



Basic Mechanics

Course 301: Basic Mechanics

Covers force, motion, work, energy, and fluid mechanics as applied in industrial maintenance. Explains principles of operation for simple machines. Explains the basic elements of industrial machines, as well as common measurement tools used to monitor and adjust equipment. Covers hand tools, power tools and fasteners, ending with a discussion of ways to reduce friction and wear.

TPC Training is accredited by IACET to offer **1.0 CEU** for this program.



Lesson 1: Forces and Motion

Topics

Definition of Force; Sources of Forces; Measuring Forces; Forces Applied to Stationary Objects; Normal Forces; Describing Motion; Acceleration; Types of Motion; Newton's Law of Motion

Objectives

- Name five ways forces originate.
- Explain how forces are measured.
- Define velocity, acceleration, and elastic distortion.
- Define rotary motion and reciprocating motion.
- State and explain Newton's Laws of Motion

Lesson 2: Work, Energy, and Power

Topics

Defining Work; Measuring Work; Torque; Energy; The Law of Conservation of Energy; Forms of Energy; Kinetic and Potential Energy; Power; Horsepower; Calories and Btu

Objectives

- Define work, and explain how to calculate it.
- Define the terms torque and prime mover.
- Define energy, and tell how it is measured.
- Differentiate between kinetic and potential energy, and give an example of each one.
- Define power and horsepower, and tell how each is measured.

Lesson 3: Fluid Mechanics

Topics

Definition of a Fluid; Fluids Distribute Forces; Definition of Pressure; Measuring Pressure; Sources of Fluid Pressure; Gauge Versus Absolute Pressure; Liquid Seeks Its Own Level; Velocity Head Versus Static Pressure Head; The Bernoulli Effect; Venturi Applications; Friction Head; The Siphon

Objectives

- Define a fluid.
- Define pressure, and identify common units of pressure measurement.
- State Pascal's Law, and give an example of its application.
- Explain the difference between gauge pressure and absolute pressure.
- Explain the Bernoulli Effect, and give three examples of how it is utilized in industry.
- Explain how a siphon works.

Lesson 4: Simple Machines

Topics

Simple Machines in Your Life; The Lever; Classes of Lever; The Wheel and Axle; Gear Trains; The Inclined Plane; The Wedge; Cam-and-Follower Devices; The Screw; Jackscrews; Pulleys and Pulley Systems; Mechanical Efficiency

Objectives

- Identify and name six types of simple machines.
- Calculate the ideal mechanical advantage of each of six simple machines.
- Describe the action and purpose of cam-and-follower mechanisms.
- Determine the ideal mechanical advantage of several simple gear trains.
- Explain mechanical efficiency and show how to calculate it.

Lesson 5: Machine Elements

Topics

The Machine; Machine Motions; Mechanisms; Lever Linkages; Four-Bar Linkages; Cam-and-Follower Mechanisms; Devices For Producing Linear Motion; Ratchet-and-Pawl Mechanisms; Fluid-Powered Mechanisms; Applying Your Knowledge of Mechanisms

Objectives

- List the four classifications of mechanisms.
- Name the six basic motion conversions, and give an example of each.
- Explain the functions of bell cranks, Pitman arms, and toggle bars.
- Name three types of four-bar linkages, and explain how they function.
- Describe the ratchet-and-pawl mechanism.

Lesson 6: Measurement Tools and Instruments

Topics

Definition of Measurement; Measurement Terminology; Function of Measurement Tools and Instruments; Classification of Measurement Instruments; Typical Portable Instrument Design; Measurements in Maintenance; Routine Maintenance and Repair; Process Monitoring and Quality Assurance; Predictive Maintenance

Objectives

- Define measurement, parameter, accuracy, precision, sensitivity, and range.
- Explain why measurements are important to maintenance operations.
- Describe the general features of a portable measurement instrument.
- List the basic measurement instruments most often used in mechanical maintenance, and describe the operating principles of each.

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Lesson 7: The Safe Use of Hand Tools

Topics

Screwdrivers; Wrenches; Hammers and Mallets; Chisels and Punches; Saws; Files and Rasps; Snips, Nippers, and Cutters; Pliers; Organizing Your Tools

Objectives

- Name the major hand tools used in maintenance.
- State criteria for selecting the proper tools for specific jobs.
- Identify safe/unsafe practices in the use of hand tools and explain why they are safe/unsafe.
- Explain how to prolong the useful life of selected hand tools.
- Explain the advantages of having a well-organized tool box.

Lesson 8: The Safe Use of Portable Power Tools

Topics

Hazards of Power Tool Use; Rules to Observe Before Using Power Tools; Protection Against Electric Shock; Electric Drills; Electric Sanders; Portable Grinders; Portable Circular Saws; Saber Saws; Metal Shears; Electric Impact Wrenches; Rotary Hammers; Pneumatic Power Tool Safety; Pneumatic Impact Wrenches; Pneumatic Hammers; General Guidelines for Power Tools

Objectives

- State three precautions to take before using any power tool.
- Describe the safe use of each of the following power tools: electric drills, sanders, grinders, and saws; electric impact tools; pneumatic impact wrenches and hammers.
- State three general guidelines for the safe operation of any portable power tool.
- Describe the potential electrical hazards associated with electric power tools.

Lesson 9: Fasteners

Topics

Kinds of Threaded Fasteners; Screw Threads; Screw Thread Specifications; Threaded Fastener Specifications; Types of Nuts; Washers; Safety Wiring; Keys and Pins; Rivets

Objectives

- Identify seven major types of threaded fasteners.
- Read and interpret common screw thread and threaded fastener specifications.
- Describe the three actions in a manual riveting operation, and explain why each action must be done properly.
- Demonstrate the proper technique for safety wiring a group of threaded fasteners.
- Identify three kinds of washers.

Lesson 10: Friction and Wear

Topics

The Nature of Friction and Its Importance; Causes of Friction; Static and Kinetic Friction; Measuring Friction; Coefficients of Friction; Wear—The Major Consequence of Friction; Static Electricity

Objectives

- Define friction, identify the forces that cause it, and describe its effects.
- Differentiate between static friction and kinetic friction.
- Define coefficient of friction.
- Calculate the expected friction force between two surfaces, given the normal force and the coefficient of friction.
- Describe four types of wear.