| **Test Content Categories** | **How well do I know the content?  (scale 1–5)** | **What resources do I have/need for this content?** | **Where can I find the resources I need?** | **Dates I will study this content** | **Date completed** |
| --- | --- | --- | --- | --- | --- |
| **I. Agribusiness Systems (12%)** |  |  |  |  |  |
| **A. Know the principles of capitalism and entrepreneurship in the agribusiness industry** |  |  |  |  |  |
| 1. Describe how supply and demand interact to determine the price of agricultural commodities |  |  |  |  |  |
| 2. Describe the law of diminishing returns |  |  |  |  |  |
| 3. Distinguish between fixed and variable costs |  |  |  |  |  |
| 4. Distinguish between marginal cost and marginal return |  |  |  |  |  |
| 5. Distinguish between inputs and outputs, and makes decisions based on costs and availability |  |  |  |  |  |
| 6. Distinguish among current and noncurrent assets and liabilities |  |  |  |  |  |
| 7. Identify the opportunity costs within an agribusiness |  |  |  |  |  |
| 8. Compare and contrast the main characteristics of individual proprietorships, partnerships, cooperatives, and corporations |  |  |  |  |  |
| 9. Distinguish among the sectors of agribusiness (e.g., producer, service, processing, and marketing) |  |  |  |  |  |
| 10. Identify methods of reducing risk in an agribusiness |  |  |  |  |  |
| **B. Know the management skills needed to organize an agribusiness.** |  |  |  |  |  |
| 1. Identify and describe key components of a contract and a lease |  |  |  |  |  |
| 2. Describe diversification and specialization in agribusiness |  |  |  |  |  |
| 3. Understand basic management skills (e.g., scheduling, hiring, purchasing) |  |  |  |  |  |
| 4. Describe the components of an agribusiness plan |  |  |  |  |  |
| 5. Understand steps in the management decision-making process |  |  |  |  |  |
| **C. Know the record keeping needed to accomplish agribusiness objectives** |  |  |  |  |  |
| 1. Describe the purposes of enterprise records |  |  |  |  |  |
| 2. Develop and complete an enterprise budget |  |  |  |  |  |
| 3. Develop a balance sheet and analyzes its uses |  |  |  |  |  |
| 4. Complete and interpret a cash-flow statement |  |  |  |  |  |
| 5. Identify the components of a completed inventory |  |  |  |  |  |
| 6. Describe depreciation |  |  |  |  |  |
| 7. Develop an income/expense statement and describe its purposes |  |  |  |  |  |
| **D. Is familiar with generally accepted accounting practices for making agribusiness decisions** |  |  |  |  |  |
| 1. Describe the differences between single- and double-entry methods of accounting |  |  |  |  |  |
| 2. Complete a break-even analysis for an enterprise |  |  |  |  |  |
| 3. Analyze the important financial ratios and calculations (e.g., net worth, debt to equity, solvency) |  |  |  |  |  |
| **E. Is familiar with the fundamentals of savings, investments, and credit in agribusiness** |  |  |  |  |  |
| 1. Identify the importance of a savings and investment plan |  |  |  |  |  |
| 2. Identify the sources of credit |  |  |  |  |  |
| 3. Describe ways to build and maintain credit |  |  |  |  |  |
| 4. Describe a business proposal |  |  |  |  |  |
| **F. Is familiar with the marketing principles needed to accomplish agribusiness objectives** |  |  |  |  |  |
| 1. Describe the components and purpose of a promotional campaign |  |  |  |  |  |
| 2. Describe key factors involved in marketing (e.g., product knowledge, service knowledge, customer knowledge) |  |  |  |  |  |
| 3. Describe how market prices and cycles affect agricultural commodities |  |  |  |  |  |
| 4. Describe commodity futures and options trading |  |  |  |  |  |
| 5. Distinguish between hedging and speculation |  |  |  |  |  |
| **II. Animal Systems (16%)** |  |  |  |  |  |
| **A. Is familiar with the historical development and trends of the animal systems industry** |  |  |  |  |  |
| 1. Explain past, current, and emerging trends related to the animal agricultural industry |  |  |  |  |  |
| 2. Describe the domestication of animals |  |  |  |  |  |
| **B. Know the classification, anatomical, and physiological characteristics of animals** |  |  |  |  |  |
| 1. Identify the major species of livestock |  |  |  |  |  |
| 2. Understand the taxonomical classification system of animals |  |  |  |  |  |
| 3. Identify the structure and function of the major body systems of animals (e.g., digestive, reproductive, respiratory) |  |  |  |  |  |
