

AGRICULTURAL MECHANICS TECHNOLOGY II

#01044

Description

Agricultural Mechanics courses are designed to reinforce and extend students' understanding of applied mechanical applications by associating scientific principles and concepts with relevant applications in fields associated with mechanics. Students will be exposed to mechanical, fluid, electrical, and thermal power that are associated with the field of agriculture. Course sequence is designed to provide students with applied activities which may include: metal fusion (welding), structures, surveying, electrical wiring principles, agricultural power and equipment, plumbing, electric motors and controls, CNC, robotics, CADD, Lasers, GIS and GPS systems. Leadership development and supervised agricultural experiences are integral to these courses.

Grade 9-12

½ or 1 credit

Max Credit = 1

Standard 1	AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) CLUSTER SKILLS	
Topic 1.1	<i>Analyze how issues, trends, technologies, and public policies impact systems in the Agriculture, Food, & Natural Resources Career Cluster.</i>	
	Student Competencies	
	1.1.1	RESEARCH, EXAMINE, AND DISCUSS ISSUES AND TRENDS THAT IMPACT AFNR SYSTEMS ON LOCAL, STATE, NATIONAL, AND GLOBAL LEVELS.
		1.1.1.1 Examine historical and current data to identify issues impacting AFNR systems.
		1.1.1.2 Research and summarize trends impacting AFNR systems.
	1.1.2	EXAMINE TECHNOLOGIES AND ANALYZE THEIR IMPACT ON AFNR SYSTEMS.
		1.1.2.1 Research technologies used in AFNR systems.
		1.1.2.2 Compare and contrast AFNR systems before and after the integration of technology.
		1.1.2.3 Apply appropriate use of technologies in AFNR workplace scenarios.
		1.1.2.4 Analyze how technology is used in AFNR systems to maximize productivity.
	1.1.3	IDENTIFY PUBLIC POLICIES AND EXAMINE THEIR IMPACT ON AFNR SYSTEMS.
		1.1.3.1 Summarize public policies affecting AFNR systems.
		1.1.3.2 Identify influential historical and current public policies that impact AFNR systems.
Topic 1.2	<i>Evaluate the nature and scope of the Agriculture, Food, & Natural Resources Career Cluster and the role of agriculture, food, and natural resources (AFNR) in society and the economy.</i>	
	Student Competencies	
	1.2.1	RESEARCH AND USE GEOGRAPHIC AND ECONOMIC DATA TO SOLVE PROBLEMS IN AFNR SYSTEMS.
		1.2.1.1 Research and describe different types of geographic data used in AFNR systems.
		1.2.1.2 Identify and examine economic data related to AFNR systems (e.g., commodity markets, food marketing, food, and nutritional assistance programs, etc.).
		1.2.1.3 Analyze and interpret AFNR related geographic data using a variety of systems and technologies (e.g., GIS, GPS, etc.).
	1.2.2	EXAMINE THE COMPONENTS OF THE AFNR SYSTEMS AND ASSESS THEIR IMPACT ON THE LOCAL, STATE, NATIONAL, AND GLOBAL SOCIETY AND ECONOMY.
		1.2.2.1 Identify and summarize the components within AFNR systems (e.g., Animal Systems: health, nutrition, genetics, etc.; Natural Resources Systems: soil, water, etc.).
		1.2.2.2 Define and summarize societies on local, state, national, and global levels and describe how they relate to AFNR systems.
		1.2.2.3 Examine and summarize the components of the agricultural economy (e.g., environmental, crops, livestock, etc.).

