Oregon Agriculture, Food and Natural Resources (AFNR)

AFNR - Power, Structural and Technical Systems

Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems. PST.01.

1 **Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.** PST.01.01.

1a Research and identify renewable and nonrenewable energy sources used in AFNR. PST.01.01.01.A.

1b Assess the environmental impacts of renewable and nonrenewable energy sources used in AFNR. PST.01.01.01.B.

1c Design and implement methods to evaluate the efficiency of renewable and nonrenewable energy sources used in AFNR. PST.01.01.01.C.

2a Compare and contrast the pathways of delivery for renewable and nonrenewable energy sources in an AFNR enterprise or business. PST.01.01.02.A.

2b Calculate the costs of using renewable and nonrenewable energy sources in an AFNR enterprise or business. PST.01.01.02.B.

2c Devise a strategy to incorporate the use of selected energy sources in an ANFR enterprise or business. PST.01.01.02.C.

3a Summarize methods and compare and contrast units used to benchmark energy use of AFNR structures (e.g., EUIs, BTUs, etc.). PST.01.01.03.A.

3b Convert energy utilized in an AFNR structure to an energy utilization index (e.g., convert CCF, KWH, etc. to Btu consumption per square foot, etc.). PST.01.01.03.B.

3c Apply energy benchmarking data to examine and select methods to conserve energy in AFNR structures. PST.01.01.03.C.

2 **Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.** PST.01.02.

- 1a Compare and contrast applications of simple machines in AFNR related mechanical systems. PST.01.02.01.A.
- 1b Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems. PST.01.02.01.B.
- 1c Apply the scientific method to devise strategies to improve the efficiency of operation of AFNR related mechanical systems. PST.01.02.01.C.
- 2a Identify the tools, machines and equipment needed to construct and/or fabricate a project in AFNR. PST.01.02.02.A.
- 2b Calculate the maintenance and purchase cost of tools, machines and equipment used in AFNR. PST.01.02.02.B.
- 2c Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery and equipment. PST.01.02.02.C.
- 3a Examine owner's manuals to classify the types of safety hazards associated with different mechanical systems used in AFNR (e.g., caution, warning, danger, etc.). PST.01.02.03.A.
- 3b Select, maintain and demonstrate the proper use of tools, machines and equipment used in different AFNR related mechanical systems. PST.01.02.03.B.
- 3c Conduct a safety inspection of tools, machines and equipment used in different AFNR related mechanical systems. PST.01.02.03.C.

3 **Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).** PST.01.03.

- 1a Compare and contrast the principles and procedures of different welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.). PST.01.03.01.A.
- 1b Analyze the situation and determine the best welding and cutting process to be used in metal fabrication. PST.01.03.01.B.
- 1c Evaluate the quality of metal fabrication procedures (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.). PST.01.03.01.C.
- 2a Compare and contrast the properties of different metals used in AFNR power, structural and technical systems (e.g., malleability, conductivity, optical properties, chemical composition, etc.). PST.01.03.02.A.
- 2b Assess and select the proper electrode for use in various shielded metal arc welding situations. PST.01.03.02.B.
- 2c Construct and/or repair metal structures and equipment using metal fabrication procedures. PST.01.03.02.C.

Operate and maintain AFNR mechanical equipment and power systems. PST.02.

1 **Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.** PST.02.01.

- 1a Maintain the cleanliness and appearance of equipment, machinery and power units used in AFNR power, structural and technical systems to assure proper functionality. PST.02.01.01.A.
- 1b Develop a preventative maintenance schedule for equipment, machinery and power units used in AFNR power, structural and technical systems. PST.02.01.01.B.
- 1c Devise a strategy to communicate to different audiences, preventative maintenance and service schedule for equipment, machinery and power units used in AFNR power, structural and technical systems. PST.02.01.01.C.
- 2a Examine operator's manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery and power units used in AFNR power, structural and technical systems. PST.02.01.02.A.
- 2b Service filtration systems and maintain fluid levels on equipment, machinery and power units in accordance with operator's manuals. PST.02.01.02.B.
- 2c Assess and adjust equipment (e.g., belts and drives, chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning. PST.02.01.02.C.

