COURSE OUTLINE

MECH 332 – INTERMEDIATE MACHINE DESIGN

Prepared By: Daniel J. Miller
Updated By: Daniel J. Miller (April 2015)
A. **TITLE:** Intermediate Machine Design

B. **COURSE NUMBER:** MECH 332

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE:** No

E. **LENGTH OF COURSE:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall

G. **HOURS OF LECTURE:** 3 lecture hours per week

H. **CATALOG DESCRIPTION:** This course is a continuation of MECH 232 – Machine Design. Design of shafts, keys, couplings and seals provide application to tolerances and fits. The study of bearing types, loads, design life and selection along with fastener selection, machine frames, connection and joints; linear motion, motion control and electric motors and controls used in automated machinery.

I. **PRE-REQUISITE/CO-COURSES:** MECH 232

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

<table>
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<th>Course Objective</th>
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| 1. Design shafts using keys, couplings and seals | 1. Communication  
2. Critical Thinking  
3. Professional Competence |
| 2. Apply design tolerances for acceptable fits and failure analysis | 2. Critical Thinking  
3. Professional Competence |
| 3. Select the proper bearings for application and loading | 2. Critical Thinking  
3. Professional Competence |
| 4. Specify the proper fastener and connection type for common mechanical assemblies | 2. Critical Thinking  
3. Professional Competence |
| 5. Choose applications and specify components requiring motion control | 2. Critical Thinking |


L. **REFERENCES:**

M. **EQUIPMENT:** Computer & CAD software
N. **GRADING METHOD:** A - F

O. **MEASUREMENT CRITERIA/METHODS:**
   Exams, Homework/Quiz, Design Project

P. **DETAILED TOPICAL OUTLINE:**

   I. Keys, Couplings and Seals
      
      A. Uses and materials for keys
      B. Stress analysis in keys
      C. Application and uses of couplings and U-joints
      D. Retaining rings and stress analysis
      E. Type of seals and materials used

   II. Tolerances and Fits
      
      A. Factors that affect tolerances and fits
      B. Cost associated with tolerance specification
      C. Clearance, interference, transitional fits
      D. Stresses due to force fits

   III. Bearing Types and Selection
      
      A. Type of bearings (roller, thrust, surface)
      B. Bearing Materials
      C. Bearing mounts
      D. Load/Life relationship
      E. Bearing selection
      F. Lubrication requirements
      G. Design considerations

   IV. Fasteners and Connections
      
      A. Materials, designation and selection of fasteners
      B. Fastener strength and clamping loads
      C. Eccentrically loaded bolted joints
      D. Machine frames and structures
      E. Welded joints

   V. Springs
      
      A. Type of springs
      B. Stresses and deflection
      C. Improving spring performance
      D. Applications
VI. Linear Motion and Controls

A. Power screw and ball screw systems
B. Clutches and brakes
C. Acceleration and inertia
D. Heat dissipation
E. Motors and Controls