# ETME 341 – MACHINE DESIGN Fall 2014

**LEC (001) - 3:10 pm M W F (RH 301)**
**LAB (002) – M 4:10 – 6:00 pm (EPS 008F)**
**LAB (003) – Tu 8:00 – 9:50 am (EPS 008F)**

Instructor: Kevin R. Cook Phone: 994-6503
Office: Roberts Hall 203 E-mail: kcook@me.montana.edu
**Office Hours:** TBD

**PREREQUISITE:** EGEN 208 or equivalent.

**TEXTBOOK:** 1. Machine Elements in Mechanical Design - Robert L. Mott, Fifth Edition, 2014, Pearson, Inc.

**COURSE DESCRIPTION:** This course is designed to provide an overview of the concepts, procedures, analysis techniques, and application techniques necessary to design machine elements commonly found in mechanical devices and systems.

**Course Website**: Log into D2L: https://ecat.montana.edu/

## Specific Course Outcomes:

Upon completion of this course, students should be able to:

- Demonstrate required proficiency in math to solve machine design related problems
- Properly select materials for machine design components
- Apply appropriate stress analysis techniques in order to effectively and safely design machine elements
- Apply specific machine component design processes to effectively and safely design machine elements
- Communicate the design intent of mechanical components effectively through CAE techniques
- Complete laboratory experiments / assignments requiring appropriate data collection, synthesis, interpretation and presentation
- Effectively integrate machine components into an operational machine system.
- Demonstrate the ability to work cooperatively and interactively with others in a team environment to complete a given design project
- Be familiar with the design resources and journals available in order to maintain currency with new technology and apply new methods and techniques to design processes and products in industry

**Topics Covered:**

| | | |
|---|---|---|
| **1.** Design Process | **6.** Design of Belt and Chain Drives | **11.** Gear Design |
| **2.** Materials in Mechanical Design | **7.** Tolerances and Fits | **12.** Bearing Design |
| **3.** Stress Analysis in Mechanical Design | **8.** Keys, Couplings, and Seals Design | **13.** Mechanical Drive Design |
| **4.** Design for Loading of Systems | **9.** Shaft Design | **14.** Bolted and Welded Joints |
| **5.** Design of Columns | **10.** Kinematics of Gears | **15.** Selected Component Design |

**STUDENT EVALUATION:**

The student will be evaluated for a final course grade based upon the "Inspection Model" where the score distributions are evaluated at the end of the semester for natural breaks or cut-offs. Note that this is not a "curve" grading system. Your final grade will be based upon where you fall in the score distributions and my subjective evaluation of total class performance. Grading will be distributed as follows:

1. Exams//Final Exam 50%
2. Lab Work / participation 25%
3. Homework / quizzes 25%

**Internet Course Site**
I expect that you will check the course website: (located in D2L: https://ecat.montana.edu/) on a daily basis in order to keep current with course announcements, assignments, schedule changes, etc.

**Student Educational Records**

All records related to this course are confidential and will not be shared with anyone, including parents, without a signed, written release. If you wish to have information from your records shared with others, you must provide written request/authorization to the office/department. Before giving such authorization, you should understand the purpose of the release and to whom and for how long the information is authorized for release.
*Students have the right to access their educational records by appointment. This information is protected by the Family Educational Rights and Privacy Act (FERPA). For more information contact the Dean of Students office at 994-2826.*

**Conduct Guidelines and Grievance Procedures for Students:**

Refer to the following policy for MSU Student Conduct Code:

http://www2.montana.edu/policy/student_conduct/student_conduct_code.htm

**Lab, Homework Problem, and Design Assignments:** Homework Problems and Design Projects will be assigned from the text and other supporting materials as the course progresses. The lab work required each week will be specified in lab assignments. These assignments will be posted on the course website for students to review. When appropriate, paper copies will also be handed out. The requirements for communicating the results of these assignments will be specified in the assignment as well. Content of these assignments will be reflected on the quizzes and examinations. Completed assignments are due at the **beginning** of class or lab on the due date (unless otherwise specified by the instructor). Late assignments will be accepted up to 24 hours after the assigned time and date with a 15% reduction. No assignments will be accepted after that point unless prior arrangements are made with the instructor. Assignments **must** also conform to the following criteria:

➲ Written communication (lab and design project reports) must conform to proper communication standards and expectations of junior level engineering students (see page 3)
➲ Problem solutions (lab and homework) must include all elements of the scientific problem-solving method.
➲ Use plain white paper or engineering paper for all solutions
➲ Use only one side of the paper
➲ Answers and process must be ***communicated effectively*** and ***legibly***

**Lab Sessions:** The lab portion will complement the course subjects through the use of :

- hands-on experiences
- computer software usage (MDSolids, SolidWorks, etc.)
- computer program development (excel, mathCad, etc.)
- group and individual design projects

Therefore, ***attendance*** at all sessions is ***mandatory*** unless otherwise specified by the instructor. Also, everyone is to respect the value of each other's time and ***be on time***! **Attendance will be taken and will contribute to your overall lab grade.**

**Reading, Homework Problem, and Lab Assignment Schedule:** The schedule for Fall 2014 will be detailed as the course progresses. Each student is expected to keep abreast of all assignments as they are given. Students are expected to be prepared for each class. Quizzes over the reading material will periodically be given at the beginning of class.

## Reading and Homework Assignment Schedule

| Date | Text / Topic | Assignment | Due Date |
|---|---|---|---|
| 8/25 | Course Introduction | - Read Chap.1 | 8/27 |
| 8/27 | Ch. 1 – Mechanical Design | - Homework Assignment #1<br>- Read Chap. 2 | 8/29 |
| 8/29 | Ch. 2 – Materials in Mechanical Design | - Homework Assignment #2<br>- Read Chap. 3 | 9/3 |
| 9/1 | Labor Day Holiday – no classes | | |
| 9/3<br>9/5 | Ch. 3 – Stress and Deformation Analysis | - Homework Assignment #3<br>- Read Chap. 4 | 9/8 |
| 9/8<br>9/10 | Ch. 4 – Combined Stress/Mohr's Circle | - Homework Assignment #4<br>- Read Chap. 5 | 9/12 |
| 9/12<br>9/15<br>9/17<br>9/19<br>9/22 | Ch. 5 – Design for Different Loading | - Homework Assignment #5<br>- Read Chap. 6 | 9/24 |
| 9/24 | Ch. 6 - Columns | - Homework Assignment #6 | 9/26 |
| 9/26 | Test #1 Review | - Read Chapter 7 | -- |

**Test #1 – Monday, September 29. 2014 – Chapters 1 through 6**

## Lab Schedule:

### Mondays (Section 02)

| Date | Lab Assignment | Due |
|---|---|---|
| 8/25 | No Lab | |
| 9/1 | Labor Day Holiday – No Lab | |
| 9/8 | MD Solids and Stress Analysis | 9/15 |
| 9/15<br>9/22<br>9/29 | Design for Different Types of Loading Conditions | 10/6 |

### Tuesday (Section 03)

| Date | Lab Assignment | Due |
|---|---|---|
| 8/26 | No Lab | |
| 9/2 | No Lab | |
| 9/9 | MD Solids and Stress Analysis | 9/16 |
| 9/16<br>9/23<br>9/30 | Design for Different Types of Loading Conditions | 10/7 |