aeration has on water quality and how it can affect odour and colour.

17. Make calculations for and be able to prepare standard solutions as required.

18. Prepare calibration curves and determine the best fit time.

19. Select the correct instrumentation for chemical analysis.