Turf Science & Management

Subject Code: 010635
Course & Unit Descriptions

Course Description:

Principles of science and engineering will be delivered through the establishment, culture and maintenance of athletic and recreational turf. Experience is gained in propagation, care, production, and marketing of turf grass and turf services. Students will learn to practice safe operation and maintenance of specialized equipment. Environmental awareness and conservation practices will be exercised. Students will also develop communication and business skills to prepare for further education and employment in the turf grass industry.

Unit: Safety

Students will demonstrate rules and regulations for safety on the work site and take corrective measures when hazards arise. Students will demonstrate first aid procedures and how to properly handle an emergency response.

Benchmark: 4.1 Safety Procedures
Level 2: Follow safety procedures in specific situations with specialized tools and equipment, evaluate situation and take corrective action

Indicators
4.1.01 Demonstrate knowledge of safety rules and regulations
4.1.02 Interpret safety signs and symbols
4.1.03 Model safe attitudes and behaviors (e.g., lifting, climbing)
4.1.04 Identify safety hazards and take corrective measures
4.1.05 Use safety equipment in accordance with established procedures
4.1.06 Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)

Unit: Turf Equipment

Students will service machinery and equipment plus ensure the presence and function of their safety systems. Students will perform appropriate start-up, operating and shut-down procedures and perform post-operating inspections and adjustments.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.01 Perform a machine condition inspection
4.2.02 Lubricate machinery and equipment
4.2.03 Ensure presence and function of safety systems and hardware
4.2.04 Service basic electrical systems (e.g., fuses and bulbs)
4.2.05 Perform machine adjustments (e.g., belts, clippers, drive chains)
4.2.06 Service filtration systems
4.2.07 Identify, select and maintain fluid levels

4.2.08 Maintain machinery, equipment, instruments and facility cleanliness, appearance, and safety
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation
Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators
4.3.01 Follow manufacturer's recommended operating procedures and adjustment specifications
4.3.02 Describe function, limitations, and proper use of equipment, equipment controls and instrumentation
4.3.03 Perform pre-operation inspection and adjustments
4.3.04 Perform appropriate start-up, operating and shut-down procedures
4.3.05 Identify, select and exhibit the desired application of hand and power tools
4.3.06 Perform post-operating inspection and adjustments

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Unit: Turf Pest Management
Students will be able to identify and classify turf pests. Students will determine and implement proper pest control using integrated pest management and safe application methods.

Benchmark: 7.3 Pest Management
Level 2: Scout and identify specific plant pests and plant damage and apply specialized pest management control methods

Indicators
7.3.01 Identify and classify plant pests (i.e., insects, pathogens, weeds, diseases, animals)
7.3.02 Examine interrelationships between plants, pests, humans and environment (e.g., non-native species, climate change)
7.3.03 Analyze and calculate economic threshold of pest damage
7.3.04 Determine and implement pest management safety practices (e.g., MSDS, EPA, OSHA, PPE)
7.3.05 Develop an integrated pest management plans based on pest life cycles, available treatments and application methods
7.3.06 Select application methods, implement pest control plan (i.e. organic and non-organic) and evaluate effectiveness and impact on environment

Academic Standards
English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)

Math: Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data. (Data Analysis D, 8-10)
Science: Explain the structure and function of ecosystems and relate how ecosystems change over time. (Life Sciences F, 9-10)
Social Studies: Evaluate the consequences of geographic and environmental changes resulting from governmental policies and human modifications to the physical environment. (Geography B, 11-12)

Unit: Turf Fertility

Students will compare and contrast the sources of macronutrients and micronutrients plus describe their functions. Students will identify the symptoms and causes of deficiencies and analyze the data collected from plant tissue and soil for optimum turf management. Students will use this data to calculate and apply the required nutrients.

