AET 3703 – Machine Design
Eastern Illinois University

**Course Description:** Design of basic machine components: shafts, springs, bearings, gears, fasteners, belts, chains, screws, lubrication systems, welded joints, brakes, clutches, and hydraulic/pneumatic systems.

**Prerequisites:** PHY 1351G, PHY 1352G or (PHY 1151G, 1152G and MAT 1340 or 1141G).

**Texts:** None.

**Equipment and Additional Materials:** Scientific calculator, writing utensil, writing media

**Course Objectives:** Upon completion of this course the student will be able to articulate and demonstrate a thorough understanding of industrial application of theoretical and practical concepts as they relate to the applicability of flexible connectors, gears, cams, mechanical transactional systems, and hydraulic/pneumatic circuits.

**Course Content:**

1. Design basics
   a. Types of design
   b. Design factors
   c. Materials
2. Professional Practices
   a. Organization of design function
   b. Surface finishes
   c. Protective coatings
   d. Engineering changes
3. Engineering calculations
   a. Area
   b. Volume
   c. Pressure
   d. Force
   e. Distance
   f. Speed
   g. Velocity
   h. Circumferential
   i. Rotational
   j. Power
   k. Work
   l. Horsepower
   m. Newton
   n. Joules
   o. Newton-meter
   p. Foot-pound
   q. Mechanical advantage
   r. Work efficiency
   s. Engine output
4. Simple machines
   a. Lever
   b. Wheel and axle
   c. Inclined plane
   d. Pulleys
   e. Screw
   f. Wedge
   g. Fluid transfer
5. Review of mechanics and strength of materials
   a. Statics definition
   b. Force systems and motion
   c. Work, Energy, and Motion
d. Centroids
e. Moments of Inertia
f. Shear and Moment diagrams
g. Stresses

6. Friction and Lubrication
   a. Sliding friction
   b. Rolling resistance
   c. Journal, Pivot, and Collar
   d. Viscosity
e. Lubrication

7. Intermittent-motion Mechanisms
   a. Bearings
   b. Shaft design and seals
   c. Fasteners
d. Couplings
e. Keys
f. Welding and weld design

8. Drive trains
   a. Belting
   b. Chain drives
c. Hoists and conveyors
d. Ropes

9. Power Mechanisms
   a. Power screws
   b. Gears
c. Gear trains
d. Force analysis
e. Cams
f. Springs

10. Power and Energy
   a. Flywheels
   b. Power units
c. Fluid Power
d. Fluids
e. Strainers and filters
f. Valves
g. Symbols and circuits
h. Seals
i. Pumps and motors

11. Other systems as identified
    (Note: Some topics may not be covered)

Grading Evaluation

A: 90 – 100  Midterm  20%
B: 80 - <90  Final  25%
C: 70 - <80  Individual Project  15%
D: 60 - <70  Group Project  20%
F: <60  Assignments/Quizzes  20%

All points will be prorated to the amounts listed above on the right.
Class Policies:

1. **Attendance:** In every class period an attendance sheet will be used. It is up to the student to show up on time and to sign the attendance sheet. Failure to do so is the fault of the student. Although no points will be removed from a student’s grade for an absence, missing classes will be detrimental to your success in the class. Every student is responsible for all materials covered in class. If a student misses a test, the student will receive a score of zero (0) for the test unless there is a legal document that proves the absence was unavoidable and out of a reasonable level of control for the student (definition of reasonable is at the discretion of the instructor).

2. **Late submittals:** No late submittals will be accepted. In the event that a student knows that he or she will be absent from a class where an assignment or project is due, then it is the responsibility of the student to make arrangements for an early submittal with the instructor’s approval.

3. **Electronic devices:** Electronic devices are defined as those that are primarily used for personal, non-course-related objectives and include, but are not limited to, cell phones, pagers, video games, computers, iPods and other entertainment devices. No electronic devices may be used during the class period unless is has been approved by the instructor prior to their use. Anyone caught using these may be asked to leave the classroom for the remainder of the class period so that the course and other students’ learning environment do not affect the offending student’s non-course related activities. (This is overruled by documentation from Disability Services.)

4. **Outside material:** It is the student’s responsibility to ensure that he or she does not participate in non-course related activities. This includes newspapers and other reading; crossword puzzles and other time-consuming leisure activities; homework or assignments from other classes. If a student is caught participating in these non-course related activities, he or she may be asked to leave the class for the remainder of the class period.

5. **Academic success:** If a student does not understand something in the class, it is his or her responsibility to ask the instructor for clarification. If a student cannot see or hear something in the classroom, it is his or her responsibility to speak to the instructor about it. The academic development and success of the student is the interest of the instructor, but it is the responsibility of the student.

6. **Academic honesty:** At no point will academic dishonesty be tolerated by the instructor. Each student must do his or her own work. Plagiarism, fabrication, and falsification or work constitutes academic dishonesty.

Disability statement:
If you are a student with a documented disability in need of accommodations to fully participate in this class, please contact the Office of Disability Services (ODS). All accommodations must be approved through ODS. Please stop by Ninth Street Hall, Room 2006, or call 217-581-6583 to make an appointment.

Right of Revision: The instructor reserves the right to revise the syllabus, course policies, or tentative topic schedule without notice.