Topic 1.3	<i>Examine and summarize the importance of health, safety, and environmental management systems in AFNR workplaces.</i>	
	Student Competencies	
	1.3.1	IDENTIFY AND EXPLAIN THE IMPLICATIONS OF REQUIRED REGULATIONS TO MAINTAIN AND IMPROVE SAFETY, HEALTH, AND ENVIRONMENTAL MANAGEMENT SYSTEMS.
	1.3.1.1	Research and explain the implications of regulatory, safety, and health standards on AFNR systems (e.g., SDS, bioterrorism, etc.)
	1.3.1.2	Summarize the importance of safety, health, and environmental management in the workplace.
	1.3.2	DEVELOP AND IMPLEMENT A PLAN TO MAINTAIN AND IMPROVE HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE AND PERFORMANCE.
	1.3.2.1	Research and identify components required in health and safety performance plans.
	1.3.2.2	Examine and categorize examples of environmental compliance plans from AFNR workplace.
	1.3.3	APPLY HEALTH AND SAFETY PRACTICES TO AFNR WORKPLACES.
	1.3.3.1	Research and summarize the purposes and objectives of health and safety policies and procedures relevant to AFNR careers.
	1.3.3.2	Identify emergency response procedures for health and safety issues at AFNR workplaces.
	1.3.3.3	Examine and categorize examples of how to avoid health or safety risks in AFNR workplaces.
	1.3.3.4	Examine and categorize the risk level of contamination or injury as associated with AFNR tasks in the workplace.
	1.3.3.5	Analyze and evaluate the impact of current health and safety practices of AFNR workplaces.
	1.3.3.6	Assess various emergency response plan requirements for an AFNR workplaces and/or facility.
	1.3.3.7	Assess and apply first aid knowledge and procedures relevant to AFNR workplaces.
	1.3.3.8	Assess the safety priorities and select appropriate responses for different levels of contamination or injury at an AFNR workplace.
	1.3.4	USE APPROPRIATE PROTECTIVE EQUIPMENT AND DEMONSTRATE SAFE AND PROPER USE OF AFNR TOOLS AND EQUIPMENT.
	1.3.4.1	Identify and differentiate the appropriate protective equipment for the safe use and operation of specific tools and equipment (e.g. PPE, etc.).
	1.3.4.2	Identify standard tools, equipment and safety procedures related to AFNR tasks.
	1.3.4.3	Read and interpret operating instructions related to operation, storage and maintenance of tools and equipment related AFNR tasks.
	1.3.4.4	Analyze and demonstrate adherence to protective equipment requirements when using various AFNR tools and equipment.
	1.3.4.5	Complete the set up and adjustment for tools and equipment related to AFNR tasks.
	1.3.4.6	Assess and demonstrate appropriate operation, storage, and maintenance techniques for AFNR tools and equipment.

Topic 1.4	<i>Demonstrate stewardship of natural resources in AFNR activities.</i>	
	Student Competencies	
	1.4.1	IDENTIFY AND IMPLEMENT PRACTICES TO STEWARD NATURAL RESOURCES IN DIFFERENT AFNR SYSTEMS.
	1.4.1.1	Define stewardship of natural resources and distinguish how it connects to AFNR systems.
	1.4.1.2	Read and interpret the definition of sustainability and summarize how it relates to AFNR activities.
Topic 1.5	<i>Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food, & Natural Resources career pathways.</i>	
	Student Competencies	
	1.5.1	EVALUATE AND IMPLEMENT THE STEPS AND REQUIREMENTS TO PURSUE A CAREER OPPORTUNITY IN EACH OF THE AFNR CAREER PATHWAYS (E.G., GOALS, DEGREES, CERTIFICATIONS, RESUMES, COVER LETTER, PORTFOLIOS, INTERVIEWS, ETC.).
	1.5.1.1	Identify and summarize the steps to pursue a career in an AFNR pathway (e.g., self-assessment, set goals, etc.).
	1.5.1.2	Examine the educational, training, and experiential requirements to pursue a career in an AFNR pathway (e.g., degrees, certifications, training, internships, etc.).
	1.5.1.3	Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.
	1.5.1.4	Create a personal plan outlining goals and steps to obtain a career in an AFNR pathway.
	1.5.1.5	Analyze personal skillset and create a plan for obtaining the required education, training, and experiences to obtain a career in an AFNR pathway.
	1.5.1.6	Assess personal goals, experiences, education, and skillsets and organize them to produce the appropriate tools and develop the skills to effectively communicate about one's qualifications for an AFNR career.
	1.5.1.7	Evaluate progress toward AFNR career goals and identify opportunities for improvement and necessary adjustments to one's plan of action.
	1.5.1.8	Implement one's personal plan of action for obtaining the required education, training, and experiences and evaluate progress to identify opportunities for improvement and necessary adjustments.
	1.5.1.9	Evaluate, update, and improve a set of personal tools to reflect current skills, experiences, education, goals, etc. and complete the processes needed to pursue and obtain a career in an AFNR pathway.
	1.5.2	EXAMINE AND CHOOSE CAREER OPPORTUNITIES THAT ARE MATCHED TO PERSONAL SKILLS, TALENTS, AND CAREER GOALS IN AN AFNR PATHWAY OF INTEREST.
	1.5.2.1	Examine and categorize careers in each of the AFNR pathways.
	1.5.2.2	Research and describe careers in each of the AFNR pathways and choose potential careers connecting to personal interests and skills.
	1.5.2.3	Assess personal skills and align them with potential career opportunities in AFNR pathways.

