MONROE COUNTY COMMUNITY COLLEGE

Course Outcome Summary

METC 220
Statics and Strength of Material

Course Information

Division	**Applied Science and Engineering Technology**
Contact Hours	**90.0**
Total Credits	**4.0**

Prerequisites

MATH 124 or MATH 151 or MATH 157 or MATH 160 or MATH 164 or MATH 171 or MATH 172 or qualifying scores on accepted placement tests

Course Description

This course presents fundamental techniques and processes used to determine the forces on members, the stresses developed in such members, and the relation of these stresses to potential failure of the member. The focus is on static planar systems of forces and the resulting stresses. Mathematical tools required for the modeling of components under load, computer based implementation, two dimensional force systems, trusses, and basic beam deflection are presented.

This course is a required core course 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:

Mechanical Engineering Technology

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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
F. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations.
G. Communicate effectively, and work as part of a team.

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Course Outcomes

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

1. Represent forces as vectors and break them into orthogonal components.
   - 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.
   - E. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications

2. Analyze systems of vectors using graphical and trigonometrical techniques to calculate unknown forces and moments.
   - 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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications

3. Use method of joints or sections to find forces in truss members.
   - 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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
   - E. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications

4. Calculate physical properties of areas and volumes.
   - 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. Apply instruments to make measurements and analyze data from such measurements
   - E. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
   - F. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations.

5. Calculate material stresses resulting from a single force.
   - 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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
F. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations.
G. Communicate effectively, and work as part of a team.

6. Calculate a component size to meet a design load criteria.
   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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
   F. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations.
   G. Communicate effectively, and work as part of a team.

7. Identify deflections caused by thermal temperature changes and calculate applicable thermal stress.
   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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications

8. Select standard structural shapes to meet load criteria (shaft OD, beam section.)
   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. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications
   F. Recognize the need to engage in lifelong learning, and to perform research or conduct investigations.
   G. Communicate effectively, and work as part of a team.

9. Develop beam shear and moment diagrams given load and support conditions.

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E. Recognize assumptions and limits of analysis to the application of technology, including social and ethical implications

10. Evaluate the factor of safety for a given load condition.
    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.

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By: MJ Dubois