

Machine Design Lecture: Spring 2012
Course # MEC K281
Technologies Department

Course Description:

This course utilizes skills from previous courses and gives students the opportunity to investigate the design of machine elements. Actual design conditions are studied along with classical engineering design practice utilizing the concepts of stress, materials, pneumatics, economy, safety, strength and appearance.

Instructor:

PROF Patrick H. Knowles Jr. Room C-160 ph: 885-2379 pknowles@trcc.commnet.edu

Text Book:

Machine Elements in Mechanical Design – Mott, Robert L., 4e; ISBN 0-13-061885-3

Procedure:

The course will consist of a lecture. The lecture will consist of open discussion, during which the student is encouraged to ask questions and relate their own experiences. The discussions will be conducted around the reading assignments and the comprehension quizzes.

Lecture Outcomes:

- Students will practice the skills needed to work effectively in teams.
- Students will demonstrate the ability to use appropriate mathematical and computational skills needed for engineering technology applications.
- Students will know of a professional code of ethics.
- Students will be able to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for process improvement.
- Students will have the ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems.
- Students will illustrate an ability to think critically and identify, evaluate and solve complex technical and non-technical problems; demonstrate creativity in designing problem solutions; and conduct and interpret experimental data and outcomes.

Lecture Performance Criteria:

The above outcomes will be assessed using these performance criteria:

- Work effectively in team-
 - ✓ Produces research information for a team
 - ✓ Demonstrates understanding of team roles when assigned
 - ✓ Shares in work of team
 - ✓ Demonstrates good listening skills

- Mathematical and computational skills-
 - ✓ Ascertain problem conditions by identifying known and unknown quantities in formulating a problem for solution
 - ✓ Demonstrates the correct selection and application of pertinent formulae, principles and concepts.
 - ✓ Pursue solutions in a methodical, logical manner with results correctly explained with sufficient detail and properly documented
 - ✓ Submit problem solutions with a minimum of computational errors, identifying and selecting the correct dimensional units
- Professional code of ethics-
 - ✓ Demonstrate knowledge of a professional code of ethics / conduct
 - ✓ Evaluate the ethical dimensions of professional engineering, mathematical and scientific practices
- Work in both thermal and mechanical systems areas including design-
 - ✓ Show an understanding of the engineering design process by designing a mechanical system
 - ✓ Be able to design a multi-component thermo-fluid system.
- Function in a laboratory setting-
 - ✓ For a given experimental task be able to specify the independent and dependent variables and plan the experiment.
 - ✓ Be able to collect and record raw data. Data are presented in ways that facilitate understanding.
 - ✓ Be able to follow instructions to perform an experiment. (including calibration, configuring, and testing the instruments to conduct the laboratory work).
- Illustrate an ability to think critically and identify-
 - ✓ Show the ability to evaluate the credibility of sources of information
 - ✓ Demonstrate the ability to refine generalizations, establish rational & pertinent assumptions, and avoid oversimplifications.
 - ✓ Exhibit the ability to generate, analyze / evaluate, and assess multiple engineering problem solution options
 - ✓ Produce documentation that reflects organization and application of engineering principles in specifying solution to an engineering problem

Instructor Assistance:

Seeking help from the instructor outside of class is encouraged if you are having difficulty understanding course material. Feel free to Email/call for an appointment during office hours.

Academic Integrity:

Academic integrity is essential to a useful education. Failure to act with academic integrity severely limits a person's ability to succeed in the classroom and beyond. Furthermore, academic dishonesty erodes the legitimacy of every degree awarded by the College. In this class and in the course of your academic career, present only your own best work; clearly document the sources of the material you use from others; and act at all times with honor.

Course Work Portfolio:

The course work portfolio is a collection of copies of all work performed in the class. The portfolio should be broken into the following sections: (1) homework, (2) quizzes/exams, (3) project. The portfolio is due on 16May and should be contained in a binder or folder. Grading will be based on completeness & organization.

Homework is not mandatory in the sense that it will be collected daily/weekly. However, completing homework has been found to be extremely helpful in understanding and reinforcing the concepts covered in class. Those who attempt and complete (to the best of their ability) the ALL of the homework using the proscribed format can expect to receive a "homework bonus" up to 7.5% added to the final average (after quizzes & exams). Homework is due on the assigned due date at the beginning class. Late homework will not receive credit. To receive the "homework bonus", students will be allowed

to miss no more than one assignment. There will be no “prorating” of the bonus percentage for missing more than one assignment.