2 **Operate machinery and equipment while observing all safety precautions in AFNR settings.** PST.02.02.

- 1a Research and summarize the use of equipment, machinery and power units for AFNR power, structural and technical systems. PST.02.02.01.A.
- 1b Analyze and calculate the cost of using equipment, machinery, and power units for AFNR power, structural and technical systems. PST.02.02.01.B.
- 1c Perform pre-operation inspections, start-up & shut-down procedures on equipment, machinery and power units as specified in owner's manuals. PST.02.02.01.C.
- 2a Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems (e.g., caution, warning, danger, etc.). PST.02.02.02.A.
- 2b Apply safety principles and applicable regulations to operate equipment, machinery and power units used in AFNR power, structural and technical systems. PST.02.02.02.B.
- 2c Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems. PST.02.02.02.C.

Service and repair AFNR mechanical equipment and power systems. PST.03.

1 **Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.** PST.03.01.

- 1a Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems. PST.03.01.01.A.
- 1b Analyze and explain how the components of internal combustion engines interrelate during operation. PST.03.01.01.B.
- 1c Evaluate service and repair needs for internal combustion engines using a variety of performance tests (e.g., manuals, computer-based diagnostics, etc.). PST.03.01.01.C.
- 2a Distinguish the characteristics of spark-and-compression internal combustion engines used in AFNR power, structural and technical systems. PST.03.01.02.A.
- 2b Utilize technical manuals and diagnostic tools to determine service and repair needs of spark-and-compression internal combustion engines used in AFNR power, structural and technical systems. PST.03.01.02.B.
- 2c Inspect, analyze and repair spark-and-compression internal combustion engines used in AFNR power, structural and technical systems. PST.03.01.02.C.

2 **Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.** PST.03.02.

- 1a Compare and contrast basic units of electricity (e.g., volts, amps, watts, and ohms) and the principles that describe their relationship (e.g., Ohm's Law, Power Law, etc.). PST.03.02.01.A.
- 1b Assess the tools used to measure the basic units of electrical circuits in AFNR power, structural and technical systems, and perform the measurements. PST.03.02.01.B.
- 1c Analyze and design electrical circuits for AFNR power, structural and technical systems using knowledge of the basic units of electricity. PST.03.02.01.C.
- 2a Compare and contrast the characteristics of electronic components used in AFNR power, structural and technical systems (e.g., battery, resistor, diode, transistor, capacitor, etc.). PST.03.02.02.A.
- 2b Analyze and interpret electrical system symbols and diagrams. PST.03.02.02.B.
- 2c Conduct testing procedures to evaluate and repair malfunctioning electrical components and systems used in AFNR power, structural and technical systems. PST.03.02.02.C.
- 3a Classify the uses of electrical sensors and controls in AFNR power, structural and technical systems. PST.03.02.03.A.
- 3b Distinguish and select materials and tools used in electrical control circuit installation. PST.03.02.03.B.
- 3c Plan and install electrical control circuits and/or circuit boards to assure proper operation within AFNR power, structural and technical systems. PST.03.02.03.C.

3 **Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).** PST.03.03.

- 1a Research and summarize the applications of common types of hydraulic and pneumatic systems used in AFNR power, structural and technical systems. PST.03.03.01.A.
- 1b Analyze and interpret hydraulic and pneumatic system symbols and diagrams used in AFNR power, structural and technical systems. PST.03.03.01.B.
- 1c Inspect, analyze and repair hydraulic and pneumatic system components used in AFNR power, structural and technical systems. PST.03.03.01.C.
- 2a Compare and contrast operation principles and features of mechanical transmission systems used in AFNR power, structural and technical systems (e.g., belts, chains, gears, bearings, seals, universals, drive shafts, etc.). PST.03.03.02.A.
- 2b Utilize speed, torque and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural and technical systems. PST.03.03.02.B.
- 2c Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems. PST.03.03.02.C.
- 3a Identify and examine the components of suspension and steering systems used in AFNR power, structural and technical systems. PST.03.03.03.A.
- 3b Assess and analyze vehicle and machinery performance related to suspension and steering systems used in AFNR power, structural and technical systems. PST.03.03.03.B.
- 3c Inspect, analyze and repair vehicle suspension and steering systems used in AFNR power, structural and technical systems. PST.03.03.03.C.