Benchmark: 7.1 Plant Nutrition
Level 2: Diagnose macronutrient and common micronutrient deficiencies in specific plants and select and apply macronutrients and micronutrients, using specialized application methods

Indicators
7.1.01 Compare and contrast organic and inorganic sources of macronutrients and micronutrients
7.1.02 Describe the functions of macronutrients and micronutrients
7.1.03 Determine nutrient requirements for food-grade, non-food-grade and organic plants
7.1.04 Identify symptoms and causes of plant nutrient deficiencies
7.1.05 Collect and test soil and/or plant tissue
7.1.06 Analyze test data from soil and plant tissue, make inferences and draw conclusions for optimum management
7.1.07 Determine the biotic and abiotic factors that influence and optimize availability of nutrients to plants (e.g., pH, microorganisms, growth media)
7.1.08 Calculate nutrient requirements and select nutrient sources and additives for optimum economic return
7.1.09 Select application methods, determine time of application, and apply nutrients
7.1.10 Interpret fertilizer labels

Academic Standards
English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
Science: Explain the structure and function of ecosystems and relate how ecosystems change over time. (Life Sciences F, 9-10)

Unit: Irrigation System

Students will calculate the daily water needs and identify components of a water distribution system. Students will diagnose and repair problems in the supply system as well as perform tests on water supplies and drainage systems.

Benchmark: 4.15 Water Distribution Systems
Level 2: Design and install a basic water/wastewater distribution system using multiple zones

Indicators
4.15.01 Calculate daily water needs
4.15.02 Identify the common components of a water distribution system and describe their functions
4.15.03 Describe the types and operating principles of pumps and controls used in water supplies
4.15.04 Calculate water demand for specific applications
4.15.05 Detect, test and repair problems in the water supply system
4.15.06 Install and secure waste/drain lines and vents
4.15.07 Install water supply and treatment systems with both plastic and metal components
4.15.08 Perform tests on water supply and drainage systems for pressure and leaks
4.15.09 Describe the types and sources of contamination in water supplies (i.e., fuel storage tanks, septic systems, pesticide mixing areas, hazardous waste, manure storage, livestock yard, and silage effluent) and methods for disinfecting water
4.15.10 Protect pipes from freezing and mechanical damage

Academic Standards
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
Science: Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources. (Earth and Space Sciences D, 9-10)

Unit: Water
Students will determine water quality using a variety of factors (pH, dissolved oxygen, biological oxygen demand, temperature, and macroinvertebrate populations. Students will implement practices to maintain or improve quality.

Benchmark: 5.2 Water
Level 2: Analyze and interpret the biological, chemical and physical properties of water quality

Indicators
5.2.01 Measure pH, dissolved oxygen (DO), biological oxygen demand (BOD), temperature and macroinvertebrate populations to determine water quality
5.2.02 Measure hardness, nitrogen, phosphorus, vegetation and physical characteristics of lentic and lotic waters to determine water quality
5.2.05 Monitor and analyze water quality and quantity
5.2.06 Explain the interactions between human activities and the earth's hydrosphere (e.g., septic systems, desalinization, point and nonpoint sources of pollution)
5.2.07 Implement practices to maintain or improve water quality

Academic Standards
English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)
Math: Apply various measurement scales to describe phenomena and solve problems. (Measurement B, 11-12)
Science: Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources. (Earth and Space Sciences D, 9-10)

Unit: Growing & Mowing
Students will use turf taxonomy and identification to develop and implement a turf grass maintenance and management plan to meet cultural needs of turf (mowing, dethatching, topdressing, core aeration, etc.).

Benchmark: 7.4 Plant Production and Management
Level 2: Manage growth of specific types of plants using specialized equipment

Indicators

7.4.01 Identify and classify seeds and plants at all stages of growth
7.4.02 Identify plant anatomical structures and tissues (e.g., roots, stems, flowers, leaves, fruits, seeds)
7.4.03 Describe physiological functions of plants (e.g., photosynthesis, respiration, transpiration, absorption)
7.4.04 Identify and classify plants using taxonomy
7.4.05 Select seeds and plants (e.g., production, ornamental, erosion control, genetically modified organism [GMO], moisture control, bioremediation)
7.4.06 Manipulate abiotic and biotic factors (e.g., irrigation, mulch, lighting, temperature, drainage) to alter plant germination, growth and development
7.4.07 Evaluate and demonstrate planting practices (e.g., population rate, germination/seed vigor, inoculation, seed and plant treatments, cuttings and pot in pot, type of planter)
7.4.08 Evaluate and implement transplanting practices
7.4.09 Evaluate/select and prepare soil/media for planting
7.4.10 Control plant growth (e.g., pruning, pinching, chemical, disbudding)
7.4.11 Determine maintenance schedule for plant management plan
7.4.12 Analyze and satisfy plant water requirements
7.4.13 Identify characteristics (e.g., visual appeal, quality, test weights, final usage) of grains, seeds, vegetables, fruits, and ornamental plants