You may work with others on nightly/weekly homework assignments to determine analysis methods, but you must indicate on your paper from whom you have received assistance.

Attendance:

This course is designed in such a way that a student should get more from the in-class activities than from the textbook alone. Therefore, students who are registered for this course are naturally expected to attend class regularly. Over the span of a semester the instructor expects to become familiar with the attendance habits of individual students. Therefore, these habits cannot help but be a factor in the evaluation of class participation and student contribution.

Grading Policy:

Several exams will be given during the semester. The dates of the exams are noted in the Lecture Schedule. Approximately one hour of the class meeting will be devoted for each exam. Final grades will be based on a normal distribution of all students taking the course based on the following weighting:

Exam & Quiz Average	55%
Design Project	20%
Ethics Case Study	10%
Course Work Portfolio	15%

Withdrawal:

A student who finds it necessary to discontinue a course must complete a "Withdrawal Request Form" available in the Registrar's office within the time limits of the semester calendar. Students who do not withdraw, but stop attending will be assigned an "F" signifying a failing grade. The last day to withdraw from classes is 09May2011.

Disabilities Statement:

If you have a question regarding a disability that may affect your progress in this course, please contact one of the college's Disability Service Providers as soon as possible. Chris Scarborough (892-5751) generally works with students who have learning disabilities or attention deficit disorder. Kathleen Gray (885-2328) generally works with students who have physical, visual, hearing, medical, mobility, and psychiatric disabilities. Matt Liscum (860/383-5240) also works with students who have disabilities.

If you will need accommodations for this class, you must contact the Disabilities Counseling Services. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. *The instructor cannot provide accommodations until an accommodation letter from the Disabilities Counselor is received.*

Date	Class #	Topic	Reading	Hwk
1/19/2012	1	The Nature of Mechanical Design; Materials in Mechanical Design	Chap.1; Chap. 2	Ch1: 15 thru 23, 28 Ch2: 1-10, 13-17, 21, 28, 44, 51, 70, 76, 79, 81
1/26/2012	2	Stress and Deformation Analysis	Chap. 3	Ch3: 8, 14, 16, 21, 29, 30, 31, 37, 45, 54, 65, 66, 67, 76
2/9/2012	3	Combined Stresses and Mohr's Circle	Chap. 4	Ch4: 7, 9, 16, 31, 36 - show answers on properly oriented stress element
2/16/2012	4	Design for Different Types of Loading	Chap. 5	Ch5: 9, 11, 25, 26, 27, 31, 32, 73, 81, 83
2/23/2012	5	Exam I		
3/8/2012	6	Belt Drives and Chain Drives; Kinematics of Gears	Chap. 7; Chap. 8	Ch7: 1, 2, 3, 18, 22, 24, 25, 34, 39
3/15/2012	7	Kinematics of Gears	Chap. 8	Ch8: 3, 21, 37, 39, 41 (only enough to draw picture in # 46), 46
3/29/2012	8	Spur Gear Design	Chap. 9	Ch9: 3, 33, (37 & 43), (49 & 55)
4/5/2012	9	Helical Gears (10-1 thru 10-8); Keys, Couplings, and Seals	Chap. 10; Chap. 11	Ch10: 5, 7 (use your same P_d , N_p data as 9.60 and 62), 14 (forces only) Ch11: 1, 3, 5 (#3 only), 20, 22, 24, 28, 37
4/12/2012	10	Shaft Design	Chap. 12	Ch12: 1, 14, 24, 35 (complete shaft design for 24 & 35 including drawing and design report!)
4/19/2012	11	Exam II		
4/26/2012	12	Tolerances and Fits		
5/3/2012	13	Rolling Contact Bearings; Plain Surface Bearings; Linear Motion Elements		
5/10/2012	14	Fasteners; Springs; Machine Frames, Bolted Connections, and Welded Joints		
		Exam III		
		Electric Motors and Controls.; Motion Control: Clutches and Brakes		
		Design Process; Professional Codes		
		Engineering Ethics		
		Exam IV		