SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON

COURSE OUTLINE

Course Title: Water Transportation Systems

Code No.: CIV 317-5   **Semester:** IV

Program: Water Resources/ Environmental/ Civil
Engineering Technology

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Date: February 1998   **Previous Outline Date:** Feb./92

Approved: _K. DeRosario_   _Mas. 27/98_
                Dean   **Date**

Total Credits: **Prerequisite(s):** WTR30 - Hydraulics
Length of Course: **Total Credit Hours:** 80

I.   COURSE DESCRIPTION:

Basic fluid flow principles and their application in the design and operation of wastewater collection systems, storm drainage systems and water supply and distribution will be discussed. Pump types, characteristics and operation to match the system being served will be included. System appurtenances including manholes, fire hydrants, valves, meters and pressure gauges will be covered.

II.   LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

(Generic Skills Learning Outcomes placement on the course outline will be determined and communicated at a later date.)

Upon successful completion of this course the student will demonstrate the ability to:

1)   Basic Hydraulics

Potential Elements of the Performance:

- Understand the significance of water transportation systems
- Understand and use the concept of fluid energy/head
- Apply energy equation to fluid systems
- Apply dimensional consistency to units in equations
- Calculate the lead loss in fluid flow system
- Use the three flow equations
- Use of computer software for solving problems

2)   Pumps and Pumping Units

Potential Elements of the Performance:

- Understand the role of pumps in fluid dynamic applications
- Cite some examples of various types of pumps
- Understand why pumps cavitate
- Figure out the maximum permissible suction lift
- Use the affinity laws to evaluate the performance of similar pumps
- Calculate the pumping head and find the operating point
- Match the system head curve with pump curve
- Evaluate the performance of multiple pumps

II.   LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE (Continued)

3)   Water Supply and Distribution Systems

Potential Elements of the Performance:

- Analyze single pipeline systems
- Calculate the hydraulic equivalent of compound pipeline systems
- apply the principle of continuity of flow and energy conservation to determine hydraulic grade line of simplified water supply system
- Cite the components of pipe net work
- Apply Hardy Cross Method for loop analysis
- Understand the various methods of water distribution testing
- Perform a fire flow test and a pressure test

4)   Wastewater Collection System

- Name various components of sanitary sewage system
- Estimate sanitary flows based on land use and population
- Estimate peaking factors based on population
- Design a simple sanitary saver system
- Understand the significance of minimum and maximum flow velocities
- Use Manning's equation for determining discharge and velocity when saver pipe is partially flowing, partially full

5)   Storm Drainage Systems

- Understand the hydrology and hydraulic component of a storm drainage system
- Apply Rational Method to compute peak storm flows from urban catchments
- Select sewer pipe size and slope by applying Manning's flow equation
- Design sewer systems with multiple inlets

III. TOPICS:

1) Review of Hydraulics
2) Pumps
3) Pipeline Analysis and Design
4) Wastewater Collection Systems
5) Storm Drainage Systems
6) Water Supply and Distribution Systems

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Verma, S.C., (1998), Water Transportation Systems, ETS Inc., Sault Ste Marie
Hammer, Mark J., (1986), Water & Wastewater Tech., 2nd Ed., John Wiley & Sons, Toronto
Haestad Methods Inc., (1997), Computer Applications in Hyd. Engineering, Haestad Press, CT.

ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION:

Hwang, H.C and Robert J. Houghtalen, (1996), Fundamentals of Hydraulic Engineering Systems, Third Ed., Prentice Hall inc.
Mott, Robert (1990), Applied Fluid Mechanics, 3rd. Ed., Charles E. Merrel Publishing Compant, Toronto
Gupta, Ram S. (1989), Hydrology and Hydraulic Systems, Prentice Hall, Englewood Cliffs, New Jersey
Peavy, H.S., Rowe et al. (1985), Environmental Engineering, McGraw-Hill Book Company, Toronto
WPCP (1982), Design and Construction of Sanitary and Storm Sewers, Manual of Practice No. 9
Tchobouoglous, G. (1981), Wastewater Engineering: Collection and Pumping of Wastewater, McGraw-Hill Book Company, Toronto

V. EVALUATION PROCESS/GRADING SYSTEM

The final mark will be based on the aggregate of the following :

Mid -Term	25%	Grading	A+ = 90 - 100%
Quiz Test	25%		A = 80 - 89%
Final Test	50%		B = 70 - 79%
			C = 60 - 69%

To pass this course a minimum aggregate of 60% is required.
This method of evaluation is subject to change.

VI.   SPECIAL NOTES:

- Special Needs
  If you are a student with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities), you are encouraged to discuss required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Ext. 493, 717, 491 so that support services can be arranged for you.

- Retention of Course Outlines
  It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other post-secondary institutions.

- Disclaimer for Meeting the Needs of the Learners

- Substitute Course Information is available at the Registrar's Office.

VII.   PRIOR LEARNING ASSESSMENT

Students who wish to apply for advanced credit in the course should consult the instructor.