

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: HEAVY CONSTRUCTION
Code No.: ARC 232
Program: CIVIL/CONSTRUCTION
Semester: FOURTH
Date: MAY, 1983
Author: W. R. DAVIES

New: _____ Revision: X

APPROVED:

J.P. Crozietto
Chairperson _____ Date _____

HEAVY CONSTRUCTION
Course Name

ARC 232
Course Number

PHILOSOPHY/GOALS:

To further the student's understanding of the wide variety of techniques that go to form a heavy civil engineering project.

METHOD OF ASSESSMENT (GRADING METHOD):

Formwork Design	25%
Seminar/Laboratory Work	25%
Final Examination	50%
	<u>100%</u>

TEXTBOOK(S):

Construction Methods and Management - Nunally

REFERENCES:

Concrete Engineering Handbook - Lalonde & James

Formworks of Concrete Structure - Peurifuy (McGraw-Hill)

ACI Formwork Handbook

TOPIC	PERIODS	TOPIC DESCRIPTION
1	5	<u>Cement & Concrete Technology Review</u> Physical properties of cement & concrete
2	8	<u>Formwork</u> Properties of concrete in the Plastic state Properties of formwork material Design tables for timber forms Shoring and scaffold Causes of failure
3	8	<u>Reinforced Concrete</u> Simple and doubly reinforced beams Columns Floors Lift slab and tilt slab construction
4	8	<u>Prestressed Concrete</u> Pretensioned units Post tensioned beams and slabs Stage prestressing
5	8	<u>Structural Steelwork</u> Post and beam Trusses Rigid Frames Fasteners Welding
6	8	<u>Piling</u> Timber steel and concrete Bearing piler Sheet Piling Piling Records
7	6	<u>Additional Miscellaneous Heavy Construction Methods</u> Dewatering Trenching Tunneling Quarrying Marine
8	6	<u>Construction Safety</u> The Construction Safety Act 1973 Trenching Access Structures

HEAVY CONSTRUCTION

ARC 232-4

GENERAL OBJECTIVES

To further the student's understanding of the wide variety of technical, financial and managerial techniques that go to form a heavy civil engineering project.

SPECIFIC OBJECTIVES

Unit 1 - Cement & Concrete Technology

- 1/1 Experimentally determine the soundness of a portland cement using an autoclave.
- 1/2 Experimentally determine the performance of a variety of concrete mixes subjected to a protracted series of freeze-thaw cycles.
- 1/3 Experimentally determine the setting time of a normal portland cement.
- 1/4 Experimentally determine the value of the modulus of elasticity of a portland cement concrete.
- 1/5 Experimentally evaluate the effect of an air entrainment agency on normal concrete mixes.
- 1/6 Experimentally verify the factor affecting the wear properties of a concrete surface.

Unit 2 - Formwork Design

- 2/1 The student must calculate the hydrostatic pressure exerted by plastic concrete for any given condition of form, temperature and pouring rate.
- 2/2 For a calculated concrete pressure the student must calculate the safe sheeting thickness and span to safely accommodate bending stresses, shear stresses and deflection criteria.
- 2/3 For a given concrete wall the student must calculate the sizes of all formwork members supporting the sheeting i.e. joists, wales and struts.
- 2/4 In support of the above design the student must prepare a detailed formwork design drawing of the formwork showing all material sizes and fastenings.
- 2/5 From the above drawing the student must prepare detailed material schedule for a nominal length of the wall.

Unit 3 - Reinforced Concrete Project

N.B. As part of this course a number of full size reinforced concrete structures will be built. Working in groups the students will actively engage in every aspect of the procedures that normally make up a structural concrete project.

Specifically, his objectives are as follows:

- 3/1 Prepare a general arrangement drawing of the structure
- 3/2 Prepare calculation sheets and reinforcing details of the structure.
- 3/3 Draw a bar chart and "S" curves of all work on the project including the design, detailing procurement construction and testing phases of the work.
- 3/4 Initiate a progress control with weekly reporting on all aspects of the programme.
- 3/5 Calculate for design and detail all necessary formwork and supports.
- 3/6 Prepare a detailed construction sequence indicating the allocation of equipment, men and materials.
- 3/7 Actively participate in the construction period of the job.
- 3/8 Evaluate the structure by the preparation, implementation and analysis of a full scale test and strain survey.
- 3/9 Prepare a written project report including all designs, details, calculations, programmes and progress records together with a thousand word evaluation of the job.

Unit 4 - Prestressed Concrete Project

The students working in groups will actively engage themselves in the detailing and construction of an engineered structure.

- 4/1 Draw a critical path schedule for the detailing construction and testing of a full size prestressed concrete structure.
- 4/2 Initiate a progress control and network up-dating procedure for the work.
- 4/3 Actively participate in the construction work.
- 4/4 Prepare a cable stressing schedule for the post tensioning operation.

- 4/5 Evaluate the structure by the preparation, implementation and analysis of a full scale test and strain survey.
- 4/6 Prepare a written project report including all details, schedules, charts and progress records together with a thousand word evaluation of the job.

Unit 5 - Piling

- 5/1 Illustrate three types of preformed bearing pile.
- 5/2 Sketch the construction procedure for constructing a caisson pile.
- 5/3 List the duties of a piling inspector.

Unit 5 - Construction Safety

- 6/1 Define the role of the constructor, employer, inspector.
 - 6/2 Outline the requirements of the act with respect to housekeeping and storage.
 - 6/3 List the requirements of the act respecting access and hoisting.
 - 6/4 Fully describe the act's demands for safe trenching.
- N.B. Pending laboratory re-construction Units 3 and 4 will be carried out using a seminar format.