Western Technical College

10606164 Design Problems

Course Outcome Summary

Course Information

Description	An opportunity to integrate the knowledge & skills acquired during the program by completion of a design of a mechanical device. Project completion requires definition of the product reqmt's, analysis of the load conditions, selection of mtls, conduct stress analysis and motion simulations, prepare layouts, detailed drawings & a final written and oral report to summarize their work. Rapid prototypes of final project will be made.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree Courses
Total Credits	4
Total Hours	126

Textbooks

Machines and Mechanisms. 4th Edition. Copyright 2012. Myszka, David H. Publisher: Pearson. **ISBN-13**: 978-0-13-215780-3. Required.

Machine Elements in Mechanical Design - With CD. 6th Edition. Copyright 2018. Mott, Robert L. Publisher: Pearson. **ISBN-13**: 978-0-13-444118-4. Required.

Program Outcomes

1. Prepare detail and assembly drawings for documentation of mechanical components and products.
2. Create CAD geometry, parts, and assemblies.
3. Design mechanical components and products.
4. Analyze mechanic engineering problems.
5. Select purchase parts.
6. Produce and revise supporting engineering documentation.
7. Evaluate manufacturing processes and materials for product development.
8. Demonstrate awareness of product liability and industry standards.

9. Meet design and production deadlines.
10. Interpret and communicate technical concepts, designs, and documentation.

Course Competencies

1. Investigate Design Problem.

Assessment Strategies

1.1. Portfolio
1.2. Presentation

Criteria

You will know you are successful when:

1.1. you provide statement of product need.
1.2. you conduct research to identify performance specifications.
1.3. you provide sketches of design ideas.
1.4. you specify design components.
1.5. you demonstrate ability to work effectively with team members.

Learning Objectives

1.a. Identify need for product.
1.b. Identify feasibility of design
1.c. Draw sketches
1.d. Write function statement
1.e. Write design criteria

2. Compile schedule for project completion.

Assessment Strategies

2.1. Written Product

Criteria

You will know you are successful when:

2.1. You will submit project timeline to instructors
2.2. You will complete benchmarks on time

Learning Objectives

2.a. Write a schedule of tasks to be completed
2.b. Select time line for each task
2.c. Meet with class mates
2.d. Meet estimated completion dates for design release

3. Analyze existing designs.

Assessment Strategies

3.1. Written Product
3.2. Presentation

Criteria

You will know you are successful when:

3.1. you research similar products.
3.2. you document your research findings.
3.3. you consider purchased components

Learning Objectives

3.a. Locate existing designs
3.b. Compare components that you may use in design
3.c. Write list of standard components
3.d. Write list of vendors

4. Create and choose from several design ideas.

Assessment Strategies

4.1. Written Product
4.2. Interview

Criteria

You will know you are successful when:

4.1. you determine product requirements.
4.2. you determine selection criteria.
4.3. you present your selection

Learning Objectives

4.a. Write design criteria
4.b. Write a weight system for selecting your design based on the design criteria
4.c. Compare your design to design criteria

5. Produce layout of design.

Assessment Strategies

5.1. Demonstration
5.2. Written Product

Criteria

You will know you are successful when:

5.1. you sketch design
5.2. you specify which parts are purchased
5.3. you specify which parts are manufactured
5.4. you manufacture prototype parts.
5.5. you participate in design review

Learning Objectives

5.a. Draw CAD models and assemblies
5.b. Draw detailed drawings
5.c. Use rapid prototype machine to make prototype parts
5.d. Review prototype for form, fit and function

6. Apply stress analysis on design.

Assessment Strategies

6.1. Report
6.2. Portfolio

Criteria

You will know you are successful when:

6.1. you complete preliminary stress calculations
6.2. You will choose materials for design
6.3. You will add constraints to assembly
6.4. You will determine the type of and location of load(s) to be applied
6.5. You will run stress analysis using software

Learning Objectives

6.a. Draw preliminary design.
6.b. Draw tutorial assembly and practice how to use stress analysis
6.c. Complete stress analysis on assembly
6.d. Complete stress analysis reports
6.e. Read results of reports
6.f. Draw design changes if required

7. Produce set of working drawings of the final design concept.

Assessment Strategies

7.1. Portfolio
7.2. Oral Presentation

Criteria

You will know you are successful when:

7.1. You will produce a complete set of working drawings
7.2. You will create a title block for working drawings containing pertinent information
7.3. You will identify critical process control features
7.4. You will produce product support documentation

Learning Objectives

7.a. Draw models of individual parts
7.b. Draw 3D model of the completed assembly
7.c. Draw title block for set of working drawings
7.d. Draw revisions to improve design.
7.e. Draw detail drawings of each part
7.f. Draw assembly drawing
7.g. Identify key product characteristics
7.h. Add safety and health considerations into design
7.i. Write product support documentation

8. Participate in design review.

Assessment Strategies

8.1. Oral Presentation
8.2. Portfolio

Criteria

You will know you are successful when:

8.1. You will present design concept to piers
8.2. You will participate in design reviews with instructors
8.3. You will present design concept to panel of judges

Learning Objectives

8.a. Draw documentation for design review
8.b. Give details of design to piers and panel of judges
8.c. Defend design decisions
8.d. Give function of design using prototype or computer simulation
8.e. Discuss design, things gone right vs things gone wrong

9. Investigate and select vendor components.

Assessment Strategies

9.1. Oral Presentation
9.2. Portfolio

Criteria

You will know you are successful when:

9.1. You will research vendor components
9.2. You will document all vendor contacts

Learning Objectives

9.a. Research existing product designs.
9.b. Determine which vendors to contact for information.
9.c. Select standard component parts that meet the criteria of the design.