

SAULT COLLEGE
of Applied Arts and Technology
Sault Ste. Marie

COURSE OUTLINE

ARCHITECTURAL TECHNICIAN 1

Construction Materials

ARC 132-3

revised March, 1979 by M. Urse11

TEXT:

"Materials of Construction" by Smith - McGraw-Hill Publishers

REFERENCE TEXTS:

Canadian Wood Council
National Research Council
C.S.A. Standards
A.S.A. Standards
Portland Cement Association
Brick & Tile Institute
The Canadian Institute of Steel Construction
The Plywood Manufacturers Association

Topic Number	Periods	Topic Description	Reference
1	2	<u>Introduction</u> Terminology - load - stress - strain - classical Materials - contemporary materials	
2	16	<u>Cement, Aggregates & Concrete</u> - history of cement - types of cement and their applications - cement additives - design of concrete mixes - concrete testing methods - types of aggregates - tests for aggregates - quality control of concrete - proper placing of concrete	
3	12	<u>Wood</u> - structure and properties - uses of wood in the construction industry - types of lumber - lumber grading - tree classifications - framing lumber use - structural characteristics of various lumber samples - timber beam design - plywood manufacture - plywood grades, - plywood types and finishes - plywood strength	
4	12	<u>Steel and Nonferrous Metals</u> - history of steel production - the manufacture of steel - types of steel - steel shapes used in Architecture - structural tests on various steel samples - the manufacture of aluminum - aluminum extrusion processes - uses of aluminum in Architecture	
5	12	<u>Brick & Tile & Stone</u> - types of mortar - masonry terminology - types of brick and tile - types of concrete block - tests on brick and block samples - manufacture of brick and tile - acoustic, fire, and N.C.R. ratings of concrete block brick & tile	

PREFACE

The list of construction materials is constantly growing and a basic knowledge of the important ones is essential to any architectural student engaged in the designing, estimating or actual construction of a building.

The purpose of this course then, is to give the student a brief description and some involvement with the basic material of construction.

Each student will also be responsible for one seminar to be given on a selected topic sometime during the duration of this course.

Behavioural Objectives:

Unit 1 - Introduction & Terminology

1. The student shall identify the various materials used in construction.
2. The student will identify load.
3. The student will identify stress.
4. The student will identify strain.
5. The student will relate the various types of stress and strain as applied to structures.

Unit 2 - Cement, Aggregates & Concrete

1. The student will outline the history of cement.
2. The student will identify the most common types of portland cement.
3. The student will identify absolute volume.
4. The student will identify air entraining agent.
5. The student will identify calcine.
6. The student will define clinker.
7. The student will name four basic ingredients of portland cement.
8. The student will differentiate between masonry cement and normal portland cement
9. The student will perform the colorimetric test.
10. The student will perform the fineness modulus test.
11. The student will perform the silt test.
12. The student will name five types of aggregates used to make concrete.

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BEHAVIOURAL OBJECTIVES

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NOTE:

The student is also responsible for a seminar. Topics will be presented by the instructor at the beginning of the course.

All seminar information shall be related to the class in S.I. as manufactures design literature becomes available.

Lab demonstrations and "hands-on" activities will be instituted throughout the course - see course behavioural objectives.

13. The student will outline the design of a concrete mix.
14. The student will identify the slump test.
15. The student will identify the compressive strength and the flexure strength of a concrete sample.
16. The student will identify and apply the direct stress formula.
17. The student will differentiate between post tensioning and pretensioned concrete units.
18. The student will perform the sieve test for concrete aggregates.
19. The student will identify the ball penetration test.
20. The student will identify the air content test.
21. The student will identify a lean concrete mix.
22. The student will identify concrete bleeding.
23. The student will identify plasticity.
24. The student will identify and outline the use of three concrete additives.
25. The student shall explain air-entrained concrete.
26. The student will outline the proper methods of placing and curing concrete.

Unit 3 - Wood

1. The student shall list nine advantages of wood as a construction material.
2. The student shall list four disadvantages of wood as a construction material.
3. The student shall identify the structure of wood.
4. The student shall identify the various classifications of trees.
5. The student shall relate the properties and the uses of ten common trees.
6. The student shall determine the moisture content of a wood sample.
7. The student shall explain two methods of seasoning wood.
8. The student shall identify and outline as least two common wood diseases.
9. The student shall list five categories for dimension lumber.
10. The student shall determine the effects of chemical treatment on wood strength.
11. The student shall identify edge grain and flat grain.

12. The student shall identify the board foot of measure.
13. The student shall determine the quantity of lumber required for a specific problem.
14. The student shall outline the reasons for proper lumber grading.
15. The student shall relate the responsibilities of the construction superintendent in the storage and handling of wood.
16. The student shall specify the various nails by their type and length.
17. The student shall list fifteen types of nails used in building construction.
18. The student shall identify the N.B.C. regulations governing the use of nails.
19. By means of a flow chart, the student shall outline the manufacture of plywood.
20. The student shall identify the types of wood used in the manufacture of plywood.
21. The student shall identify the glues used in the manufacture of plywood.
22. The student will identify the grades of plywood sold commercially.

Unit 4 - Steel

1. The student shall outline the history of steel production.
2. The student shall identify the types of furnaces used in steel production.
3. The student, by means of a block diagram, shall show the manufacture of steel.
4. The student shall list and explain the use of at least ten types of steel.
5. The student shall identify and explain at least ten uses of steel products for the construction industry.
6. The student shall identify and draw the various common steel sections used in architecture.
7. The student shall list three common uses of extruded aluminum.
8. The student shall outline the function of a hot strip mill.
9. The student shall outline the function of a cold reduction mill.
10. The student shall determine the method of ordering reinforcing steel.

Unit 5 - Brick, Tile & Stone

1. The student shall identify and explain the use of a bond beam.
2. The student shall identify and describe cellular concrete.
3. The student shall identify and describe cement-lime mortar.
4. The student shall identify and draw a lintel.
5. The student shall be able to define:
 - a) pilaster
 - b) slurry
 - c) water retentivity
6. The student shall be able to outline the A.S.T.M. specifications with regard to:
 - a) compressive strength of load-bearing concrete blocks
 - b) allowable absorption rate of load-bearing blocks
 - c) moisture content of blocks.
7. The student shall describe the difference between face-shell and full mortar bedding of blocks.
8. The student shall explain why good water retentivity of mortar used in laying blocks is important.
9. The student shall be able to list five factors basic to the construction of a good quality block wall.
10. The student shall identify and describe the National Building Code requirements for lateral support, thickness and height of masonry walls.
11. The student shall be able to outline the history of the manufacture of brick and tile.
12. The student shall identify the various types of clay used in brick and tile manufacturing processes.
13. The student shall describe the six phases in the manufacture of brick.
14. The student shall identify and know the structural dimensions of at least five types of brick.
15. The student shall describe the properties of at least four types of masonry mortar.
16. The student shall draw six types of mortar joints.
17. The student shall be able to differentiate between the various types of clay tile and know their uses in construction.
18. The student shall test a brick or tile sample for flexure strength and compressive strength.

19. The student shall describe the "U rating" for various masonry wall types.
20. The student shall describe the fire rating for various wall types.
21. The student shall identify the terminology of masonry construction.