COURSE: MENG 3309 – Mechanical Systems Design

Credits: 3 hours lecture, 0 hours laboratory per week

Instructor: Dr. Syed Abraruddin Hasan, 903 245 6707 (Cell Phone) – shasan@uttyler.edu

Text(s): Budynas and Nisbett “Mechanical Engineering Design” 9th ED, McGraw Hill

Additional Material:
- Class materials and handouts

Course Information

Catalog Description: Characterization, design, selection, and integration of mechanical systems and components including shafts, bearings, gears, springs, and mechanical fasteners

Prerequisites: MENG 3303 – Dynamics of Machinery
MENG 3306 – Mechanics of Materials

Required, Elective, Selected: Required

Relationship to Student Outcomes:

This course supports the following Mechanical Engineering Program Student Outcomes, which state that our students will:

1. be able to apply science, mathematics, and modern engineering tools and techniques to identify, formulate, and solve engineering problems
2. be able to design thermal/fluid, mechanical, and electro-mechanical components or systems, individually or on interdisciplinary teams, and effectively communicate those designs in both technical and non-technical forums
3. be able to apply a broad-based educational experience to understand the interaction of engineering solutions with contemporary business, economic, and social issues.
4. be able to recognize ethical behavior and continuous acquisition of knowledge are attributes of successful professionals.

Topics Covered:

The following syllabus describes the course contents in general terms. A flexible lecture schedule will be used to adjust the material covered to suit the background, interest and response of the students in order to maximize the overall benefits. All the sections shown below are from the textbook – 9th edition.
Introduction to Engineering Materials and material properties.
- Stress analysis: stress transformation
- Stress analysis: Mohr's circle

Review Session 1 on Thursday February 05, 2015 during the regular class
Exam 1 on Tuesday February 10, 2015 in class

- Working stresses, forces and failure modes
- Failure theories: ductile / brittle materials under static load
- Failure theories: ductile materials under fatigue load

Review Session 2 on Tuesday March 03, 2015 during the regular class
Exam 2 on Thursday March 05, 2015 in class

- Design of Shafts
- Design of Couplings
- Design of Helical springs

Review Session 3 on Thursday April 02, 2015 during the regular class
Exam 3 on Tuesday April 07, 2015 in class

- Joining process: Welding
- Lubrication theory and bearing selection
- Design of Spur and Helical Gears

FINAL COMPREHENSIVE EXAMINATION: The date for the 2-hour comprehensive final exam will be announced later and will be during the final exam week.

ATTENDANCE:

Mechanical Systems Design is one of the challenging core courses in engineering. Regular attendance is imperative if you want to do well in this course. Therefore, regular attendance is highly recommended. In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class on homework, tests etc.

ASSESSMENT:

HOMEWORK:

Home works are considered very important for the understanding of the course material. Completing your homework independently is an absolute necessity to do well in this course. Therefore I strongly suggest that students complete the homework assignments independently and submit them on time. They will, in general, be assigned after lectures on sections that are completed. Homework assignments and solutions will be posted on blackboard. Homework will NOT be collected or graded. However, one question in each exam will be from the homework problems.

EXAMS:

Closed-book, closed-notes tests will be given after completing a reasonable amount of material from the text as shown in the syllabus. A final 2-hour COMPREHENSIVE examination will be given during the final exam week. For each of the exams and the final exam, you are allowed to use only one page of self-written
notes (with no problem solutions of any kind) which will be collected with the exam papers. A formula sheet will be posted on BB before each exam and it will also be included with the exam.

**FINAL GRADES:**

Final grades are based on:

- 3 Exams @ 25% each \[75\%\]
- Final Comprehensive Exam \[25\%\]
- Total \[100\%\]

**NOTE:**

Course syllabus, course material such as handouts and example problems with solutions, homework assignments, homework solutions, review material, exam solutions will all be posted on Blackboard. Please review all the material posted on blackboard on a regular basis. I will use Blackboard to post announcements and contacting students by e-mail.

You will need a scientific calculator to solve problems in exams. You are not allowed to store any class material in the calculator during the exams. **THERE WILL BE NO MAKE-UP EXAMS.** The percentage of any exam missed by a student will be added to his/her final comprehensive exam only if prior approval is granted. The student is responsible to contact me at least a week before the scheduled exam date to get an excuse from the exam. If you have to miss an exam due to emergencies (such as medical and other emergencies) please inform me as soon as possible before or immediately after the exam. Class average for each exam will be posted on BB after each exam. Final grades will be determined on the basis of the class average. If your grade is consistently at the class average you will get a “C” grade. If you miss any exam without getting **prior approval from me at least one week before the exam date,** it will be counted as zero in the calculation of your final course grade. If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify me at least two weeks prior to the date of the planned absence.

Academic policies regarding withdrawal from the course, state-mandated course drop rule, grade forgiveness, student rights, absence for religious observance, grade replacement, social security and privacy, learning disability, academic dishonesty and others can be found at [http://www.uttyler.edu/wellness/rightsresponsibilities.php](http://www.uttyler.edu/wellness/rightsresponsibilities.php). Some of the policies are reproduced below for your information.

**Grade Replacement/Forgiveness:**

If you are repeating this course for a grade replacement, you must file an intent to receive grade forgiveness with the registrar by the 12th day of class. Failure to do so will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates will receive grade forgiveness (grade replacement) for only three course repeats; graduates, for two course repeats during his/her career at UT Tyler.

**State-Mandated Course Drop Policy:**

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the 12th day of class (See Schedule of Classes for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Registrar’s Office and must be accompanied by documentation of the extenuating circumstance. Please contact the Registrar’s Office if you have any questions.
Disability Services:

If you have a disability, including a learning disability, for which you request disability support services/accommodation(s), please contact Ida MacDonald in the Disability Services office so that the appropriate arrangements may be made. In accordance with federal law, a student requesting disability services/accommodation(s) must provide appropriate documentation of his/her disability to the Disability Services counselor. In order to assure approved services the first week of class, diagnostic, prognostic, and prescriptive information should be received 30 days prior to the beginning of the semester services are requested. For more information, call or visit Disability Services located in the University Center, Room 3150. The telephone number is (903) 566-7079. Additional information may also be obtained at the following UT Tyler Web address: http://www.utttyler.edu/disabilityservices.

Student Absence for University-Sponsored Events and Activities:

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement:

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Course Objectives:

By the end of this course students will be able to:

1. Apply engineering principles to create, analyze or improve a design of machine component to achieve desired objectives.
2. Determine the critical locations of maximum stress in typical machine components and compute the state of stress, principal stresses and VonMises stress at the point.
3. Determine stress concentration to evaluate actual stress level applied on mechanical structures.
4. Demonstrate an understanding of mechanical behavior of both ductile and brittle materials.
5. Demonstrate an understanding of static failure theories as a mechanism for computing factor of safety against yielding.
6. Demonstrate an understanding of fatigue failure theories as a mechanism for computing the factor of safety against loading cycles.
7. Apply failure theories to design shafts.
8. Apply failure theories to design Couplings.
9. Identify the functional characteristics of various machine elements.
10. Design and select machine elements for a specific application.

Prepared By:  Dr. Syed Abraruddin Hasan  Date:  01/02/2015