SAULT COLLEGE
of Applied Arts and Technology
Sault Ste. Marie

COURSE OUTLINE

STRUCTURAL DESIGN
CIVIL ENGINEERING TECHNICIAN
ARC 213-4

revised February, 1979 by G. Frech

STRUCTURAL DESIGN

Civil Engineering Technician

ARC 213-4

TEXTS:

C.I.S.C. Metric Structural Steel Design Data

Simplified Engineering for Architects and Builders - 5th Edition - Parker

REFERENCE TEXTS:

Simplified Design of Structural Steel	H. Parker
Simplified Design of Roof Trusses	H. Parker
Theory of Simple Structures	Shedd and Vater
A.I.S.C. Shop Drafting	
Design of Structural Steel	J. R. Lothers
Standard Structural Details for Builders	Ketchum
Limit States Design Steel Manual	C.I.S.C.
Limit States Design In Structural Steel	C.I.S.C.

Topic Number	Periods	Topic Description	Reference
1	6	Eccentric Column Design a) Eccentric loads b) Combined axial and eccentric loads	
2	20	Walls and Dams a) Buttress b) Cantilever c) Forces d) Middle third e) Design	
3	6	Foundations a) Types and purposes b) reinforced footing	
4	4	Smoley's Tables a) Uses b) Application	
5	20	Trusses a) Loading b) Stress diagrams c) Compression members d) Tension members e) Panel points f) Splices g) End Connections	

CIVIL ENGINEERING TECHNICIAN

Performance Objectives for Structural Design

ARC 213-4

The general objective of the course is to further the basic working knowledge in design, the student first having taken Structural Design MCH 207, and this course will broaden his knowledge and scope for basic design in structural materials at the technician level. The student to complete this course must be able to design the following, according to basics in S.I. and Imperial units.

UNIT D-1 -- Retaining Walls

1. Identify the three types of retaining walls
2. Identify surcharge
3. Identify the line of action of the retained load from formula, either from an even load or surcharge
4. Draw the wall and loads to scale, both the applied load and load of wall acting through its center of gravity
5. Scale the resultant load position accurately with respect to the position along the base
6. Identify middle third and be able to determine the proper middle third formula to use, then calculate the resulting pressure on the soil
7. Identify the three checks used in design of the wall
8. Identify the factors of safety for sliding and overturning
9. Calculate the checks to made for a retaining wall
10. Completely draw and do all calculations in the design of a retaining wall, any of the three kinds whether or not including a surcharge.

UNIT D-2 -- Eccentric Loading

1. Identify eccentric loading of a column
2. Identify the actual stress in such a column by use of direct stress formula and stress due to bending.
3. Compare the actual stress with allowable stress used in design by use of $\frac{K1}{r}$ tables or from column formula.
4. Identify the signs for stress (minus or positive) and use these in the formula for loading of a rectangle in any quadrant or axis.
5. Calculate the stress in any quadrant of an eccentrically loaded rectangle.

UNIT D-3 -- Truss Forces Graphically and Analytically

1. Identify and use Bow's Notation with respect to loads and truss members.
2. Draw to scale force and stress diagrams for trusses using Bow's Notatic
3. Measure stresses accurately from the stress diagram and determine whether the member(s) is in tension or compression.

4. Identify forces in a truss analytically - method of joints.
5. Calculate mathematically, stresses at panel points of a truss using laws of equilibrium, and indicate tension or compression.

UNIT D-4 -- Smoley's Tables

1. Calculate bevels using Smoley's Tables.
2. Calculate slope lengths using Smoley's Tables.
3. By use of bevel tables, determine slope, rise or base for any bevel.
4. Calculate distances by use of similar triangles and the bevel tables.
5. Identify clearance.
6. Identify, edge distance, gauge, and centers when working with connectors.
7. Identify the use of Smoley's Tables in the design of truss or bracing members.

INIT D-5 -- Truss Design

1. Design compression members in a truss.
2. Design tension members in a truss.
3. Identify clearance for members at the panel point of a truss.
4. Design the connection using bolts or rivets at the panel point.
5. Calculate the number of connectors for members at any panel point in a truss.
6. Calculate the size of gusset plate an any panel point.
7. Identify a chord splice in a truss.
8. Design and make all calculations as to number of connectors, size of plates and dimensions for detail at any chord splice.
9. Design compression or tension truss members when truss is welded instead of bolted or riveted.
10. Design and calculate a welded connection at any panel point or splice in a truss.
11. Design a truss to column connection using either bolted, welded or riveted connection.
12. Use eccentric bolted connection table in Steel Handbook.
13. Draw and design by use of free body diagram and stress diagram, a complete truss system. This involves calculation of loads in all members, ten or compression; design member sizes, calculate all levels and length of members; design of all panel points, connections, materials; design of splices; design of truss to column connection. All distances must be calculated and sketch made of each panel to show dimensions.
14. Identify skewed connections, being able to calculate clearance by using Smoley's Tables.