| 4. Define terms used to distinguish animals by sex, age, and physical traits in livestock |  |  |  |  |  |
| **C. Is familiar with proper health care of animals** |  |  |  |  |  |
| 1. Describe the use of vaccination and immunization in the animal science industry |  |  |  |  |  |
| 2. Select proper routes of administration of medications and vaccines on various animal species |  |  |  |  |  |
| 3. Describe methods of controlling parasites of livestock |  |  |  |  |  |
| 4. Describe noninfectious and infectious diseases and disorders |  |  |  |  |  |
| **D. Know basic principles of animal nutrition** |  |  |  |  |  |
| 1. Describe the importance of proper nutrition for animal production |  |  |  |  |  |
| 2. Differentiate between ruminant and nonruminant digestion |  |  |  |  |  |
| 3. Identify the major groups of nutrients (e.g., proteins, carbohydrates, minerals) |  |  |  |  |  |
| 4. Describe the general principles involved in balancing a ration |  |  |  |  |  |
| 5. Calculate a balanced ration given animal requirements and feed composition using the Pearson’s square method |  |  |  |  |  |
| 6. Describe symptoms of common nutrient deficiencies |  |  |  |  |  |
| **E. Know the basic principles of animal production and management** |  |  |  |  |  |
| 1. Select market and breeding livestock based on visual assessment |  |  |  |  |  |
| 2. Select animals to cull based on performance data |  |  |  |  |  |
| 3. Describe grading systems of livestock (e.g., feeder, quality, and yield) |  |  |  |  |  |
| 4. Interpret expected progeny differences (EPDs) to make production decisions |  |  |  |  |  |
| 5. Describe processes involved in cell division, including how genes affect the transmission of characteristics |  |  |  |  |  |
| 6. Complete Punnett square crosses for one-factor and two-factor crosses |  |  |  |  |  |
| 7. Define phenotype and genotype of animals |  |  |  |  |  |
| 8. Describe management procedures needed for effective livestock production (e.g., castration, docking, dehorning) |  |  |  |  |  |
| 9. Define crossbreeding, grading up, inbreeding, linebreeding, and purebred breeding |  |  |  |  |  |
| **F. Know safety practices related to animal production** |  |  |  |  |  |
| 1. Describe basic procedures for handling animal materials (e.g., vaccinations, supplements) |  |  |  |  |  |
| 2. Describe safe animal-handling procedures |  |  |  |  |  |
| 3. Identify the components of a safety and biosecurity plan for a specific class of animals |  |  |  |  |  |
| **G. Is familiar with normal and abnormal animal behavior** |  |  |  |  |  |
| 1. Differentiate between normal and abnormal behavior in common livestock animals |  |  |  |  |  |
| 2. Identify causes of abnormal behavior in common livestock animals |  |  |  |  |  |
| **H. Is familiar with the proper design and use of animal facilities and the equipment for safe and efficient production** |  |  |  |  |  |
| 1. Identify common styles of facilities for common livestock production (dairy cattle, swine, beef cattle, etc.) |  |  |  |  |  |
| 2. Identify safe and effective facility designs based on animal species and environment |  |  |  |  |  |
| 3. Describe equipment needed for safe and effective handling of common livestock animals (e.g., squeeze chute, twitch, grooming stand, etc.) |  |  |  |  |  |
| **I. Know the principles and practices of basic animal reproduction** |  |  |  |  |  |
| 1. Define terminology related to reproductive management and breeding systems, including castration, estrus, gestation, lactation, parturition |  |  |  |  |  |
| 2. Explain the role of the estrus cycle, ovulation, heat detection, and fertilization in animal reproduction management |  |  |  |  |  |
| 3. Define gestation and parturition |  |  |  |  |  |
| 4. Identify practices and principles related to animal reproduction (e.g., artificial insemination, embryo transfer, selective breeding) |  |  |  |  |  |
| **J. Is familiar with the effects of environmental conditions on animal production** |  |  |  |  |  |
| 1. Understand that various environmental conditions affect animal agriculture (e.g., air, water, temperature) |  |  |  |  |  |
| 2. Describe the effect of detrimental environmental conditions on livestock (e.g., health, production, reproduction) |  |  |  |  |  |
| 3. Define gestation and parturition |  |  |  |  |  |
