

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: Heavy Construction

CODE NO. : ARC 232

PROGRAM: Civil/Construction Technician

SEMESTER: IV

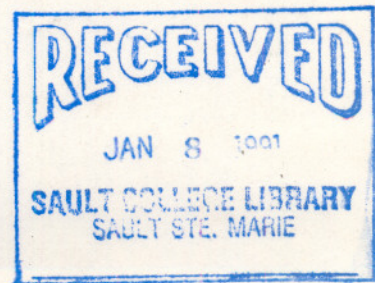
AUTHOR: S. Ienco

DATE: January 1991

NEW: _____ REVISION: X

APPROVED: *S. Ienco*
CHAIRPERSON

9/10/07
DATE



Heavy Construction

ARC 232

COURSE NAME

CODE NO.

Total Credit Hours 64

I. PHILOSOPHY/GOALS:

To further the student's understanding of concrete technology. Topics discussed will include: a review of concrete mix design and testing, followed with an introduction to formwork design, reinforced concrete design and seminars on construction safety.

In addition, the student will complete the write up of the condition survey of concrete roads in the Sault Ste. Marie area. This project is being carried over from last semester, where a condition survey of the soil conditions was undertaken.

II. METHOD OF ASSESSMENT:

| | |
|----------------------------|-------|
| Assignments | 40% |
| Mid semester examination | 25% |
| Final semester examination | 35% |
| | ----- |
| TOTAL | 100% |

| | |
|----|------------|
| A+ | 90% - 100% |
| A | 80% - 89% |
| B | 70% - 79% |
| C | 55% - 69% |
| R | Repeat |

- 1) Minimum acceptable grade is 55%
- 2) Each major assignment will carry equal weight.
- 3) If at the end of the semester your overall average of the combined assignments and tests is below 55%, then it will be up to the instructor whether you receive an "R" grade or a rewrite. The criteria employed for arriving at that decision is class attendance, class participation and overall grade, which must be at least 45%.
- 5) If a rewrite is granted it will cover the entire semester course work and the maximum overall obtainable grade on the rewrite is a "C".

Heavy Construction

ARC 232

COURSE NAME

CODE NO.

III. REQUIRED STUDENT RESOURCES (including textbooks and workbooks)

Construction Methods and Management
Latest Edition
Nunally

IV. TOPIC DESCRIPTION

| TOPIC NO. | PERIODS | TOPIC DESCRIPTION |
|-----------|---------|---|
| 1. | | <u>Cement and Concrete Technology</u> <ul style="list-style-type: none">- Physical properties of cement and concrete- Concrete mix design (laboratory)- Principles of quality concrete- Cold and hot-weather concreting- Concrete finishing- Reinforced concrete- Concrete construction practices- Testing of laboratory cylinders- Testing of laboratory beams- Reinforcing pull out test |
| 2. | | <u>Formwork</u> <ul style="list-style-type: none">- Properties of concrete in the plastic state- Properties of formwork materials- Formwork hardware and fasteners- Design loads and pressures- Analysis of formwork- Slab form design- Wall and column form design- Causes of formwork failures and necessary precautions- Shoring and scaffolding |
| 3. | | <u>Introduction To Reinforced Concrete Design</u> <ul style="list-style-type: none">- Working stress design- Modular ratio and transformed steel area- Analysis and design of beams- Maximum reinforcement ratio- Minimum reinforcement- Shear reinforcement- Bond and development length |

Heavy Construction

ARC 232

COURSE NAME

CODE NO.

4. Construction Safety

- Personal protective clothing
- Storage of materials
- Excavations
- Guardrails
- Scaffold and working platforms
- Trenching support systems

V. PERFORMANCE OBJECTIVES

Cement and Concrete Technology

Upon successful completion of this unit the student will be able to:

1. Produce a concrete mix design for a specific job outline.
2. Develop a theoretical trial mix proportions for a given mix design.
3. Describe the objectives and methods of achieving adequate curing of concrete.
4. Design, proportion, mix, form, cure and test at least three cylinders of normal Portland cement concrete at 7 and 28 days including making a slump and air entrainment test.
5. Cast, cure and test a standard concrete beam to determine it's modulus of rapture.
6. Experimentally, determine the pull-out capacity of reinforcing bars from concrete.
7. State and illustrate the necessary site conditions for curing concrete in both hot and cold weather conditions.
8. Identify the various methods employed in finishing concrete work.
9. Produce a comprehensive type written report on all facets of laboratory testing.
10. Produce a comprehensive type written report on the condition of an existing concrete bride or parking garage.

Formwork

Upon successful completion of this unit the student will be able to:

1. State and illustrate the relationship of formwork joist, diagonal bracing, shores, mudsill, ties, tie wedge and wales.
2. Identify different formwork materials.
3. State and illustrate the effect of different formwork materials on the finished exposed concrete.

Heavy Construction

ARC 232

COURSE NAME

CODE NO.

Formwork (Continued)

Upon successful completion of this unit the student will be able to:

4. Identify the essential information required on a formwork contract drawing.
5. State and illustrate vertical loads, lateral pressure of concrete, horizontal load and special loads on concrete forms.
6. List the most common formwork design deficiencies.
7. Calculate the lateral design loads for columns and walls.
8. Analyze the various components of a formwork for bending, shear, deflection, compression and tension stresses.
9. Design and draft a typical slab form.
10. Design and draft a typical wall and column form.

Introduction to Reinforced Concrete Design

Upon successful completion of this unit the student will be able to:

1. Define working stress design.
2. Compute the transformed section for a rectangular beam and a T-beam.
3. State and illustrate the difference between balanced design, overreinforced section and underreinforced section.
4. Define shear and diagonal tension in beams.
5. Calculate the shear stress in a beam and design the stirrups.
6. State and illustrate bond, anchorage and splices in reinforced bars.
7. Compute minimum laps and splices for reinforcing steel.
8. Design and detail simple concrete beams.