

Agricultural Power and Technology Detailed Course Outline

Unit 1 Introduction to Agricultural Power and Technology

Lesson 1.1 Mechanical World

1. Organization and record keeping are important to success in agricultural mechanics.
2. The agricultural industry uses power and technology to produce food, fiber, and fuel that are essential for everyday life.
3. Power and technology increase the efficiency of agriculture, food, and natural resource production.
4. People in agricultural power and technology use the engineering design process to increase agricultural productivity and solve problems.

Lesson 1.2 Mechanical Basics

1. Many forms of potential and kinetic energy are used in agriculture to complete tasks or work.
2. Machines in agriculture are designed to harness energy to perform work.
3. Work and power calculations are used to determine efficiencies in agricultural systems.
4. Communication and writing skills complement the operation of mechanical equipment used in agricultural power and technology careers.

Unit 2 Safety and Measurement

Lesson 2.1 Safety Setting

1. Site-specific safety policies and procedures are in place for agricultural mechanic shops and labs.
2. Safety must be planned and systematic for effective identification and management in a laboratory or shop.
3. Personal protective equipment is the last line of defense against injury.
4. The purpose of first aid is to treat injuries or accidents in order to sustain life until professional medical attention can be received.

Lesson 2.2 Tool Operation

1. Tools are designed for specific applications.
2. The function of tools and machines will affect how they are operated.
3. Operating procedures for machines and tools keep the operator safe and the machine or tool in good working order.

Lesson 2.3 Tools of Measurement

1. Precise and accurate measurements are important for fabrication of materials.
2. Measurements are expressed in different forms and units.
3. Estimation is used for completing a project or activity.
4. The Pythagorean Theorem can be used to determine if a corner is square.
5. Areas are calculated using mathematical formulas.

Unit 3 Material Properties

Lesson 3.1 Heavy Metal

1. Metals used in agriculture can be identified using physical properties.
2. Chemical properties of metal will determine how it reacts with other metals in the environment.
3. Mechanical properties of metal will determine its service life and applications.
4. Metals will physically change based upon environmental factors.

Lesson 3.2 Woods and Plastics

1. Wood is selected based upon their physical and mechanical properties.
2. Environmental factors determine the type of wood used for a project.
3. Plastics used in agriculture are designed for a specific purpose.
4. The chemical makeup of plastics will determine their mechanical properties.

Lesson 3.3 Fluid Material

1. Fluids cool and lubricate agricultural machines and equipment.
2. Solutions need to be mixed with the correct proportions to function correctly.
3. Temperature can change the physical properties of fluids.
4. Machines use gases, such as air, to produce power.

Lesson 3.4 Material Management

1. Water and land are material that are mechanically managed and conserved.
2. Slope has an impact on the mechanics and design of materials.
3. The strength of concrete is dependent upon proper mixing and curing of materials.
4. Volume calculations and proportions are used for properly mixing concrete.

Unit 4 Fabrication

Lesson 4.1 Making a Plan

1. Accurate plans and scaled drawings are essential for project success.
2. A bill of materials accounts for all items needed to complete a project and assists in determining the budget.

Lesson 4.2 Making the Cut

1. A variety of tools are used to process bulk materials into useable parts.
2. Proper measurements and efficient use of materials are essential when manufacturing useable parts.
3. Quality products are produced by following procedural steps.

Lesson 4.3 Fasten and Fuse

1. Torque is a factor considered when fastening material together.
2. Fasteners are selected based upon strength and durability when joining machine and structural parts.
3. A variety of welding processes are used to fuse metal.
4. Metals are welded together for a strong fit using a combination of materials.
5. Fabrication involves forming and fastening multiple types of materials together to make a useable product.

Unit 5 Energy

Lesson 5.1 Chemical Energy

1. Chemical reactions release and absorb thermal energy.
2. Electrical energy can be harnessed and transferred through chemical reactions.
3. Chemical energy can be converted into mechanical movement.
4. Agriculture is a producer of renewable forms of fuel.
5. Fossil and bio-fuels release energy and chemical bi-products when they combust.
6. Many factors influence the choice of an energy source.

Lesson 5.2 Electrical Energy

1. Electricity must flow in a complete loop from the source and to the source with no breaks for a circuit to operate correctly.
2. The relationship between amps, volts, and ohms can be defined using Ohm's Law.
3. Two types of electrical circuits used in agriculture are series and parallel.
4. The use of electricity requires a knowledge and understanding of relationships between voltage, current, and resistance.
5. Circuits are designed to provide electrical power for a specific job or application.

Lesson 5.3 Mechanical Energy

1. Electromagnetic fields are a source of mechanical energy used to produce rotational movement.
2. Mechanical energy can be converted into electrical power.
3. The force produced in a fluid power system is measured using Pascal's Law.
4. Controlled movements of fluids under pressure produce mechanical energy.

Unit 6 Machines and Structures

Lesson 6.1 Machine Design

1. Agricultural machines consist of one or more simple machines that produce linear and/or rotational movement.
2. Simple machines provide a mechanical advantage.
3. The amount of work to operate a machine will be greater than the work done by the machine.
4. The power and speed of a machine is dependent upon proper design.

Lesson 6.2 Machine Management

1. Technical reading involves interpreting and applying information from manuals, schematics, diagnostic tools, and measuring tools.
2. Preventive maintenance requires a systematic periodic schedule.
3. Troubleshooting includes identifying the problem, researching solutions, and applying the possible solutions.
4. Machines are calibrated to perform a specified task.

Lesson 6.3 Structural Design

1. Requirements of a project need to abide by code, laws, or rules governing such project.
2. Structures provide a controlled environment to protect agricultural commodities and equipment.
3. Agricultural structures contain joints and assemblies that withstand multiple types of forces.
4. Agricultural structures need to be well planned, to meet a specific need or purpose.

Unit 7 Mechanical Applications

Lesson 7.1 Mechanical Applications

1. Communication and writing skills complement the operation of mechanical equipment used in agricultural power and technology careers.
2. Careers in agricultural mechanics require the application of technical skill combined with material knowledge.
3. Agricultural mechanics design and calibrate equipment to produce food, fiber, and fuel.