	1.5.2.4	Assemble and analyze examples of careers and related statistics on a local, state, national, and global level.
	1.5.2.5	Interpret and evaluate the results of a personal career assessment and connect them to potential careers in AFNR pathways.
	1.5.2.6	Conduct interviews with career professionals within AFNR pathways and summarize the results.

Standard 5	ENVIRONMENTAL SERVICE SYSTEMS	
Topic 5.5	<i>Use tools, equipment, machinery, & technology common to tasks in environmental service systems.</i>	
	Student Competencies	
	5.5.1	USE TECHNOLOGICAL AND MATHEMATICAL TOOLS TO MAP LAND, FACILITIES AND INFRASTRUCTURE FOR ENVIRONMENTAL SERVICE SYSTEMS.
	5.5.1.1	Examine the importance and describe applications of surveying and mapping for environmental service systems.
	5.5.1.2	Research the methods in which GIS can be used in environmental service systems (e.g., tracing of point pollution, control of the spread of invasive species, etc.).
	5.5.1.3	Research how advancements in technology (e.g., unmanned aerial vehicles and drones, genetic modification, fracking, alternative energy, etc.) have changed environmental service systems.
	5.5.1.4	Apply surveying and mapping principles to a situation involving environmental service systems and identify and explain the use of equipment for surveying and mapping.
	5.5.1.5	Apply GIS skills to a situation specific to environmental service systems.
	5.5.1.6	Analyze and document examples of utilization of breaking technology in environmental service systems.
	5.5.1.7	Demonstrate surveying and cartographic skills to make site measurements in order to address concerns and needs within an environmental service systems situation.
	5.5.1.8	Interpret and evaluate GIS data to come to a conclusion about a scenario specific to environmental service systems.
	5.5.1.9	Evaluate trends in technology and develop predictions about how these advancements will change environmental service systems.

Standard 9	POWER, STRUCTURAL, AND TECHNICAL SYSTEMS	
Topic 9.1	<i>Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.</i>	
	Student Competencies	
	9.1.1	APPLY PHYSICAL SCIENCE AND ENGINEERING PRINCIPLES TO ASSESS AND SELECT ENERGY SOURCES FOR AFNR POWER, STRUCTURAL, AND TECHNICAL SYSTEMS.
	9.1.1.4	Assess the environmental impacts of renewable and nonrenewable energy sources used in AFNR.
	9.1.1.5	Calculate the costs of using renewable and nonrenewable energy sources in an AFNR enterprise or business.
	9.1.1.6	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.).
	9.1.1.7	Design and implement methods to evaluate the efficiency of renewable and nonrenewable energy sources used in AFNR.
	9.1.1.8	Devise a strategy to incorporate the use of selected energy sources in an ANFR enterprise or business.
	9.1.1.9	Apply energy benchmarking data to examine and select methods to conserve energy in AFNR structures.
	9.1.2	APPLY PHYSICAL SCIENCE AND ENGINEERING PRINCIPLES TO DESIGN, IMPLEMENT, AND IMPROVE SAFE AND EFFICIENT MECHANICAL SYSTEMS IN AFNR SITUATIONS.
	9.1.2.4	Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems.
	9.1.2.5	Calculate the maintenance and purchase cost of tools, machines, and equipment used in AFNR.
	9.1.2.6	Select, maintain, and demonstrate the proper use of tools, machines, and equipment used in different AFNR related mechanical systems.
	9.1.2.7	Apply the scientific method to devise strategies to improve the efficiency of operation of AFNR related mechanical systems.
	9.1.2.8	Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery, and equipment.
	9.1.2.9	Conduct a safety inspection of tools, machines, and equipment used in different AFNR related mechanical systems.
	9.1.3	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.).
	9.1.3.3	Analyze the situation and determine the best welding and cutting process to be used in metal fabrication.
	9.1.3.4	Assess and select the proper electrode for use in various shielded metal arc welding situations.

