Department of Engineering Technology ET-426

Course Number and Name: ET 426, Analysis and Design of Machine Elements
Credits & Contact Hours

Credits	Lectures	Lab	Contact Hours
3.0	(2) 50 min lectures/ week	(1) 2.5 hour /week	50

Instructors Name: Manuel Gomez

Textbook title, *Machine Elements in Mechanical Design (4th Ed*)
author and year: Mott, Robert L., 2004

Specific Course Description:

a. **Course Catalog Description** - Analysis of machine elements including columns, springs, shafts, coupling mechanisms, gears, belts and chain drives, clutches, brakes, and bearings.
b. **Prerequisites:** ET 310 (Applied Strength of Materials) and Math 236 (Calculus II)
c. This course is required for MET degrees.

Course Goals & Objectives: To familiarize students with how the fundamentals of applied strength of materials are applied to analyzing machine components, and to introduce additional advanced topics such as fatigue, tolerance & fits, fasteners, and the sizing of shafts for power transmission. Further, to familiarize students with the characteristics of machine components.

Related ABET Objectives & Course Outcomes: An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline, to include the following:

Student Outcomes of Instruction from MET (x.)	Student Outcomes /Criteria 3
(1.) **Algebra, trigonometry**, Boolean mathematics**, calculus**, statistics and probability, **fundamental principles and concepts of science and engineering technology, good practice in problem solving,** and **methods of standard practice in the analysis and applied design** of **mechanical systems** as applied to analysis and design of machine elements.	3.a, 3.b, 3.d, 3.f
(3.) **Basic knowledge of manufacturing processes, engineering materials and their selection, measuring tools, machine tools, quality systems and processes,** process improvement methods, **economic principles, cost analysis techniques, and project management relevant to mechanical technology areas**	3.a, 3.b, 3.c, 3.d, 3.e, 3.f, 3.g
(4**.) Current software corresponding to good practice in the application of mechanical engineering technologies**. Software application functions to include: **word processing**, spreadsheet calculations, graphing**, presentation media**, **computer assisted drafting and manufacturing, manufacturing processes**, statistics, **data acquisition, project management**, and the **analysis and applied design of systems involving mechanisms, machines**, or fluid thermal processes.	3.a, 3.b, 3.c, 3.d, 3.f, 3.k

Course Topics	Class Hours
Machine Design Course Introduction	1
Mechanical Design/Materials in Machine Design	1
Lab: Introduction to MathCAD	2.5
Stress Analysis	2
Lab: Intro to Finite Element Analysis (FEA)/Solidworks	2.5
Combined Stresses and Mohr's Circle	1
Design for Different Types of Loading	1
Lab: FEA 1 and validate model using analytical solution	2.5
Columns, Test review	1
Lab: FEA 2 and validate model using analytical solution	2.5
Belt Drives and Chain Drives, Kinematics of Gears	2
Exam #1	2
Gear Design	1
Lab: Belt Drives and Chain Drives/ Amatrol Bench – design/build belt drive system and analyze input/output speeds	2.5
Keys, Couplings, and Seals	1
Lab: Gear Layout Analysis/ Solidworks	2.5
Shaft Design	1
Lab: Gear Analysis/ Amatrol Bench – design/build gear drive train and analyze the input/output speeds	2.5
Tolerance and Fits, Test Review	1
Lab: Shaft Design FEA with Solidworks	2.5
Bearings	1
Design Project Start (Design a Power Transmission Drive system to achieve the desired output speed. Use analytical analysis and solidworks to design all of the machine elements for the drive system. A technical report and powerpoint presentation are required. Work in teams of 3)	
Exam #2	2
Linear Motion Elements, Fasteners & Springs	1
Lab: Design Project continued	2.5
Machine Frames, Bolted Connections and Welded Joints	1
Lab: Design Project continued	1
Electric Motors	2.5
Lab: Electric Motor Familarization – Electric Motor Analysis Bench	2.5
Final Exam	2

Prepared by Manuel Gomez, 01/11/2011