| 4. Identify practices and principles related to animal reproduction (e.g., artificial insemination, embryo transfer, selective breeding) |  |  |  |  |  |
| **J. Is familiar with the effects of environmental conditions on animal production** |  |  |  |  |  |
| 1. Understand that various environmental conditions affect animal agriculture (e.g., air, water, temperature) |  |  |  |  |  |
| 2. Describe the effect of detrimental environmental conditions on livestock (e.g., health, production, reproduction) |  |  |  |  |  |
| **K. Is familiar with the impacts of animal production on the environment** |  |  |  |  |  |
| 1. Describe environmental conditions affected by animal production |  |  |  |  |  |
| 2. Describe the importance of a waste-management and animal-disposal plan for livestock operations |  |  |  |  |  |
| **L. Is familiar with the issues related to animal rights, animal welfare, and producer responsibilities** |  |  |  |  |  |
| 1. Differentiate between animal welfare and animal rights |  |  |  |  |  |
| 2. Describe the United States Department of Agriculture (USDA) inspection process for livestock processing and handling facilities |  |  |  |  |  |
| **III. Food Science and Biotechnology Systems (12%)** |  |  |  |  |  |
| **A. Know major issues and trends affecting the food products and processing industry** |  |  |  |  |  |
| 1. Identify major trends and developments in the food products and processing industry (e.g., buy local, free range, irradiated beef) |  |  |  |  |  |
| 2. Describe dietary trends affecting the food industry (e.g., low fat, sugar free, gluten free) |  |  |  |  |  |
| **B. Is familiar with industry organizations, groups, and regulatory agencies that affect the food products and processing industry** |  |  |  |  |  |
| 1. Identify major industry organizations, groups, and agencies that affect food products and processing |  |  |  |  |  |
| 2. Describe how the USDA and the United States Food and Drug Administration (FDA) regulate the food products and processing industry (e.g., country-of-origin labeling, nutrition labeling, and inspections) |  |  |  |  |  |
| **C. Is familiar with the safety principles and recommended equipment and facility management practices related to the food products and processing industry** |  |  |  |  |  |
| 1. Define the hazard analysis and critical control points (HACCP) and other major food safety practices |  |  |  |  |  |
| 2. Describe the importance of controlled features in the processing of food (e.g., temperature, moisture, sanitation) |  |  |  |  |  |
| **D. Is familiar with selecting, harvesting, processing, and classifying food products for storage, distribution, and consumption** |  |  |  |  |  |
| 1. Describe the purpose of grading to select food products for a specific use |  |  |  |  |  |
| 2. Describe the methods by which value can be added to agricultural commodities |  |  |  |  |  |
| 3. Identify basic processing techniques (e.g., preservation, homogenization, meat fabrication) |  |  |  |  |  |
| **E. Is familiar with major innovations, historical developments, and applications of biotechnology in agriculture** |  |  |  |  |  |
| 1. Identify the major biotechnological innovations (e.g., increased yields, herbicide tolerance, and insect resistance) |  |  |  |  |  |
| 2. Describe the advantages provided to the local producer by the application of advances in biotechnology |  |  |  |  |  |
| **F. Is familiar with the ethical, legal, social, cultural, safety, and environmental issues related to biotechnology** |  |  |  |  |  |
| 1. Identify the major legal and ethical issues surrounding the adoption of biotechnology |  |  |  |  |  |
| 2. Identify the social and cultural issues related to agricultural biotechnology (e.g., resistance to the use of genetically modified organisms [GMO], hormones) |  |  |  |  |  |
| 3. Identify the economic impact of biotechnology |  |  |  |  |  |
| 4. Describe the environmental issues related to agricultural biotechnology (e.g., herbicide resistance in weeds, beneficial-insect decline) |  |  |  |  |  |
| **G. Know basic, safe laboratory procedures** |  |  |  |  |  |
| 1. Identify the principles of aseptic technique |  |  |  |  |  |
| 2. Identify hazards in a biotechnology lab |  |  |  |  |  |
| 3. Identify the safety equipment needed to properly conduct a laboratory experiment |  |  |  |  |  |
| 4. Describe safe handling of laboratory materials, chemicals, and equipment |  |  |  |  |  |
