Doc. 463

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: STRENGTH OF MATERIALS

Code No.: MCH 212

Program: CIVIL ENGINEERING

Semester: III

Date: JUNE 1988

Author: S. IENCO

New: _____ Revision: X

APPROVED: _____ Aug 16/88
Chairperson Date

CALENDAR DESCRIPTION

STRENGTH OF MATERIALS — COURSE NAME

MCH 212 — COURSE NUMBER

PHILOSOPHY/GOALS:

The student will be introduced to basic strength of materials. The topics covered will include: the free body diagram, framework analysis, stress strain relationships, centroids, moment of inertia, shear force diagrams and bending moment diagrams for simple beams. These topics form a partial background for the eventual design of structural members.

METHOD OF ASSESSMENT:

Quizzes	30%
Mid-semester examination	30%
Final examination	40%
	100%

A+	90% - 100%
A	80% - 89%
B	70% - 79%
C	55% - 69%
R	Repeat
X	Temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete the requirements of the course.

1. Minimum acceptable grade is 55%.

2. The in-class quizzes will cover one or two problems on a specific topic and are worked under examination conditions. Notice of a quiz is given during class at least two days in advance. Each quiz will carry equal weight.

3. Homework problems are assigned during lecture and the solution to selected problems is discussed subsequently. They are not graded.

4. If at the end of the semester your overall average of the combined quizzes, mid-semester test and final test 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.

5. In case a rewrite is granted, it will be permitted only once and will be subjected to the following conditions:

   a. It will cover the entire semester's course outline.
   b. The maximum obtainable grade is "C".
   c. The rewrite grade weight is 100%.
   d. The student must score a 60% overall average on the rewrite in order to obtain a "C" grade.

PREREQUISITE: Applied Mechanics (MCH 100)

TEXT: Applied Strength of Materials
Jensen/Chenoweth
McGraw Hill

CIVIL AND ARCHITECTURAL ENGINEERING

MCH 212

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1.	10	Statics Review - Equilibrium equations - Moment of force - Determination of reactions - Analysis of frameworks
2.	14	Stress Strain Relationships - Definition of stress and strain - Stress-strain diagram - Hooke's law, modulus of elasticity - Allowable stresses, factor of safety - Poisson's ratio - Thermal stresses - Axial stresses in components formed from two materials
3.	4	Thin Walled Vessels - Definitions - Formulas
4.	12	Centroids and Moment of Inertia - Determination of the centre of area - Second moment of areas - Parallel axis theorem - Moments of inertia of simple and composite areas - Radius of Gyration
5.	14	Stresses in Simple Beams - Types of beams and loadings - Calculation of beam reactions - Shear force diagram - Bending moment diagrams - Moving loads - Flexure formula

MCH 212

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
6.	8	Torsion - Twisting moment - Torsion formula - Polar moment of Inertia - Angle of twist of circular members

COURSE OBJECTIVES

MCH 212

Statics Review

1. Determine reactions in frameworks.
2. Analysis of trusses by graphical method.
3. Analysis of frameworks by mathematical method (sections, joints).

Stress and Strain Relationships

1. Define stress.
2. Define tensile, compressive and shearing stresses.
3. Define ultimate stress, allowable stress and factor of safety.
4. Acquire a working knowledge of both imperial and SI units.
5. Solve problems using the direct stress formula.
6. Define strain.
7. Understand the relationship of the stress strain curve.
8. Define elastic limit, yield point, ultimate strength, permanent set and percent elongation.
9. Define Hooke's Law.
10. Formulate the equation to determine deformation for members subjected to axial loads.
11. Solve problems in deformation for one material under axial load.
12. Solve problems in deformation for two materials in series under axial load.
13. Solve problems in deformation for two materials in parallel.
14. Identify Poisson's ratio.
15. Solve problems using Poisson's ratio.
16. Define thermal expansion and contraction.
17. Solve problems for temperature stress.

Thin Walled Vessels

1. Identify thin walled pressure vessels.
2. Define stresses in the longitudinal and circumferential direction.
3. Develop the stress formulas.
4. Solve simple problems for thin walled vessels.

Centroids and Moment of Inertia

1. Calculate centroids for simple and irregular rectangular, circular and triangular shapes.
2. Calculate centroids for built up structural shapes.
3. Identify moment of inertia.

COURSE OBJECTIVES

MCH 212

Centroids and Moment of Inertia (Cont'd)

4. Define section modulus and calculate it.
5. Define radius of gyration and calculate it.
6. Identify the flexure formula.
7. Solve simple problems using the flexure formula.

Stresses in Simple Beams

1. Identify point, concentrated and U.D.L. loads.
2. Identify different beam supports.
3. Calculate reactions for simple beams under various loading conditions.
4. Calculate shear in simple beams.
5. Calculate moments in simple beams.
6. Draw shear force and bending moment diagrams.
7. Solve for maximum bending moment.
8. Calculate shear and maximum bending moment for moving loads.

Torsion

1. Identify torque; acting and resisting.
2. Identify the torque formula.
3. Identify the maximum unit shearing stress formula.
4. Identify the formula for polar moment of inertia of solid and hollow shafts.
5. Identify the angle of twist formula.
6. Solve problems using the above formulas.