	9.1.3.5	Evaluate the quality of metal fabrication procedures (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).
	9.1.3.6	Construct and/or repair metal structures and equipment using metal fabrication procedures.
Topic 9.2	<i>Operate and maintain AFNR mechanical equipment and power systems.</i>	
	Student Competencies	
	9.2.1	PERFORM PREVENTATIVE MAINTENANCE AND SCHEDULED SERVICE TO MAINTAIN EQUIPMENT, MACHINERY, AND POWER UNITS USED IN AFNR SETTINGS.
	9.2.1.3	Develop a preventative maintenance schedule for equipment, machinery, and power units used in AFNR power, structural, and technical systems.
	9.2.1.4	Service filtration systems and maintain fluid levels on equipment, machinery, and power units in accordance with operator's manuals.
	9.2.1.5	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.
	9.2.1.6	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.
	9.2.2	OPERATE MACHINERY AND EQUIPMENT WHILE OBSERVING ALL SAFETY PRECAUTIONS IN AFNR SETTINGS.
	9.2.2.3	Analyze and calculate the cost of using equipment, machinery, and power units for AFNR power, structural, and technical systems.
	9.2.2.4	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural, and technical systems.
	9.2.2.5	Perform pre-operation inspections, start-up, & shut-down procedures on equipment, machinery, and power units as specified in owner's manuals.
	9.2.2.6	Adjust equipment, machinery, and power units for safe and efficient operation in AFNR power, structural, and technical systems.
Topic 9.3	<i>Service and repair AFNR mechanical equipment and power systems.</i>	
	Student Competencies	
	9.3.1	TROUBLESHOOT, SERVICE, AND REPAIR COMPONENTS OF INTERNAL COMBUSTION ENGINES USING MANUFACTURERS' GUIDELINES.
	9.3.1.1	Identify and classify components of internal combustion engines used in AFNR power, structural, and technical systems.
	9.3.1.2	Distinguish the characteristics of spark-and-compression internal combustion engines used in AFNR power, structural, and technical systems.
	9.3.1.3	Analyze and explain how the components of internal combustion engines interrelate during operation.

	9.3.1.4	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.
	9.3.1.5	Evaluate service and repair needs for internal combustion engines using a variety of performance tests (e.g., manuals, computer-based diagnostics, etc.).
	9.3.1.6	Inspect, analyze and repair spark-and-compression internal combustion engines used in AFNR power, structural, and technical systems.
	9.3.2	SERVICE ELECTRICAL SYSTEMS AND COMPONENTS OF MECHANICAL EQUIPMENT AND POWER SYSTEMS USING A VARIETY OF TROUBLESHOOTING AND/OR DIAGNOSTIC METHODS.
	9.3.2.1	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.).
	9.3.2.2	Compare and contrast the characteristics of electronic components used in AFNR power, structural, and technical systems (e.g., battery, resistor, diode, transistor, capacitor, etc.).
	9.3.2.3	Classify the uses of electrical sensors and controls in AFNR power, structural, and technical systems.
	9.3.2.4	Assess the tools used to measure the basic units of electrical circuits in AFNR power, structural, and technical systems, and perform the measurements.
	9.3.2.5	Analyze and interpret electrical system symbols and diagrams.
	9.3.2.6	Distinguish and select materials and tools used in electrical control circuit installation.
	9.3.2.7	Analyze and design electrical circuits for AFNR power, structural, and technical systems using knowledge of the basic units of electricity.
	9.3.2.8	Conduct testing procedures to evaluate and repair malfunctioning electrical components and systems used in AFNR power, structural, and technical systems.
	9.3.2.9	Plan and install electrical control circuits and/or circuit boards to assure proper operation within AFNR power, structural, and technical systems.
	9.3.3	UTILIZE MANUFACTURERS' GUIDELINES TO DIAGNOSE AND TROUBLESHOOT MALFUNCTIONS IN MACHINERY, EQUIPMENT, AND POWER SOURCE SYSTEMS (E.G., HYDRAULIC, PNEUMATIC, TRANSMISSION, STEERING, SUSPENSION, ETC.).
	9.3.3.1	Research and summarize the applications of common types of hydraulic and pneumatic systems used in AFNR power, structural, and technical systems.
	9.3.3.2	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.).
	9.3.3.3	Identify and examine the components of suspension and steering systems used in AFNR power, structural, and technical systems.
	9.3.3.4	Analyze and interpret hydraulic and pneumatic system symbols and diagrams used in AFNR power, structural and technical systems.
	9.3.3.5	Utilize speed, torque, and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural, and technical systems.

