SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: CONSTRUCTION MATERIALS I

Code No.: ARC 133-3

Program: CIVIL/CONSTRUCTION

Semester: ONE

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New: _____ Revision: X

APPROVED: L. P. Chrzanowski 85-07-04

Chairperson Date

CONSTRUCTION MATERIALS I — Course Name

ARC 133-3 — Course Number

PHILOSOPHY/GOALS:

1. The student should develop an appreciation of the importance o quantifying the various properties of construction material and should always express an evaluation of such materials in a numerical form.

2. The student should understand what is universally known as the "scientific method" and should endeavour at all times to conduct his/her technical activities in such a manner.

3. The student should develop a commercial sense in appraising and evaluating construction materials.

4. The student should develop the ability to work independently in a technical situation.

5. The student must learn to express technical data clearly and concisely in both a verbal and written form.

METHOD OF ASSESSMENT (GRADING METHOD):

	% OF TOTAL GRADE ALLOCATION
Written Test:	
1. Timber Technology	5%
2. Structural Steelwork	5%
3. Concrete Materials And Concrete Construction	5%
Laboratory Investigations:	
1. Density Measurement	10%
2. Compressive Strength of Timber	10%
3. Fineness of Portland Cement	10%
4. Setting time of Portland Cement	10%
5. Compressive Strength of Portland Cement	10%
6. Aggregate Analysis	10%
7. Concrete Mix Design and Test	25%
	100%

CONSTRUCTION MATERIALS

ARC 133-3

TEXT: Highway Materials, Soils and Concretes; Harold Atkins - Reston

REFERENCES: Relevant A.S.T.M.'s and CSA's on Timber and Concrete Technology

CONSTRUCTION MATERIALS (ARC 133-3)

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1	12	Wood
		Species Structure Logging Sawing Classification Physical & Mechanical Properties Plywoods Veneers Glue Laminated Products Composition Board Seasoning
		Laboratory (Wood)
		Measurement of Moisture content & density Compression parallel to grain Compression perpendicular to grain Stress/strain relationship
2	4	Structural Steel
		Properties Manufacture Uses Ultimate strength
3	8	Hydraulic Cements
		Types History Manufacture Standards
		Laboratory (Cement)
		Cement Fineness Cement ultimate compressive strength

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
4	20	<u>Portland Cement Concrete</u> History Aggregates Water/cement ratio Mix design Batching Placing Curing Additives Types <u>Laboratory (Concrete)</u> Aggregate grading Aggregate cleanliness Mix design - manufacture and test

CONSTRUCTION MATERIALS

ARC 133-3

SPECIFIC OBJECTIVES:

Unit 1 - Strength of Materials

1. By direct weighing and volume calculation, the student must experimentally determine the mass densities of three structural materials.

2. The student must identify and differentiate between a tensile and compressive load.

3. The student must calculate the type and amount of unit stress on a given loaded member subjected to normal loading.

Unit 2 - Timber Technology

1. The student must differentiate between hardwoods and softwoods.

2. The student must identify at least three commonly used hardwoods and softwoods.

3. The student must distinguish between free and hydroscopic water in lumber.

4. The student must be able to list the seven factors considered when grading lumber.

5. The student must identify and describe the three general use classifications of structural lumber.

6. The student must calculate various sized lumber volumetrically expressing his answer in board feet.

7. The student must list at least five engineering advantages in the use of glue laminated lumber.

8. The student must list four advantages enjoyed by plywood over sawn lumber.

9. Experimentally the student must determine the ultimate compressive strength of at least two structural timbers loaded parallel to the grain.

Unit 2 - Continued .....

10. Experimentally, the student must determine the ultimate compressive strength of at least two structural timbers loaded perpendicular to the grain.

11. The student must support the experimental work carried out on timber technology by the preparation and submission of at least four written reports complete with tabulated results, graphs and conclusions drawn from comparison between his work and that covered in the established literature.

Unit 3 - Concrete Technology

1. The student must be able to sketch and label a manufacturing flow chart for a Portland Cement Plant.

2. The student must demonstrate an understanding of the terms:

   a) calcareous
   b) argillaceous
   c) possolan cement
   d) incipient fusion
   e) hydration

3. The student must identify and differentiate between the five types of Portland Cement currently in use.

4. The student must specify the physical requirements of concrete aggregates.

5. The student must define the limits of acceptability of water for use in concrete production.

6. The student must deduce and illustrate by graphical means the age/strength relationship of normal Portland Cemente concrete.

7. From a job outline brief the student must produce a design brief for a concrete mix.

8. From a concrete design brief the student must develop a theoretical trial mix proportion.

9. The student must define the site conditions necessary for both hot and cold working.

Unit 3 - Continued .....

10. The student must describe the objectives and methods of achieving adequate curing on concrete.

11. The student must distinguish between the engineering nature of mass reinforced and prestressed concrete.

12. The student should describe the differences in manufacturing and use of pre-tensioned and post-tensioned prestressed concrete.

In accordance with the appropriate ASTM or CSA standard the student must:

13. Determine the fineness of Portland Cement.

14. Determine the organic content of a fine aggregate.

15. Determine the silt content of a fine aggregate.

16. Determine the grading of a fine and coarse aggregate.

17. The student must design, proportion, mix, form, curve and test at least three cylinders of normal Portland Cement concrete at 7 and 28 days including making a slump and air entrainment test.

18. In addition to the compression test, the student must cast, cure, and test a standard concrete beam to determine its modulus of rupture.

19. The student must support the experimental work carried out on concrete technology by the preparation and submission of at least five written reports complete with tabulated results, graphs and conclusions indicating the success of the results in relationship to the controlling specifications.

Unit 4 - Structural Steelwork

1. The student must sketch and label the manufacturing flow chart of an integrated iron and steel plant.

2. The student must identify the rolled steel sections found in the construction industry.