SAULT COLLEGE
of Applied Arts and Technology
Sault Ste. Marie

COURSE OUTLINE

STRENGTH OF MATERIALS

MCH 232-4

revised   June, 1979 by B. Jenkins

Strength of Materials (MCH *2-efr*B)*

TEXT:

Mechanics of Materials - Levinson

REFERENCES:

Mechanic of Materials - Lawson & Cox

Strength of Materials - Fitzgerald

Mechanics of Materials - Argus & Palr.er

Course Study Outline

Strength of Materials (MCH 2-frg-l>)

TOPIC no.	PERIODS	j	TOPIC INFORMATION
1	4		Review of conditions of equilibrium
2	6 ,		Rf view of methods of sections
3	12		Torsion
4	3		Shear force and bending moment diagrams
5	8		*I* ending stresses in beams

Course Textbook - Mechanics of Materials (Levinson)

UNIT #1 RSVIEW OF METHOD OF SECTIONS AND EQUILIBRIUM

\J General Objective:

The student will recall Unit #4 and Unit #5 of Applied Mechanics
MCH 110.

Specific Objectives:

1. To be able to recall the three equations of equilibrium.

2. To be able to apply the three equations of equilibrium.

3. To be able to calculate the internal force in a member of
   :i structure using the Method of Sections.

UNIT   TORSION

General Objective:

The student will be able to c.esign shafts and torsion bars on the
basjs of sheer stress and an.ile of twist.

Specific Obj fcctives:

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1. To b^ ^b1~ to define the term sho^>- stress.

2. To be able to define the term sheer strain.

3. To be able to define the term polar moment of inertia.

4. To be able to calculate the polar moment of inertia for a solid
   circular shaft.

5. To be able to calculate the polar moment of inertia for a hollow
   circular shaft,

6. To be able to convert degrees to radian measure.

7. To be able to recall the number of foot lb./sec. in one horsepower

8. To be able to convert units of force, units of torque, units of
   stress, units of time and units of polar moments of inertia.

9. To be able to apply the formula using the proper units.

10. To be able to calculate the maximum sheer stress.

11. To be able to calculate the maximum angle of twist.

12. To be able to construct a Twisting Moment Diagram.

13. To be able to define the term speed reducer.

14. To be able to utilize the relationship between speed and torouo.

15. To be able to define the tern spring constant.

v.-   16. To be able to calculate the spring constant for a solid shaft.

17. To be able to calculate the spring constant for a hollow shaft

18. To bo able to define the term series combination.

19. To be able to define the term parallel combination.

20. To be able to calculate the equivalent spring constant in a series combination.

21. To be able to calculate the equivalent spring conrtant in a parallel combination.

22. To be able to produce a free-body diagram for the forces on the bolts of a coupling subjected to a torque.

23. To be able to calculate the shearing stresses in the bolts of a coupling subjected to torque.

24. The student vjIT solve correctly, the following problems: 2-2, 3, 4, 5, 6, 8, 9, 10, 13, IS, 19, 20, 21 22, 23 24, ,:5, 26, 27, 28, 44, 45 and 47.

UNIT #3 SHE&R FORCE AND BENDING MOMENT IN BEAMS

Genera[1]. Objective:

The student will be able to determine the sheering force and the benc ing moment in any part of a statically determinate bean.

Specific Objectives:

1. To be able to define the term beam.

2. To be able to define the term statically determinate.

3. To be able to define the term sheer force.

4. To be able to define the term bending moment.

5. To be able to define the term simple beam.

6. To be able to define the term cantilever beam.

7. To be able to define the term overhanging beam.

8. To be able to define the term concentrated load.

9. To be able to define the term uniformly distributed lead.

10. To be able to define the terra pave moment or couple.

11. To be able to recall the three equations of equilibrium.

12. To be able to state the convention for positive sheer.

13. To be able to state the convention for negative sheer.

14. To be able to state the convention for positive bending.

15. To be bi to state the convention for negative bending

16. To be able to state th elationsbin between the sheer force diagram and the bending moment diagram.

17. a) To bo able to ascertain the point or points of maximum sheer in the sheer force diaqram.

      b) To be able to ascertain **the point or points of zero sheer in the** sheer force diagram.

18. a) To be able **to** ascertain the **point or** points **of maximum bending** moment in the bending moment diagram.

      b) To be able to ascertain the point or points of zero bending moment in the bending moment diagram.

19. Vo be able to construct tie sheer force diagram for a given loading on a beam.

20. To be able to construct a composite bending moment diagram for a given loading on a beam.

21. To be able to construct a composite bending moment diagram by the method of superposition.

22. a) To be able to recall the areas of a rectangle, triangle and parabc1a.

      b) To be able to recall the position of the centroids of a rectangle, triangle and parabela.

23. The student **will be able,** using **the above specific objectives,** to correctly solve the fo'_lowing problems: 4-4, 6, 7, 9, 11, 17, 18, 20, 24, 26, 27 and 28.

UNI M B1T^DI"G STRESSES IN BEAMS

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The student will be able to calculate the tensile and compressive stresses induced in the beam cue to bending and thereby allowing **the** student to properly design the beam.

Specific Objectives:

1, To be able to construct a sheer force diagram.

2, To be able to construct a bending moment diagram.

3. To be able to ascertain the points of maximum and zero bending in a bending moment diagram.

4. To be able to recall the :.;ethod for calculation of the moment of inertia of a cor^osite section.

5. To be able to.ccdcul^te accurately the oment.o inerti of composite section.

6. To be able to state the formula -

7. To be able to state the formula -   correctly using the proper units.

8. To be able to solve correctly, using the above specific objectivo the following problem   G, 3, 9, 10, **11,** 12, 13, **14,** 15 **19,** 20, 22 and 23.