	9.3.3.6	Assess and analyze vehicle and machinery performance related to suspension and steering systems used in AFNR power, structural, and technical systems.
	9.3.3.7	Inspect, analyze, and repair hydraulic and pneumatic system components used in AFNR power, structural, and technical systems.
	9.3.3.8	Inspect, analyze, and repair the components of power transmission systems used in AFNR power, structural, and technical systems.
	9.3.3.9	Inspect, analyze, and repair vehicle suspension and steering systems used in AFNR power, structural, and technical systems.
Topic 9.5	<i>Use control, monitoring, geospatial, and other technologies in AFNR power, structural, and technical systems.</i>	
	Student Competencies	
	9.5.1	APPLY COMPUTER AND OTHER TECHNOLOGIES (E.G., ROBOTICS, CNC, UAS, ETC.) TO SOLVE PROBLEMS AND INCREASE THE EFFICIENCY OF AFNR SYSTEMS.
	9.5.1.1	Research and categorize computer technologies used to solve problems and increase efficiency in AFNR systems.
	9.5.1.2	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.).
	9.5.1.3	Analyze data using computer programs and other current technologies used in AFNR systems.
	9.5.1.4	Calculate the change in efficiency after using technologies in AFNR systems.
	9.5.1.5	Solve problems and calculate changes in efficiency using computer technologies for AFNR systems.
	9.5.1.6	Solve problems and evaluate changes in efficiency and create recommendations for the use of technologies in AFNR systems.
	9.5.3	APPLY GEOSPATIAL TECHNOLOGIES TO SOLVE PROBLEMS AND INCREASE THE EFFICIENCY OF AFNR SYSTEMS.
	9.5.3.1	Research and summarize the impact of utilizing geospatial technologies (i.e., GPS, GIS, remote sensing, telematics, etc.) in AFNR systems.
	9.5.3.2	Examine the components of precision technologies used in AFNR systems.
	9.5.3.3	Analyze and interpret trends in data collected utilizing geospatial technologies.
	9.5.3.4	Analyze and calculate the economic impact of utilizing precision technologies (e.g., GPS/GIS) in AFNR systems.
	9.5.3.5	Collect data and create maps utilizing geospatial technologies.
	9.5.3.6	Install, maintain, and service instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.) used in AFNR systems.

Career Ready Practices (CRP)

FFA & SUPERVISED AGRICULTURAL EXPERIENCE

CRP 1	Act as a responsible and contributing citizen and employee.
CRP 2	Apply appropriate academic and technical skills.
CRP 3	Attend to personal health and financial well-being.
CRP 4	Communicate clearly, effectively, and with reason.
CRP 5	Consider the environmental, social, and economic impacts of decisions.
CRP 6	Demonstrate creativity and innovation.
CRP 7	Employ valid and reliable research strategies.
CRP 8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP 9	Model integrity, ethical leadership, and effective management.
CRP 10	Plan education and career path aligned to personal goals.
CRP 11	Use technology to enhance productivity.
CRP 12	Work productively in teams while using cultural/global competence.