Academic Standards

English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)
Math: Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis F, 8-10)
Science: Explain the flow of energy and the cycling of matter through biological and ecological systems (cellular, organismal and ecological). (Life Sciences D, 9-10)

Unit: Turfgrass Soil Science

Students will be able to identify soil types to implement soil conservation practices appropriate for turf. Students will evaluate soil limitations and identify soil forming factors to explain how they produce variability in soils.

Benchmark: 5.1 Soils

Level 2: Utilize knowledge of soil characteristics and soil information resources to overcome any existing soil use limitations

Indicators

5.1.01 Classify soil types based on composition (e.g., aggregate size, organic matter, texture)
5.1.02 Inventory soils and determine land use capabilities
5.1.03 Interpret soil survey data to implement conservation practices
5.1.04 Select techniques that reduce soil erosion and compaction based on soil and land properties (e.g., no till, subsurface and watershed drainage)
5.1.05 Evaluate soil limitations (e.g., wildlife/wetlands habitats, septic systems, drainage, agriculture and socioeconomic considerations, preservation easements)
5.1.07 Identify soil forming factors and explain how they produce variability in soils

Academic Standards

English: Use multiple resources to enhance comprehension of vocabulary. (Vocabulary F, 8-10; Vocabulary E, 11-12)
Math: Describe and interpret rates of change from graphical and numerical data. (Algebra J, 8-10)

Science: Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources. (Earth and Space Sciences D, 9-10)
Social Studies: Use appropriate data sources and geographic tools to analyze and evaluate public policies. (Geography C, 11-12)

Unit: Turf Installation

Students will complete an estimate using a site inventory and analysis including intended use, budget, customer needs, and maintenance levels to establish the steps for installation of turf. Students will demonstrate turf installation through a variety of methods.

Benchmark: 4.10 Design and Estimate
Level 2: Level 2 Benchmark: Design a basic agricultural application for a desired outcome

Indicators
4.10.02 Complete a site inventory and analysis (e.g., physical conditions, design needs, code requirements, environmental impact, utilities requirements)
4.10.03 Develop a program list, including intended use, budget, economics, customer wants and needs, and maintenance
4.10.11 Estimate material, construction and equipment needs and costs
4.10.12 Establish the sequential steps of construction/installation

Academic Standards
English: Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
Social Studies: Use appropriate data sources and geographic tools to analyze and evaluate public policies (Geography C, 11-12)

Unit: Business Operations

Students will develop business goals and objectives using real-world examples of various organizational and business structures. Students will budget resources, evaluate outcomes, and forecast future budgetary needs according to standard business principles.

Benchmark: 3.1 Marketing
Level 2: Develop and market a product or service to maximize profits and optimize cost

Indicators
3.1.02 Research products and service design(s) and determine the technical feasibility of new products
3.1.05 Set prices using supply and demand curves and commodity and non-commodity pricing
3.1.06 Identify and evaluate methods of marketing products and services
3.1.07 Promote products and services
3.1.09 Select and implement a marketing option (e.g., cash sales, hedge, speculate, options, forward contract, government programs)

Academic Standards
English: Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)
Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)

Social Studies: Analyze how scarcity of productive resources affects supply, demand, inflation and economic choices. (Economics A, 11-12)

Benchmark: 3.2 Sales and Customer Service
Level 2: Use sales techniques to close the sale of a product/service and handle complex customer issues

Indicators
3.2.02 Develop sales goals and incentive programs
3.2.03 Forecast sales and delivery times
3.2.04 Prospect for new customers
3.2.06 Develop and conduct sales presentation
3.2.07 Utilize suggestive selling and selling up techniques
3.2.08 Build and develop customer relationships
3.2.09 Apply appropriate questioning techniques to determine client needs and wants
3.2.10 Provide product, warranty and maintenance education to the customer
3.2.11 Complete sales transactions and close-out procedures (e.g., handle money, operate cash register, scan bar codes, record sales, write invoices/orders)
3.2.12 Utilize follow-up activities/strategies and provide post-sale service
3.2.13 Handle customer complaints

Academic Standards
English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)

Unit: Communication & Information Management

Students will research and conduct presentations using a variety of computer applications including Internet. Students will utilize personal information management to develop recordkeeping and communication skills. Students will organize information accurately and practice workplace communication techniques.