Plan, build and maintain AFNR structures. PST.04.

1 **Create sketches and plans for AFNR structures.** PST.04.01.

- 1a Interpret and explain the meaning of symbols used in sketches of agricultural structures. PST.04.01.01.A.
- 1b Apply scale measurement and dimension to develop sketches of agricultural structures. PST.04.01.01.B.
- 1c Create sketches of an agricultural structure by applying principles of design. PST.04.01.01.C.
- 2a Read and interpret the parts and/or views of plans for agricultural structures. PST.04.01.02.A.
- 2b Construct plans for agricultural structures using current technology (e.g., drafting software, computer-aided design, etc.). PST.04.01.02.B.
- 2c Evaluate, plan and design functional and efficient facilities for use in AFNR power, structural and technical systems. PST.04.01.02.C.

2 **Determine structural requirements, specifications and estimate costs for AFNR structures.** PST.04.02.

1a Summarize and categorize the information needed to complete a bill of materials and cost estimate for an AFNR structure. PST.04.02.01.A.

1b Analyze a project plan to prepare a bill of materials and an estimate of material costs. PST.04.02.01.B.

1c Create a project cost estimate, including materials, labor and management for an AFNR structure. PST.04.02.01.C.

2a Research and summarize sources of industry construction and materials standards and their importance (e.g., American National Standards Institute, ANSI, Underwriters' Laboratories, UL, etc.). PST.04.02.02.A.

2b Assess and analyze local building code requirements for agriculture structures. PST.04.02.02.B.

2c Design and conduct a building functionality and safety assessment on an agricultural structure using knowledge of industry standards and local code requirements. PST.04.02.02.C.

3 Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/ masonry, etc.). PST.04.03.

1a Examine the criteria in selecting materials for constructing, maintaining, and/or repairing AFNR structures. PST.04.03.01.A.

1b Analyze and assess samples of materials or products for quality and efficiency of workmanship. PST.04.03.01.B.

1c Select materials for a project based upon an analysis of the project and the quality of the materials. PST.04.03.01.C.

2a Summarize the characteristics needed for an ideal building site. PST.04.03.02.A.

2b Complete a building site analysis checklist to select an ideal building site. PST.04.03.02.B.

2c Assess site characteristics, identify adjustments, and demonstrate procedures for preparing a building site. PST.04.03.02.C.

3a Compare and contrast the characteristics of wood and/or metal products used in AFNR structures. PST.04.03.03.A.

3b Calculate costs associated with the repair and replacement of wood and/or metal components an AFNR structure. PST.04.04.03.B.

3c Construct AFNR structures using wood and/or metal materials. PST.04.03.03.C.

4a Compare and contrast the characteristics of materials used in plumbing and water systems (e.g., copper, PVC, PEX, etc.). PST.04.03.04.A.

4b Calculate the cost of a water system in an AFNR structure (e.g., copper, PVC, etc.). PST.04.03.04.B.

4c Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures. PST.04.03.04.C.

5a Compare and contrast the characteristics of fencing materials, including government regulations and applicable installation codes. PST.04.03.05.A.

5b Measure and calculate the cost of fencing materials. PST.04.03.05.B.

5c Construct, maintain, and/or repair fencing, including wood, static wire, electrical wire and other fencing materials. PST.04.03.05.C.

6a Summarize the characteristics of the components found in concrete. PST.04.03.06.A.