| **H. Is familiar with the various uses of genetic engineering in the agricultural industry** |  |  |  |  |  |
| 1. Identify the uses of genetic engineering, cloning, stem-cell research in agriculture |  |  |  |  |  |
| 2. Identify the purpose of genetically modifying organisms in agriculture |  |  |  |  |  |
| **IV. Environmental and Natural Resource Systems (14%)** |  |  |  |  |  |
| **A. Is familiar with natural cycles related to environmental and natural resource management** |  |  |  |  |  |
| 1. Identify and explain the carbon cycle, water cycle, and nitrogen cycle as related to the environment |  |  |  |  |  |
| **B. Is familiar with chemical properties related to environmental and natural resources** |  |  |  |  |  |
| 1. Differentiate between organic and inorganic compounds |  |  |  |  |  |
| 2. Describe preemergence and postemergence herbicides |  |  |  |  |  |
| 3. Describe selective and nonselective herbicides |  |  |  |  |  |
| 4. Describe the effects of chemicals on organisms at different levels of the food chain (e.g., biomagnification) |  |  |  |  |  |
| 5. Differentiate between point and nonpoint source pollution |  |  |  |  |  |
| **C. Know the various ecosystems of the environment** |  |  |  |  |  |
| 1. Identify and describe the various types of ecosystems (e.g., biomes, aquatic versus terrestrial) |  |  |  |  |  |
| 2. Identify biotic and abiotic factors that define an ecosystem |  |  |  |  |  |
| **D. Is familiar with the ecological concepts and principles related to natural resource systems** |  |  |  |  |  |
| 1. Describe the benefits of rotational grazing |  |  |  |  |  |
| 2. Identify common forestry harvest techniques (e.g., clear-cut, thinning) |  |  |  |  |  |
| 3. Explain the process of succession in a forest |  |  |  |  |  |
| 4. Describe the purpose of reforestation (e.g., soil erosion, water quality, sustainability) |  |  |  |  |  |
| 5. Explain the difference between preservation and conservation |  |  |  |  |  |
| 6. Describe the concepts of population growth and carrying capacity |  |  |  |  |  |
| **E. Is familiar with the current issues and regulations in environmental and natural resource management** |  |  |  |  |  |
| 1. Identify the federal agencies responsible for environmental regulation and natural resource management (e.g., United States Environmental Protection Agency [EPA], Natural Resources Conservation Service [NRCS], and Bureau of Land Management [BLM]) |  |  |  |  |  |
| 2. Describe the impact of federal regulations on agriculture production (e.g., Endangered Species Act [ESA], water rights) |  |  |  |  |  |
| **F. Know the use of personal protective equipment (PPE) and safety procedures related to environmental and natural resource management** |  |  |  |  |  |
| 1. Identify PPE and safety procedures related to environmental and natural resources (e.g., forestry, fisheries, wildlife) |  |  |  |  |  |
| **G. Is familiar with the role of environmental and natural resource management in the local, state, and national economies** |  |  |  |  |  |
| 1. Describe the importance of hunting, trapping, fishing, and outdoor recreation to the economy |  |  |  |  |  |
| 2. Know significant legislative milestones related to natural resources (e.g., Clean Air Act, Clean Water Act) |  |  |  |  |  |
| 3. Explain the contributions of environmental and natural resource management to the national economy |  |  |  |  |  |
| **H. Is familiar with the impact of conventional and alternative energy sources on the environment** |  |  |  |  |  |
| 1. Identify environmental impacts of energy production |  |  |  |  |  |
| 2. Identify and explain the use of conventional and alternative energy sources (e.g., fossil fuels, solar, biomass) |  |  |  |  |  |
| **I. Is familiar with wetlands and their role in the environment** |  |  |  |  |  |
| 1. Explain the role of wetlands in the environment and the need for wetland conservation (e.g., flood control, wildlife habitat) |  |  |  |  |  |
| **J. Is familiar with the use, production, and processing of natural resources** |  |  |  |  |  |
| 1. Identify products derived from natural resources (e.g., wood products, fuels, fish, and wildlife) |  |  |  |  |  |
| 2. Differentiate between renewable and nonrenewable resources |  |  |  |  |  |
| **K. Is familiar with procedures used to develop an environmental and natural resource management plan** |  |  |  |  |  |
| 1. Describe population sampling techniques (e.g., quadrant sampling, electrofishing in aquatic systems, radio tracking) |  |  |  |  |  |