3.6 Information Management
Level 2: Integrate software applications and use multiple software options to create a product, document or presentation

Indicators
3.6.01 Utilize technology to maintain and monitor business records
3.6.02 Conduct research using the Internet
3.6.03 Create and utilize documents using word processors, spreadsheets, databases and electronic mail
3.6.04 Conduct oral/visual presentation using presentation software
3.6.05 Create and post a basic web page
3.6.06 Utilize personal information management/productivity applications
3.6.07 Operate geospatial technological systems (e.g., Global Positioning System [GPS], Geographical Information System [GIS])
3.6.08 Adhere to common security guidelines for technology

Academic Standards
English: Prepare writing for publication that follows an appropriate format and uses a variety of techniques to enhance the final product. (Writing Process F, 11-12)
Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)

Benchmark: 3.7 Communication Skills
Level 2: Conduct a business meeting using decision-making techniques

Indicators
3.7.01 Apply techniques to participate in/facilitate a group discussion
3.7.02 Apply active listening strategies
3.7.03 Develop and deliver formal and informal presentations
3.7.04 Articulate ideas and impact audience through verbal and nonverbal communication
3.7.05 Communicate directions in an organized manner appropriate to the audience
3.7.06 Use consensus-building techniques, including parliamentary procedure, to make decisions and compile summary of meeting minutes, conclusions, and next steps
3.7.07 Extract relevant, valid information from materials and cite sources of information
3.7.08 Develop reports and documents that organize information accurately and use formatting techniques for user friendliness
3.7.09 Select and use appropriate channel for workplace communication
3.7.10 Practice etiquette when using communication techniques

Academic Standards
English: Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)
Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)
Social Studies: Evaluate the reliability and credibility of sources. (Social Studies Skills and Methods A, 9 -10)

Unit: Business Leadership & Interpersonal Skills
Students will develop critical thinking and problem solving skills through the use of a variety of practical scenarios. Students will demonstrate leadership skills through participation with peer groups, support services, and professional organizations.

Benchmark: 3.8 Business Leadership
Level 2: Use multiple leadership concepts to change situations and enhance effectiveness in the change process

Indicators
3.8.01 Identify the purpose of leadership, the ethical dimensions of leadership and the relationship between leaders and team members
3.8.02 Identify leadership styles and traits of leaders
3.8.03 Identify the impact of individual differences and different situations on the practice of leadership
3.8.04 Assess strengths and weaknesses of leaders and team members and employ team-building techniques
3.8.05 Participate in and lead a small group with an interdependent task
3.8.06 Think critically and use problem-solving skills to analyze complex and diverse concepts
3.8.07 Use reasoning, judgment and imagination to create new possibilities in situations
3.8.08 Manage time with organizational tools and prioritize objectives, responsibilities and tasks
3.8.09 Apply conflict-resolution skills
3.8.10 Recognize/reward others for their efforts and contributions
3.8.11 Develop relationships with peer groups, support services, and professional organizations

Academic Standards
English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)

Math: Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner. (Mathematical Processes H, 8-10)

Social Studies: Critique data and information to determine the adequacy of support for conclusions. (Social Studies Skills and Methods B, 11-12)

Benchmark: 3.9 Emotional Intelligence

Level 2: Exhibit techniques to control emotional reactions to people and situations

Indicators

3.9.01 Conduct an interpersonal and intrapersonal inventory
3.9.02 Identify how individual actions impact others
3.9.03 Manage personal emotions, behavior and appearance to maintain professionalism
3.9.04 Describe and exhibit appropriate ethical behavior
3.9.05 Accept and use constructive feedback to improve work habits
3.9.06 Employ appropriate coping skills to prevent/handle workplace conflicts
3.9.07 Recognize, respect and utilize the diversity among people and cultures
3.9.08 Foster positive working relationships

Academic Standards

English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)

Social Studies: Analyze how issues may be viewed differently by various cultural groups. (People in Societies A, 11-12)