[r- DOC. 110

12 1990

'AAl

SAULT -£efctea& ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: WATER WELLS & PUMPS

CODE NO.: WTR 313-5 **SEMESTER:** VI

PROGRAM: WATER RESOURCES ENGINEERING TECHNOLOGY

AUTHOR: SUBHASH C. VERMA

DATE: APRIL 1990 **PREVIOUS OUTLINE DATED:** JANUARY 1989

APPROVED: _____ ^ ^ / / ^

DEAN DATE ^

WATER WELLS & PUMPS — **WTR 313-5**

Course Name — **Course Number**

TOTAL CREDIT HOURS: 60

PREREQUISITE(S): GEO 222

I. PHILOSOPHY/GOALS:

This course provides the student with an opportunity to become knowledgeable about the well and pumping systems commonly used for municipal and industrial well supplies. On completion of the course the student will be able to describe the parameters affecting the efficiencies, methods of well construction and development, well testing methods and type and selection of pumps for municipal groundwater supply systems.

11. STUDENT PERFORMANCE OBJECTIVES:

#

Upon successful completion of this course the student will be able to;

1. Relate the geology of an area to groundwater resources development.
2. Compare various well drilling techniques.
3. Select diameter of well and casing.
4. Make a sieve analysis of the aquifer material and plot particle size distribution curve.
5. Design the intake protion, i.e., screen and gravel pack.
6. Identify factors influencing the choice of method for well development.
7. Perform constant rate pumping test in the field and observe drawdown data.
8. Calculate aquifer constants viz. storage coefficient and transmissibility based on time and distance drawdown curves.
9. Select the type and size of pump for a given situation.

WATER WELLS & PUMPS **WTR 313-5**

Course Name **Course Number**

II. STUDENT PERFORMANCE OBJECTIVES: (CONT'D)

10. Make computations of operating head and selection of pump.
11. Identify factors affecting pump and well performance.
12. Calculate wire to water efficiency in the system.
13. Identify concepts, definitions and computations of system efficiency.
14. Recognize and use concepts in designing components of new systems and improving existing systems.
15. Design well and pumping system for small communities.

III. TOPICS TO BE COVERED:

TOPIC	NO. OF WEEKS

1. Review and Introduction
   - introduction
   - definitions
   - Darcy's Law
   - well equations
   - well and system efficiency
2. Well Drilling
   - cable-tool percussion method
   - hydraulic rotary drilling
   - reverse rotary drilling
   - driven wells
3. Water-Well Design
   - well screen design
   - gravel-pack design
   - sanitary protection

WATER WELLS & PUMPS **WTR 313-5**

Course Name **Course Number**

III. TOPICS TO BE COVERED - (CONT'D):

TOPIC NO. OF WEEKS

4. Well Hydraulics
   - pump testing
   - type of pump tests
   - theoretical formulations

5. Developing Wells
   - mechanical surging
   - hydraulic surging
   - overpumping and backwashing

6. Pumps
   - kinds of pumps and their uses
   - positive displacement pumps
   - centrifugal pumps
   - submersible pumps
   - pump selection
   - pump characteristic curves

7. Analysis of Well and Pumping Systems
   - concepts of efficiency
   - well and pumping plant testing and analysis
   - evaluating wells
   - evaluating pumps
   - economics of improving efficiency

IV. EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS ETC.)

Laboratory Exercises	25%
Short Tests	35%
Final Examination	40%

HATER WELLS & PUMPS	WTR 313-5
Course Name	**Course Number**

GRADING:

A+ = 90-100^
A = 80-89%
B = 70-79%
C = 60-69%

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

V. REgOIREO STUDENT RESOURCES:

TEXTBOOK(S);

Johnson, Edward E, Inc., Ground Water and Wells, Johnson Division, UOP Inc. 1986.

VI. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION:

REFERENCES;

Helweg, Otto J., Scott, V.H., and Scalmanini, J.C., Improving Well and Pump Efficiency, American Water Words Association, 1983.

Karassik, I.J., Krutzsch, W.C., Fraser, W.H., and Messina, J.P., Pump Handbook, McGraw-Hill Book Company, Toronto, 1976.

Fiygt, Production Education Manual, Canada.

Environment Protection Agency, Manual of Well Water Construction Practices, National Technical Information Service, Springfield, Virginia.

Todd, David K., Groundwater Hydrology, Second Edition. John Wiley & Sons, Toronto, 1980.

/

WATER HELLS & POMPS	WTR 313-5
Course Name	Course Number

VII. SPECIAL NOTES:

FIELD TRIPS!

Wherever possible field trips will be made to observe well drilling, existing well and pumping systems. Municipal or Industrial Water treatment plants and water distribution systems.