| 2. Describe the relationship between a species and the habitat needed to support that species |  |  |  |  |  |
| 3. Describe a food web |  |  |  |  |  |
| 4. Explain the importance of an indicator species |  |  |  |  |  |
| **L. Know the general impact of land use on environmental and natural resources** |  |  |  |  |  |
| 1. Describe methods used to limit erosion and runoff (e.g., buffers, windbreaks) |  |  |  |  |  |
| 2. Describe best management practices and explains how they benefit the environment (e.g., stocking rate, protection of critical wildlife habitat) |  |  |  |  |  |
| 3. Describe the effects of urban sprawl on the environment |  |  |  |  |  |
| **V. Plant Systems (16%)** |  |  |  |  |  |
| **A. Know the historical development of plant science and its relationship with society** |  |  |  |  |  |
| 1. Know the development of human use of plants (e.g., food, fiber, shelter) |  |  |  |  |  |
| 2. Identify the major milestones and advances of plant science (e.g., plant genetics, soil amendments) |  |  |  |  |  |
| 3. Understand the importance of plants in the global food supply |  |  |  |  |  |
| **B. Know general safety issues related to plant systems** |  |  |  |  |  |
| 1. Identify and describe safety hazards related to plant production systems (e.g., chemicals, equipment, and tools) |  |  |  |  |  |
| 2. Define hazardous plant classifications (e.g., noxious, invasive) |  |  |  |  |  |
| 3. Identify and understand the use of personal protective equipment (PPE) |  |  |  |  |  |
| 4. Interpret material safety data sheet (MSDS) information |  |  |  |  |  |
| 5. Know guidelines for safe pesticide use |  |  |  |  |  |
| **C. Know the basic principles of identification, classification, anatomy, and physiology as related to plant production and management** |  |  |  |  |  |
| 1. Understand the taxonomical classification system of plants and the importance of binomial nomenclature |  |  |  |  |  |
| 2. Differentiate between monocots and dicots |  |  |  |  |  |
| 3. Describe reproductive and vegetative plant parts and their functions (e.g., roots absorption, stem support) |  |  |  |  |  |
| 4. Describe major plant processes (e.g., photosynthesis, transpiration, respiration) |  |  |  |  |  |
| 5. Identify and classify plants according to use and growth habits (e.g., agronomic, horticultural, annual, perennial) |  |  |  |  |  |
| 6. Differentiate between herbaceous and woody plants |  |  |  |  |  |
| **D. Is familiar with the influence of environmental factors on plant growth** |  |  |  |  |  |
| 1. Describe how temperature, light, moisture, and air affect plant growth |  |  |  |  |  |
| 2. Interpret USDA Plant Hardiness Zone Maps |  |  |  |  |  |
| **E. Is familiar with propagation, cultivation, and harvesting of plants** |  |  |  |  |  |
| 1. Describe sexual reproduction in plants (e.g., fertilization, germination, pollination) |  |  |  |  |  |
| 2. Describe asexual propagation methods (e.g., cutting, layering, grafting) |  |  |  |  |  |
| 3. Identify major types of cultivation for horticultural crops, including hydroponics |  |  |  |  |  |
| 4. Identify major types of cultivation for agronomic crops |  |  |  |  |  |
| 5. Identify harvesting techniques (e.g., hand, mechanical) |  |  |  |  |  |
| **F. Know the basic characteristics of both soils and growing media and their uses** |  |  |  |  |  |
| 1. Identify the macronutrients and micronutrients needed for plant growth |  |  |  |  |  |
| 2. Describe the role of nitrogen (N), phosphorus (P), and potassium (K) in plant growth |  |  |  |  |  |
| 3. Explain the role soil pH plays in plant production |  |  |  |  |  |
| 4. Understand the materials used in soilless media, such as vermiculite, perlite, sphagnum moss, and horticultural-grade sand |  |  |  |  |  |
| 5. Explain soil structure and texture as related to plant growth |  |  |  |  |  |
| 6. Describe the types of water in soil (e.g., gravitational, capillary, available) |  |  |  |  |  |
| 7. Describe the horizons within a soil profile |  |  |  |  |  |
| 8. Understand the basics of soil conservation practices |  |  |  |  |  |
| **G. Is familiar with the use of integrated pest management (IPM) in plant production** |  |  |  |  |  |
| 1. Describe IPM and its purposes |  |  |  |  |  |
| 2. Differentiate between cultural, biological, mechanical (physical), and chemical controls |  |  |  |  |  |
