

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: Concrete Design

CODE NO.: CIV305

PROGRAM: Civil Engineering Technology

SEMESTER: V

AUTHOR: S. Ienco

DATE: August 1994

NEW: \_\_\_\_\_ REVISION: \_\_\_\_\_ x

APPROVED: *L. McQuill*  
DEAN

94-08-24  
DATE

*M. Chase Aug 24/94*

Concrete Design

CIV305

COURSE NAME

CODE NO.

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Total Credit Hours 64  
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Prerequisite (s) MCH212  
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**I. PHILOSOPHY/GOALS:**

This course is intended to introduce the student to the design of concrete beams, columns, slabs and footings including selection and placement for reinforcing steel and anchorage requirements.

**II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):**

Upon successful completion of this course the student will:

1. Use design aids for the analysis/design of beams and beam reinforcing.
2. Use design aids for the analysis/design of columns and column reinforcing.
3. Use design aids for the analysis/design of slabs including selection and placement of reinforcing steel.
4. Design footings including the selection and placement of reinforcing steel.

**III. TOPICS TO BE COVERED:**

1. Analysis and Design Considerations.
2. Flexural Analysis and Design of Beams.
3. Shear and Diagonal Tension.
4. Development of Reinforcement.
5. Columns - Combined Bending and Axial Force.
6. Slender Columns.
7. Slab Design.
8. Footings.



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IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

1. Analysis and Design Considerations

**Learning Activities**

- . Review materials and methods used in making concrete.
- . Describe principles of reinforced concrete member design.
- . Summarize the compare the differences between working stress design and limit states design.

**Resources:**

- . Chapter 1 - text, overheads and slides.
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2. Flexural Analysis and Design of Beams

- . Review basic concepts of strength of materials such as flexural formula, shearing formula and members composed of two materials in parallel.
- . Introduce basic design equations for flexure.
- . Explain the condition of balanced design, under-reinforced and over-reinforced sections.
- . Outline Code provisions for the design of beams.
- . Solve design problems for Rectangular, I, and T sections.
- . Detail reinforced concrete beams.
- . Summarize Code provisions for control of deflection and cracking.

**Resources**

- . Chapter 2 - Text, handouts.
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3. Shear and Diagonal Tension

- . Describe the general behaviour of plain concrete and reinforced concrete beams.
- . Outline code provisions for the design of shear.
- . Design beams with shear (stirrups) reinforcement.

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IV. LEARNING ACTIVITIES/REQUIRED RESOURCES (continued)

3. Shear and Diagonal Tension

Resources

- . Chapter 4 - text.

4. Development of Reinforcement

- . Explain the components of bond development and.
- . Describe the mechanics of bond failure.
- . Outline Code requirements for lateral spacing, cover and development lengths for various conditions.
- . Determine bar cutoffs using moment capacity diagrams.

Resources

- . Chapter 3 - text.

5. Columns - Combined Bending and axial Loads

- . Identify the different types of columns.
- . Outline Code requirements for reinforcement and tie requirements.
- . Design short columns.
- . Analyze and design columns using the interaction diagram.

Resources

- . Chapter 7 - Text

6. Slender Columns

- . Describe the behaviour of slender columns.
- . Explain the effective length concept.
- . Design of columns in braced and unbraced frames.



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IV. LEARNING ACTIVITIES/REQUIRED RESOURCES (continued)

Resources

- . Chapter 8 - text.
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7. Slab Design

- . Prepare slab designs indicating the selection and placement of steel, cut-offs distances, anchorage and shear reinforcement design.

Resources

- . Chapter 5 - Text
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8. Footings

- . Identify various types of footings.
- . Describe the shear and flexural behaviour of footings.
- . Solve for allowable soil bearing pressures.
- . List general design considerations for footings.
- . Design and detail square and rectangular footings.

Resources

- . Chapter 9 - text.
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V. METHOD OF EVALUATION

A final grade will be derived from the results of field testing, laboratory testing, tutorials and three tests weighed as follows:

Two term tests each worth 30%	60%
Final test	40%
TOTAL	<u>100%</u>

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V. METHOD OF EVALUATION (continued)

The grading system used will be as follows:

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

- 1) Minimum acceptable grade for this course is 55%.
- 2) If at the end of the semester your overall average of the combined three tests is below 55%, then it will be up to the instructor whether you receive an R, repeat, or a rewrite. The criteria employed for arriving at that decision is class attendance, class participation and overall grade, which should be a least 45%.
- 3) In case a rewrite is granted, it will be permitted only once it will cover the entire course outline and will limit the maximum obtainable grade for the course to 60%.
- 4) **Testing Absence:**

If a student is unable to write a test on the date assigned, the following procedure is required:

- a. The student shall provide the Professor with advance notice preferably in writing of their need to miss a test.
- b. The student may be required to document the absence at the discretion of the professor.
- c. All decisions regarding whether tests shall be re-scheduled will be at the discretion of the Professor.
- d. The student is responsible to make arrangements, immediately upon return to the College with his/her course Professor related to make-up of the missed test prior to the next scheduled class for the course in question.



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**V. METHOD OF EVALUATION (continued)**

- e. In the event of an emergency on the day of the test, the student may require documentation to support the absence and must telephone the College to identify the absence. The college has a 24 hour electronic voice mail system (759-2554).

Failure to comply with these guidelines may result in a zero grade being recorded for the missed test.

**VI. REQUIRED STUDENT RESOURCES (including textbooks and workbooks)**

METRIC DESIGN HANDBOOK  
Latest Edition  
Portland Cement Association

**VII. SPECIAL NOTES**

Students with special needs (eg. physical limitations, visual impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of the students.

