Course Outcome Summary

METC 210
Computers in Machine Design

Course Information
Division: Applied Science and Engineering Technology
Contact Hours: 90.0
Total Credits: 4.0

Prerequisites: METC 220, METC 170 (or equivalent), and MATH 160

Course Description
This course covers the application of the principles of engineering mechanics (stress/strain, impact, dynamic loading and fatigue) through computer analysis to the design and/or selection of machining elements. Components discussed include fasteners, springs, bearings, belt and chain drives, brakes and clutches, power screws and gears. Students are exposed to use of CAD to model designs, FEA stress verification and a variety of math tools to reproduce equations from industry handbooks and component supplier guides.

This course is a restricted tech elective for students pursuing a degree in Mechanical Engineering Technology

Program Outcomes Addressed by this Course:
Upon successful completion of this course, students should be able to meet the program outcomes listed below:

A. Identify and define problems in mathematic and scientific terms.
B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
C. Select materials and determine component sizes and shapes to meet design criteria.
D. Apply instruments to make measurements and analyze data from such measurements.
E. Identify typical mechanical components and explain their function.
F. Apply fundamental manufacturing processes using manual and automated machine tools.
G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
H. Select and apply power generation and power transmission components including mechanical, pneumatic, hydraulic, thermal, and electrical types.
I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
J. Communicate effectively, and work as part of a team.
Course Outcomes Summary

METC 210
Computers in Machine Design

Course Outcomes
In order to evidence success in this course, the students will be able to:

1. Represent velocity and acceleration as vectors.
   
   Applies To Program Outcomes
   
   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.

2. Assign reference frames and determine relative and absolute motion components
   
   Applies To Program Outcomes
   
   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
   J. Communicate effectively, and work as part of a team.

3. Apply computer software tools to determine motion profiles and simulated motion trajectories
   
   Applies To Program Outcomes
   
   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   D. Apply instruments to make measurements and analyze data from such measurements.
   E. Identify typical mechanical components and explain their function.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
4. **Determine dynamic loading of components using software tools**

   *Applies To Program Outcomes*

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   D. Apply instruments to make measurements and analyze data from such measurements.
   E. Identify typical mechanical components and explain their function.
   F. Apply fundamental manufacturing processes using manual and automated machine tools.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
   J. Communicate effectively, and work as part of a team.

5. **Develop a plan to design, review, test, and evaluate new designs of mechanical parts**

   *Applies To Program Outcomes*

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   D. Apply instruments to make measurements and analyze data from such measurements.
   E. Identify typical mechanical components and explain their function.
   F. Apply fundamental manufacturing processes using manual and automated machine tools.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   H. Select and apply power generation and power transmission components including mechanical, pneumatic, hydraulic, thermal, and electrical types.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
   J. Communicate effectively, and work as part of a team.
Course Outcome Summary

METC 210
Computers in Machine Design

6. **Design a drive train using gears, shafts, belts and clutches to transmit power**

   Applies To Program Outcomes

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   E. Identify typical mechanical components and explain their function.
   F. Apply fundamental manufacturing processes using manual and automated machine tools.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   H. Select and apply power generation and power transmission components including mechanical, pneumatic, hydraulic, thermal, and electrical types.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
   J. Communicate effectively, and work as part of a team.

7. **Select fasteners, springs, and other mechanical fasteners to meet design criteria**

   Applies To Program Outcomes

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   E. Identify typical mechanical components and explain their function.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   H. Select and apply power generation and power transmission components including mechanical, pneumatic, hydraulic, thermal, and electrical types.
   J. Communicate effectively, and work as part of a team.

8. **Analyze statics stress in mechanical components using Finite Element Analysis Software.**

   Applies To Program Outcomes

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   D. Apply instruments to make measurements and analyze data from such measurements.
Course Outcome Summary

METC 210
Computers in Machine Design

9. **Develop a solution to a problem based on a written problem statement**
   
   *Applies To Program Outcomes*

   A. Identify and define problems in mathematic and scientific terms.
   B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
   C. Select materials and determine component sizes and shapes to meet design criteria.
   G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
   I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
   J. Communicate effectively, and work as part of a team.

10. **Prepare reports explaining results of technical analysis, design, and testing**
    
    *Applies To Program Outcomes*

    A. Identify and define problems in mathematic and scientific terms.
    B. Produce graphic representations of designs using CAD software, Solid Modeling software, and pencil and paper methods.
    G. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications.
    I. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations to continuously upgrade knowledge and skills.
    J. Communicate effectively, and work as part of a team.

Date Updated: April 7, 2019
By: MJ Dubois