| 3. Describe the types and uses of pesticides (e.g., herbicides, fungicides, insecticides) |  |  |  |  |  |
| **H. Is familiar with production and management practices associated with horticultural crops** |  |  |  |  |  |
| 1. Identify proper management and production techniques related to greenhouses, orchards, gardens, and nurseries |  |  |  |  |  |
| 2. Describe greenhouse structures and systems |  |  |  |  |  |
| 3. Describe the divisions of horticulture: pomology, floriculture, landscape, olericulture |  |  |  |  |  |
| 4. Describe the importance of growth regulators |  |  |  |  |  |
| **I. Is familiar with production and management practices associated with agronomic crops** |  |  |  |  |  |
| 1. Identify equipment used in cultivating and harvesting agronomic crops |  |  |  |  |  |
| 2. Identify and describe the production and management practices of agronomic crops |  |  |  |  |  |
| 3. Explain the importance of weed and pest control in agronomic crop production |  |  |  |  |  |
| 4. Describe the divisions of agronomic crops (e.g., cereal grains, forage, oil, fiber) |  |  |  |  |  |
| 5. Describe the purposes of crop rotation |  |  |  |  |  |
| **J. Is familiar with the principles and elements of landscape and floral design** |  |  |  |  |  |
| 1. Identify and describe the principles and elements of landscape and floral design |  |  |  |  |  |
| **VI. Power, Structural, and Technical Systems (15%)** |  |  |  |  |  |
| **A. Is familiar with the physical science principles and engineering applications associated with power, structural, and technical systems** |  |  |  |  |  |
| 1. Describe the basic principles of hydraulics (e.g., single-acting, double-acting cylinders) |  |  |  |  |  |
| 2. Describe the basic principles of pneumatics |  |  |  |  |  |
| 3. Differentiate among basic metals as they pertain to a welding shop (e.g., mild steel, cast iron, brass, and copper) |  |  |  |  |  |
| 4. Describe horsepower for engines, equipment, and electrical motors |  |  |  |  |  |
| 5. Differentiate among conduction, convection, and radiation |  |  |  |  |  |
| 6. Describe principles of oil viscosity and lubrication |  |  |  |  |  |
| **B. Is familiar with electricity and electrical wiring** |  |  |  |  |  |
| 1. Identify proper safety procedures with electricity and electrical wiring |  |  |  |  |  |
| 2. Define common electrical terms (e.g., amp, volt, ohm, watt, kilowatt, kilowatt hour, conductor, resistance, and transformer) |  |  |  |  |  |
| 3. Determine amperage, voltage, horsepower, wattage, and rpm from the nameplate on an electric motor |  |  |  |  |  |
| 4. Identify the importance of grounding and ground fault circuit interrupters (GFCI) |  |  |  |  |  |
| 5. Calculate electrical power usage and cost using Ohm’s law |  |  |  |  |  |
| 6. Interpret electrical diagrams of common 110-120 volt AC electrical circuits (e.g., single-pole switches, three-way switches, outlets, GFCI, fixtures) |  |  |  |  |  |
| 7. Distinguish the differences between AC and DC circuits |  |  |  |  |  |
| 8. Identify conductors and insulators |  |  |  |  |  |
| **C. Is familiar with various power and energy sources** |  |  |  |  |  |
| 1. Describe proper safety procedures when dealing with power and energy sources |  |  |  |  |  |
| 2. Compare and contrast the benefits and costs of various energy sources (e.g., wind, solar, hydro, coal, nuclear) |  |  |  |  |  |
| 3. Differentiate among energy sources (e.g., internal combustion, mechanical, electrical) |  |  |  |  |  |
| **D. Is familiar with the principles of power, energy transfer, and conversion** |  |  |  |  |  |
| 1. Describe the basic operating principles of an electric motor |  |  |  |  |  |
| 2. Describe the basic principles of gears and pulleys |  |  |  |  |  |
| 3. Describe gear reduction and multipliers |  |  |  |  |  |
| 4. Describe the transfer of power/energy from a motor to an implement |  |  |  |  |  |
| **E. Know the proper use, storage, and disposal of potentially hazardous materials common to the agricultural mechanics laboratory** |  |  |  |  |  |
| 1. Describe the importance of proper laboratory safety |  |  |  |  |  |
| 2. Interpret MSDS instructions and precautions |  |  |  |  |  |
| 3. Identify Occupational Safety and Health Administration (OSHA) regulations regarding laboratory safety colors and uses |  |  |  |  |  |
| 4. Explain the proper storage of compressed-gas bottles according to OSHA regulations |  |  |  |  |  |
