Fall 2015

ENME 3734

W. St. Cyr
University of New Orleans

DRAFT ENME 3734 Syllabus

Machine Elements – Fall 2015

3:30 – 4:45 M & W Science 2072

W. W. St. Cyr, Ph.D. Office: Room 903

Office Hours: 10:00 to 12:30 pm, M & W

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Week	Date	Topic	Homework
1	8/19-8/24	Chapter 3	On McG-H
2	8/26-8/31	Chapter 4	"Connect"
3	9/2-9/9	Chapter 5	
4	9/14-9/16	Quiz 1 & Ch 6	
5	9/21-9/33	Ch 6 & Ch 7	
6	9/29-9/30	Ch 7 & Ch 8	
7	10/5-10/7	Ch 8 & Quiz 2	
8	10/12-10/14	Ch 9	
9	10/19-10/21	Ch 10	
10	10/26-10/28	Ch 11	
11	11/2-11/4	Ch 14 & Quiz 3	
12	11/9-11/11	Ch 14 & Ch 16	
13	11/16-11/18	Ch 16 & Ch17	
14	11/23-11/25	Ch 17	
15	11/30-12/2		

Final drop date is Oct. 14. Mid-semester break is Oct. 15-16. Thanksgiving is Nov. 26-27

Catalog Description: Prerequisites: ENCE2351, ENME 2740, and credit or registration in ENME 2785. Application of engineering mechanics to the design and selection of machine elements. Topics include fatigue, stress analysis, and failure theories.

Required Textbook: *Shigley's Mechanical Engineering Design,* 9th or 10th edition, by Richard G. Budynas and J. Keith Nisbett. Note: If you do not purchase a new book, you will have to pay a fee to access the on-line homework site "Connect".

Recommended Reference: *Roark's Formulas for Stress and Strain.* 7th or 8th edition, McGraw-Hill. Electronic version of 7th edition available from library.

Course Topics: Stress Analysis, Deflection Analysis, Failure Analysis, Fatigue Analysis, Fasteners, Welding, Springs, Bearings, Gears, Clutches, Brakes, Flexible Mechanical Elements, Shafts.

Course Objectives After completing this course, students will have demonstrated the following:
Static Failure Prediction (Chapters 3, 4, 5) - Determine the maximum stresses and deflections caused by the applied loading. Identify stress concentrations and principal stresses with correct orientations in a complicated stress state. Estimate the critical column-buckling load. Use static failure theories to predict failure load and failure modes.
Fatigue Failure Prediction (Chapter 6) - Determine fatigue endurance limits. Using various criteria, predict the fatigue life of machine components including effects such as notch sensitivity, fatigue stress concentration, loading type, surface finish, temperature, and desired reliability.
Shaft Use and Design (Chapter 7) - determine shaft dimensions based on applied torque and/or bending moment, safety factor, stress-concentration factors, and shaft material fatigue strength and ultimate strength. Calculate bending and torsional deflections caused by the applied loads.
Fastener Use and Design (Chapter 8) - determine the torque and efficiency of power screws. Distribute the loading to multiple fasteners and determine the critical fastener(s). Estimate necessary preload torque.
Welding Use and Design (Chapter 9) - Determine allowable loads per length of weld under parallel and transverse loading. Determine the section modulus and polar moment of inertia of weld groups.
Spring Use and Design (Chapter 10) - Determine the spring rate, static and fatigue stresses and strength of helical springs. Determine the material and dimensions of a helical compressive spring under the restrictions of space, spring rate, load range and maximum deflection.
Bearing Use and Design (Chapters 11) – Selection and mounting of ball and roller bearings.
Gear Use and Design (Chapters 14) - Determine bending and contact stresses in gear teeth. Use AGMA equations to determine the structural integrity of the gear set.
Design and Selection of Clutches, Brakes and couplings (Chapter 16)
Design and Selection of Flat, Metal and V-Belts (Chapter 17)

Course Outcomes All mechanical engineering graduates are expected to have achieved certain abilities by the time of graduation. These abilities are referred to as program outcomes. The outcomes addressed in this course are listed below.
Outcome A - an ability to apply knowledge of mathematics, science, and engineering. Principal stresses with correct orientations in a complicated stress state. Estimate the critical column-buckling load. Use static failure theories to predict failure load and failure modes.
Outcome C - an ability to design a system, component, or process to meet desired needs.
Outcome E - an ability to identify, formulate, and solve engineering problems.
Outcome K - an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Outcome N - an ability to apply solid mechanics concepts to mechanical engineering practice.

Course Administration

Examinations and quizzes – Unless otherwise directed, all exams and quizzes will be closed-book and closed notes, however a formula sheet will be provided Your work must be your own (no texting, emailing, or other communications with others).

Homework – Problem sets are to be submitted using the following website: http://connect.mheducation.com/class/w-st-cyr-330---445-mw
HW problem sets are due at 3:00 pm, on the class day following the last lecture from each chapter. Late homework submissions are assessed a penalty.

Professionalism – Class attendance and participation is NOT optional (roll will be taken every day!). Excessive unexcused absences will result in loss of at least one letter grade! Class begins promptly at 3:30 pm and ends no later than 4:45 pm. Late arrivals, talking in class, cell phones, and other disturbances are unprofessional and distracting to those trying to learn. Repeated tardiness and other unprofessional behaviors will result in points deducted from your final score.

Academic integrity is fundamental to the process of learning. Cheating and other forms of academic dishonesty **(such as using a solution manual)** are not tolerated. Refer to the UNO Honor Code (Judicial Code) for further information.

Grading

Test dates shown here are subject to change

	WEIGHT	DATE
Exam 1	20%	SEPT 14
Exam 2	20%	OCT. 7
Exam 3	20%	NOV. 4
Final Exam	30%	DEC 9
Homework	5%	
Weekly Quizzes	5%	
TOTAL =	100%	

Class Notes

I have established a "Google Site" tied to my gmail account and post all my lecture slides there, along with formula sheets and other material useful for this course. To access this "Site", you must have a gmail account. Once you provide me with your gmail account name, I will be give you access to the Machine Elements "Site".

A useful web site - http://www.unitconverters.net/

SOME OF MY TEST REQUIREMENTS FOR THIS COURSE

1. All final answers must list magnitude, units and, if a vector the direction of the vector. Forces are vectors. Tension in rope, wire, etc. are scalars.

2. Draw a box around any answer you want graded.

3. All final answers must be reported to slide rule accuracy. If the answer begins with a "1", four significant figures are reported. Otherwise, three significant figures are reported. (This is not the same as "decimal places".)

4. Do not leave "negatives" in the final answer. Watch for double negatives, for example: σ = -3300 psi compression. This means σ = 3300 psi tension.

5. All calculations must be carried out to a minimum of five significant figures. Round only the final answers.

6. Use a separate sheet of paper for each problem. Use pencil only!

7. Do not write on the back of the paper.

8. Write down the equation you are using next to or below the sketch or FBD before substituting numeric values.

9. Show detailed steps if you want partial credit for the problem. Don't leave out steps.

10. All problems require a sketch or FBD.

Recommendations:
Watch the units of the problem. If some data is in inches and some in feet, convert all data to the same unit. Don't mix SI and US customary units.