6b Calculate volume for concrete projects. PST.04.03.06.B.

6c Construct, maintain and/or repair AFNR structures with concrete, brick, stone or masonry. PST.04.03.06.C.

7a Differentiate between types of insulation materials used in AFNR structures. PST.04.03.07.A.

7b Calculate BTU loss in an AFNR structure. PST.04.03.07.B.

7c Insulate a structure and estimate reduced BTU loss. PST.04.03.07.C.

4 Apply electrical wiring principles in AFNR structures. PST.04.04.

- 1a Compare and contrast direct and alternating current. PST.04.04.01.A.
- 1b Assess and analyze the electrical requirements of an AFNR structure. PST.04.04.01.B.
- 1c Install and/or repair fixtures following appropriate codes and standards. PST.04.04.01.C.
- 2a Distinguish electrical circuits and the components of each. PST.04.04.02.A.
- 2b Calculate the cost of operating an electrical motor. PST.04.04.02.B.
- 2c Plan and wire electrical circuits (i.e., single pole switch, three-way switch, duplex outlet, etc.). PST.04.04.02.C.

Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems. PST.05.

1 Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems. PST.05.01.

- 1a Research and categorize computer technologies used to solve problems and increase efficiency in AFNR systems. PST.05.01.01.A.
- 1b Analyze data using computer programs and other current technologies used in AFNR systems. PST.05.01.01.B.
- 1c Solve problems and calculate changes in efficiency using computer technologies for AFNR systems. PST.05.01.01.C.
- 2a Examine and summarize the specific intent of technologies used to solve problems and increase the efficiency of AFNR systems (e.g., robotics, UAS, CNC, etc.). PST.05.03.02.A.
- 2b Calculate the change in efficiency after using technologies in AFNR systems. PST.05.03.02.B.
- 2c Solve problems and evaluate changes in efficiency and create recommendations for the use of technologies in AFNR systems. PST.05.03.02.C.

2 **Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.** PST.05.02.

- 1a Examine and categorize electrical control system components used in AFNR systems (e.g., transistors, relays, HVAC, logic controllers, etc.). PST.05.02.01.A.
- 1b Analyze schematic drawings for electrical control systems used in AFNR systems. PST.05.02.01.B.
- 1c Design schematic drawings for electrical control systems used in AFNR systems. PST.05.02.01.C.
- 2a Differentiate between the purpose of electrical sensors and controls used in AFNR power, structural and technical systems. PST.05.02.02.A.
- 2b Interpret maintenance schedules for electrical control systems used in AFNR power, structural and technical systems. PST.05.02.02.B.
- 2c Troubleshoot electrical control system performance problems found in AFNR power, structural and technical systems. PST.05.02.02.C.
- 3a Research and summarize the importance of AFNR power, structural and technical control systems using programmable logic controllers (PLC) and/or other computer-based systems. PST.05.02.03.A.
- 3b Assess the functions of AFNR power, structural and technical control systems using programmable logic controllers (PLC) in agricultural production and manufacturing. PST.05.02.03.B.
- 3c Develop and implement AFNR power, structural and technical control systems using programmable logic controllers (PLC) and/or other computer-based systems. PST.05.02.03.C.

3 **Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.** PST.05.03.

- 1a Research and summarize the impact of utilizing geospatial technologies (i.e., GPS, GIS, remote sensing, telematics, etc.) in AFNR systems. PST.05.03.01.A.
- 1b Analyze and interpret trends in data collected utilizing geospatial technologies. PST.05.03.01.B.
- 1c Collect data and create maps utilizing geospatial technologies. PST.05.03.01.C.
- 2a Examine the components of precision technologies used in AFNR systems. PST.05.03.02.A.
- 2b Analyze and calculate the economic impact of utilizing precision technologies (e.g., GPS/GIS) in AFNR systems. PST.05.03.02.B.
- 2c Install, maintain and service instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.) used in AFNR systems. PST.05.03.02.C.