| 5. Describe the proper storage and disposal of hazardous materials (e.g., fuels, pesticides, paints) |  |  |  |  |  |
| **F. Know the safe operation and maintenance of hand tools, power tools, and other equipment** |  |  |  |  |  |
| 1. Identify potential safety hazards in the agricultural mechanics laboratory |  |  |  |  |  |
| 2. Identify and follow OSHA regulations |  |  |  |  |  |
| 3. Identify hand tools and determine their uses |  |  |  |  |  |
| 4. Identify power tools and determine their uses |  |  |  |  |  |
| 5. Identify the proper use of electrical wiring tools and supplies |  |  |  |  |  |
| 6. Describe the basic use and maintenance of common pneumatic shop equipment (e.g., air compressor, impact wrench) |  |  |  |  |  |
| 7. Describe hand-tool and power-tool maintenance |  |  |  |  |  |
| **G. Is familiar with the principles of small-engine operation, maintenance, and repair** |  |  |  |  |  |
| 1. Identify basic maintenance procedures and adjustments of internal combustion engines |  |  |  |  |  |
| 2. Identify the basic parts of a small gas engine |  |  |  |  |  |
| 3. Describe the four-stroke cycle and two-stroke cycle |  |  |  |  |  |
| 4. Describe the principles of spark-ignition engine (gas) operation |  |  |  |  |  |
| 5. Describe the basic principles of compression engine (diesel) operation |  |  |  |  |  |
| 6. Identify the different fuels used in internal combustion engines |  |  |  |  |  |
| 7. Describe engine displacement |  |  |  |  |  |
| **H. Is familiar with the planning and building of structures** |  |  |  |  |  |
| 1. Describe safety practices associated with building construction |  |  |  |  |  |
| 2. Read and interpret project plans for agricultural-structure projects |  |  |  |  |  |
| 3. Discuss the importance of slope, elevation, and grades in site preparation |  |  |  |  |  |
| 4. Identify types and designs of buildings |  |  |  |  |  |
| 5. Identify and select construction materials. |  |  |  |  |  |
| 6. Calculate a bill of materials |  |  |  |  |  |
| 7. Define basic framing terminology (e.g., studs, headers, cripple studs) |  |  |  |  |  |
| 8. Describe the purpose of walls, types of walls, supports, and siding used in agricultural buildings |  |  |  |  |  |
| 9. Identify factors affecting the heating, cooling, and ventilation of agricultural structures |  |  |  |  |  |
| **I. Is familiar with metal fabrication and welding** |  |  |  |  |  |
| 1. Describe and identify metal shop safety procedures and equipment |  |  |  |  |  |
| 2. Describe different types of welding (e.g., shielded metal-arc welding (SMAW), gas metal-arc welding (GMAW), flux-cored arc welding (FCAW), and tungsten-inert gas (TIG) welding, oxy-fuel welding, and brazing) |  |  |  |  |  |
| 3. Identify common welding joints, including lap, butt, and fillet |  |  |  |  |  |
| 4. Describe basic arc welding procedures and terminology (e.g., positions, classifying rods, polarity) |  |  |  |  |  |
| 5. Describe proper metal cutting practices (e.g., oxy-fuel, plasma, cutoff saws, and shears) |  |  |  |  |  |
| 6. Describe basic oxy-fuel welding procedures and terminology (e.g., positions, equipment setup and selection) |  |  |  |  |  |
| 7. Describe the fundamentals of cold metal work |  |  |  |  |  |
| **J. Is familiar with the installation, maintenance, and repair of water systems** |  |  |  |  |  |
| 1. Describe safety practices for plumbing |  |  |  |  |  |
| 2. Describe the process of plastic pipe fitting |  |  |  |  |  |
| 3. Describe the process of sweating copper pipe |  |  |  |  |  |
| 4. Identify methods of protecting water pipes against freezing |  |  |  |  |  |
| 5. Identify different plumbing materials and common joints |  |  |  |  |  |
| **K. Is familiar with the application of technology to the agriculture industry** |  |  |  |  |  |
| 1. Define the term GIS (Geographic Information System) and explain its relationship to GPS (Global Positioning System) |  |  |  |  |  |
| 2. Explain how GPS and GIS are used in precision agriculture |  |  |  |  |  |
| 3. List the common applications of GPS technology in agriculture |  |  |  |  |  |
| 4. Identify potential applications for computer-controlled technology (e.g., greenhouse controls, computer numerical control machines, automated equipment) |  |  |  |  |  |
| **L. Is familiar with the use of technical and mathematical approaches to map land, facilities, and infrastructure** |  |  |  |  |  |
