Western Technical College

10606156 Mechanisms and Dynamics

Course Outcome Summary

Course Information

Description	Mechanisms: A study of the motion of mechanical systems using graphical and analytical methods as well as 3D computer modeling and simulations tools. Topics include the displacement of linkages, velocity and acceleration calculations and force analysis.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	90

Pre/Corequisites

Prerequisite 10606133 Parametric Design 2

Textbooks

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

Learner Supplies

Scientific calculator (recommend T1-36x Solar). **Vendor:** Campus Shop. Required.

Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Cultivate Passion: Increase Self-Awareness

3. Live Responsibly: Develop Resilience
4. Live Responsibly: Foster Accountability
5. Refine Professionalism: Act Ethically
6. Refine Professionalism: Improve Critical Thinking
7. Refine Professionalism: Participate Collaboratively
8. Refine Professionalism: Practice Effective Communication

Program Outcomes

1. Create CAD geometry, parts, and assemblies
2. Design mechanical components and products
3. Analyze mechanic engineering problems
4. Select purchase parts
5. Produce and revise supporting engineering documentation
6. Demonstrate awareness of product liability and industry standards
7. Meet design and production deadlines
8. Interpret and communicate technical concepts, designs, and documentation

Course Competencies

1. Identify motion of complex machines using Kinematic Diagrams.

Assessment Strategies

1.1. Drawing/Illustration

Criteria

You will know you are successful when

1.1. you count the number of links and joints to determine the degrees of freedom.
1.2. you use Gruebler's equation correctly.
1.3. you assign numbers to links.
1.4. you identify the point of interest.
1.5. you assign letters to joints.

Learning Objectives

1.a. Identify the need for kinematic analysis of mechanisms
1.b. Define the basic components that comprise a mechanism
1.c. Draw a kinematic diagram from a view of a complex machine
1.d. Compute the number of degrees of freedom of a mechanism
1.e. Identify a slider-crank mechanism

2. Differentiate between different types of four-bar mechanisms.

Assessment Strategies

2.1. Drawing/Illustration
2.2. Written Product

Criteria

You will know you are successful when

2.1. you draw a sketch of a crank rocker mechanism.
2.2. you draw a sketch of a double crank mechanism.
2.3. you draw a sketch of a double rocker mechanism.
2.4. you draw a sketch of a change point mechanism.

2.5. you draw a sketch of a triple rocker mechanism.
2.6. you select the type of four bar mechanism by looking at your sketches.

Learning Objectives

2.a. Select input link
2.b. Select longest link
2.c. Select shortest link
2.d. Select intermediate link
2.e. Identify a crank rocker mechanism
2.f. Identify double crank mechanism
2.g. Identify double rocker mechanism
2.h. Identify change point mechanism
2.i. Identify triple rocker mechanism

3. Draw vectors to graphically solve performance characteristics of a mechanism.

Assessment Strategies

3.1. Drawing/Illustration

Criteria

You will know you are successful when

3.1. you draw vectors.
3.2. you add vectors graphically.
3.3. you subtract vectors graphically.

Learning Objectives

3.a. Differentiate between a scalar quantity and a vector
3.b. Draw the resultant of two vectors.
3.c. Solve vector quantities into components in the horizontal and vertical directions
3.d. Draw the resultant of subtracting two vectors
3.e. Manipulate vector equations.
3.f. Utilize a vector equation to determine the magnitude of two vectors

4. Draw the position of all links in a mechanism.

Assessment Strategies

4.1. Drawing/Illustration

Criteria

You will know you are successful when

4.1. you model each link and joint to correct scale.
4.2. you assemble each link and joint.
4.3. you add angular constraint and drive constraint.
4.4. you create a positional representation.
4.5. you create a drawing showing multiple positions and answer to unknown.

Learning Objectives

4.a. Define position and displacement of a point
4.b. Draw the position of all links in a mechanism as the driver links are displaced.
4.c. Draw the limiting position of a mechanism.
4.d. Draw the position of all links for an entire cycle of mechanism motion
4.e. Draw skeletal assemblies to determine position of links
4.f. Draw positional representations to show position of the mechanism

5. Solve graphically the velocity or "how fast" certain points on the links of a mechanism are traveling.

Assessment Strategies

5.1. Drawing/Illustration
5.2. Written Product

Criteria

You will know you are successful when

5.1. you define linear velocity.
5.2. you define rotational velocity.
5.3. you define relative velocity.
5.4. you convert between linear to angular velocity.
5.5. you draw velocity vector diagrams using the relative velocity method to solve for the velocity of a point on a link, knowing the velocity of another.
5.6. you produce a drawing of velocity vector diagrams showing solution to problem.

Learning Objectives

5.a. Define linear, rotational and relative velocities
5.b. Convert between linear and angular velocities
5.c. Draw vector diagrams using relative velocity method to solve for the velocity of a point on a link, knowing the velocity of another point on that link.
5.d. Draw velocity diagrams using the relative velocity method to determine the position of a floating point on the mechanism

6. Solve for the acceleration, "speeding up" or "slowing down", of certain points on a mechanism.

Assessment Strategies

6.1. by completing displacement kinematic diagrams
6.2. for a slider crank, four bar linkage, crank shaper, and combination mechansisms

Criteria

You will know you are successful when

6.1. you show calculations of linear, rotational, normal, and tangential accelerations.

6.2. you draw a properly labeled kinematic diagram.
6.3. you produce a drawing with acceleration vector diagrams with solution to problem.

Learning Objectives

6.a. Define linear, rotational, normal, tangential, and relative accelerations.
6.b. Draw acceleration vector diagrams using relative acceleration method to solve for the acceleration of point on a link, knowing the acceleration of another point on that link.
6.c. Draw acceleration diagrams using the relative acceleration method to determine the acceleration of a point of interest on a floating link

7. Use software to solve mechanism problems.

Assessment Strategies

7.1. Drawing/Illustration

Criteria

You will know you are successful when

7.1. you model links.
7.2. you model a slider.
7.3. you model a frame.
7.4. you add work points.
7.5. you add work axis.
7.6. you model and ipart link.
7.7. you produce skeletal assemblies.
7.8. you produce drawings.

Learning Objectives

7.a. Draw kinematic diagrams
7.b. Draw intelligent links
7.c. Draw links, frames and sliders.
7.d. Draw constraints to other positions
7.e. Draw positional representations
7.f. Draw positional representations.
7.g. Draw velocity and acceleration polygons and solve for unknown.