| 1. Determine land area in acres and location from diagrams or legal description |  |  |  |  |  |
| 2. Describe basic surveying procedures and equipment |  |  |  |  |  |
| 3. Calculate slope, elevation, and grades |  |  |  |  |  |
| **VII. Leadership and Career Development (15%)** |  |  |  |  |  |
| **A. Know the principles of leadership** |  |  |  |  |  |
| 1. Describe the importance of personal leadership development (e.g., personality, leadership style, Maslow’s hierarchy) |  |  |  |  |  |
| 2. Describe various forms of leadership (e.g., democratic, authoritarian, situational) |  |  |  |  |  |
| **B. Know the foundational areas of career development** |  |  |  |  |  |
| 1. Describe how to develop a career plan (e.g., strengths, values, interests) |  |  |  |  |  |
| 2. Develop a career plan to meet career goals (e.g., education, employment, lifestyle goals) |  |  |  |  |  |
| 3. Describe the various components related to job preparation (e.g., resume development, interviewing, and overall business etiquette) |  |  |  |  |  |
| **C. Understand the purpose, structure, and function of the National FFA Organization** |  |  |  |  |  |
| 1. Identify the FFA mission statement, creed, motto, ceremonies, and salute |  |  |  |  |  |
| 2. Identify different types of FFA membership |  |  |  |  |  |
| 3. Describe major historical moments and figures of FFA (e.g., founded in 1928, NFA, E. M. Tiffany, girls allowed in 1969, Henry C. Groseclose) |  |  |  |  |  |
| 4. Identify the constitutional officer positions and their duties |  |  |  |  |  |
| 5. Know the FFA degrees |  |  |  |  |  |
| 6. Understand the importance of the Program of Activities and FFA Committee structures |  |  |  |  |  |
| **D. Know individual and team leadership skills** |  |  |  |  |  |
| 1. Understand basic parliamentary procedural motions described in the FFA manual |  |  |  |  |  |
| 2. Describe proper presentation and disposal of a main motion |  |  |  |  |  |
| 3. Describe the purpose of parliamentary procedure in an FFA meeting |  |  |  |  |  |
| 4. Describe team-building skills (e.g., motivation, communication, influence) |  |  |  |  |  |
| 5. Differentiate between the positive and negative attributes of a leader |  |  |  |  |  |
| 6. Identify the importance of ethics in leadership |  |  |  |  |  |
| **E. Know communication skills** |  |  |  |  |  |
| 1. Describe effective communication skills (e.g., written, verbal, and nonverbal) |  |  |  |  |  |
| 2. Identify techniques to improve listening, reading, writing, speaking, and nonverbal communication skills |  |  |  |  |  |
| **F. Know information research skills to make informed decisions** |  |  |  |  |  |
| 1. Describe how to determine validity and reliability of a source (e.g., author, date, bibliography, type of source) |  |  |  |  |  |
| 2. Understand the scientific method |  |  |  |  |  |
| **G. Understand supervised agricultural experiences (SAE)** |  |  |  |  |  |
| 1. Describe the purpose of an SAE |  |  |  |  |  |
| 2. Describe the major types of SAEs (e.g., entrepreneurship, placement, agriscience, agribusiness, exploratory) |  |  |  |  |  |
| 3. Describe how to develop an SAE program |  |  |  |  |  |
| 4. Identify student advancement and awards related to the SAE program (e.g., degrees, proficiency awards) |  |  |  |  |  |
| 5. Apply basic financial record-keeping skills for the establishment and maintenance of an SAE |  |  |  |  |  |
| **H. Know career opportunities across the various pathways of agriculture** |  |  |  |  |  |
| 1. Describe the various career pathways within the Agriculture, Food, and Natural Resources Career Cluster |  |  |  |  |  |
| 2. Identify the specific skills and education needed for career pathways |  |  |  |  |  |
| 3. Describe agricultural careers available to students in an agricultural education program |  |  |  |  |  |
| **I. Is familiar with local program planning and management** |  |  |  |  |  |
| 1. Identify and describe the three components of a comprehensive agricultural education program |  |  |  |  |  |
| 2. Define the scope and sequence for a secondary agricultural education program |  |  |  |  |  |
| 3. Identify the purpose and importance of an advisory committee |  |  |  |  |  |
| 4. Identify and describe career development events (CDEs) and their purpose |  |  |  |  |  |
| 5. Identify FFA award programs (e.g., degree programs and applications, proficiencies, leadership awards, scholarships) |  |  |  |  |  |